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## A Study of the Relationship between Neonatal Characteristics and Attachment Behavior in Infants at Twelve Months

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A STUDY OF THE RELATIONSHIP BETWEEN NEONATAL CHARACTERISTICS AND  
ATTACHMENT BEHAVIOR IN INFANTS AT TWELVE MONTHS

by

Janice M. Kowalski

A Thesis Submitted to the Faculty of the Graduate School  
of Loyola University of Chicago in Partial Fulfillment  
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1983

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## VITA

The author, Janice Marie Kowalski, is the daughter of Joseph G. and Helen Kowalski. She was born July 6, 1956, in Chicago, Illinois.

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## CHAPTER I

### INTRODUCTION

The contemporary view of the human infant portrays the infant as an active, stimulus seeking individual whose behaviors both modify and are modified by the environment around him/her. Such a perspective has been the result of the convergence of extensive empirical research from diverse scientific disciplines directed towards understanding the period of infancy within a larger life-span perspective. As such, the current understanding of the human infant stands in evident opposition to the traditional view which prevailed among the scientific community well into the 1960's. The traditional view suggested that the infant was the product of constitutional and/or environmental factors which shaped his/her earliest behaviors and thus directed the course of subsequent development. Consistent with this perspective, the empirical research of the first half of the 20th century attempted to delineate those factors outside the control of the infant which were believed to contribute significantly to developmental outcomes. In general, the majority of the research emphasized the unidirectional relationship between the infant and his/her subsequent development and specified constitutional and environmental variables.

However, as the research continued, the findings suggested that none of the hypotheses regarding infant development--constitutional, environmental, or interactional--had adequately described

the relationship between infant characteristics and subsequent development in a satisfactory manner. Beginning in the 1960's a gradual shift in the perception of the infant was becoming more readily evident. It was about this time that the thrust of empirical research on infant development began to examine individual differences among infants and the implications such differences held for subsequent cognitive, emotional, and physical development. In time, the traditional view of the infant was discredited and replaced by the perspective which emphasized the unique individual capacities of each child to regulate his/her interaction with the environment in order to elicit from it the stimulation necessary for physical and psychological growth.

The contemporary literature is replete with evidence suggesting the inherent adaptive capacities of the human infant to extract from the environment the developmental supplies necessary for both physical and psychological well-being. The majority of such research has focused on the dynamics of the mother-infant dyad in order to delineate those characteristics of the infant, the mother, and the system which contribute most significantly to the child's development. The mother-infant dyad has been studied rather extensively because it is within this setting that the child begins to develop his/her own unique interactional style with the environment. This occurs because the human infant is dependent upon the mother for a relatively long period of time; in other words, it is the mother who largely represents the environment to most children during the first critical

years of life. Thus, the research on infant development has utilized this circumscribed relationship to gather important data regarding those variables which significantly affect the infant's subsequent cognitive, social-emotional, and physiological growth.

The present study was designed to contribute further understanding of the relationship between early infant characteristics and subsequent developmental outcomes, particularly those related to social development and functioning. Stern (1977) suggested that the mother-infant relationship--the first social relationship--is the prototype for all subsequent social development. Thus, how the infant relates to the mother holds important implications for his/her future interpersonal dealings. However, the implications of the infant's first social relationship extend beyond the social-emotional realm as it is through the dyadic interaction that the infant learns the skills of communication, efficacy, and competence (Schaffer, 1977) necessary for optimal cognitive development. Thus, it is postulated that adequate negotiation of the mother-infant relationship will provide the child with the cognitive, social, and affective skills necessary for optimal adjustment to the environment.

With this premise in mind, it is the purpose of this study to examine the relationship between neonatal characteristics and subsequent social development at one year of age. It is hoped that the study will contribute further knowledge to the current understanding of human social development during the first year of life through the identification of salient neonatal characteristics that contribute

to the mother-infant relationship. Such knowledge holds both theoretical and practical implications for the study of infant development.

## CHAPTER II

### REVIEW OF THE RELATED LITERATURE

The systematic investigation of infant development is a relatively modern phenomenon. As Emde and Robinson (1979) observed, both the nature and the methodology of the study of the human infant has changed significantly over the course of the last two decades. Traditionally, the period of infancy was referenced within the theoretical systems of human biological and psychological development through inference rather than empirical study. Scientific questions related to aspects of infant development were often times answered through retrospective analyses of adult behavior or extrapolation from the theoretical frameworks which served to describe and explain adult behaviors. Increased interest in the human infant has developed over the last fifteen years as a result of the convergence of scientific inquiry into the area of human development. The culmination of this research has been the growing acceptance of an integrative, organizational view of human development (Brody & Axelrod, 1970; Emde, Gaensbaurer, & Harmon, 1976; Emde & Robinson, 1979). Within such a model, the organization of development refers to the nature of the developmental process, particularly in terms of the ways in which behaviors are hierarchically organized into more complex patterns within developmental systems, the way in which behaviors and functions evolve from earlier and more primitive prototypes, and the way in

which complementary behaviors and functions are integrated into the overall behavioral repertoire of the individual (Escalona, 1968; Sroufe, 1979; Werner & Kaplan, 1964). In addition, such a perspective emphasizes the relationships among physiological, social, cognitive, and affective systems, assuming that developmental regressions, progressions, and lags in a single behavioral system affect development in the other systems as well (Brody & Axelrod, 1970; Sroufe, 1979). Development is thus seen as progressing along prescribed lines, with behavior advancing from primarily physiological control to greater psychological control by the individual.

Within an organizational model of development, the period of human infancy takes on greater significance in the understanding of subsequent development across all spheres. The contemporary view of the human infant portrays him/her as an active participant in the structuring of his/her social environment. There is a dynamic interaction between the infant, who attempts to organize and structure his/her world, and the environment, which in turn, acts to modify the behavior of the infant. Both the individual and the environment change as a result of the mutual adaptation and transaction that occurs over time (Sameroff & Chandler, 1975). Within the context of this model, it is obvious that the quality of the interaction will vary both as a function of individual characteristics of the caretaker and the infant. Although psychologists have long acknowledged the existence of individual differences in caretaking, it is only recently that differences in the behavioral capabilities of the infant have

been noted. Important individual differences in infant behavior include activity level, reactivity, and the ability to settle oneself or be settled (Brazelton, 1961; Escalona, 1968; Thomas, Chess, & Birch, 1968). Wide individual differences in sleep-wake cycles, crying time, and sensory thresholds have been reported (Brackbill, 1975; Osofsky & Danzger, 1974; Wolff, 1966). Korner (1971) suggested that such differences among infants hold profound direct and indirect implications for the subsequent organization of behavioral systems as a result of the interaction with environmental experiences. In order to examine the relationship between early infant differences and subsequent development, it would be useful to discuss the infant's initial behavioral capabilities and methods of assessing these abilities. Following this discussion, it would be equally useful to examine the mother-infant relationship as the focal setting of the infant's interaction with the environment around him/her.

#### Neonatal Behavioral Organization and Its Assessment

Research (Korner, 1971; Precht1, 1963; Sroufe, 1979) indicates that the infant's behavior from birth is characterized by endogeneous control, organization, and rhythmicity. Such factors as temperament, state, and physiological regulation are the primary forces during the first months of life as the thrust of development is maturational in nature. In fact, some investigators (Mahler, Pine, & Bergman, 1975; Sander, 1962, 1974) suggest that the first adaptive task of infancy is the establishment of regularity in physiological cycles. Brazelton (1972) has reported that during the first month of life the "healthy and well-mothered" infant appears to achieve control over the basic

physiological demands such as heart rate, respiration, temperature, color changes, and tremulousness. The establishment of modulated control over these functions attenuates the physiological burdens placed upon the infant as well as allows the child more control over his/her alert state. Within this context, Als (1970) has delineated the tasks of infancy, beginning with autonomous regulation of physiologic and motoric homeostasis and progressing to the modulated autonomous regulation of simultaneous object play and play dialogue, suggesting that the "fueling drive" for this hierarchical process comes from the individual and is a function of genetic endowment common to all humans. Individual differences, occurring as early as birth, may impede the smooth progression along the various stages of this process, thus holding profound implications for developmental outcomes.

These findings offer evidence demonstrating the fact that early infant behavior is heavily influenced by the physiological contexts in which it occurs. Because of the documented differences among infants in their ability to regulate basic physiological processes necessary for appropriate developmental maturation, and the significant implications such differences hold for subsequent development, recent attention has been focused upon the study of the neonate's entering repertoire of behavioral functions and capabilities, including neurological and physiological integrity.

The neonatal period, which extends from birth until the 28th day of life, is a period during which a number of important physiological adjustments necessary for extrauterine life occur. Contemporary research in the area of infancy has shifted towards delineating the



capabilities of the neonate and investigating the possible role of both antecedent and consequent events in subsequent behavioral development (Appleton, Clifton, & Goldberg, 1975; Stone, Smith, & Murphy, 1973). As a result, there has been a progression in the development of neonatal assessment measures which allow for a richer and much more complex evaluation of the newborn's structural, functional, and behavioral capabilities.

At the present time, there are a variety of neonatal assessment procedures utilized in both clinical practice and infant research. Speaking in general terms, current neonatal measures fall into one of three categories--screening tests, neurological examinations, and behavioral assessment techniques. These broad categories of assessments vary in both purpose and methodology, and thus often times yield neither comparable nor complementary results. Screening tests, for example, are generally designed to provide a quick and relatively simple means of differentiating normal infants from exceptional ones on the basis of specified criteria. Examples of popular neonatal screening measures in current use are the Apgar Scoring System (Apgar, 1953) and the Denver Developmental Screening Test (1967). On the other hand, neurological examinations provide for a more comprehensive evaluation of the neonata, yielding a diagnosis, typically regarding the maturity and the functioning of the infant's central nervous system. Widely employed neurological measures include the Assessment of Gestational Age (Dubowitz, Dubowitz, & Goldberg, 1970), The Neurological Examination of the Full-Term Newborn Infant (Prechtl &

Beintema, 1964), and the Newborn Neurological Examination (Parmelee, 1974). The final category of neonatal assessment measures, behavioral assessment techniques, tend to be more varied in purpose and design than either the screening tests or the neurological examinations, and thus sample more extensively the newborn's repertoire of behavioral capacities. Representative of this sort of assessment instrument are the Bayley Scales of Infant Development (Bayley, 1969), the Gesell Developmental Schedules (Knobloch & Pasamanick, 1974), the Graham-Rosenblith Test (Rosenblith, 1974), and the Brazelton Neonatal Behavior Assessment Scale (Brazelton, 1973).

Als, Tronick, Lester, and Brazelton (1979), in a review of current neonatal assessment instruments, suggested that many of the measures utilized, while effective in the evaluation of gross central nervous system abnormalities and specification of psychophysiological malfunctions, are not effective in the detection of milder CNS dysfunction during the neonatal period and do not discriminate among temperamental variations in behavior which are believed related to differential environmental responses. The authors suggest that such limitations found within current assessment measures may be attributed to the conceptualizations that underlie these examinations. In general, the vast majority of pediatric and neurological evaluations of the neonate emphasize the detection of pathology and rely on the newborn's response to reflex stimulation and aversive stimuli. Such assessment measures are based on the assumption that all newborn behavior is regulated by the lower brain stem and therefore only

examine reflex behavior as representative of adequate functioning. In doing this, the neonate's capacity to orient and respond to positive stimulation is often overlooked. Valuable information relevant to the evaluation of the newborn's capacity to organize his/her behavior in a purposeful and goal-oriented fashion is not considered. Als et al. (1979) postulate that it is this very sort of information about the neonate's organizational abilities that is of the greatest importance in understanding subsequent development.

To counteract the emphasis placed upon negative behavioral response and organization found among many of the current neonatal assessment techniques, the Brazelton Neonatal Behavioral Assessment Scale (BNBAS) was developed. Extrapolating from and extending beyond the Graham/Rosenblith Behavioral Examination of the Neonata (Rosenblith, 1959), the BNBAS is based upon the conceptualization of the infant as a complexly organized creature, adapted to defending himself/herself from negative stimuli, and controlling interfering motor and autonomic responses in order to attend to important external stimuli. Brazelton (1973) suggests that the infant adapts to the environment in order to interact with it and elicit from it the stimulation necessary for his/her species-specific motor, emotional, and cognitive development. In order to evaluate the neonate's behavioral capacities necessary for these tasks, the BNBAS combines a series of elicited behaviors from diverse situations in an attempt to recapitulate experiences typical of subsequent interactive situations. One of the major innovations found in the BNBAS is that the examination attempts

to assess the infant's optimal performance across behavioral dimensions. This "optimal" performance is obtained through the use of multiple trials and flexibility of item administration. The completed examination does not yield an overall behavioral quotient or total score. It is not individual items, but patterns of item scores, which are taken into consideration in deciding "normal" or "at risk" status.

Because there is no overall total score for the BNBAS, one of the recurrent difficulties with its employment in infant research has been the lack of uniformity in the statistical properties of the items and subscales. As a result, a number of different types of analyses have been undertaken. These can be grouped in four categories which include item-by-item comparisons, summary scales and subscales, factor analyses, and typological and profile analysis. Als et al. (1979), in their review of the BNBAS, strongly recommended that the test data be organized along four a priori clusters which utilize all information gathered from the evaluation. These four specified dimensions are (I) Interactive Processes, (II) Motoric Processes, (III) Organization Processes-State Control, and (IV) Organization Processes-Physiological Response to Stress. This approach allows for the comparison of individual infants and groups of infants on the cluster scores for each dimension.

Although theoretical construction of an assessment instrument is of extreme importance in the understanding of the test results, the predictive validity of the measure, especially when employed with newborn infants, often takes on greater significance. The BNBAS is no exception. Research, although still somewhat limited to date, has

been done in order to evaluate how well the BNBAS predicts subsequent functioning. Several studies have been reported that have examined the relationship between BNBAS performance and later functioning during the course of the first year of life. Bakow, Sameroff, Kelly, and Zax (1973) reported that alertness, motor maturity, tremulous, habituation, and self-soothing behavior, as measured by the BNBAS shortly after birth, correlated significantly with infant temperament at four months. Powell (1974) reported that summary scales of head control and responsivity correlated with performance on the Bayley behavior record at four months, while the responsivity dimension correlated with both the Bayley motor score and the behavior record at six months of age. Finally, Scarr and Williams (1971) found, in a one year follow-up study, that the reactivity dimension of the BNBAS yielded a small but significant correlation with infant performance on the Cattell Infant Intelligence Scale. The authors suggested that the BNBAS's ability to assess behavioral responsivity and organization were focal factors in the prediction of developmental status at one year of age. However, despite the positive trends cited in the aforementioned studies, meager attention has been directed towards the assessment of the BNBAS's ability to predict the infant's subsequent cognitive and social-emotional development. Rather, a great majority of the research (Als et al., 1979) has examined the relationship between BNBAS performance and a variety of prenatal and perinatal factors. As a result, more research evaluating the relationship between BNBAS performance and subsequent cognitive and social-emotional development beyond the neonatal period must be undertaken before more

definitive conclusions regarding the examination's predictive validity may be drawn.

### The Mother-Infant Relationship

The literature on infant development provides ample documentation of the infant's extensive behavioral functions and capabilities. However, because of the infant's relative state of dependence upon his/her primary caretaker, the relevance of these factors are seldom studied as isolated phenomena. Rather, the infant and his/her behavioral capabilities and organizational processes are examined within the contexts of the primary caretaker (usually mother)-infant relationship. Traditionally, research on the dyadic relationship emphasized the caretaker's role in nurturing and shaping the infant's behaviors. Interaction was viewed as essentially unidimensional, going from the mother to the infant. In sharp contrast, the emergent research trend today emphasizes both sides of the interactional system simultaneously. Within this perspective each partner is regarded as having separate competencies which affect the other and thus the dyad is characterized by mutual adaptation. Isolated behaviors of either the mother or the infant are no longer the focus of study; rather, behaviors emanating from either partner of the dyad are evaluated in terms of their effects on the other partner and the system as a whole. It appears that the trend of contemporary infant research has been directed towards delineating those behaviors of both the primary caretaker and the infant which contribute most significantly to the development of the dyadic system and its functioning.

One of the most widely employed constructs for the examination

of the dynamics of the mother-infant interaction has been the attachment model (Bowlby, 1958, 1969). Since Bowlby's original work in 1958, there has been a significant amount of research directed towards the areas of mother-infant attachment, mother-infant interaction, and early social development. Some of the research has extended and complemented Bowlby's evolutionary-ethological perspective (Ainsworth, 1969, 1972, 1978; Sroufe & Waters, 1977) while other findings (Cairns, 1972; Maccoby & Masters, 1970) have attempted to assimilate attachment theory into other developmental paradigms.

Attachment is defined as the enduring affective tie between the infant and his/her primary caretaker (Ainsworth, 1978; Bowlby, 1969). Attachment theory, as originally developed by Bowlby, resulted from the convergence of several important trends within the biological and social sciences, notably psychoanalytic theory, ethology, and psychobiology. Originally, attachment was seen as the establishment and maintenance of proximity between the mother and the infant (Bowlby, 1969). The affective tie between the infant and his/her mother was believed to originate from the biological function of protecting the young and involved a species-specific pattern of social behavior. More recently, Sroufe and Waters (1977) have suggested that the function of the mother-infant attachment should be viewed as "felt" security by the infant that facilitates exploration of the environment as well as the sense of safety from environmental dangers. Attachment between mother and infant is mediated by three forms of behavior: (1) orientation behavior, such as tracking the mother visually and auditorially; (2) signaling behavior, such as crying, smiling,

calling, and reaching, which brings the mother to the infant; and (3) approach behavior, such as seeking, clinging, and sucking, which brings the child to the mother. These behaviors are species-specific and are organized into four phases which comprise the developmental sequence of attachment.

The first phase of the attachment process between mother and infant lasts from birth until three months of age. During this phase, attachment consists primarily of the infant orienting and signaling with little differentiation of the mother from other individuals found within the environment. Such behaviors as crying, visual tracking, smiling, reaching, and vocalizing are rooted in the biological nature of the infant and serve to regulate amount and nature of required caretaking. During Phase II, the infant begins to discriminate the mother-figure from other people and directs orientation and signaling behaviors primarily towards her. This phase generally lasts until the infant is six or seven months of age. In Phase III, the infant incorporates locomotion into his/her behaviors in order to maintain proximity to the mother. It is at this time that the child begins to follow the mother around, responds to her departures and returns, and employs her as a secure base for venturing out into the environment. The infant's initial period of fear of strangers (stranger anxiety), which occurs at the onset of this phase, gradually subsides and disappears. The infant also begins to exhibit simple goal-directed behaviors in order to maintain proximity to the mother. Such behaviors typically involve the child's active attempts to adjust his/her behaviors to those of the mother in order to both maintain closeness



and evoke positive interaction. Bowlby sees this behavioral capacity as the highest form of attachment. It is not until the fourth phase of this developmental process that the goal-corrected character of the process is fully established. Bowlby suggests that this phase lasts throughout childhood and consists of the process by which the child gradually adopts more and more highly abstract ways of expressing goal-directed attachment to significant individuals in his/her world.

The contemporary perspective of attachment emphasizes it as an organizational construct (Ainsworth, 1974; Bowlby, 1969; Sroufe, 1979). As such, it refers to an organized behavioral system that characterizes the affective bond between the infant and the caretaker. Such a model suggests that it is the pattern of behavioral organization or the quality of attachment that endures between the members of the dyad, while the discrete behaviors observed between the infant and the mother vary over time. However, the quality of attachment at any particular developmental level may be inferred from patterns of behavior that the child exhibits (Ainsworth et al., 1978). Research (Sroufe, 1979) supports this view in that while the frequencies or durations of individual behaviors have not been found to be consistent over development, patterns of attachment illustrating affective bonding and security of attachment have been consistently assessed (Ainsworth, 1979).

Contemporary research on attachment behavior between the infant and his/her primary caretaker emphasizes the ethological perspective of Bowlby and Ainsworth. Within this model, focal importance has been given to the examination of attachment in terms of the secure-insecure

dimension. Security of attachment denotes the relative balance between the attachment (proximity and comfort-seeking) and exploratory behavioral systems (Ainsworth et al., 1978; Sroufe & Waters, 1977). The child's ability to appropriately move towards the away from his/her primary caretaker is implicit in the security of attachment construct of adaptive behavior. By the end of the first year of life, the adaptive secure infant-adult attachment relationship emerges and is characterized by the infant's confidence in the availability and responsiveness of one or a few select adults as a secure base from which to explore the environment.

In this view, the security of attachment relationship is determined by observing the infant-caretaker interaction and is assessed through examination of: (1) the extent to which stress promotes a shift from predominant exploratory to predominant attachment behavior, and (2) the extent to which the infant uses his/her caretaker as a secure base from which to explore the environment. Employing the security of attachment construct for the description of the mother-infant relationship, patterns of adaptive and maladaptive attachment have been reliably assessed in infants twelve months of age through the use of a laboratory procedure known as the "Strange Situation" (Ainsworth, 1973, 1979). The Strange Situation takes the infant through eight episodes in an unfamiliar room with toys, a stranger, and two brief separations and reunions with the mother. Based upon the infant's responses to the toys, the room, the stranger, and the mother's departures and returns, individual differences among infants' quality of attachment to their mothers may be inferred.

Ainsworth (1973, 1979) reported that the Strange Situation has adequately differentiated infants in terms of the quality of attachment behavior exhibited towards their mothers. Subsequent research (Easterbrooks & Lamb, 1979; Londerville & Main, 1980; Pastor, 1981) supports this contention. To summarize the literature briefly, current research indicates that infants who explore the environment and toys during the pre-separation episodes of the Strange Situation and who greet and/or seek to establish contact with their mothers during the reunion episodes are classified as having a secure attachment. These infants, labeled type B, are viewed as exhibiting the most adaptive patterns of behavior for the situation. Feiring (1983) suggested that these infants have developed confidence in the responsiveness and availability of their caretakers and have generalized these positive feelings to the larger social environment. Possessing this confidence, the infants are free to independently explore the world around them. In addition, the research (Matas, Arend, & Sroufe, 1978; Waters, Wippman, & Sroufe, 1979) indicates that the securely attached infant is more likely to exhibit competent and autonomous behavior as a child than his/her insecure counterparts. Peer competence, ego strength, and cognitive performance have also been related to early security of attachment (Feiring, 1983).

Two other groups of infants have also been identified by assessment of their behaviors in the Strange Situation. Although these two groups differ greatly in terms of the infants' reactions to their mothers during the laboratory procedure, Ainsworth (1973) has described both the patterns as maladaptive in nature. One group of

infants, labeled group C, often appear to have an anxious-resistant attachment to their mothers. These infants are perceived as markedly ambivalent in their reaction to their mothers, exhibiting both strong contact-seeking behaviors as well as contact-resisting and angry behaviors to them during the procedure. They typically do not engage in extensive exploration of the environment during the pre-separation episode, often appearing frightened or discomforted by the novel surroundings. Type C infants are distressed by the maternal separation and demand contact upon her return. However, this contact is frequently not comforting for the infant, and an angry rebuff may follow the intense efforts of the infant for physical reunion. Similar angry resistant behavior is exhibited towards the stranger. Pastor (1981) has reported that infants assessed as Type C at 18 months of age were later found to be negative and responsive to both mother and peers at 22 months of age.

A third group of infants whose attachment relationship with the mother is characterized by avoidance has been identified and are known as group A. Type A infants exhibit marked avoidance of proximity to or interaction with their mothers in reunion episodes. Although these infants experience physiological reactions to placement in a novel environment and separation from the mother (Sroufe & Waters, 1977), they do not express the feelings. Rather, it appears that such infants "displace" the aversive physiological sensations and psychological experience of anxiety through increased activity, often solitary in nature (Ainsworth et al., 1978). As with the group C infants, group A infants are perceived as less competent in affective

and cognitive spheres than group B infants (Pastor, 1981).

In light of the research findings previously summarized, it appears logical to suggest that the quality of the infant's attachment to his/her primary caretaker (usually the mother), as measured by the Strange Situation, serves as the foundation for the child's subsequent social development. Consistent with the organizational model of development, the conclusion may be drawn that early social relationships (i.e., mother and infant) serve as the prototype for subsequent social and affective bonding. The infant who has developed a secure attachment relationship with his/her primary caretaker should be able to transfer his/her trust in the caretakers and the expectation that others will be responsive to his/her needs and signals to the larger social environment encountered. Limited research carried out in this area (Arend, Gove, & Sroufe, 1979; Sroufe, 1978) have yielded results which suggest that there are predictable developmental consequences in both affective and cognitive spheres associated with the quality of infant attachment to his/her primary caretaker exhibited as early as twelve months of age.

In summary, the current literature on human development suggests the increasing acceptance of an organizational model of development for both the description and explanation of the developmental progression from birth throughout the course of life. Within such a theoretical framework, the period of infancy takes on greater significance in the understanding of subsequent development across all spheres of development. However, it appears that while the organizational model of development is theoretically appealing and widely employed to

understand developmental phenomena, empirical research supporting the model is lacking. In particular, research directed towards specifying the relationship between neonatal and infant behavioral characteristics and subsequent cognitive and social development is scarce. One of the factors underlying this dearth of empirical study is the lack of valid neonatal assessment measures designed to assess behavioral capacities which appear related to subsequent development. To remedy this situation, the Brazelton Neonatal Behavioral Assessment Scale was designed with the intent to assess the neonate's behavioral competencies at birth. Research indicates that the BNBAS has proved its utility as a discriminating measure of normal and "at risk" infants; however, little attention has been directed towards determining the instrument's predictive ability. Therefore, more research is needed in order to verify the BNBAS's ability to predict the infant's subsequent development in those areas which the instrument purports to measure--that is, interactive, motoric, and physiological processes. Brazelton (1973) has suggested that the infant's performance on these dimensions, as assessed by the BNBAS, is highly correlated with subsequent cognitive and social-emotional development. It would appear most useful then that one thrust of contemporary research examine the relationship between neonatal performance on the BNBAS and cognitive and social-emotional development in infancy and early childhood.

#### Statement of Problem and Hypotheses

Given the level of sophistication of current neonatal assessment measures and the increasing interest in understanding the role of early infant development within a life-span developmental model, it

appears logical to hypothesize that there exists a relationship between neonatal behaviors and subsequent development. However, it is difficult to isolate individual variables, such as intellectual performance or affective style, readily and reliably in an infant one year of age. This difficulty arises from the fact that the young infant does not exist as a fully functioning individual at this time. Rather, he/she is part of the infant-adult dyad. Within this dyad, the infant acts in tandem with the primary caretaker, continually modifying and being modified by the dynamic interaction which occurs. This interactional process is one which demands the infant's control over his/her psychophysiological systems. It is on the basis of a well-modulated state organization that the infant can negotiate and regulate a wide array of social interactional skills. This suggests that the infant, who at the age of twelve months exhibits age appropriate social skills and development, has successfully regulated primary physiological processes in order to attend to his/her immediate environment and extract from it the stimulation necessary for development. Sroufe and Waters (1977) suggest that attachment may be a key construct in the organization of infant development as it is a consequence of the infant's cognitive, social, and affective growth during the first months of life.

The current study proposed to examine the contribution of a number of neonatal characteristics to the formation and development of the infant-caretaker relationship. It was not the intention of the study to overlook the reciprocal nature of this first social relationship. Rather, it hoped to contribute further knowledge to the contemporary understanding of the mechanisms underlying the infant-

caretaker relationship by delineating those infant characteristics which appear to be most important in the formation and development of this relationship. The primary dimensions under consideration were those which assessed the physiological and neurological functioning of the neonate, with particular attention given to those behaviors which serve as the basis for the infant's interaction with his/her caretaker and the immediate environment. The general hypothesis was that the infant whose physiological and neurological functioning falls within normal limits--in other words, the "average" health infant--is more likely to exhibit those behaviors which facilitate the development of the infant-caretaker social bond. A group of healthy full-term infants were studied in order to determine the relationship between neonatal levels of behavioral organization and subsequent attachment behavior at twelve months of age. Only healthy full-term infants were included in the sample in order to minimize individual differences that might merely reflect prenatal or postnatal complications. In addition, the neonatal measures were taken on each infant when he/she was between two and four days of age in order to minimize differences which might result from differential maternal handling. The Brazelton Neonatal Behavioral Assessment Scale (BNBAS) was employed to measure neonatal neurological and behavioral functioning. Infant responses on this measure yielded four dimensions of functioning--interactive processes, motoric process, state organization, and physiological response to stress--examined in this study. The first hypothesis stated that there would be a positive correlation between the neonate's performance score on each of the four dimensions of the



BNBAS and quality of attachment to his/her mother at twelve months of age. In particular, it was hypothesized that Dimension I (interactive processes) would yield the strongest correlation with subsequent attachment behavior. Secondly, it was hypothesized that infants demonstrating greater physiological and neurological integrity (defined as a score of 1 or 2 on the two or more of the specified dimensions) would be most likely to exhibit qualitatively better patterns of attachment behavior.

## CHAPTER III

### METHOD

#### Subjects

A total of twelve healthy, full-term infants were included in this study. All of the infants, six females and six males, were part of a larger sample involved in a longitudinal research project on infant development conducted jointly by Loyola University of Chicago and the Evanston Hospital. The infants selected for this study were chosen from the newborn nursery at the Evanston Hospital. They were all from middle-class intact families and had received proper prenatal care. All of the infants were first borns of appropriate birth weight for their gestational age, with 5 minute Apgar scores of 8 or higher. Medical evaluations completed subsequent to delivery yielded a diagnosis of healthy full-term infant for each infant involved in the study. (See Table 1 for characteristics of the infant sample.)

#### Materials

The Brazelton Neonatal Behavioral Assessment Scale (BNBAS) was employed as the assessment measure of the neonate's neurological, physiological, and behavioral organization following the birth process. The neonate's neurological functioning is assessed through 20 reflex items, such as rooting, sucking, and grasping behaviors. Each reflex is scored on a 4-point scale, from 0-3. The average healthy full-term infant will receive a score of 2 on these items.

Table 1  
 Characteristics of the Infant Sample

Sex			
Male	6		
Female	6		
		<u>M</u>	<u>SD</u>
Birth Weight (grams)		3478.33	403.96
Gestational Age (weeks)		40.50	.91
Length of Hospitalization (days)		3.50	1.31
Postnatal Complication Scores <sup>a</sup>		116.00	30.20
Obstretic Complication Scores <sup>a</sup>		155.33	16.17

<sup>a</sup>High scores represent fewer medical complications.

On the reflex items, lower scores are indicative of better performance by the infant. Two global measures, attractiveness and need for stimulation, summarize the infant's overall organization and are rated on a 4-point scale. On these items, a higher score indicates better performance. These two items assess the neonate's ability to extract from the environment the necessary stimulation required for appropriate developmental growth. Two other individual items on the BNBAS are of particular importance in understanding the neonate's performance on the examination. The first of these, interfering variables, gives an indication of the extraneous environmental stimulation which may adversely affect performance. As such, this measure gives an indirect estimate of the neonate's capacity to shut out interfering stimuli and direct his/her attention to relevant stimuli in the environment. The second item, activities used to quiet self, assesses the neonate's capacity to employ self-soothing behaviors to regulate internal stress. Finally, the major portion of the examination, comprised of 26 behavioral items, assesses the neonate's capacity to interact with the environment. These items are scored on a 9 point scale. (See Appendix A for a standardized copy of the BNBAS.) Test items are then analyzed by means of item-to-item comparisons, summary scales, factor analysis, or typological analysis.

The quality of infant attachment behavior to his/her mother at twelve months of age was assessed through the Strange Situation (Ainsworth et al., 1978). This research paradigm was designed to assess individual differences in the quality of infant's attachment to his/her primary caretaker by observation of the infant's progression

through eight episodes involving a new environment, a stranger, and two brief separations from and reunions with the caretaker. (See Appendix B for a complete description of the eight episodes comprising the Strange Situation.) During this sequence, the infant's behaviors are coded for locomotion, body movement, hand movement, posture, visual regard, crying, vocalization, location, and smiling. These coded data yield a descriptive classification of the quality of the infant's attachment to the caretaker. There are three primary classifications of attachment behavior derived from the observational data --Secure, Avoidant, and Ambivalent. Subsumed under each major category are a number of subgroup classifications to encompass the more subtle behavioral variation within each larger category of attachment behavior. In qualitative terms, the Secure attachment classification is considered the most adaptive interactive pattern for the infant and his/her caretaker. The other two classifications denote insecure or maladaptive patterns of attachment behavior. (See Appendix C for a more detailed discussion of the classifications derived from the analysis of the Strange Situation.)

#### Procedure

The BNBAS was administered to all of the infants in this study within 48 hours of their discharge from the hospital. It was administered by one of two psychologists trained in its administration in a room adjoining the newborn nursery approximately midway between feedings. The examination was subsequently scored by the examiner into the four a priori clusters described by Als et al. (1979):

Dimension I (Interactive Processes) - These items assess the newborn's capacity to attend to and process simple and complex environmental events.

Dimension II (Motoric Processes) - These items assess the neonate's capacity to maintain adequate muscle tone, control motor behaviors, and perform integrated motor activities.

Dimension III (Organization Processes - State Control) - This dimension assesses the neonate's ability to maintain a calm, alert state despite increased stimulation, how much exhaustion enters into the picture of state modulation, how much control the environment exerts over the child, and how vulnerable he/she is to continued stimulation.

Dimension IV (Organization Processes - Physiological Response to Stress) - This dimension assesses how well the neonate's capacity to recover from the physiological demands of the birth process has developed so that he/she can attend to relevant stimulation in the environment.

These dimensions are divided into typologies which indicate the quality of the infant's performance along the dimension being scored. Dimensions I, II, and III are divided into three typologies: (1) exceptionally good performance, (2) adequate performance, and (3) deficient performance. Dimension IV is divided into two typologies: (1) adequate performance and (2) deficient performance. This particular method of scoring was chosen for this study because it allows for the utilization of all of the data obtained from the BNBAS in the determination of the four dimension performance scores. In addition, the employment of the four dimensions scores allows for a descriptive classification of the infant's performance on each of the dimensions which can then be compared to the performance scores of other infants. (See Appendix D for a more detailed description of the a priori clustering method and the individual items comprising the four resulting dimensions.)

In addition, a number of descriptive measures were obtained for each infant. These included birth weight, gestational age, as determined by the Dubowitz Assessment (Dubowitz et al., 1970), and the Obstetric Complication Scale and Postnatal Complication Scale scores developed by Littman and Parmelee (1970).

Approximately twelve months after the infant's birth, each mother-infant pair was contacted for a follow-up visit conducted at the Evanston Hospital. At this time, a video-tape recording of the Strange Situation was obtained on each of the pairs. Each of the recordings was subsequently scored according to the Ainsworth et al.'s (1978) method of analysis. According to this procedure, the tapes were scored to obtain both a primary classification (Secure, Avoidant, or Ambivalent) of the infant's quality of attachment to his/her mother, as well as the appropriate subgroup classification. In addition, each of the eight episodes were rated for the frequency and quality of the following behaviors: proximity and contact seeking, contact maintaining, resistant, avoidant, search, and distance interaction behaviors. Interjudge reliability was calculated for the primary attachment classification, subgroup classification, and quality of the six behavioral patterns examined in each of the eight episodes comprising the Strange Situation.

## CHAPTER IV

### RESULTS

Because of the limited size of the infant sample employed in the current study, a detailed description of the subjects' performances on both the BNBAS and the Strange Situation will be given. Such a description will contribute to the understanding of the research findings and the implications these findings hold for further study of the mother-infant social relationship.

The first set of variables examined in the present study were the infants' performance scores on each of the four dimensions of the BNBAS. Each of these dimensions were evaluated independently because the BNBAS does not yield a single culminative score. Out of the twelve infants included in the sample, a total of six infants (50%) obtained an optimal score of 1 on Dimension I (Interactive Processes). Two infants (17%) obtained an average score of 2 on this dimension, while four infants (33%) obtained a worrisome score of 3. On Dimension II (Motoric Processes), only two infants (17%) received an optimal score of 1, while eight infants received the average score of 2. The remaining two infants (17%) obtained a worrisome score of 3 on this dimension. Five of the twelve infants (42%) obtained an optimal score on Dimension III (Organization Processes-State Control). The remaining seven infants (58%) obtained the average score of 2. On Dimension IV (Organization Processes-Physiological Response to



Stress) all of the infants (100%) obtained the optimal score of 1. Table 2 reports the group performance means and standard deviations for all of the dimensions of the BNBAS under consideration in this study.

The second variable examined in the present study was the quality of the infant's attachment to his/her mother at the age of twelve months. Of the twelve infants studied, one of the infants (8%) was classified as Avoidant (group A), nine (75%) were classified as Securely Attached (group B), and two (17%) were classified as Ambivalent (group C). Given the small sample size and the limited variability among both primary group classification and subgroup classification, the quality of attachment variable was collapsed into two groupings--Securely Attached and Insecurely Attached. Infants who were classified as Security Attached (group B) continued to be classified as Securely Attached. Infants who were classified either as Avoidant (group A) or Ambivalent (group C) according to the Ainsworth et al.'s (1978) method of categorization were reclassified as Insecurely Attached in this system.

#### Chi Square Analyses

Because all of the infants comprising this sample obtained an optimal score of 1 on Dimension IV of the BNBAS, no analyses were conducted on this dimension. The relationship between the remaining three dimensions and the quality of infant attachment to his/her mother were analyzed by Chi Square analyses.

An analysis of the relationship between infant performance on Dimension I (Interactive Processes) and the quality of infant

Table 2  
Means and Standard Deviations of Dimension  
Scores for Infants on the BNBAS

	$\bar{X}$	<u>SD</u>
Dimension 1	1.83	0.27
Dimension 2	2.00	.17
Dimension 3	1.58	.15
Dimension 4	1.00	0.00

For each dimension score, a score of 1.00 indicates optimal performance; 2.00 indicates average performance; and 3.00 indicates worrisome performance.

attachment to his/her mother at twelve months of age was not significant,  $\chi^2(2) = 4.00$ ,  $p = .13$ . Table 3 reports the contingency table depicting the relationship between the two variables.

An analysis of the relationship between infant performance on Dimension II (Motoric Processes) and the quality of infant attachment at twelve months was not significant,  $\chi^2(2) = 2.00$ ,  $p = .36$ . Table 4 reports the contingency table between these two variables.

An analysis of the relationship between infant performance on Dimension III (Organization Processes--State Control) and quality of infant attachment at one year of age was not significant,  $\chi^2(1) = .64$ . Table 5 reports the contingency table depicting the relationship between these two variables.

In summary, the hypothesis that there would be a significant correlation between the neonate's performance on each of the four dimensions of the BNBAS and the quality of attachment to the mother at twelve months of age was not supported by this study. However, it is important to note that there was a positive trend, approaching significance, which suggested that while performance on Dimension I was independent of quality of attachment for Securely Attached Infants, this was not the case for those infants classified as Insecurely Attached. It is important to note that all three (100%) of the infants classified as Insecurely Attached obtained the optimal score of 1 on Dimension I, whereas only 33% of those infants classified as Securely Attached obtained the optimal score. This apparently paradoxical finding--that infants possessing superior abilities to interact with the environment should exhibit maladaptive patterns of

Table 3  
Relationship Between Dimension I and Quality of  
Infant Attachment at Twelve Months

Quality of Attachment	Dimension I		
	1	2	3
Insecure	3	0	0
Secure	3	2	4

$$\chi^2 (2) = 4.00, p = .13$$

Table 4  
Relationship Between Dimension II and Quality of  
Infant Attachment at Twelve Months

Quality of Attachment	Dimension II		
	1	2	3
Insecure	0	3	0
Secure	2	5	2

$$\chi^2(1) = 2.00, p = .36$$

Table 5  
Relationship Between Dimension III and Quality of  
Infant Attachment at Twelve Months

Quality of Attachment	Dimension III		
	1	2	3
Insecure	1	2	0
Secure	4	5	0

$$\chi^2(1) = .636$$

attachment towards their mothers at twelve months of age--is contrary to the original hypothesis and must therefore be examined in order to understand more fully the implications of the finding.

### Regression Analyses

Simple regression analyses were computed, with quality of infant attachment to his/her mother as the criterion variable. Dimensions I, II, and III of the BNBAS were employed as independent predictor variables.

Analyses of the quality of infant attachment revealed that none of the three BNBAS dimensions under study made a significant independent contribution to the variance. However, there was a clear trend for performance on Dimension I (Interactive Processes) of the BNBAS and the quality of infant attachment at twelve months of age. In this analysis, Dimension I accounted for 28% of the variance,  $F(1,10) = 4.03$ ,  $p = .07$ .

Stepwise multiple regression analyses were also computed, with quality of infant attachment as the criterion variable. In addition to Dimensions I, II, and III of the BNBAS, gestational age at birth, birth weight, sex, length of hospitalization, Obstetric Complications Scale scores, and Postnatal Complications Scale scores were used as independent predictor variables in the regressions. The analyses revealed that none of the predictor variables contributed significantly to the quality of infant attachment to his/her mother at twelve months of age.

In sum, the hypothesis that infants demonstrating greater physiological and neurological integrity at birth would exhibit

qualitatively better patterns of attachment behavior was not supported by the findings. In fact, there was a suggestion that the reverse may be true.



## CHAPTER V

### DISCUSSION

The purpose of the current study was to examine the contribution of a number of neonatal characteristics to the formation and development of the infant-caretaker relationship. Its goal was to contribute further knowledge to the contemporary understanding of the mechanism underlying this relationship by delineating those neonatal characteristics that appear to be most important in the formation and development of this bond. Basic to the rationale of this study was the assumption that the mother-infant relationship--the first social relationship--is the prototype for the infant's social development. In addition, the implications of this relationship extend beyond the social-emotional realm and affect the infant's development in all areas. It is through the successful negotiation of this relationship that the child develops the necessary cognitive, social, and affective skills required for successful adaptation to the environment.

A total of twelve healthy full-term infants were examined in order to assess the physiological and neurological characteristics, as measured by the BNBAS, that appeared to make the most salient contribution towards the development of an adaptive attachment between infant and his/her mother, as measured by the Strange Situation. The initial hypothesis stated that there would be a positive correlation between the neonate's performance score on each of the four dimensions

of the BNBAS and the quality of infant attachment at twelve months. In particular, it was hypothesized that Dimension I (Interactive Processes) would yield the strongest correlation with subsequent attachment behavior. Secondly, it was hypothesized that infants demonstrating greater physiological and neurological integrity on the BNBAS would be most likely to exhibit qualitatively better patterns of attachment.

Abiding with statistical convention which sets  $p < .05$ , the results indicate that neither of the hypotheses specifying a positive relationship between neonatal levels of behavioral organization and subsequent attachment is supported. However, in both Chi-Square and simple regression analyses of the relationship between Dimension I of the BNBAS and quality of infant attachment, clear trends emerged. The Chi Square analysis indicated that while infant performance on Dimension I was independent of quality of attachment for Securely Attached infants, this was not the case for those infants classified as Insecurely Attached. The paradoxical finding obtained was that all three of the Insecurely Attached infants had received optimal scores of 1 on the Interactive Processes dimension. This finding directly contradicts the initial hypothesis of this study. Similarly, simple regression analysis indicated that Dimension I of the BNBAS accounted for 28% of the variance in quality of attachment. Although the effect is not significant, a trend is evident. Moreover, because of the low power of the analysis, due to small sample size and the truncated nature of the independent variables, it seemed that the trend observed in these data may reflect a true effect. Hence, the

meaning of this effect will be discussed further.

In speculating upon this effect, it seemed useful to examine vicissitudes in the mother-infant relationship which might account for the differences in attachment behavior. First of all, it is important to consider that there was no systematic relationship between performance on Dimension I of the BNBAS and quality of attachment behavior for the nine infants classified as Securely Attached. In this subgroup, 25% of the infants obtained an optimal score of 1 on this dimension, whereas 17% obtained an average score of 2. 33% of the Securely Attached infants obtained a worrisome score of 3. On the other hand, all three of the Insecurely Attached infants obtained the optimal score of 1 on Dimension I. Looking at these data from another perspective, of the six infants who obtained an optimal score on the interactive measure, three developed adaptive patterns of attachment to their mothers and three developed maladaptive patterns of attachment. Thus, in addition to the question of why all the Insecurely Attached infants had initially attained optimal BNBAS interactive scores, one must add the question of why only half of the infants who received optimal scores later were rated as Insecurely Attached. The following explanation to the first question is suggested by an item analysis of the performance of the infant sample on Dimension I. Such an analysis reveals that the major differences between obtaining an optimal score and those obtaining a worrisome score on the interactive dimension lies in the infant's level of irritability and ability to self-soothe. Thus, an infant who obtains a score of 1 typically cries and frets less than the average infant

and possesses the ability to console himself/herself better. In other words, such an infant appears to be more self-sufficient and quieter in nature than the infant who might obtain a score of 2 or 3 on this dimension. It is suggested that this quality of self-sufficiency may be misinterpreted by a parent who is not attuned to his/her child. For example, Moss and Robson (1960) reported that approximately 80% of the interaction recorded between mothers and their infants was initiated by crying behaviors of the infant. Similarly, Caron and Templeton (1980) reported that increased crying among infants was associated with the mothers' ability to perceive their children's needs and respond to them. In turn, higher levels of crying and fretting behaviors were associated with the mother's perception of her child's adaptation to the environment as well as reported positive feelings toward the infant. Such results suggest, that at least for middle-class white mothers, auditory and visual cues from the infants elicit positive mothering behaviors as well as foster positive affective feelings.

Moreover, this line of reasoning helps us to address the second question, namely, why do only half the infants who obtain optimal BNBAS interactive scores show later insecurity of attachment? These individual outcomes may be due to differences in maternal behavior. All three of the infants who were classified as Insecurely Attached had mothers who were perceived informally by trained examiners as competent career women who appeared ill at ease with their children. These mothers seemed to lack the sensitivity needed to perceive the infant's needs and respond to nonverbal cues indicative of internal state. As a result of this apparent mismatch between mother's perceptions of the

infant and the infant's actual needs, the quality of the interactions were often times characterized by too little or too much stimulation and intrusion. On the other hand, those infants who were classified as Securely Attached, regardless of performance on the BNBAS may have had mothers who were sensitive to their internal state and thus able to monitor external stimulation for the infant. Such regulation of environmental input allows the infant to gradually adapt and modulate the environment for himself/herself. The sensitive, empathetic mother will act to increase and decrease intrusive stimulation to the child based upon her perception of the child's state.

Thus, the results of the present study, when considered in this fashion, suggest that neonatal characteristics interact with the mother's perceptions, attitudes, and psychological needs to determine the quality of the infant-mother relationship. It appears that optimal social attachment and development occur when there is a matching between the infant's needs and behavioral characteristics and the mother's need to mother and her perceptions of both self and the infant. Greater predictive ability of the infant's subsequent social development may be obtained through the dynamic study of the neonatal behavioral capabilities and the psychological history of the mother, with an emphasis upon her adaptation to the mothering role. More research is necessary to delineate the specific relationship between maternal perceptions and attitudes and neonatal characteristics, such as level of irritability, patterns of crying behavior, and sleep-wake cycles, as similar infant behaviors may communicate different messages to different mothers according to their own psychological needs.

Given an understanding of the infant's behavioral organization, in conjunction with his/her mother's expectations and feelings about mothering and her infant, may serve to increase our knowledge of the developing interaction between the child and mother. This, in turn, would increase our ability to intervene in situations where the initial interaction between mother and infant is not characterized by mutual adaptation and "matching" between the partners of the dyad.

In summary, the results of the present study, though not significant by conventional statistical standards, lend support to the transactional model of mother-infant interaction and the hypothesis that optimal developmental outcomes result from the dynamic interchange between child and adult which is characterized by continual and mutual adaptation.

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## APPENDIX A

## BEHAVIORAL AND NEUROLOGICAL ASSESSMENT SCALE

Infant's name \_\_\_\_\_ Sex \_\_\_\_ Age \_\_\_\_ Born \_\_\_\_\_ Date \_\_\_\_\_ Hour \_\_\_\_\_

Mother's Age \_\_\_\_\_ Father's Age \_\_\_\_\_ Father's SES \_\_\_\_\_  
Apparent Race \_\_\_\_\_

Examiner(s) \_\_\_\_\_ Place of examination \_\_\_\_\_  
Date of examination \_\_\_\_\_

## Conditions of examination:

Birth weight \_\_\_\_\_ Current weight \_\_\_\_\_ Length \_\_\_\_\_ Head Circ. \_\_\_\_\_

Time examined \_\_\_\_\_ Time last fed \_\_\_\_\_ Type of feeding \_\_\_\_\_

Type of delivery \_\_\_\_\_ Apgar \_\_\_\_\_

Length of labor \_\_\_\_\_ Birth order \_\_\_\_\_

Type, amount and timing of medication given mother \_\_\_\_\_

Anesthesia? \_\_\_\_\_ Abnormalities of labor \_\_\_\_\_

Initial State: observe 2 minutes

1 2 3 4 5 6  
deep light drowsy alert active crying

Predominant states (mark two)

1 2 3 4 5 6

## ELICITED RESPONSES

	O*	L	M	H	A+
Plantar grasp		1	2	3	
Hand grasp		1	2	3	
Ankle clonus		1	2	3	
Babinski		1	2	3	
Standing		1	2	3	
Automatic walking		1	2	3	
Placing		1	2	3	
Incurvation		1	2	3	
Crawling		1	2	3	
Glabella		1	2	3	
Tonic deviation of head and eyes		1	2	3	
Nystagmus		1	2	3	

## ELICITED RESPONSES (continued)

	O*	L	M	H	A+
Tonic Neck reflex		1	2	3	
Moro		1	2	3	
Rooting (intensity)		1	2	3	
Sucking (intensity)		1	2	3	
Passive movement					
Arms R		1	2	3	
L		1	2	3	
Legs R		1	2	3	
L		1	2	3	

\*0 = response not elicited (omitted)

+A = asymmetry

Descriptive Paragraph  
(optional)

Attractive	0	1	2	3
Interfering variables	0	1	2	3
Need for stimulation	0	1	2	3

What activity does he use to quiet self?

  hand to mouth

  sucking with nothing in mouth

  locking onto visual or auditory stimuli

  postural changes

  state change for no observable reason

COMMENTS:

## BEHAVIOR SCORING SHEET

Initial State \_\_\_\_\_

Predominant State \_\_\_\_\_

1 2 3 4 5 6 7 8 9 \_\_\_\_\_

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1. Response decrement to light (2,3) \_\_\_\_\_
  2. Response decrement to rattle (2,3) \_\_\_\_\_
  3. Response decrement to bell (2,3) \_\_\_\_\_
  4. Response decrement to pinprick (1,2,3) \_\_\_\_\_
  5. Orientation inanimate visual (4 only) \_\_\_\_\_
  6. Orientation inanimate auditory (4,5) \_\_\_\_\_
  7. Orientation animate visual (4 only) \_\_\_\_\_
  8. Orientation animate auditory (4,5) \_\_\_\_\_
  9. Orientation animate visual & auditory  
(4 only) \_\_\_\_\_
  10. Alertness (4 only) \_\_\_\_\_
  11. General tonus (4,5) \_\_\_\_\_
  12. Motor Maturity (4,5) \_\_\_\_\_
  13. Pull-to-sit (3,5) \_\_\_\_\_
  14. Cuddliness (4,5) \_\_\_\_\_
  15. Defensive movements (4) \_\_\_\_\_
  16. Consolability (6 to 5,4,3,2) \_\_\_\_\_
  17. Peak of excitement (6) \_\_\_\_\_
  18. Rapidity of buildup (from 1,2 to 6) \_\_\_\_\_
  19. Irritability (3,4,5) \_\_\_\_\_
  20. Activity (alert states) \_\_\_\_\_
  21. Tremulousness (all states) \_\_\_\_\_
  22. Startle (3,4,5,6) \_\_\_\_\_

## BEHAVIOR SCORING SHEET (continued)

23. Lability of skin color (from 1 to 6)
24. Lability of states (all states)
25. Self-quieting activity (6,5 to 4,3,2,1)
26. Hand-mouth facility (all states)
27. Smiles (all states)

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**APPENDIX B**



## Summary of Episodes of the Strange Situation

Number of Episode	Persons Present	Duration	Brief Description of Action
1	Mother, baby, & observer	30 secs.	Observer introduces mother and baby to experimental room, then leaves.
2	Mother & baby	3 min.	Mother is nonparticipatant while baby explores; if necessary, play is stimulated after 2 minutes.
3	Stranger, mother & baby	3 min.	Stranger enters. First minute: Stranger silent. Second minute: Stranger converses with mother. Third minute: Stranger approaches baby. After 3 minutes mother leaves unobtrusively.
4	Stranger & baby	3 min. or less <sup>a</sup>	First separation episode. Stranger's behavior is geared to that of baby.
5	Mother & baby	3 min. or more <sup>b</sup>	First reunion episode. Mother greets and/or comforts baby, then tries to settle him again in play. Mother then leaves, saying "bye-bye."
6	Baby alone	3 min. or less <sup>a</sup>	Second separation episode
7	Stranger & baby	3 min. or less <sup>a</sup>	Continuation of second separation. Stranger enters and gears her behavior to that of baby.

## Summary of Episodes of the Strange Situation (continued)

Number of Episode	Persons Present	Duration	Brief Description of Action
8	Mother & baby	3 min.	Second reunion episode. Mother enters, greets baby, then picks him up. Meanwhile stranger leaves unobtrusively.

<sup>a</sup>Episode is curtailed if the baby is unduly distressed.

<sup>b</sup>Episode is prolonged if more time is required for the baby to become re-involved in play.

APPENDIX C

Criteria for Group and Subgroup Classification  
of Infant Behavior in the Strange Situation

GROUP A:

--Conspicuous avoidance of proximity to or interaction with the mother in the reunion episodes. Either the baby ignores his mother on her return, greeting her casually if at all, or, if there is approach and/or a less casual greeting, the baby tends to mingle his welcome with avoidance responses--turning away, moving past, averting the gaze, and the like.

--Little or no tendency to seek proximity to or interaction or contact with the mother, even in the reunion episodes.

--If picked up, little or no tendency to cling or to resist being released.

--On the other hand, little or no tendency toward active resistance to contact or interaction with the mother, except for probable squirming to get down if indeed the baby is picked up.

--Tendency to treat the stranger much as the mother is treated, although perhaps with less avoidance.

--Either the baby is not distressed during separation, or the distress seems to be due to being left alone rather than to his mother's absence. For most, distress does not occur when the stranger is present, and any distress upon being left alone tends to be alleviated when the stranger returns.

Subgroup A<sub>1</sub>

Conspicuous avoidance of the mother in the reunion episodes, which is likely to consist of ignoring her altogether, although there may be some pointed looking away, turning away, or moving away.

If there is a greeting when the mother enters, it tends to be a mere look or smile.

Either the baby does not approach his mother upon reunion, or the approach is "abortive" with the baby going past his mother, or it tends to occur only after much coaxing.

If picked up, the baby shows little or no contact-maintaining behavior. He tends not to cuddle in; he looks away; and he may squirm to get down.

Subgroup A<sub>2</sub>

The baby shows a mixed response to his mother on reunion, with some

tendency to greet and to approach, intermingled with a marked tendency to turn or move away from her, move past her, avert the gaze from her, or ignore her. Thus, there may be moderate proximity seeking, combined with strong proximity avoiding.

If he is picked up, the baby may cling momentarily; if he is put down, he may protest or resist momentarily; but there is also a tendency to squirm to be put down, to turn the face away when being held, and other signs of mixed feelings.

#### GROUP B:

--The baby wants either proximity and contact with his mother or interaction with her, and he actively seeks it, especially in the reunion episodes.

--If he achieves contact, he seeks to maintain it, and either resists release or at least protests if he is put down.

--The baby responds to his mother's return in the reunion episodes with more than a casual greeting--either with a smile or a cry or a tendency to approach.

--Little or no tendency to resist contact or interaction with his mother.

--Little or no tendency to avoid his mother in the reunion episodes.

--He may or may not be friendly with the stranger, but he is clearly more interested in interaction and/or contact with his mother than with the stranger.

--He may or may not be distressed during the separation episodes, but if he is distressed this is clearly related to his mother's absence and not merely to being alone. He may be somewhat comforted by the stranger, but it is clear that he wants his mother.

#### Subgroup B<sub>1</sub>

The baby greets his mother, smiling upon her return, and shows strong initiative in interaction with her across a distance, although he does not especially seek proximity to or physical contact with her.

If picked up, he does not especially seek to maintain contact.

He may mingle some avoiding behavior (turning away or looking away) with interactive behavior, but he shows little or no resistant behavior and, in general, seems not have feelings as mixed as an A<sub>2</sub> baby.

He is likely to show little or no distress in the separation episodes.

### Subgroup B<sub>2</sub>

The baby greets his mother upon reunion, tends to approach her, and seems to want contact with her, but to a lesser extent than a B<sub>3</sub> baby. Some B<sub>2</sub> babies seek proximity in the preseparation episodes, but not again until Episode 8, and then perhaps only after some delay.

The B<sub>2</sub> baby may show some proximity avoiding, especially in Episode 5, but this gives way to proximity seeking in Episode 8, thus distinguishing him from the A<sub>2</sub> baby.

Although he accepts contact if he is picked up, he does not cling especially, and does not conspicuously resist release.

On the other hand, he shows little or no resistance to contact or interaction, and in general shows less sign of mixed feelings than A<sub>2</sub> babies.

He tends to show little distress during the separation episodes.

He resembles a B<sub>1</sub> infant, except that he is more likely to seek proximity to his mother.

### Subgroup B<sub>3</sub>

The baby actively seeks physical contact with his mother, and when he gains it he is conspicuous for attempting to maintain it, actively resisting her attempts to release him. Most B<sub>3</sub> babies show their strongest proximity-seeking and contact-maintaining behavior in Episode 8, but some do so in Episode 5 and are so distressed in the second separation episode that they cannot mobilize active proximity seeking and resort to signaling. Occasionally, a baby who seems especially secure in his relationship with his mother will be content with mere interaction with and proximity to her, without seeking to be held.

At the same time, the B<sub>3</sub> baby may be distinguished from other groups and subgroups by the fact that he shows little or no sign of either avoiding or resisting proximity to or contact or interaction with his mother.

He may or may not be distressed in the separation episodes, but if he shows little distress, he is clearly more active in seeking contact and in resisting release than B<sub>1</sub> or B<sub>2</sub> babies.

Although his attachment behavior is heightened in the reunion episodes, he does not seem wholly preoccupied with his mother in the preseparation episodes.

### Subgroup B<sub>4</sub>

The baby wants contact, especially in the reunion episodes, and seeks it by approaching, clinging, and resisting release; he is, however, somewhat less active and competent in these behaviors than most B<sub>3</sub> babies, especially in Episode 8.

He seems wholly preoccupied with his mother throughout the strange situation. He gives the impression of feeling anxious throughout, with much crying. In the second separation, particularly, he seems entirely distressed.

He may show other signs of disturbance, such as inappropriate, stereotyped, repetitive gestures or motions.

He may show some resistance to his mother, and indeed he may avoid her by drawing back from her or averting his face when held by her. Because he also shows strong contact-seeking behavior, the impression is of some ambivalence, although not as much as is shown by Group-C infants.

### GROUP C

--The baby displays conspicuous contact- and interaction-resisting behavior, perhaps especially in Episode 8.

--He also shows moderate-to-strong seeking of proximity and contact and seeking to maintain contact once gained, so that he gives the impression of being ambivalent to his mother.

--He shows little or no tendency to ignore his mother in the reunion episodes, or to turn or move away from her, or to avert his gaze.

--He may display generally "maladaptive" behavior in the strange situation. Either he tends to be more angry than infants in other groups, or he may be conspicuously passive.

### Subgroup C<sub>1</sub>

Proximity seeking and contact maintaining are strong in the reunion episodes, and are also more likely to occur in the preseparation episodes than in the case of Group-B infants.

Resistant behavior is particularly conspicuous. The mixture of seeking and yet resisting contact and interaction has an unmistakably angry quality and indeed an angry tone may characterize behavior even in the preseparation episodes.

Angry, resistant behavior is likely to be shown toward the stranger

as well as toward the mother.

The baby is very likely to be extremely distressed during the separation episodes.

### Subgroup C<sub>2</sub>

Perhaps the most conspicuous characteristic of C<sub>2</sub> infants is their passivity. Their exploratory behavior is limited throughout the strange situation, and their interaction behaviors are relatively lacking in active initiative.

Nevertheless, in the reunion episodes they obviously want proximity to and contact with their mothers, even though they tend to use signaling behavior rather than active approach, and protest against being put down rather than actively resist release.

Resistant behavior tends to be strong, particularly in Episode 8, but in general the C<sub>2</sub> baby is not as conspicuously angry as the C<sub>1</sub> baby.



**APPENDIX D**

Criteria for A Priori Clustering of  
Brazelton Neonatal Behavior Assessment Scale

Dimension I. Interaction Processes

(1) -- Orientation: 4 of 5 { 7 or above on visual reactions  
6 or above on auditory reactions  
none below 4 if done

-- Alertness: 6 and above

-- One of { cuddliness 6 or above  
consolability NA\* or 6 and above

\*NA: Not answerable

(3) -- Two of { orientation: 3 or 5 NA or 5 and below  
alertness: 1-4 or NA  
one of cuddliness 1-4  
consolability 1-4

Dimension II. Motoric Processes

(1) -- No more than 1 deviant reflex (excluding 0 or 1 on clonus, nystagmus, and TNR and counting both arms and both legs as one item on passive movements)

-- Motor tone: 5 or 6

-- Three of { 7 or above on pull-to-sit  
5 or above on motor maturity  
7 or above on defensive reaction  
5 or above on hand-to-mouth activity

-- Activity: 4-6

(3) -- Two of { Motor tone: 1-3 or 7-9  
Three of maturity 1-3  
pull-to-sit 1-4  
defensive reaction 1-4  
activity 1-3 or 8 and 9  
hand-to-mouth 1-3  
More than 3 deviant reflexes (excluding as above)

## Criteria for A Prior Clustering (continued)

## Dimension III. Organization Processes: State Control (continued)

(1) -- State 4 is scored as one predominant state

-- Habituation: { if all done, all are 5 and above  
if 2 done, both are 5 and above  
if only 1 done, does not apply

-- Peak of excitement: 5-7, or 4 if predominant state is 4 and not 1,2, or 3

--Three of { lability of states 3 or less  
rapidity of buildup 4 or less  
irritability 4 or less  
self-quieting 6 or more or NA

(3) Type I -- Very Labile

--Three of { rapidity of buildup 7-9  
irritability 7-9  
self-quieting 1-4  
state lability 6 or above  
peak of excitement 8 or 9  
habituation all 4 or below if done  
pin prick 1 or 2

Type II -- Flat, Depressed

-- Peak of excitement: 1-4

--One of { rapidity of buildup 1-3  
irritability 3 or less  
state lability 1 or 2

--Predominant states are not 4 or 6

## Dimension IV. Organization Processes: Response to Stress

(3) If two of { tremulousness 6 or above  
skin color 1,7,8, or 9  
startles 6 and above

APPROVAL SHEET

The thesis submitted by Janice M. Kowalski has been read and approved by the following Committee:

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The final copies have been examined by the director of the thesis and the signature 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 accepted in partial fulfillment of the requirements for the degree of Master of Arts.

11/4/83  
Date

Deborah L. Holmes, Ph.D  
Director's Signature