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I am submitting herewith a dissertation written by Doris Sharpe Burrus entitled "A Brief Educational Strategy for Parents of Preterm Infants: Its Effects on Parent-Infant Bonding and Infant Development." I have examined the final copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Psychology.

William H. Calhoun
William H. Calhoun, Major Professor

We have read this dissertation
and recommend its acceptance

Richard Anderson
Charles L. Hayson
Michael G. Johnson

Accepted for the Council:

C. W. Mink
Vice Provost
and Dean of the Graduate School

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A BRIEF EDUCATIONAL STRATEGY FOR PARENTS OF PRETERM INFANTS:
ITS EFFECTS ON PARENT-INFANT BONDING AND INFANT DEVELOPMENT

A Dissertation
Presented for the
Doctor of Philosophy
Degree
The University of Tennessee, Knoxville

Doris Sharpe Burrus

March 1985

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To Ross,
for countless kindnesses,
for many gifts of love,
and for the patience of Job.

ACKNOWLEDGMENTS

This study grew out of a graduate seminar on Infant Research and Related Readings taught by Dr. Harvey Kaufman in 1975. From that intent, interested group of students two dissertations have already been completed; this is the third. For providing me with a focus for my graduate training and for introducing me to an area that has never failed to intrigue and fascinate me, I am deeply grateful to Dr. Kaufman.

I would also like to express my appreciation to the other members of my committee, Dr. William Calhoun, Dr. Stephen Handel, and Dr. Charles Thompson, for their encouragement, forbearance, and dedicated example. Their consistent exemplification of careful scholarship and ready availability to their students has been instructive.

My research assistants and stalwart data gatherers, Paul C. Long and A. Dirk Hightower, are due grateful thanks and applause for their support, kindness, and persistence in the face of deadlines, long hours, and often uncertain outcome.

To Dr. Larry Rodgers and the nursing staff of the Intensive Care Nursery at The University of Tennessee Memorial Hospital, may I offer sincere words of appreciation for ideas and ideals shared, for grace under pressure personified, and for acceptance unfailingly offered this researcher.

Finally, gratitude must be expressed to the funding agency whose grant helped make this study possible. Except for the support of the Appalachian Regional Commission, this research could not have been realized.

ABSTRACT

A brief educational strategy was used with parents of preterm infants during the infant's hospitalization. The intervention used (1) the Brazelton Neonatal Behavioral Assessment Scale (BNBAS) as a teaching device and (2) the demonstration and teaching of stimulation activities to be used by parents with their infants in the hospital and later in their homes.

Subjects were 40 parent-infant units divided into experimental and control groups. Data were gathered at three points: in the hospital prior to intervention (Time 1), following intervention two days before the infant was discharged (Time 2), and one month after discharge in the home (Time 3). At Time 1, the mother's perception of her infant was assessed using the Broussard Neonatal Perception Inventory; the infant was evaluated using the Brazelton Neonatal Behavioral Assessment Scale; parents and infants were observed for frequency and types of attachment behaviors with a Parent-Infant Behavioral Observation. At Time 2, the Brazelton Scale was again administered to both groups of infants and experimental and control infants and parents were again evaluated using the Parent-Infant Behavioral Observation. A frequency count of calls and visits was kept for experimental and control groups of parents throughout hospitalization of the infant. From hospital admission to Time 3, both groups of parents and infants were scrutinized for effects of the crisis of premature birth on family structure. Stress

indicators evaluated were: spouse and child abuse, job loss, change of residence, and separation and/or divorce.

At Time 3, data were collected in the infant's home using the Home Observation for the Measurement of the Environment. The Neonatal Perception Inventory was again administered, along with the Degree of Bother Inventory. Parents were observed once more for frequency and types of attachment behaviors (using the Parent-Infant Behavioral Observation). Infants were given a final evaluation on the Brazelton Scale.

Findings were that mothers in the experimental group perceived their infants significantly more positively at Time 3 ($p < .05$) than control mothers; experimental group mothers also found their infants' behaviors less bothersome ($p < .01$). The Parent-Infant Behavioral Observation found two infant behaviors and eleven parent behaviors favoring attachment in the experimental group at Time 2 at the .01 level or above. At Time 3, the significance level of two of the parent attachment behaviors, gazing and vocalizing, increased ($p < .00001$), while experimental group infants were significantly more often awake and alert ($p < .001$). HOME scores were significantly higher in the experimental group ($p < .01$). Parents in this group made significantly more hospital visits ($p < .001$) and suffered fewer family disruptions ($p < .05$, approaching $p < .02$). Experimental infants scored significantly higher on the Brazelton Scale at Time 2 on interactive processes and motor processes ($p < .01$); at Time 3, experimental group infants scored significantly higher on interactive

processes ($p < .00001$), motor processes ($p < .001$), and organizational processes ($p < .001$).

It is concluded that a simple intervention strategy used during the infant's hospitalization favorably affected parent-infant bonding and infant development in the experimental group.

TABLE OF CONTENTS

CHAPTER	PAGE
I. REVIEW OF THE LITERATURE	1
A Theory of Attachment	1
Ethological Instinct Theory of Attachment	1
Mary Ainsworth	9
The Socially Responsive Infant	13
Auditory Responsiveness in the Infant	13
Smiling, Endogenous and Elicited	16
Crying	19
Noncrying Vocalizations.	25
Postural Adjustment, Grasping, and Clinging	26
Rooting and Sucking	30
Visual Responsiveness in the Infant	36
Face Perception	44
Development of Maternal Attachment: The Mother's Readiness for Reciprocal Interaction	49
Evidence for a Maternal "Sensitive Period"	49
Human Maternal Sensitive Period	53
II. PREMATURITY AND ITS EFFECT ON MOTHER-INFANT ATTACHMENT . .	69
Sequelae of Premature Birth	69
Maternal Reactions to Premature Birth	75
Mother-infant Separation: Interactional Deprivation . . .	77
Interruptions in Mother-infant Bonding	80
Mother-infant Interactional Styles	83
III. A BRIEF EDUCATIONAL STRATEGY FOR PARENTS OF PRETERM INFANTS: ITS EFFECTS ON PARENT-INFANT BONDING AND INFANT DEVELOPMENT	88
Introduction	88
The Present Study	92
Experimental Hypotheses	95
IV. METHOD	98
Subjects	98
Setting	104
Experimental Design	105
Materials and Procedures	107
V. RESULTS	122
Experimental Findings	122

CHAPTER

PAGE

V. (Continued)

Neonatal Perception Inventory (NPI)	122
Parent-Infant Behavioral Observation (P-IBO)	126
Home Observation for the Measurement of the Environment (HOME)	138
Telephone Calls and Visits from the Families	144
Family Disruptions	146
Brazelton Neonatal Behavioral Assessment Scale (BNBAS)	149

VI. CONCLUSIONS 156

"Acute Emotional Crisis" in the Families of Premature

Infants	156
Neonatal Perception Inventory (NPI)	159
Parent-Infant Behavioral Observation (P-IBO)	161
Home Observation for the Measurement of the Environment (HOME)	164
Telephone Calls and Visits from the Families	166
Family Disruptions	168
Brazelton Neonatal Behavioral Assessment Scale (BNBAS)	170
A Final Conclusion	174

LIST OF REFERENCES 176

APPENDICES 202

Appendix A	203
Appendix B	205
Appendix C	208
Appendix D	215
Appendix E	218
Appendix F	223
Appendix G	227
Appendix H	229
Appendix I	235
Appendix J	240
Appendix K	242
Appendix L	247

VITA 253

LIST OF TABLES

TABLE	PAGE
1. Infant Demographic Data	101
2. Family Demographic Data	103
3. Data Collection	107
4. NPI-DBI Summary of Scores	124
5. Changes in the Mother's Perception of Her Baby from Time 1 to Time 3 Using the NPI Scores	127
6. The Statistic U for the Parent-infant Behavioral Observations	129
7. Parent-infant Behavioral Observation	131
8. Attachment Behavior Index Scores	133
9. Home Observation for the Measurement of the Environment Data Summary	140
10. HOME Data	142
11. Family Calls and Visits	145
12. Family Disruptions	147
13. Raw Brazelton Cluster Data	152
14. Summary Data for Brazelton <u>A Priori</u> Clusters	153

CHAPTER I

REVIEW OF THE LITERATURE

1. A Theory of Attachment

Maccoby and Masters (1970), writing in Carmichael's Manual of Child Psychology, delivered an exhaustive survey of theories of infant-mother attachment. In a more concise but no less comprehensive delineation of attachment theories, Ainsworth (1969) analyzed three approaches to the origin and development of the infant-mother relationship. All three writers included a review of the psychoanalytic theory of object relations, social learning theories of dependency and attachment, and an ethological theory of attachment proposed originally by John Bowlby (1958, 1960, 1969) and amplified by Mary Ainsworth (1969, 1973; Ainsworth, Blehar, Waters, & Wall, 1978); this speculative approach provides the framework for the ensuing research.

Ethological Instinct Theory of Attachment

John Bowlby, British psychiatrist and psychoanalyst, behaved as an orthodox Freudian might have in regarding the beginnings and growth of the infant-mother tie as an aspect of instinct theory (Ainsworth, 1973; Bowlby, 1969; Maccoby & Masters, 1970), giving it "firm roots in the biological nature of man" (Ainsworth, 1973, p. 4). However, Bowlby's theorizing, unlike Freud's, did not require

orality or primary drive gratification as a necessary precondition for infant-mother attachment (Bowlby, 1958, 1969; Culbertson, 1978). Bowlby differed from Freud in his treatment of the infant as an active rather than passive participant in his or her socialization, presenting him or her as predisposed to attachment and "so made that he responds readily to social stimuli and engages quickly in social interaction" (Bowlby, 1969, p. 216).

Ainsworth (1969, 1973) wrote that Bowlby revised classic psychoanalytic theory, linking it to recent advances in biology and ethology. Specifically, Bowlby set the origin and development of human social interactions within a framework of evolutionary theory. More recently, Ainsworth and her collaborators (1978) presented Bowlby's attachment theory as a synthesis of the following distinctive components: a psychoanalytic and ethological orientation, already noted, combined with psychobiology and its attendant concentration on neurophysiological, endocrine, and receptor processes; control systems theory, combining concepts such as feedback and goal-corrected behavior; and a bias toward Piaget's cognitive theories. Ainsworth interpreted Bowlby's theory of attachment as more than a theory. In fact, Ainsworth et al. (1978) equated it with what Kuhn (1962) referred to as a "paradigm change" or a thoroughgoing shift in perspective affecting research in developmental psychology.

Biological basis and function of Bowlby's theory. Bowlby posited certain species-characteristic behaviors favoring the survival of the human species and transmitted through the gene pool (Ainsworth,

1973). Bowlby (1958, 1969) enumerated five separate behavior systems serving to protect the young by binding the mother to the infant and serving reciprocally in the attachment of the infant to the mother. Two of the behaviors, crying and smiling, serve to bring the mother to the infant and to maintain her in close proximity. Crying and smiling constitute the so-called "signaling" behaviors in attachment theory (Maccoby & Masters, 1970). Two of the behaviors, following and clinging, serve an "executive" function. Here the infant is an active initiator of behaviors that aid in bringing him or her the mother and in keeping proximity. Bowlby (1969) mentioned that a fifth behavior, sucking, was difficult to categorize, although it was grouped with clinging and following in his original paper on attachment (1958). In a later exposition of his theory, Bowlby (1969) listed a sixth behavior, calling, as being important. Ainsworth (1969), in her treatment of Bowlby's theory, grouped calling with the other "signaling" behaviors of crying and smiling; Maccoby and Masters (1970) agreed.

From an evolutionary perspective, behavioral systems serve the biological functions that offer survival value to the organism and species. Bowlby theorized that the function of the comparatively stable behavioral systems which comprised attachment behavior, taken together with reciprocal parental care behaviors, protected the infant from environmental hazards during the period of infant helplessness (Ainsworth, 1969, 1973; Bowlby, 1969). Bowlby submitted that the biological function served by attachment behavior

and reciprocal maternal "retrieving" behavior was to shelter the infant from harm, particularly predatory attack. Bowlby's theory rested on his examination of primitive hunting and gathering groups of people. Nevertheless, his position was that even in modern, developed countries genetic programming biased the infant to behave in certain species-specific ways that were advantageous in the original environment in which they had developed. An example of a behavior which would have given survival advantage was the infant's seeking to be near a protective mother figure (Ainsworth, 1973).

Bowlby distinguished between the biological function of attachment behavioral systems and their "predictable outcome." The biological function was protection; the "predictable outcome" was to bring the infant and the adult into closer proximity or actual contact with each other (Ainsworth et al., 1978; Bowlby, 1969). Taken together, the signaling behaviors, such as crying, calling, or smiling, and the infant's more active behaviors, such as clinging and following, aided in insuring this "predictable outcome."

Bowlby emphasized that attachment behaviors were instinctive, although not inherited intact. Instead, it was the potential to develop attachment behavioral systems which was inherited, and the behavioral systems would differ according to the environment in which development occurred (Ainsworth, 1969).

Goal-corrected behavior's relation to attachment.

Instinctive behavioral systems which constituted attachment included both the reflexive "fixed action patterns" of early infancy, such

as crying, smiling, and sucking, and the more complex, sophisticated "goal-corrected" systems of later infancy and early childhood (Bowlby, 1969; Maccoby & Masters, 1970). Bowlby suggested that there was a regular developmental sequence during which the fixed action patterns of the neonatal and early infancy periods became modified through experience or coordination into goal-directed (or, as Bowlby preferred it, goal-corrected) systems (Ainsworth, 1973). To explain the progression from fixed action patterns to a goal-corrected system of behavior, Bowlby utilized concepts taken from control systems theory. In a goal-directed control system, use was made of feedback related to the placement of a goal-object, and behavior changed based on this feedback. The major portion of attachment behavior was considered to have been mediated by "homeostatic control systems" which served to keep an organism's behaviors directed toward the achievement of a goal (Bowlby, 1969; Maccoby & Masters, 1970). Bowlby theorized that the complex systems which comprised attachment operated flexibly and purposefully, but with a "built-in bias." For example, the goal of an infant keeping proximity with the mother may have had survival value, but the behaviors which accomplished the goal were very flexible (Ainsworth, 1973; Ainsworth et al., 1978).

The beginnings of attachment behaviors. Bowlby categorized attachment behaviors into four sequential phases. The first phase included the initial eight to twelve weeks of an infant's life and was marked by a period of relatively indiscriminating social

responsiveness. Bowlby formally termed this phase that of "orientation and signals without discrimination of figure" (Bowlby, 1969, p. 266).

Behaviors by the infant were exhibited toward anyone in his or her vicinity and might include, for example, smiling, grasping, or tracking movements of the eyes. The second phase of attachment behavior was marked by evidence of discriminating social responsiveness. As Bowlby wrote, during this phase the infant continued to respond to people in the "same friendly way" as in Phase 1, but he or she had begun to discriminate the mother or mother-figure from others in his or her environment. Generally, this phase lasted until about six months of age. Phase 3 was the period in which the infant began to take active initiative in seeking closeness to and contact with the mother. In Phase 3 the mother was frequently used as a safe base from which to explore the environment and was followed with body orientation and eyes when she left the infant and was greeted when she returned. It was a time of "maintenance of proximity to a discriminated figure by means of locomotion as well as signals" (Bowlby, 1969, p. 267). Phase 3 began at six months and continued through the second year and into the third year of the child's life. Finally, Phase 4 was established by Bowlby as one during which a more complex relationship evolved; this he termed a "goal-corrected partnership." For this phase to occur, the child had to be able to understand and interpret the mother's goals (or, as Bowlby called them, set-goals) in order

to attempt to alter them to fit in with his or her own plans for closeness and contact (Ainsworth, 1973). Nearly always by Phase 4 and usually by Phase 3, the child had become attached to the mother or a mothering figure. The point is that attachment does not emerge fully blown, in mature form. Instead, it occurs gradually during a sequence of separate, distinguishable phases.

The following study is concerned with the infant's behavior during the first weeks of life, a time span corresponding roughly to Bowlby's initial phase in the development of attachment. It would seem, then, that a more complete look at Phase 1 is appropriate. During this phase the young infant is already capable of orienting to environmental stimuli, particularly people (Ainsworth, 1973). Included in the infant's orienting behaviors are visual fixation and tracking, listening, rooting, and postural adjustments when held. Further, the young infant has a variety of signaling behaviors. He or she can cry from birth on, and two other signaling behaviors, smiling and vocalizing, soon emerge. All these signals serve to induce adults to approach, thus promoting proximity and contact. Since Bowlby has defined attachment behavior as "seeking and maintaining proximity to another individual" (1969, p. 194), these Phase 1 signals would be placed in the category of attachment behaviors. In this same period, the infant has a few behaviors which can be used to gain or maintain contact with the mother; chief among them are sucking and grasping. However, if the infant is not in actual contact with the caregiver, he or she can use

signaling behaviors to promote closeness and/or contact in both Phases 1 and 2 (Ainsworth et al., 1978).

From the outset the infant's sensory equipment is unusually efficient, and it improves even further in the first weeks of life. Even in this first phase, the infant demonstrates discrimination among stimuli, and it appears that the stimuli to which infants most readily respond are those emitted by people. The infant does not, however, discriminate between persons, as it responds to the mother in about the same way as to others. In fact, it is the infant's ability to distinguish a mother figure from other individuals which ends Phase 1. The transition between Phase 1 and Phase 2, that period of discriminative social responsiveness, is somewhat ambiguous since discrimination between persons is accomplished earlier in some sensory modalities than others. For example, it is thought that tactual-kinesthetic discrimination comes first, followed by auditory discrimination. Finally, visual discrimination appears to occur between eight and twelve weeks of age (Ainsworth, 1973; Ainsworth et al., 1978).

Bowlby's theory and mutual influence. It can be said that Bowlby's theory of attachment is consistently interactional. The infant's genetically programmed "initial equipment" is presented as developing through environmental interaction (Ainsworth, 1969). The individual is always set in a social context with his or her attachment behaviors intermeshed with others' reciprocal behaviors;

the infant's attachment behaviors inevitably interact with reciprocal behaviors of the mother.

Bowlby's point of view is interactionistic in another sense as well. When he discusses the development of fixed action patterns into fully-elaborated, complex behavioral systems in his theory, he blurs the lines between learning and maturation. From his ethological perspective, environmental stimulation is needed for maturation to occur in behavioral systems related to attachment, and maturation is a necessary condition for further learning to occur. As Ainsworth (1973) has written, Bowlby held that a little learning was needed for the startup of development directed by an inner program.

Finally, the infant-mother set can be placed in a somewhat larger environmental context, one in which Bowlby's use of control systems theory can be seen. For the infant the interaction occurs in the balancing of those behavioral systems which advance play and exploration and those related to attachment. In a similar fashion, his or her mother's caregiving behaviors are balanced against other behaviors which are antithetic to caregiving (Ainsworth, 1969, 1973).

Mary Ainsworth

Contributions to Bowlby's theory of attachment. In a discussion of Bowlby's theory of attachment, recognition must be accorded to Mary Ainsworth for her experimental studies related to infant-mother

attachment and for her own unique elaboration of the original approach. As she herself stated (Ainsworth et al., 1978), her theoretical view "dovetails" closely with that of Bowlby. Ainsworth pointed out that the differences between her position on attachment theory and Bowlby's stance were slight, being chiefly those of emphasis (Ainsworth, 1969).

Attachment and attachment behaviors. Ainsworth (Ainsworth et al., 1978) distinguished between the hypothetical construct attachment, which she described as a bond or enduring relationship between the young child and the mother, and attachment behaviors. It was the attachment behaviors through which the bond or tie formed; these same behaviors then served to "mediate the relationship." Ainsworth (1969) noted that starting at birth the infant behaved in ways that promoted proximity and contact with others. She classified the following as attachment behaviors in the neonate since they played an essential role in the development of attachment: the infant's cries which brought others near; the infant's smiles which promoted interaction, attracting others to approach and even pick him or her up; and the infant's ability to use, albeit in primitive form, behaviors in which he or she was even more active in promoting and maintaining contact.

Ainsworth further noted that after the bond had been achieved the attachment behaviors continued to mediate it. Attachment behaviors were described as intermittent, with the intensity varying according to circumstances. On the other hand, attachment was held

to exist even when the attached pair was separated by time and space, was delineated as unvarying in its intensity, and was defined as "abiding." Ainsworth concluded that one could infer the existence of attachment from "a stable propensity to seek proximity to . . . a specific figure over time and despite all . . . vicissitudes" (1973, p. 2).

Ainsworth pointed out that Bowlby himself gave little attention to the relationship between attachment as a tie or bond and attachment behaviors. Her conclusion was this: Bowlby considered it to be self-evident that attachment represented the manner in which the attachment behaviors were "internally organized" with regard to a particular person (Ainsworth et al., 1978). Neither Bowlby nor Ainsworth had ever concluded that attachment and overt attachment behaviors were one and the same.

Ainsworth and the emotional concomitants of attachment. One further difference between Bowlby's and Ainsworth's interpretation of attachment theory needs to be addressed briefly, that being Ainsworth's emphasis on the emotional factors related to attachment. Ainsworth herself had written of Bowlby's identification and grouping of affect and emotions as "appraising processes" in his control-systems theory of attachment. Sensory input from either the organism's state or the environment's conditions had to be appraised or interpreted to be useful. Both affect and emotions (or feelings, as Ainsworth wrote) served as appraising processes; input was compared to internal set-points with some behaviors selected above

others as a result of the appraisal. Ainsworth (Ainsworth et al., 1978) wrote further that Bowlby did not himself expand any further on the role of feelings in his initial volume on attachment.

As for Ainsworth, in her amplification of Bowlby's theory she wrote more specifically of the emotional concomitants of attachment. For example, she referred to attachment as an "affectional tie," pointing out that "positive affects predominated." She also averred that one usually thought of attachment as "implying affection or love" (Ainsworth, 1973). Earlier she had written of attachment's being "a synonym for love" (Ainsworth, 1969).

In spite of her emphasis on the emotional aspects of attachment, Ainsworth concerned herself in her research with those discernible behaviors serving to orient the infant to the mother, signal to her, and promote closeness or contact with her, and in the mother's response to these behaviors. She listed the following behaviors as being of primary importance in the service of attachment: rooting, sucking, postural adjustment, looking, smiling, vocalizing, crying, and grasping (Ainsworth, 1973). It is these early behavioral indicators of attachment which are functional in Phase 1, the period of orientation and signals without discrimination of figure, that we will now consider since they figure so prominently in the research which follows.

2. The Socially Responsive Infant

Each infant is born into a social environment and, as Rheingold stated, "can remain alive only in a social environment . . . from birth he takes his place in that environment" (1969, p. 791). Furthermore, the infant is an active participant in the modification of the social environment. From birth on, he or she has a number of capabilities which serve well in the development of "that special social response," attachment (Stone, Smith, & Murphy, 1973). Bowlby referred to the infant's capabilities as its "behavioral equipment" (1969). To clarify the infant's role as a social partner, Bowlby grouped the behavioral equipment into the following three categories: preceptual equipment which orients the infant toward the mother; effector equipment, consisting of hands, feet, and mouth, which "latch" him or her in contact with the mother; and signaling equipment such as crying, smiling, vocalizing, and arm gestures. It is to these categories of behavioral equipment which are functional in the early phases of attachment that we now turn.

Auditory Responsiveness in the Infant

Research indicated that the anatomy of the human auditory system was fundamentally complete by the later stages of fetal development (Patten, 1953), and that the auditory system itself was functional some weeks prior to birth (Spears & Hohle, 1967). In spite of this, popular belief has been that the infant was unable to hear at birth. For example, Bridger (1961) pointed out that until recently the

literature portrayed the infant as incapable of sensory discrimination in any modality, and as recently as 1960 writers were still concluding that the newborn infant was deaf (Martin & Vincent, 1960).

Although the bulk of research into infants' sensory abilities focused on visual skills, still enough probing into auditory capacities has occurred to demonstrate that they can respond to sounds right from birth. Moreover, they respond differentially to different quality sounds (Ainsworth, 1973; Rheingold, 1968). The infant can make any one of a number of behavioral responses to auditory stimulation. The most reliably observed is the auro-palpebral reflex (blinking to a loud sound when the eyes are open, or tightening the eyelids if the eyes are shut). He or she can also kick, increase general bodily activity, begin or cease crying, startle, and turn the head and eyes to the sound source (Spears & Hohle, 1967).

Wolff (1959) reported head-turning to auditory stimulation in infants as early as 24 hours after delivery, with soft noise emerging as the stimulus which evoked more "auditory pursuit" movement than loud noise. His research indicated further that auditory responsiveness was best when the infant was in a quiet, alert state of inactivity (Wolff, 1966). Wertheimer (1961) examined a newborn infant's ability to localize sound when the researcher presented clicking sounds to the left and right of the infant's head and observed eye movements in the direction of the

sound. Research by Bronshtein and Petrova (1967) showed similar results in infants as young as two hours old. There was discrimination of spatial location of sounds by the infants, with orienting responses habituating to sound in one location then reappearing when the sound was moved to a new location.

Leventhal and Lipsitt (1964) reported comparable results in an experiment using somewhat older infants (23 to 100 hours old). Brazelton (1973a), in the research leading to the development of his Neonatal Behavioral Assessment Scale, found that neonates would respond with head and/or eye turning to a human voice or rattle. He discovered that "continuous, soft, and high-pitched speech" (Brazelton, 1973a, p. 23) was the best auditory stimulus for the neonate.

Spears and Hohle (1967) proposed that localization of sounds by the infant required the coordination of information from separate receptor systems involving higher centers of the central nervous system. The indication was that the infant's auditory system was developed to a fair degree of complexity at birth. Eisenberg (1965, 1970) pointed out, through her research, that the infant was differentially "tuned" to the carrier frequencies of human speech (500-900 cycles per second). She suggested that the "tuning" might have been built in during intrauterine life.

Wolff's research (1963) showed that the infant responded as early as the third week of life with a social smile when a high-pitched human voice was the auditory stimulus, this being more

effective than a variety of other auditory stimuli. Wolff posited that certain auditory stimuli as well as visual stimuli, acted as releasers, or unconditioned stimuli, for evoking smiles in very young infants. Walters and Parke (1965) concurred. The importance of the emergence of the social smile in the development of attachment is already known and will be addressed in a later section.

Finally, Bowlby commented on the mother's being for the infant "an interesting and rewarding object to listen to" (1969, p. 274). His theory was as follows: The infant attends, with his listening being augmented by feedback and learning processes. For example, the infant's attention to the mother, which increased her vocalization in the first place, will now likely lead the infant to pay even more attention to her vocalizing (Ainsworth, 1973; Bowlby, 1969). A number of investigators have suggested that the provision of "interesting" auditory stimuli, as well as visual stimulation, was a primary factor in the forming of infant-mother attachment (Bowlby, 1958; Rheingold, 1968; Schaffer & Emerson, 1964a; Walters & Parke, 1965).

Smiling, Endogenous and Elicited

One behavioral precursor of attachment in the infant which has served as a focus for research perhaps more than any other is the smile (Ainsworth, 1973; Kessen, Haith, & Salapatek, 1970). The smile has been referred to as an "index" of social responsiveness (Walters & Parke, 1965). Bowlby (1958, 1969) and others (Ainsworth, 1973; Hess, 1970) hypothesized that smiling in

the infant was an instinctive pattern of behavior which had a signaling objective, functioning to activate maternal behavior. Bowlby (1969) suggested that the smile worked as a social releaser. The infant's smile had as its predictable outcome the increased likelihood that the mother would demonstrate maternal behavior in the future, and that there would be an extension of social interaction between mother and infant.

Both spontaneous and elicited smilelike mouth movements are present in the neonate. Regarding endogenous smiling, Wolff (1959, 1963) observed such smiles in both full-term newborns and in premature infants (28-34 weeks gestation), noting that the smiles occurred without any external stimulation. Wolff termed this variety of smiling a "physiological mechanism" although he never referred to it as an innate behavior (Hess, 1970). Freedman (1964) came nearer the concept of innateness, describing the smile as "reflexive." He used an ethological concept in his depiction of spontaneous smiling, calling it a vacuum reaction, or behavior without a normal stimulus (Freedman, 1966).

Elicited or exogenous smiling begins to occur in the third week of life. Researchers have referred to these emerging smiles as social (Ainsworth, 1973; Freedman, Loring, & Martin, 1967; Walters & Parke, 1965; Wolff, 1963) since the stimuli normally eliciting the smiles were characteristically social in origin. For example, Wolff (1963) found that the high-pitched human voice was the most effective stimulus in eliciting smiling in the neonate

at three weeks. He pointed out that the social smile occurred when the infant was alert, bright-eyed, and fully awake. Other researchers also observed social smiling in the infant between two and eight weeks (Ambrose, 1961; Gewirtz, 1965).

The smile is more readily evoked by visual stimuli which are social in origin (Freedman et al., 1967). Rheingold (1961) compared infants' smiles and vocalizations to both social stimuli, people, and to a nonsocial object, a rattle. Results showed that although the infants responded with smiles to both stimuli, they did so more often to people. When the social smile does occur, it is noticeably different from the presocial, spontaneous smile. As the infant produces the social smile, the muscles of the cheeks and eyes are used. No longer is there merely discrete movement of the infant's mouth, as in endogenous smiling. In fact, the social smile has been classified as "full facial smiling" (Freedman et al., 1967). The infant engages in vigorous whole-body activity during social smiling as well.

As to the visual stimuli capable of eliciting nonselective social smiling, the literature is so extensive that only a small representative sampling can be offered. Wolff's research (1963) on social smiling suggested that the human head produced a smile if there was movement or eye-to-eye contact between the observer and the infant. Ambrose (1961) agreed. By the eighth or ninth week the infant will give a smiling response to an immobile human face (Ambrose, 1961; Gewirtz, 1965).

Ambrose (1961) compared home-reared and institutionalized infants as to their responsiveness to an immobile, unsmiling human face. He found that there were similar patterns of responsiveness in both groups, but that smiling occurred earlier to the stationary face in home-reared infants (six to ten weeks) than in institutionalized infants (nine to fourteen weeks). Ambrose theorized that the visual stimulus, the face, had two purposes, to act as both elicitor and reinforcer. In home-reared infants, smiling was elicited and reinforced more often with smiling responses reaching peak strength earlier than for institutionalized infants.

Walters and Parke (1965) theorized that the rapidity of the development of social smiling was determined largely by caretaking arrangements. Their suggestion was that smiling and other social responses happened more quickly when caretaking allowed for a "great deal of sensory stimulation in a wide variety of social-interaction situations" (p. 68).

Summarizing, research appears to favor the view that the infant's social smile is elicited and maintained, to a large extent, by auditory and visual stimuli, while the endogenous smile, its predecessor, can be said to be innately determined.

Crying

Crying has already been introduced as serving a signaling function in the attachment process; the predictable outcome is to bring the mother or a mother-figure into proximity or contact with the infant. Classed together with crying are what Rheingold (1968)

calls the "distress vocalizations," that is, fussing and protests by the infant. Included here also are "whimpering and whining" (Walters & Parke, 1965). Crying is peculiar to the attachment process. While social stimuli serve to elicit and reinforce a number of "friendly responses" from the infant such as looking, listening, and smiling, this is not the case with crying (Ainsworth, 1973; Bowlby, 1969).

The infant is capable of crying from birth onward. In fact, Hooker (1952) described the vocal and respiratory apparatus of the full-term infant as functional well before normal birth, noting crying as having been heard in a 23.5 week-old fetus on its exposure to air. The first cry has been characterized as reflexive, being under subcortical control (Tonkova-Yampol'skaya, 1969, cited in Osofsky & Connors, 1979). Researchers (Osofsky & Connors, 1979) have noted that the infant's first cry is of singular importance to the mother, providing her with "a sense of well-being and assurance that her infant is alive and responding as expected" (p. 527).

Wolff (1969) made observations on the crying of 14 infants, analyzing the various cries by means of sound spectrographs. He identified three patterns: a discomfort cry, a hunger cry, and a pain cry. Wolff noted that the mothers of the infants could both differentiate and categorize the three separate cries on the basis of sound alone. Formby (1967) also found that mothers recognized their infant's cry early in the postpartum period. His

study of 23 mothers showed that one-half could distinguish their own infant's cry within 48 hours of the infant's birth.

Rheingold (1968) suggested that the importance of crying as a means of "vocal communication" between infant and caregiver was too often ignored. She hypothesized that the infant's cry initiated contact with its social environment since the cry brought to the infant's side "people who not only minister to . . . primary biologic needs but also supply stimulation" (p. 279). Rheingold (1969) presented cessation of crying in the infant as an early social response, pointing out that crying which was initially an expression of discomfort quickly became a social signal. Other researchers have provided ample evidence of the potency of the very young infant's cry as an elicitor of maternal attention and caretaking, alongside Rheingold (Gewirtz, 1961; Korner, 1974; Moss, 1967; Richards, 1971). Ambrose (1963) submitted that the reason the infant's cries had proven to be such a powerful signal for maternal attention was that the cries themselves had wide variability in rhythm and range, making it difficult for the hearer to become habituated to them.

Wolff's research (1969) showed infants initiating a new variety of crying in the third week of life, a type mothers referred to as "faking" or a "fake" cry. The pitch and intensity of the cry were low, and there were no tears. The cry appeared to be unrelated to any bodily distress, ending as it did when the mother gave the infant attention. Wolff theorized that the infant's increased

capacity for alertness and responsiveness to the social environment at this period was exemplified by this new cry; a shift had begun from physiological interventions to "psychologically significant" ones.

More attention has been given to those events which terminated an infant's crying than to stimuli which elicited crying. Nonetheless we know something of the wide variety of stimuli that activate crying in the neonate. Ainsworth (1973) mentioned pain, gastrointestinal distress, and hunger; Illingworth (1955) suggested sudden, sharp visual or auditory changes; Bowlby (1969) included postural changes. Wolff's (1969) longitudinal analysis of infants' cries added to the list these eliciting stimuli: cold, sleep disruptions, nakedness, and noxious stimuli not physiologically painful but unpleasant as to quality (e.g., bitter taste). Kessen and Mandler (1961) made their own contribution through their criticism of those theories suggesting that all infant distress and crying originated in a lone archetypical event producing physical pain.

Experimenters have a clearer understanding of stimuli which terminate crying in infants if the volume of research is any indication. Wolff's (1969) naturalistic observations of crying found the human voice to be the most effective of all stimuli tested in halting crying in the infant's second week of life; other stimuli used were a rattle, a bell, and a whistle. By the third week, the female voice was the most effective stimulus (when compared to a

male voice). At one month, in addition to the voice's effectiveness, the mere "visual presence" of an individual inhibited crying.

One study (Bell & Ainsworth, 1972) found that picking up and holding the infant was more than 85% effective in terminating crying in the first three months of life. Similarly, Korner and Grobstein's study (1966) of 12 neonates (with an average age of 55 hours) discovered that the infants' cries were readily soothed when the infants were picked up and held to the shoulder; additionally, the infants often alerted and scanned the environment. These findings were thought to have implications for an infant's earliest learning since the quiet, alert state was considered optimal for learning. Further, the neonate normally spent no more than from 8% to 16% of his time in this state of alertness (Wolff, 1965). The infant who was regularly soothed in the aforementioned manner, it followed, would have more opportunity to interact with his environment.

In a later report of her studies involving 40 crying neonates, Korner (1971) again found that infants were comforted most effectively when they were lifted to an adult's shoulder with their faces above shoulder level. In the shoulder position, 77.5% of the infants calmed and responded by alerting and scanning the environment. As a result of her research Korner posited an interesting theory. She suggested that it was the vestibular-proprioceptive component of maternal intervention involving contact comfort which was so potent, rather than the contact itself. The reason, as she stated it, that vestibular-proprioceptive stimulation

functioned so well was that it was mediated by the infant's vestibular system which was well developed at birth (becoming functional at four months gestational age).

A final question concerning crying in the newborn period might consider whether or not there are individual differences to be noted, as well as gender differences. Korner's research (1971) provided information relative to individual differences in duration and frequency of crying in neonates. Thirty-two infants were monitored; the experimenter found there were significant differences among the infants in how frequently ($p < .01$) and how long ($p < .05$) they cried. Korner speculated that the irritable infant would elicit more frequent maternal attention and stimulation than would the placid infant who cried less often. She pointed out that aside from feeding the main interactions between infant and mother in the neonatal period "center around comforting and soothing interventions designed to calm the crying infant" (p. 105). Korner theorized that the infant was active in determining just how much stimulation and social interaction were received. In a related area, she and her coworkers (Korner, Chuck, & Dontchos, 1968; Korner & Thoman, 1972) found no sex differences in crying in infants directly after birth, nor were there any sex differences found in termination of crying related to various types of maternal interventions aimed at soothing the infant.

Noncrying Vocalizations

Regarding noncrying vocalizations, Ainsworth (1973) presented an interesting fact:

In view of the significance of language as a mode of interpersonal communication throughout most of the lifespan, it is surprising that the social and communicative aspects of preverbal vocalization have been given but scant attention in research (p. 22).

Bowlby suggested that smiling and vocalizing (or, as he called it, "babbling") served similar purposes. Both were social releasers whose predictable outcomes were to "hook" the caregiver in a sociable response and to engage him or her in a chain of social interactions. Noncrying vocalizations were heard from the infant by the third year of life (Wolff, 1963, 1969), occurring shortly before the infant grew fussy.

In the fourth week of life, Wolff (1963, 1969) reported that the infant's vocalizations were most effectively elicited by auditory stimuli, especially the human voice. No sex differences with regard to the amount or type of vocalizations were noted in this initial period of attachment (Rebelsky, Starr, & Luria, 1967). Between the sixth and eighth week of life the infant "invents" new sounds when alone, practicing them in cycles and repeating them in a kind of "vocal circular reaction" (Wolff, 1969). Of the growing richness in the infant's vocalizations, Wolff (1969) made these comments: the vocalizations registered as more complex on a sound spectrogram, and the individual vocalizations were more discrete to the human ear.

Jones and Moss (1971) also made note of infants who vocalized while in an "awake active" state. These researchers placed babbling in the context of a reciprocal game; the infant's vocalizing was a discriminative stimulus for the mother's social response. Once the mother responded to the infant's sounds the infant discontinued, shifting into a reciprocal relation in which the mother vocalized, and vice versa. As with Jones and Moss, Rheingold (1956) referred to the "vocal play" between the infant and mother, suggesting that the mother's response to the infant's vocalizations played a major part in the development of social responsiveness in the infant.

In a further look at the development of the infant's social responsiveness, Rheingold and her coworkers (Rheingold, Gewirtz, & Ross, 1959) successfully increased the frequency (overall increase of 86%) of vocalizations in 21 12-week-old infants in one set of experiments. Reinforcing stimuli consisted of smiles, light touching of the infant's abdomen, and "tsk-tsk" sounds presented simultaneously by the experimenter, contingent on the infant's vocalizing. Rheingold's studies suggested that even very young infants' vocal behaviors were conditionable, with routine behaviors of caregivers acting as reinforcing stimuli for the infant.

Postural Adjustment, Grasping, and Clinging

Bowlby (1969) included grasping and clinging as behaviors of the neonate which actively promoted proximity to or contact with the mother. In fact, he (Bowlby, 1958) specified clinging as one of five species-characteristic behavior patterns related to

attachment. Ainsworth (1973) agreed, identifying grasping and clinging as precursors to attachment, occurring even in Phase 1 of the attachment process (see page 10). She added to the list of behavioral precursors of attachment postural adjustment. Although Bowlby had no separate category for postural adjustment in the infant as such, he did indicate the mother's role in elicitation of this behavior in the newborn in these words:

By cradling [the infant] to herself in a ventro-ventral fashion [the mother] is likely to elicit reflex responses that not only orient him more precisely to her, but also give him the chance to use mouth, hands, and feet to grasp parts of her (1969, p. 272).

Blauvelt and McKenna (1961) studied the neonate's use of movements of "orientation, prehension, and opposition," that is, postural adjustment when in ventro-ventral contact with the mother. Research of filmed sequences of behaviors of mothers and their newborn infants demonstrated that mothers oriented to their infants in the first day postpartum. The mother maintained either a face-to-face posture with her infant, or she adopted a ventro-ventral position in which the head movements of the baby were felt. A further finding was the infant's use of postural reflexes, or in these researcher's words, "reflex responses" in a reciprocal manner to orient to the mother.

Ainsworth (1973), writing of her longitudinal study of Baltimore infants, commented on the neonates' characteristic molding and curving in a relaxed way toward the adults' bodies when they were

placed in a ventro-ventral position; the infants moved into what she called a "cuddly" posture. In a related interesting study Schaffer and Emerson (1964b) made the distinction between infants who were cuddlers and those who were non-cuddlers. Interviews concerned with the development of social attachment conducted with the mothers of 37 infants determined that approximately one-fourth of the infants consistently resisted, even protested, the cuddling situation. Furthermore, the resistance to physical contact was stable over the first 12 months of life. These researchers noted that the non-cuddlers tended to show less intense attachments at 12 months than did the cuddlers; however, these differences disappeared by 18 months.

Prechtl (1963) made note of grasping and postural adjustments in the neonate as necessary parts of the series of behaviors needed for normal mother-infant interaction. He suggested that it was essential for the infant to display the usual amount of activity and motility in order to elicit an optimal amount of caretaking from the mother. In his study of the interactions of mothers with minimally brain damaged infants, Prechtl called attention to the difficulty the mother had in forming an abiding attachment to the newborn infant who was either hypoactive and therefore too floppy to mold into a cuddling posture, or to the hyperkinetic infant who was too jerky and rigid for relaxed cuddling. Brazelton (1973a) and others (Osofsky & Connors, 1979; Quinn & Goldberg, 1977) also referred to the infant's ability to cuddle and mold to the body

of the caregiver as being an important component of its interactive skills. Brazelton (1973a) devoted a specific evaluative category in the scoring profile of his Neonatal Behavioral Assessment Scale to the quality of the infant's cuddliness, viewing it as an aspect of the neonate's social competence. Evidence has also been offered that the infant's posture and muscle tonus affected the mother's movements and "style" of handling her infant (Osofsky & Connors, 1979), along with her feelings of "acceptance" or "rejection" by the infant (Wolff, 1971).

Thoman (1975a) in her research involving mother-infant pairs during the first five weeks of life, described the disruptive effect a "rejecting" baby (one who when picked up and held to the shoulder either became drowsy or fussy by turns) had on its mother. Thoman placed the mother-infant relationship in an interactional framework with each half of the partnership contributing to an ongoing process of mutual modification of behavior. The "rejecting" infant, here one failing to mold or adjust actively to being held, was seen as hindering the normal synchrony of behaviors which developed between mother and infant.

Considered as reflexive components of the infant's ability to make postural adjustment when held, or taken separately, grasping and clinging are seen, as previously stated, as "early" attachment behaviors (Ainsworth, 1973; Bowlby, 1969). Grasping is an involuntary motor act, or reflex, present at birth (Brazelton, 1973a; Crowell, 1967; Prechtl & Beintema, 1964). This reflex develops

in the fetus at three months gestation and becomes inhibited when voluntary control of the hand occurs in the infant's third month of life. The Moro reflex, commonly called the embracing reflex, is also in the infant's behavioral repertoire at birth. In the complete reflex there is a straightening of arms and elbows away from the body with extension of fingers and wrists. Reflex movements of hips and knees also occur quickly (Korones, 1976; Prechtl & Beintema, 1964). Bowlby assumed a genetic bias for clinging and placed the Moro reflex in this context

Rheingold (1961), in contrast to the importance Bowlby conferred on grasping and clinging for attachment, viewed these behaviors as less important to the developing of social responsiveness than visual exploration in the infant. Although Ainsworth (1973) considered clinging a proper attachment behavior, she was less enthusiastic about its importance than Bowlby, writing that even though the newborn was equipped for holding on by reflexive grasping and clinging, current rearing conditions discouraged early development of voluntary "holding-on" behaviors in the infant.

Rooting and Sucking

Rooting and sucking satisfied a number of both Bowlby's and Ainsworth's criteria for mother-infant attachment: both reflexes were present in the infant from birth; both promoted proximity and contact with the mother; and both afforded the mother a signal for responding. Stated more simply, rooting and sucking oriented the infant to the mother and promoted feeding.

Prechtl (1958) gave a thorough description of the "search behavior" associated with feeding in both premature and full-term infants. Side-to-side head movements or directed head movements to bring the infant's mouth into contact with breast or bottle nipple, taken together with the infant's opening his or her mouth and grasping with lips after tactile stimuli around these areas, constituted the rooting reflex. Prechtl distinguished between the rhythmic non-directed rooting motions occurring even in premature infants when there was no external stimulation and a second variety of "directed" rooting reflex, or head turning to a specific stimulus. The second form of rooting was seen as a more sophisticated form of behavior, since it came later in the infant's development (after two or three weeks) and happened in response to stimuli in a more restricted area on the face.

In their classic study of 21 healthy, newborn infants, Gentry and Aldrich (1948) elicited a rooting reflex from infants as young as one-half hour of age. Their research indicated that rooting was related to the infant's state of consciousness, and that the "deeply asleep" infant would exhibit neither rooting nor sucking reflexes. Wolff (1959) reported a similar finding in his study of neonates, pointing out, as had Gentry and Aldrich, that rooting depended "on the infant's state of responsiveness." In fact, the infant's state appeared a more important determinant of rooting than did hunger, since 46 to 48 infants tested rooted when alert even when evaluated immediately after having been fed.

Rooting behaviors, whether they are termed "elicited reflexive responses" (Brazelton, 1973a) or, more elegantly, "reactions des points cardinaux" (André-Thomas, Chesni, & Saint Anne-Dargassies, 1960), now are regularly included parts of numerous neonatal evaluation procedures, describing as they do an aspect of the infant's central nervous system organization (Kessen et al., 1970).

In a pair of studies involving a total of 63 neonates in their first four days of life (Blauvelt & McKenna, 1961), findings were that the reciprocal postural adjustments infants and mothers made when they were in ventro-ventral contact also elicited the rooting reflex in the infant. A related finding indicated that the mother then coordinated her actions related to feeding with this reflex when the baby was oriented toward her.

Bowlby (1969) suggested that both rooting and sucking, so-called "chain-linked sequences" in the service of feeding, were readily altered by learning. For example, Papoušek's research (1967) demonstrated the conditioning of head turning (i.e., rooting when the infant's cheek was touched) in 14 newborn infants. In addition to newborns, groups of both three- and five-month-old infants were used as subjects. Although the rate of conditioning was slow in the neonates, with an average of 32.2 trials preceding the first conditioned head turn (compared to 9.4 trials for the three-month-old infants), the significant decrease ($p < 0.001$) pointed to, as the author put it, a speedy development of conditionability in the first three months of life.

In related research, Lipsitt and Kaye (1964) utilized a "non-nutritive nipple," an automatic device for recording sucking responses, to condition sucking responses in neonates. For the experimental infants, a tone CS preceded the insertion of a nipple into the infant's mouth by one second. Experimental subjects showed a significantly greater amount of change than did controls from basal to extinction periods in percent of response and number of sucks [$t(18) = 2.14$ and $t(18) = 2.41$, respectively, $p < .05$, 2-tailed].

Kron's experimentation (1967) with newborns, in which nutritive sucking was the operant, indicated that instrumental conditioning could occur in the first 24 hours of an infant's life. In another study, Kron and his co-workers (Kron, Ipsen, & Goddard, 1968) made a unique application of their interest in the nutritive sucking of newborn infants. This experiment involved eight neonates and was aimed at demonstrating consistent differences in early behavior. A sucking instrument was devised to measure both sucking rate and pressure. Findings indicated a pause-burst pattern of sucking that was unique to each infant and consistent over time. These researchers speculated that such consistent patterns might prove valuable for predicting later behavior. In still a third study of newborn sucking behavior, Kron and his associates (Kron, Stein, & Goddard, 1966) noted that routine obstetric sedation administered to the mother produced depressant effects on the infant's feeding behavior. The inference was that vigorous adaptation to the breast or bottle by the infant set the stage for

beneficial mother-infant relations, with the lethargic, nonresponsive infant at a disadvantage here.

Siqueland and DeLucia (1969), in a group of experiments with infants ranging in age from three weeks to one year, reported on the establishment of rapid conditioning in the infants when non-nutritive sucking was used as the operant; the reinforcer was a series of colored slides changed every 30 seconds. The researchers noted habituation or satiation in the infants when the stimulus proved to be "boring" rather than changing every 30 seconds.

Finally, there is the precise, technically sophisticated work being done by Lipsitt (1975) in which the neonate's sucking behavior is but one of the sensory capacities investigated in a complex linking of polygraphic recordings and computer print-outs. Lipsitt's studies are representative of the developmental theorists who have moved from the assessment of infants with developmental tests alone to utilization of behavioral observations and experimental techniques to alter infant behavior. Lipsitt, for example, used simultaneous polygraphic documentation of multiple responses (sucking, respiration, and heart rate), claiming that this allowed for a more sensitive detection of the neonate's sensory and neurological ability.

Teasing out the sucking behavior of the newborn from a polygraphic recording, Lipsitt (1975) noted that in a 20 minute sucking period the infant would show an orderly progression of sucking rate within bursts, slowing up for a fluid-sucking condition relative to a no-fluid condition. Additionally, the infant's suck

rate would slow down further for a 15% sucrose solution relative to the suck rate for distilled water. Lipsitt demonstrated that in sucking patterns the infant sucked more times per minute for sweet than for non-sweet liquid since he or she took shorter rests in sucking. Within the bursts of sucking the infant sucked more slowly as if to savor the sweetness fully. In a related finding viewed as indicative of memory functioning in the neonate, Lipsitt found that when a group of newborns receiving a sucrose solution during a 20 minute period were compared to a group which alternately received sucrose solution, then water, in five minute periods, the alternated group evidenced an experiential effect. When the alternated group sucked for the sucrose solution their rates were comparable to the group sucking for sucrose throughout. However, the alternated group's sucking rates for water were significantly lower than their counterpart control group which received water all during testing. Lipsitt noted that when the neonates had had experience sucking for the sweet liquid, later experience sucking for water "turned them off," as shown by their instrumental behavior.

Perhaps most pertinent to the research report which follows is Lipsitt's similar interest in the development of a model reflective of what he called the "constant reciprocity" of the infant and its surroundings. Lipsitt stated that current experimental techniques attempt to tease apart this infant-environment interaction by studying the infant under both stimulus conditions controlled by the examiner and in a free behavior condition.

Visual Responsiveness in the Infant

Of all the infant's sensory capacities explored by researchers, the one which has proven to be the most perennially intriguing, if variability of techniques employed and sheer number of studies are indicative, is that of vision. In spite of traditional views which have held that the infant's visual world is one of disordered shapelessness, recent findings call for a revision of this notion (Brazelton, 1973a).

It is by now apparent from physiological and anatomical evidence that the infant's visual structures are, at birth, both intact and well-developed albeit somewhat immature (Cohen, DeLoache, & Strauss, 1979; Greenman, 1963; Kessen et al., 1970; Spears & Hohle, 1967). Kessen and his coworkers (Kessen et al., 1970), along with Spears and Hohle (1967), pointed out that the neonate was appreciably sensitive to light, noting that the pupillary reflex was "functionally lively" from birth, regulating light as it entered the eye.

In their study of visual accommodation in infants, Haynes, White, and Held (1965) found that quiet, alert neonates had a fixed focal point of clearest vision at approximately eight or nine inches. In a discussion of this study, Walters and Parke (1965) suggested that the infant had numerous early opportunities for visual stimulation since the mother's face was often presented in this range in her routine feeding and other caretaking activities.

Gorman, Cogen, and Gellis (1959) accurately assessed visual acuity in 100 healthy newborns by measuring optokinetic nystagmus (sometimes called railway nystagmus) to a field of moving stripes passed across the infant's field of vision; all the infants responded to patterns representing visual acuity of approximately 20/450, indicating reasonably good near vision. Previous researchers had estimated the infant's vision to be only 20/1500 even at four months of age.

In a later study in which the goal was evaluation of visual acuity in a sample of 39 normal newborn infants, Dayton and his coworkers (Dayton, Jones, Aiu, Rawson, Steel, & Rose, 1964) found evidence of the infants' ability to pursue moving objects visually. Electrooculographic recordings were taken while a series of lines were presented to the infants; the recordings were marked by an observer when optokinetic nystagmus, indicating pursuit, occurred. Investigators noted visual acuity in the infants of at least 20/150, adequate for at least a small measure of binocular vision.

When Greenman (1963) tested the visual behavior of 127 newborn infants, he found that 120, or 95%, exhibited visual following one or more times within the first 96 hours after birth. Greenman pointed out that horizontal following was more easily elicited than was vertical following; he also mentioned that cradling the infant and decreasing surrounding light had an "organizing effect" for eliciting a visual response. Wolff's (1959) observations on the neonate's visual pursuit movement matched those of Greenman. Results of his

study showed the newborn following a visual stimulus with both head and eyes in a vertical, horizontal, or circular pattern when in an alert, inactive state of consciousness. Of interest was Wolff's suggestion that the infant's supposed incapacity to follow or track visually was related to his or her being in an alert, inactive state so infrequently during the neonatal period that an opportunity for experimenters to study infant visual pursuit was exceedingly rare. Brazelton and his associates (Brazelton, Scholl, & Robey, 1966) tested 96 infants, both full-term and premature, in their first week of life for visual behavior. He mentioned, as had Wolff, the infant's state of consciousness as being the chief determinant in the elicitation of a visual response. The visual stimulus used in this study was a red ball suspended six to ten inches from the infant's face in the line of vision. Brazelton succeeded in eliciting both fixation and visual pursuit in 57.5% of the infants. He described pursuit arcs of from 60 to 90 degrees, accompanied by head turning. As visual pursuit occurred, Brazelton noted a brightening of the eyes together with suppression of random body movements and regular respiration.

An experiment by Trincker and Trincker (1955) involving a group of 38 infants in their first 10 weeks of life provided information about the newborns' sensitivity to light stimulation of various wavelengths. Selecting for study the "eye-on-the-neck" reflex during which the infant's body makes an opisthotonic (S-shaped) curve response when the eyes are stimulated by sudden illumination, the

infants were examined under varying conditions of light stimulation. Findings were that after 15 minutes of brightness adaptation the infants responded to the different wavelengths of light with a sensitivity similar to adults throughout the 10 week test period. This was not the case after darkness adaptation. The values obtained under darkness adaptation were significantly different from adult values, becoming similar only after several weeks. The authors concluded that in the infant eye the cones, which allow for photopic vision, developed earlier than the rods, which provided the foundation for scotopic vision.

It has by now been relatively well established, therefore, that the neonate's pupils react to light, can fixate on light and track it briefly, and can respond to color stimuli. Nevertheless, if the infant is to develop spatial orientation, object recognition, and social responsiveness, he or she must have the ability to respond to patterned visual stimulation also. It was Robert Fantz (Fantz & Nevis, 1967) who asserted that the eye was dependent upon pattern vision for almost all useful information taken in visually. It was his opinion that without pattern an individual would be considered blind for most practical purposes. For some clarification of pattern vision capability in the newborn, it is toward Fantz's varied, often elegantly simple, experimentation that we now look.

Fantz challenged long held notions that neonates had limited or no pattern vision, either because of immaturities of eye and brain or because visual learning had not yet happened. A number

of his studies indicated that in the early months of life infants had moderately acute pattern vision, showed more visual interest in pattern than in plain colors, differentiated among patterns of similar complexity, and showed interest in a pattern similar to a human face (Fantz, 1963).

In a study aimed at collecting evidence of pattern vision in newborns, Fantz (1963) compared visual responsiveness to plain-colored and patterned surfaces in 18 infants ranging in age from 10 hours to 5 days. The six targets used in the study were circular, non-glossy, and six inches in diameter. Included were three with black/white patterns (concentric circles, schematic face, newspaper print), and three which were brightly colored and unpatterned. The targets were sequentially presented in random order to the subjects. The infants' fixation time on each target was recorded by observing corneal reflection of the target in the pupil. The infants paid twice as much visual attention to patterns as to plain-patterned surfaces. Fantz found that the infants spent more time fixating the schematic face than any of the other targets. Results suggested a re-evaluation of the view of the infant's visual world as formless.

Following closely on Fantz's discovery that infants perceived and even preferred patterned to plain surfaces came the findings of Hershenson, Munsinger, and Kessen (1965). These experimenters determined that infants showed preference for shapes of intermediate variability in terms of angles. It had already been established that this was the case for adults and children. In their study

subjects were 17 neonates ranging in age from 2 to 4 days. Each of the infants was exposed to pairs of shapes with each member of the pair differing from the other in number of angles. Preference for a shape was estimated from the number of times it was fixated by the infant. The six stimulus pairs were presented to each subject in random order for 30 seconds. Findings were as follows: shapes with an intermediate number of angles were preferred to shapes with few angles; infants preferred intermediate shapes to more complex ones, although this difference was not significant. The authors concluded that newborn infants appeared to prefer a greater variety of stimulation if allowed a choice between a simple and a more complex figure.

Fantz (1965), pointing out the newborn's ability to see and discriminate patterns from birth as well as his or her competence in selectively attending to patterning of surfaces and objects, went on to provide experimental evidence of the alteration of selectivity through visual experience by 2 months of age. Twenty-two infants were administered 10 weekly tests during their first 6 months of life. Four pairs of targets were presented randomly during any test session; fixation times were recorded for each stimulus. Of the targets, the simplest pair (identical triangles) received the least attention; the pair of relatively complex patterns received most attention; and intermediate fixation times were registered for target pairs of intermediate complexity. The differential results remained consistent among the infants for all ages. One

interesting finding showed the infant under 2 months of age preferring a striped pattern within a pair of patterns of equal complexity, whereas the infant older than 2 months preferred the bull's eye pattern. Fantz controlled for repeated testing to rule out this as a possible cause of the finding; he attributed the change either to maturation or to visual learning.

Still later Fantz and Nevis (1967) evaluated longitudinal data collected once weekly from 10 university-faculty and 10 foundling-home infants between 2 and 24 weeks of age. Throughout the study the infants were tested with 18 pairs of stimuli of differing complexity. One purpose of the study was corroboration of changing trends in preference hinted at in Fantz's earlier research (1965, 1966). As Fantz explained, configurational differences (form of contour or arrangement of pattern elements) elicited strong, consistent preferences in the infants even though the targets used were quite similar. For example, infants showed an increasing preference for a bull's eye pattern over a horizontal arrangement of linear stripes (from 6 to 8 weeks onward). Preferences were also shown for a red checkerboard over a red square, for a polka dot pattern over a random shape pattern, and for a checkerboard over a lattice arrangement of squares. Fantz's tentatively drawn conclusion was that development of selective attention to configurational variables represented a first stage of "perceptual-cognitive" growth for infants.

In an interesting variation on the theme of selective attention to configurational variables, Lang (1966, cited in Kessen et al.,

1970) investigated emotional reaction and visual orientation in infants from 8 to 10 weeks of age. Targets consisted of either regular or grossly distorted dotted or continuous circles. At 8 weeks infants showed no differential preceptual behavior towards the stimuli. However, at 10 weeks the infants showed "a more relaxed approach" to regular circular shapes than to either the dotted or continuous distorted forms.

Salapatek (1975) emulated Fantz in the use of a developmental change approach to study the scanning patterns in infants to geometric figures such as circles, squares, and triangles. Findings were that 1-month-old infants fixated an edge or an angle of a figure, while 2-month-old or older infants generally scanned the figures more extensively. Results were similar when infants were shown a line drawing of a face (Maurer & Salapatek, 1976). Neonates scanned only a small area of the outer contour of the face while 2-month-old infants moved quickly from scanning the outer contour to focusing on the internal features in the facial schema. Speculation was that a more extensive scanning of figures occurred as the infant developed.

In their attempts to comprehend the relationship between an infant's visual preference or attention and its relatedness to cognitive development in the infant, researchers amassed numerous findings dealing with stimulus complexity. General findings established that infants preferred more complex stimuli as they got older. Depending on the researcher, stimulus complexity was

taken to mean anything from the number of turns in a random shape to the numbers of squares in a checkerboard pattern to the amount of contour in a shape.

Although it was generally agreed that infants preferred more complex stimuli as they matured, what was less well understood was exactly what the complexity meant and the basis for its effect (Cohen et al., 1979). Apparently two divergent views were held. For example, Greenberg (1971) held that the main determinant in complexity preference in the infant was cognitive development. He conjectured that for the infant there was always an optimal level of complexity in stimuli, with stimuli above and below the optimum being responded to (or preferred) less than the optimal level. As the infant developed cognitively the amount of stimulus information he could process increased, therefore the "optimal level of complexity" increased over age as well. Karmel (1969) disagreed with theoreticians who chose a cognitive explanation of development. He preferred instead to explain the phenomenon of complexity preference in terms of neurological maturation of the infant's visual system. In so doing Karmel stood as a representative of those investigators who preferred a maturational point of view.

Face Perception

Although theorists with an ethological orientation (Bowlby, 1958; Freedman, 1974) adopted the position that the newborn infant innately preferred the human face, or so-called "visual figures with social significance" (Kessen et al., 1970), data suggested

that the infant's perception of faces followed a similar developmental course as that for shapes or patterns. As Cohen and his associates (1979) stated: "there is little evidence of an innate preference for human faces, and infants younger than two months seems to respond to only one or a few isolated high-contrast facial features" (p. 419). Kessen and fellow workers (Kessen et al., 1970) concurred, concluding in their survey of human infancy that: "at birth, patterns with social significance are no more preferred than meaningless geometric figures with approximately the same amount of patterning" (p. 357).

Fantz's study (1963) of pattern vision in neonates illustrated a preference for patterned over plain surfaces in 18 infants ranging in age from 10 hours to 5 days, and further demonstrated the "longest fixation" for a schematic face (for a group under 2 days, mean percentages of fixation time = 29.5; $P < .005$; for a group aged 2 to 5 days, mean percentages of fixation time = 29.5, $P < .001$). However, as Fantz (1963) and others (Cohen et al., 1979) speculated, the selective responses could have been related to a variety of other variables, notably complexity.

The same conclusion could be drawn from Stechler's research (1964). Twenty neonates from 2 to 4 days of age were presented three stimuli in random order: a facial schema, a die with three dots, and a blank sheet. Findings were that the infants preferred the face to the die and the die to the blank stimulus. It was noted that "faceness" and contour in the stimuli varied considerably

(Kessen et al., 1970), and once again complexity appeared to be related to the infants' responses.

Recent research (Maurer & Salapatek, 1976; Salapatek, 1969) seemed to support the assertion stating that those variables influencing infants' responses to human faces and their attention to other visual stimuli were much the same. For example, in Salapatek's study (1969) of the scanning patterns directed to geometric figures for two chronologically different groups of infants, a younger sample (mean age of 33.1 days) and an older group (mean age of 63.9 days), findings were that the older group tended to select an internal feature of the geometric figures for prolonged gazing. The younger group differed, preferring to fixate a very limited area of the outer contour of shapes, usually at an angle.

Similarly, Maurer and Salapatek (1976) reported much the same scanning patterns when infants attended to human faces. Findings were that the 1-month-old infant showed a preference for a three-dimensional representation of a human face over a two-dimensional copy by visually fixating it for a longer time. Kagan and associates (Kagan, Henker, Hen-Tov, Lenine, & Lewis, 1966) found a comparable pattern of behavior in 4-month-old infants, pointing out their deferential responses to a three-dimensional model of a face over models of faces which either had scrambled features, were eyeless, or were blank.

It was Wolff (1963) who placed the crucial change in the infant's attending to the human face at approximately 3 to 4 weeks of age.

At this point, he speculated, the infant made "true eye-to-eye contact" with the observer. Wolff held this development to be of signal importance in the growing "social interchange between parent and offspring."

Robson (1967) added eye-to-eye contact to Bowlby's list of behaviors--sucking, clinging, crying, smiling, and following--which acted as releasers of maternal caretaking responses. He noted the appeal of the infant's eyes for his or her mother due to their stimulus richness (i.e., qualities such as the pupil's capacity to vary in diameter, the shininess of the eye itself, etc.). In his longitudinal study of 54 primiparous mothers involving post-natal interviews, Robson found that most of the mothers expressed feelings of unfamiliarity and strangeness toward their new infant for several weeks; the feelings lasted until the infant had made true eye-to-eye contact with them. In a later, more complete treatment of this same research, Robson and Moss (1970) found that for the first four to six weeks of life the "modal mother" saw her infant as anonymous and nonsocial, experiencing only an impersonal affection for the infant. Results indicated that the infant's ability to make eye-to-eye contact with the mother led to an intensification of maternal feelings and to the mother's perception of her infant as more uniquely human.

Klaus and Kennell (1976a) also emphasized the importance of eye-to-eye contact, asserting the position of this behavior as a mediator of maternal attachment. Brazelton (1976a) commenting in

their definitive synopsis of attachment, Maternal-Infant Bonding, suggested that mutual visual regard afforded a new mother feedback while providing a kind of "personification" for the infant. Wolff (1976) named eye-to-eye contact a powerful social communication signal, one which must necessarily be explored by observing the reciprocal interactions between mother and infant.

A later research report (Lozoff, Brittenham, Trause, Kennell, & Klaus, 1977) confirmed earlier mentions of eye-to-eye contact in facilitating attachment, terming it one of several "interactive indications of recognition, affection, or appreciation." In another instance (Klaus, Kennell, Plumb, & Zuehlke, 1979) in which newborn infants were handed to their mothers in privacy, over 70% of the taped comments from mothers in this situation referred to the infant's eyes. Kennell and fellow researchers (Kennell, Voos, & Klaus, 1976) put it most simply with their remark that early development of the infant's visual system is complemented by the mother's interest in the infant's eyes.

Rheingold's (1961) curiosity about the infant's visual capabilities predated these recently reported findings. In an earlier paper she mentioned a sequence of events following the infant's visual regard and repeating themselves frequently since "most prominent among the infant's waking activities is looking" (p. 166). Repeatedly, the infant presented these sequential behaviors: facial brightening, smiling, increased whole body activity, and vocalization. Both Rheingold and a later observer of the infant's visual capacity

(Korner, 1974) asserted that the neonate's visual behaviors were the most mature in his or her behavioral repertoire. Rheingold noted that as early as 2 months they are already in the form they will keep throughout life. Certainly it is a uniquely potent force the infant possesses for eliciting and reinforcing nurturant behavior in his or her family. Perhaps it is this visual ability that the infant has which makes us most aware of its active role in its own socialization. Rheingold's telling phrase fittingly describes the infant's unusual skill: "Of men and women he makes fathers and mothers" (1968, p. 283).

3. Development of Maternal Attachment: The Mother's Readiness for Reciprocal Interaction

Evidence for a Maternal "Sensitive Period"

"The readiness of the neonate and the adult for mutual involvement encourages social stimulation, protection from pain or danger, and satisfaction of physical need" (Lozoff et al., 1977, p. 92).

So far in this survey of the literature it has been the infant half of the infant-mother dyad which has been of concern. The intention has been to present the neonate as a complex, socially responsive organism, capable of more than reflexive behavior and possessed of some cortical control. On the other hand, the following summary of a series of studies by Klaus, Kennell, and associates clarifies the timing and sequence of behaviors of mothers

interacting with their newborn infants. This time immediately after the birth was called by Klaus and Kennell (1976a) the maternal sensitive period. It is during this interval that a mother needs to have adequate contact with her newborn if the initiation of those affectional bonds which Bowlby calls attachment is to occur.

Animal studies: mammalian maternal behavior after parturition.

In spite of the view of some investigators who have cautioned against overemphasizing ethology in attempts to understand human maternal behavior, even more researchers have pointed to the usefulness of an evolutionary perspective for illuminating overall patterns from species to species (Bernal & Richards, 1972; Klaus & Kennell, 1970; Rosenblatt, 1975; Sameroff, 1975). Therefore, before proceeding to the studies pertaining to a maternal sensitive period in humans, it would be useful to have a very brief look at maternal behavioral patterns in mammals after parturition.

For example, researchers (Hersher, Richmond, & Moore, 1963; Klopfer, Adams, & Klopfer, 1964; Moore, 1968) found that in sheep, cattle, and goats if the mother was separated from her young in the first hour or first few hours after birth, then reunited with her offspring, she showed various disturbances in maternal behavior such as: failing to care for her young; feeding her own and other young indiscriminately; and butting her own offspring away. Looking more closely, Collias (1956) and Klopfer (1971) found that in goats, dams would not accept their own young after the infants had been removed at birth for more than one hour. In contrast, Hersher and

coworkers (1963) noted that if dams were given as little as five minutes contact with their kids immediately after parturition then most of the offspring were reaccepted (even after three hours apart). However, persisting effects of separation on "nursing patterns" were seen, even after two to three months. Reflecting on these studies, Klaus and Kennell (1970, 1976a) posited a maternal sensitive period in these mammals, suggesting that when animal mothers were separated from their young "deviant maternal behavior" could result.

Rosenblatt (1975) also supported the notion of an optimal time for mother-infant attachment as can be seen in the following excerpt from a recent symposium presentation:

Among all mammals the onset of maternal behavior after parturition is rapid. Because this allows the mother and her newborn to form a behavioral bond that has important consequences for the young, this period has been referred to as a "critical period." Without the formation of such a bond the young suffer in their development (p. 17).

Rosenblatt's research (1965) with lab rats found the maintenance of maternal behavior to be most vulnerable to disruption the first few days after birth. When rat pups were taken away from their mother in the first or second day (after maternal behavior had been initiated), maternal behavior quickly extinguished. On the other hand, after three days of the mother's caring for her pups, even a four-day separation caused only a slight reduction in maternal responsiveness. Sameroff (1975) wrote that it appeared essential for the mother rats to spend time with their young in the time

immediately after birth if later maternal behavior was to reappear after separation from the young. Perhaps even more instructive are those studies involving primate mothers and infants, since this group falls nearer man on the phylogenetic scale. For instance, Meier (1965) studies rhesus macaque mothers' behaviors toward their surgically delivered (Caesarean section) newborns. Two groups of mothers were studied, laboratory animals who had been reared in isolation and feral animals. After the two-hour separation, the laboratory reared monkeys refused to accept their infants, neither approaching and picking the infants up nor holding them in ventro-ventral position, as was normal. In contrast, the feral animals ($N = 7$) (who had been captured after having been reared by their own mothers) did accept their infants, three on the day of birth and the remaining four the next day. Sackett and Ruppenthal (1974) posited "second generation effects of inadequate mothering" in the laboratory reared monkeys, resulting in maternal behavior that was more easily extinguished than in the feral group.

A further example of second generation effects of inadequate mothering can be found in Harlow's work (Harlow & Harlow, 1964). In one study those infant monkeys who were separated from their mothers and reared in isolation were handicapped in performing adult functions, notably sexual intercourse and mothering. Harlow noted that these monkeys were largely indifferent to their own offspring once they themselves had become mothers. Furthermore, they occasionally treated their newborn brutally. As for the effects

of longer periods of separation, Harlow's research (Harlow, Harlow, & Hansen, 1963), in which rhesus monkey mothers were deprived of tactile contact and could only see and hear their infants, found that after two weeks the mothers rapidly decreased the time they spent viewing their infants. Indications were that viewing alone was insufficient stimulus to maintain maternal interest in the infant (Klaus & Kennell, 1970).

Summarizing, separation of the newborn or young animal from the mother significantly alters maternal behavior. Each species has a specific length of time that separation can be endured. Separation continuing beyond the sensitive period usually produces "drastic and irreversible effects" on mothering behavior (Klaus & Kennell, 1970).

Human Maternal Sensitive Period

Supporting the hypothesis of a human maternal sensitive period is the research of Klaus and his coworkers (1972). In a study of two groups of mothers of normal, full-term infants, differing amounts of contact with their infant were allowed the mothers. The control group of 14 mothers received routine hospital care; the experimental group were given their nude infants for one hour within the first three hours of birth. They were also allowed five extra hours of contact each day for three days following delivery. The groups were matched for infant characteristics and background. At one month maternal behaviors were measured using three techniques: a standardized interview, time-lapse analysis of a feeding, and

scored observation of the mother during a physical exam of her infant. At one month the extended contact (EC) mothers were judged to be more reluctant to leave their infants during the exam than the control group and showed more soothing behavior throughout the exam. In the feeding situation the EC mothers had significantly higher scores on measures of soothing, fondling, and en face behaviors (i.e., when the eyes of the mother and the infant were in the same vertical plane of rotation), all of which were considered indicative of attachment. During the interviews the EC mothers stated that they picked up their infants more frequently in response to their crying and were more hesitant to leave them than were the control mothers.

This same group of mothers were evaluated one year later (Kennell, Jerauld, Wolfe, Chesler, Kreger, McAlpine, Steffa, & Klaus, 1974) to determine whether or not the early measurable differences had persisted. In a one-and-one-half-hour observation segment, naive observers found that EC mothers spent significantly more time ($p < 0.05$) close by their infants during a physical exam. In addition, EC mothers spent more time soothing in response to crying and were more likely to kiss their babies ($p < 0.05$) than were control mothers.

A study one year later (Ringler, Kennell, Jarvella, Navojosky, & Klaus, 1975) compared the speech patterns of 10 mothers chosen randomly from the two groups. Linguistic analysis of the mothers and their children in a free play situation showed the EC mothers used significantly more adjectives ($p < 0.02$) and more questions ($p < 0.05$), expressed fewer commands ($p < 0.05$), and used more words

per proposition ($p < 0.05$) than the normal contact mothers. In other words, EC mothers had verbal output which was more varied and elaborative; they initiated more teaching behavior and used richer language with their children. Nine children of the EC mothers were compared to 10 children of control mothers when the children reached 5 years of age (Ringler, Trause, & Klaus, 1976). The EC children had more advanced scores on two language tests and significantly higher IQs than did the control children.

The maternal sensitive period is now being investigated cross-culturally. Kennell (Kennell, Trause, & Klaus, 1975) pointed to a long-term study in Guatemala using matched groups of subjects ($N = 19$). The contact group was composed of mother-infant pairs who had nude, skin-to-skin contact in privacy for 45 minutes directly after delivery. In contrast, the control group, following usual hospital procedure, were separated from their infants immediately after birth. In the contact group three important differences were noted: fewer infections were reported in these infants at 6 and 12 months; significantly more of these mothers continued to breast feed ($p < 0.05$); and their infants showed a significantly greater amount of weight gained ($p < 0.05$).

Attempting to define the limits of the maternal sensitive period, Hales (Hales, Trause, & Kennell, 1976) experimented with two groups of mothers. The early contact group had 45 minutes of extra skin-to-skin contact with their infants immediately after birth; delayed contact (DC) group had this 45 minute period delayed for 12 hours.

A third group received routine hospital care. The early contact mothers showed significantly more affectionate behaviors indicative of attachment: talking, fondling, smiling, kissing, and en face activity (EC compared to controls, $p < 0.005$; EC compared to DC, $p < 0.01$). There were no differences noted in the groups on measures of caregiving or proximity behavior. They reached two conclusions: that the maternal sensitive period appeared to be within the first 12 hours after birth, and that early contact encouraged maternal affection.

A Vanderbilt Hospital study involving 301 low-income, primiparous mothers (O'Connor, Vietze, Hopkins, & Altmeier, 1977) considered the effects of extended contact between the mother and her newborn on child health and subsequent mothering. Mothers were either given up to eight hours of rooming-in during the day (EC) or were given their infants every four hours for feeding according to usual hospital routine (HR). Assignment to groups was made randomly. In the 12-21 month follow-up, more of the HR children (6.3%) were admitted to the hospital for parenting disorders; in the EC group only one child was hospitalized. Parenting disorders included abuse, neglect abandonment, or failure-to-thrive without organic cause. Although contact in the EC group was not made immediately postpartum, the extra contact appeared to improve both subsequent mothering and child health.

Results of a series of studies of white, primiparous mothers completed in Sweden (de Chateau, 1976; de Chateau & Wiberg, 1977a,

1977b; de Château, 1979) seemed to confirm Klaus and Kennell's findings of a maternal sensitive period. In reports of the initial study (de Château, 1975; de Château & Wiberg, 1977a) matched mother-infant pairs were randomly assigned to one of two groups. Early contact (EC) mothers (N = 22) were given 15-20 minutes of extra skin-to-skin contact with their newborn, followed by routine care. The other group (N = 20) had no such contact and received usual hospital care. When the two groups were observed breastfeeding at 36 hours, findings were that the EC mothers sat up, held, and cradled their infants significantly more than did control mothers. They also carried their infants closer to their bodies. The groups were followed-up at three months during a free play period in the home (de Château & Wiberg, 1977b). Differences in the groups had persisted. The EC mothers spent more time in the en face position and kissed their infants more; control mothers spent more time cleaning their infants. As Klaus and Kennell (1976a) pointed out: "The two groups appear to focus on different ends of the baby. One group was busy cleaning up whereas the other was giving love" (p. 63). The infants in the two groups differed as well, with the EC subjects crying less and laughing and smiling more. One final finding was that the EC mothers continued to breastfeed their infants longer. de Château, the major researcher in this series of experiments, saw the maternal sensitive period as a unique time for the establishment of smooth, synchronous mother-infant interaction.

Various studies (Greenberg, Rosenberg, & Lind, 1973; Kennell et al., 1975; Kennell et al., 1976; McBryde, 1951) saw the hospital practice of rooming-in (with the infant remaining at the mother's bedside) as a logical extension of the postpartum sensitive period. In McBryde's classic study (1951), when rooming-in was instituted breastfeeding increased and "anxious phone calls" from mothers decreased once they were discharged. Other researchers reported similar findings. For example, when mothers who had been randomly assigned to a rooming-in situation were interviewed, these differences were found: the mothers were more competent in giving care to their infants; they were more sensitive to their infant's cry; and they were more willing to undertake the care of their infant without outside assistance (Greenberg et al., 1973). The preceding investigators saw rooming-in as allowing more sensitive, relaxed mother-infant interaction in the postpartum period.

In conclusion, the pioneering studies undertaken by Klaus and Kennell and associates here and abroad as well as the research efforts of de Ch[^]ateau, O'Connor, and others suggest a sensitive period immediately following birth, and up to a yet to be determined limit, that is critical to the formation of the mother-infant bond. Failure to develop attachment during this sensitive period has serious deleterious effects on future development.

Early mother-infant synchrony: some comments. There is considerable evidence of the very young infant's adaptive ability to respond to social stimuli. There is also evidence for a maternal sensitive period. It is now time to address what is variously referred to as: reciprocal behavior (Klaus et al., 1975), neatness of fit (Klaus & Kennell, 1976a), mutual adjustment (Stone et al., 1973), match (Brazelton et al., 1974), synchrony (de Chateau, 1979), mother-infant equilibrium, or mutual modification of behavior (Osofsky & Connors, 1979). These inclusive words and phrases referred to the interactions occurring simultaneously between the mother and infant in the early postpartum period. Each partner in the dyad contributed to the synchronous interactions; each influenced and was influenced by the other in what Klaus called the "recognition ritual" (Klaus & Kennell, 1976b). Osofsky pointed out (Osofsky & Connors, 1979) that a synchronous relationship, a "fit" between mother and infant, was a complex transaction requiring time and fostering to evolve smoothly. Klaus and Kennell concurred (1976a). Of the reciprocal interactions transpiring between a mother and her newborn they made these comments:

Each is intimately involved with the other on a number of sensory levels. Their behaviors complement each other and serve to lock the pair together. The infant elicits behaviors from the mother which in turn are satisfying to him, and vice versa, the mother elicits behaviors in the infant which in turn are rewarding (p. 67).

Sander's research illuminated the mutual adjustments in behavior which occurred between mother and baby as routines of sleeping,

eating, and caretaking were established. In one study, Sander and his associates (Sander, Stechler, Burns, & Julia, 1970) evaluated the establishment of day and night rhythms (i.e., macrorhythms) in infants in a newborn nursery. In the group of infants with multiple caretakers, day and night patterns were not established before 10 days of life, while those infants with a single caretaker established such a pattern in only a few days.

In a related study Burns and coworkers (Burns, Sander, Stechler, & Julia, 1972) compared infants with multiple caretakers to those with one caretaker on feeding. Results were that infants with multiple caretakers showed significantly more "distress during feeding." Distress was operationally defined as gagging, spitting up, fussing, crying, grimacing, turning away from the nipple, etc. A further finding was that when infants with a single caretaker, so-called "low distress" infants, were changed to a new caretaker at 10 days, there was a significant increase in distress ($P < 0.02$). The researchers concluded that these infants had already established a measure of fittedness with their caretaker in regulating the feeding function which was violated when a new person took over.

Stechler (1973) later reported on the infant's visual attention patterns in different caretaking environments. In the single-caretaker group of infants, visual attention patterns became regular in eight to ten days, whereas these same patterns in infants with multiple caretakers failed to become regular even after eight to ten weeks. Again, as in Burns's study (Burns et al., 1972), when

the group with a single caretaker changed to a new caretaker at 10 days, there was marked disorganization and distress. Facial gazing at the caretaker fell significantly, feeding distress increased, and sleep-activity cycles were disrupted for these infants.

Sander (1976) theorized that the first 10 days of life, of a phase called the "period of initial adaptation" (0-2½ months), was the optimal time frame for the establishment of an interactive mesh, or mutual fit, for mother and infant. He further hypothesized that those infants and mothers fortunate enough to room-in developed a synchrony in intensity, timing, and modality of behaviors that the nursery infants with multiple caretakers did not. His research showed such infants to be more asynchronous and unpredictable in their interactional patterns.

Klaus and Kennell (1976a) positively evaluated Sander's research on mothers and infants. They saw it as illustrative of what they termed a period of "entrainment," that time following birth when the mother assisted the infant in reorganizing and reestablishing biorhythmic cycles. Speculation was that in utero the infant had his or her rhythms and actions attuned to those of the mother--her diurnal hormonal rhythms, heart beat, and sleep-wake cycle. When the mother was given time and opportunity to interact steadily with her infant after birth, she became, in Cassel and Sander's (1975) words, the Zeitgeber, or timegiver, for her baby, helping it to function rhythmically.

Specific maternal behaviors in the maternal sensitive period:

touch. Now that the parameters of the maternal sensitive period have been defined, it is time to look more closely at some specific maternal behaviors directed at the infant early in the mother's attachment period. For example, when mothers were first presented their infants after birth, they proceeded to touch them in a specific, orderly fashion (Klaus et al., 1970; Rubin, 1963). Klaus and his colleagues (1970) suggested that the mother's touching her newborn constituted a species-specific sequence. In filmed sessions, when nude infants were placed beside their mothers, the mothers touched the babies with their fingertips on the infant's extremities during the first three minutes. In four to eight minutes, the mothers began using palm contact to massage, enfold, and stroke the infant's trunk. More recent research (Lang, 1972) revealed a similar pattern of maternal touch in home births. The progression of maternal touch, then, during the first 10 minutes when mothers were handed their nude, full-term infants, was from fingertips to palms, proceeding from the infant's extremities to his or her trunk (Kennell et al., 1976).

High-pitched voice. Early in the postpartum period mothers used a high-pitched voice when speaking to their babies, and we knew from information presented (Brazelton, 1973a; Eisenberg, 1965, 1970; Kennell et al., 1976; Klaus & Kennell, 1976a; Wolff, 1959, 1966) that infants responded optimally to a high-pitched voice from the first minutes after birth. When mothers spoke to their infants,

linguistic analysis (Stern, 1974) showed that the voice patterns used with the infants were different from those used with adults. For instance, mothers elongated vowels; the speed they used in changing pitch was frequently markedly slow but occasionally very fast; their range of loudness was altered; and their range of pitch was expended at the high end. Although we know little as yet of maternal paralinguistic behavior, at least one researcher has suggested that early on when a mother used "baby talk" she slowed down and elaborated her speech elements to match her infant's perceptual capabilities. Again, in home births the pattern the mother used in speaking to her infant appeared to be the same as that observed in hospital infants (Lang, 1972).

An interesting investigation of 1-to-2-day-old infants in a State 4 of quiet alertness showed them (in a filmed microanalysis) moving in time with the articulated structure of human speech. The infants observed moved in rhythmic patterns to either English or Chinese speech, but not to disconnected vowel sounds nor to a mechanical tapping noise (Condon & Sander, 1974). The authors speculated that the infant's motor behavior in response to the mother's speech represented an early example of entrainment by or synchronization with the mother. Several other investigators agreed (Brazelton, 1976b; Klaus & Kennell, 1976a). At least one (Brazelton, 1976b) viewed the interaction of the mother's speech and the infant's subsequent movements as "ambience for the affective communications thereafter" (p. 74).

Maternal odor. MacFarlane's two unique experiments (1975) showed us that even the mother's smell had an effect on her newborn infant. In one experiment using 20 clinically normal breast-fed infants, findings indicated that these infants distinguished between the smell of a clean breast pad and one that had been in contact with the mother's breast. Seventeen of 20 infants spent more than three-fourth of the testing time with their heads turned towards their mother's breast pad ($p < 0.001$). A second experiment using newborn infants ($N = 32$) was conducted to determine if the neonate could distinguish between his own mother's smell and that of another mother. By 8 to 10 days of life, the infant showed a preference for its own mother's smell by selectively turning its head to her breast pad significantly more often ($p < 0.001$) than to the "strange" mother's pad. Results indicated that the infant "knew" its mother, at least by smell, early in the newborn period. MacFarlane noted that the mother's "chemical signature" (i.e., her smell) was apparently easily discriminated by her infant during the first days of life.

Early mother-infant reciprocity: ongoing face-to-face interaction. As an example of the synchronicity between the mother and her infant which developed optimally in the early days and weeks of life, Brazelton and his associates chose to look at ongoing face-to-face interaction (Brazelton et al., 1974; Brazelton, Tronick, Adamson, Als, & Wise, 1975; Tronick, Als, & Brazelton, 1977).

Brazelton (Brazelton et al., 1974; Brazelton, 1975) described a homeostatic curve of attention and nonattention underlying early face-to-face interactions of mothers and their infants. Each partner in this dyad manifested a rhythmic attention-withdrawal cycle. In a videotaped frame-by-frame analysis of reciprocal social interactions, findings were that the mother provided cues for the infant's attentions to her. According to Brazelton's analysis, as mother and infant engaged each other, face-to-face, the infant behaved as follows:

All parts of the infant's body move in circular patterns as he attends to her. His face-to-face attention to her is rhythmic with approach-withdrawal cycling of extremities. The attention phase and build-up to her cues are followed by turning away and a recovery phase in a rhythm of attention-nonattention which seems to define a cyclical homeostatic curve of attention, averaging several cycles per minute (Brazelton et al., 1975, p. 137).

Thus, Brazelton and associates described a cyclical pattern of behavior by the infant which indicated a strong orientation toward the mother. They further evaluated the infant's cycle of attention with its mother by comparing this to its attention to other objects. They found the spans of attention and looking away for human interaction to be smoother and more gradual in their build-up, peaking and diminishing than for nonhuman objects. Periods of looking away were also shorter for humans than for nonhuman objects. Such smooth transitions were seen as contributing to the interdependency of the dyad. Brazelton theorized that the attentional

cycling described was a distinguishing mark of optimal mother-infant interactions.

Thoman (1975b) drew the same conclusions as Brazelton regarding mother-infant interdependency and smooth interactions. This researcher investigated the sensitivity of mothers to their infants' cues at feeding during the earliest postpartum period (0-2 days). Findings were that a mother who was more sensitive to her infant's cues and responded appropriately as she fed it facilitated "behavioral organization" or a receptive state. Thoman hypothesized that a mother and infant constituted a system which had a reciprocal pattern of activity. That is, the mother affected the infant, intervening as she sensitively read his or her cues; the infant's behavior in response to her intervention indicated its effectiveness. Infant behavior meant any of the following: states of sleep and waking, vocalizing, smiling, sucking, etc.

Klaus and Kennell (1976a) saw the mother's behaviors directed toward her baby, and her infant's synchronous responding as complementary, stating that such activities involving various sensory and motor systems seemed: "specific and innately programmed to start the process of locking mother and infant together in a sustained reciprocal rhythm" (p. 79).

Conclusion. In conclusion, both Bowlby (1969) and Ainsworth (1969, 1973) postulated a theory of attachment notable for its interactional point of view. The infant and mother were always presented within a framework of mutual influence. The infant's

attachment behaviors from birth on were presented as invariably intermeshed with those of the mother. In other words, the infant's attachment behaviors were reciprocated by those of the mother, with each member of the interactional dyad affecting the other. Joining Bowlby and Ainsworth, various other researchers (Lewis & Rosenblum, 1974; Rheingold, 1969; Stone et al., 1973) also noted the infant's active participation in altering his or her social environment. Research involving a close look at each participant's behavior in the mother-infant dyad is relatively recent and certainly long overdue, at least according to the following investigators:

For many years workers in child development have neglected the significance of interaction between mother and infant and . . . the subtle contributions that each makes to the other in shaping their ongoing dyadic behavior. There have been few voices stressing the necessity of observing both partners in this dyadic bond. It is important that we now focus attention on the . . . infant as a source of the formation, regulation, and indeed even the malevolent distortion of the caregiver's behavior. . . . we have begun to see in quite explicit terms that the infant even at birth is no mere passive recipient of stimulation . . . ready to be molded like clay on the potter's wheel (Lewis & Rosenblum, 1974, p. ix).

Reaching a similar conclusion with her research on the normal development of synchrony between mother and infant, Thoman (1975b) noted the need for utilizing an interactional framework for studying the ongoing process of mutual modification of behavior between mother and infant.

More recently researchers have begun to point out the remarkable capacity of the neonate for "social interaction" (Lozoff et al.,

1977). No longer is the infant presented as a reflexive being "functionally decorticated"; emphasis now is on the newborn as an "active, perceiving, learning, and information-organizing individual" (Stone et al., 1973, p. 4). Along with this change, due importance is now accorded the newborn period as a decisive period for mutual parent-infant involvement. As Bowlby first averred (1969) and as research has since demonstrated, the readiness of neonate and parent for reciprocal involvement at this time encourages the following: protection from pain or danger, social stimulation, and satisfaction of physical needs (Freedman, 1974).

The preceding studies in this chapter presented the infant's perceptual competencies and innate behavioral responses which were useful in promoting social interaction. Alongside these studies, attention was focused on the complexity of behaviors comprising the delicate balance involved in the earliest mother-infant interactions. Throughout this section emphasis has been on a careful unraveling of the "fit" which develops between mother and infant during the neonatal period. It is a recognition of the importance of this mutual dovetailing of behaviors in which mother and infant sensitively respond each to the other's cues that has served as the impetus for the research which follows.

CHAPTER II

PREMATURITY AND ITS EFFECT ON MOTHER-INFANT ATTACHMENT

1. Sequelae of Premature Birth

A population of particular interest and importance, in view of the research which follows, are those infants born prematurely, or preterm. The premature infant is defined as one weighing less than 2500 grams, and born before the end of the 37th week of pregnancy (Korones, 1976; Lubchenco, 1976). Prematurity occurs in 10% of all pregnancies which continue past the fifth month, making the condition the most prevalent abnormality of birth. Prematurity has been related to a high incidence of significant handicaps arising later, and it has been referred to as both a "classic perinatal hazard" (Sameroff & Chandler, 1975) and a "modal problem" (Birch & Gussow, 1970). Hence, prematurity is the most widespread problem affecting the childbearing population.

To this point the literature survey has centered on the full-term neonate as a complicated organism finely attuned and capably interacting with the mother. The mother's actions which dovetail with those of her newborn in the minutes and hours after birth have also been reviewed. Research presented indicates the necessity for a mother and her infant to remain together if attachment is to begin and proceed optimally. But, regarding prematurely birthed children, what happens when birth occurs preterm and the process

of attachment is interrupted? What are the effects of prematurity on the infant? Are they transient or longlasting? In this culture the high-risk preterm infant is routinely separated from its mother immediately after birth. Often it is moved miles distant to receive medical attention in a specialized neonatal intensive care center. Does this forced physical separation of mother and infant, often for months, result in a form of psychological separation? When the mother of a premature infant interacts with her baby, is her style of interacting different from that seen in the mother of a full-term infant? These are basic questions to be addressed by this research.

"Risk research" (Sameroff & Chandler, 1975) over the last 15 to 20 years has begun to provide us with answers to some of the questions. Technological advances made in the last decade in perinatal care have insured the survival of a larger number of premature infants than ever before. The large number of premature infants saved provides a large, unique population for study in addressing the aforementioned questions. In this chapter consideration will be given to the aftereffects of prematurity; maternal reactions to premature birth will be explored. The separation of the mother from the preterm infant and the resulting interference with attachment will be investigated. Finally, a brief look at mothering disorders resulting from a breakdown in mother-infant attachment will be offered.

It can be safely said that prematurely born infants are at risk for developing many different handicapping disorders (Caputo

& Mandell, 1970). Some caveats must be stated before going further, however. Parmalee, Sigman, Kopp, & Haber (1976) argued that prediction of the long-term effects of prematurity was difficult because of the frequent "transient" nature of neonatal insult and the stronger influence of later environmental factors over earlier biological events. It had also been theorized that the adverse sequelae of prematurity were as much a function of accompanying factors--low birth weight, extended isolation in an incubator, perinatal trauma, or the infant's later social environment--as of the prematurity itself (Parmalee & Haber, 1973). Furthermore, a number of studies, particularly earlier ones, were beset by one or more of the following problems: a retrospective method of gathering information, lack of objective measures of progress, inadequate follow-up studies, and insufficient control groups (Knobloch, Rider, Harper, & Pasamanick, 1963). A further complication needs attention. Until recently a useful rule-of-thumb was that preterm infants would develop handicaps whose severity was typically inversely proportional to their birth weight ((Lubchenco, Horner, Reed, Hix, Metcalf, Cohig, Elliot, & Bourg, 1963). Very recent improvements in management of the perinatal period have resulted in improved prognosis for even the very low birth weight infants of 1500 grams or less (Fitzhardinge & Ramsey, 1973; Stewart & Reynolds, 1974), with numerous perinatal centers reporting falling mortality rates and declining incidences of major handicaps (Stewart, Turcan, Rawlings, Hart, & Gregory, 1978). Nevertheless, so few infants are born at

very low birth weights or gestational ages that it will take some years to accumulate enough data on this group to be of any use.

In addition to the hazards inherent in follow-up studies of effects of prematurity already noted, other problems equally significant should be listed briefly. As an example, numerous studies have defined prematurity solely in terms of birth weight without giving consideration to gestational age or other measures of intrauterine development. Such studies generate data difficult to evaluate usefully since we now know that infants of low birth weight are by no means a homogeneous group (Caputo & Mandell, 1970; Drillien, 1964; Lubchenco, 1976). The practice continues in spite of the development of numerous additional methods which could be used to assess infant maturity such as neurological exams, measures of nutritional state, examination of physical characteristics, etc. (Mitchell & Farr, 1965).

Finally, populations of handicapped premature infants which are followed-up vary greatly, with perhaps one being middle-class white and another being indigent black, so that comparisons of results are difficult. The criteria set by researchers to define a handicap vary as well. "No handicap" may be an IQ of 75 to 80 in one instance while another researcher may require an IQ of 90 as a criterion of adequate intellectual functioning. Follow-up times when infants are tested for handicaps vary greatly too; some infants are tested in the first year with attendant problems of assessment of sensorimotor functioning only, and predictability;

other infants are evaluated at school age when results are more reliable, but outcome is modified by the socio-economic factors (Lubchenco, 1976).

Keeping these admonitions in mind, it is nevertheless possible to make comments about prematurity: prognosis for the prematurely born infant is improving; longterm follow-up for preterm infants is very important because of the high incidence of handicaps which occur later; and even now handicap in the premature infant appears to be related to birth weight (Caputo & Mandell, 1970; Drillien, 1964; Herbert, 1974; Illingworth, 1972; Kempe, Silver, & O'Brien, 1976; Lubchenco, 1976; Wiener, 1962).

As to the specific handicaps significantly associated with prematurity, the list is long and troubling. Pasamanick and Knobloch (1960, 1966) mentioned cerebral palsy, epilepsy, reading disorders, mental retardation, and behavior disorders. In Wiener's survey of the effects of prematurity (1962), he found that only one of 18 studies did not report an IQ deficit in groups of preterm infants. Comprehensive studies which followed premature infants through school age reported intellectual deficits associated with low birth weight (Drillien, 1964, 1967; Douglas, 1960; Knobloch et al., 1956; Wiener, 1968; Wiener, Rider, Oppel, Fischer, & Harper, 1965; Wiener, Rider, Oppel, & Harper, 1968). Looking closely, the Baltimore Study, a large group of preterm infants originally studied by Knobloch (Knobloch et al., 1956), were tested when they were 6 to 7 years old (Wiener et al., 1965), and again at 8 to 10 years (Wiener et

al., 1968). On intelligence tests, the premature infants (weighing between 1500-2000 grams) scored five points lower than their matched controls at ages 6 to 7 and six points lower at ages 8 to 10. Other studies relating intellectual functioning to prematurity showed significantly higher numbers of preterm school-age children either institutionalized (Katz & Taylor, 1967; Moore, 1965) or in some form of special placement (Drillien, 1961; Vernon, 1967).

Hyperactivity and disorganized behavior have been found significantly more often in prematurely born children, compared to both black and white comparison groups (Pasamanick, Rogers, & Lilienfeld, 1956). Various physical defects also appear to be associated with prematurity. For example, studies reported a significantly higher incidence of hearing problems (Drillien, 1961), eye problems such as myopia and strabismus (Lubchenco et al., 1963), as well as numerous neurological soft signs (Caputo & Mandell, 1970). This very brief listing of some of the aftereffects of prematurity suggests at the least that preterm infants as a group require further careful following if we are to learn why harmful sequelae occur and perhaps how to prevent them.

In recent times, researchers have explored not only the effects of prematurity on the infant alone but on the mother-infant dyad as well. The push has been to understand how attachment proceeds or fails when the mother and infant are separated; a major recognized need has been to comprehend how the crisis of premature birth affects the mother and how to prevent mothering disorders

related to this crisis. It is to the findings related to such issues that we now look.

2. Maternal Reactions to Premature Birth

The premature delivery of an infant has been spoken of as a crisis superimposed on the already ongoing crisis of pregnancy (Kaplan & Mason, 1960), or simply as an "acute emotional crisis" (Caplan, 1960) for a mother. Contributing directly to the mother's trauma are the early, usually unexpected onset of labor and the unusual characteristics of the infant delivered (Kaplan & Mason, 1960). It has been speculated that since the mother loses the last weeks of the gestational period, she has taken away from her time needed to psychologically prepare for taking on her new infant and mastering the feelings associated with the stress of labor and delivery (Brazelton, 1973b; Cohen, 1979; Smith, Schwartz, Mandell, Silberstein, Dalack, & Sacks, 1969).

Solnit and Stark (1961) theorized that there was always a degree of discrepancy between the fantasized ideal infant and the infant delivered. In other words, expectant mothers simultaneously fantasize giving birth to a perfect child while fearing the delivery of a "damaged" child (Klaus & Kennell, 1976a). As a number of researchers have reported (Caplan, Mason, & Kaplan, 1965; Kaplan & Mason, 1960), the mother of a premature infant views herself as having delivered an abnormal child. On delivery of the premature infant, the mother goes through a mourning sequence during which she grieves the loss

of the fantasized infant before she can realistically adapt to the child she has delivered (Klaus & Kennell, 1976a; Solnit & Stark, 1961). If the infant is isolated, as in an incubator, the mother will not be permitted to hold the infant. Further, she is often uncertain whether the child will live or die and is usually affected by negative emotions--fear guilt, disappointment, and grief. Kaplan and Mason (1960) listed four psychological tasks which the mother needed to accomplish if she was to establish a good relationship with her infant: (1) anticipatory grief--maintaining a hope that the infant would survive while simultaneously preparing for its possible death; (2) acknowledging failure to deliver the planned-for, normal infant; (3) resumption of the interrupted relationship with the infant once the medical condition improved; and (4) understanding the special needs and growth patterns of a premature infant and their temporary quality. Studies (Caplan, 1960; Mason, 1963) have shown that the successful resolution of the "accidental psychosocial crisis of premature birth" (Cramer, 1976) depended on the mother's ability to handle her own feelings, to cognitively grasp the situation facing her, and to secure support from her environment.

While earlier writers clarified interpersonal and intrapsychic reactions of parents of high-risk infants (Caplan, 1960, Caplan et al., 1965; Kaplan & Mason, 1960; Mason, 1963; Solnit & Stark, 1961), later researchers (Barnett et al., 1970; Klaus & Kennell, 1970, 1976; Klaus, Jerauld, Kreger, McAlpine, Steffa, & Kennell, 1972; Leifer, Leiderman, Barnett, & Williams, 1972) took exception

to a strictly psychotherapeutic approach. Their focus instead was on the manipulation of the hospital environment for the benefit of the preterm infant and its family. A brief review of some of these more recent findings related to the separation of the mother and her infant and their subsequent interactional deprivation will now follow.

3. Mother-infant Separation: Interactional Deprivation

As Sameroff (1975) wrote, mothers separated from their premature infants directly after birth often reported that when the baby was finally allowed to come home their feelings were those "of receiving a stranger." Ongoing research (Barnett, Leiderman, Grobstein, & Klaus, 1970; Klaus & Kennell, 1970, 1976a) is now assessing the results of separation on both the mother and the infant, theorizing that such deprivation may alter maternal attachment behavior and consequently infant development.

When mothers were first allowed into the premature nursery at Stanford University, a unique chance for research was opened (Barnett et al., 1970; Leiderman & Seashore, 1975; Leifer et al., 1972; Seashore, 1973). A pilot study used three groups of mothers (Barnett et al., 1970); two groups were mothers of preterm infants, and one group of mothers had delivered full-term healthy infants. One group of "preterm" mothers was allowed "early contact" with their infants, entering the nursery two to five days after birth to handle and feed their babies as often as possible. The mothers

of the other premature group were "separated" from their babies but were allowed visual contact (following usual hospital routine). Full-term mothers saw their babies at normal feeding hours for their three-day stay. Mother-infant interactions were observed at three points: prior to hospital discharge, one week post-discharge, and one month post-discharge. Findings were that full-term mothers smiled at their infants more and held them more closely to their bodies more often than both groups of mothers of prematures (Leifer et al., 1972). There appeared to be no significant differences in behavior toward their babies by mothers in the contact and separated groups. Barnett and others (Klaus & Kennell, 1976a; Sameroff, 1975) concluded that the differences in behavior could be attributed to the separation of the mothers and their babies.

Klaus, Kennell, and associates (Klaus & Kennell, 1970; Klaus et al., 1970) reported a similar pattern of contact, in comparison to mothers of full-term infants, when mothers of premature infants handled their babies. In their first visits with their infants, mothers of prematures spent significantly less time in the en face position; they took longer to touch and manipulate their infant's extremities, "circling the incubator" (Klaus & Kennell, 1976a) and slowly moving in to touch their newborn.

In a reanalysis of the Stanford mothers of premature infants (26 "separated" compared to 23 "contact"), Leifer and associates (Leiderman, Leifer, Seashore, Barnett, & Grobstein, 1973; Leifer et al., 1972) reported interesting findings regarding marital status.

In the "separated" group there were five divorces, while there was only one divorce in the "contact" group. In the "separated" group, two of the infants were given up for adoption, while none of the infants in the "contact" group were given up for adoption. Taking a slightly different slant with this same group, Seashore (Seashore, Leifer, Barnett, & Leiderman, 1973) reported on the effects of separation on maternal self-confidence. Interviews with separated primiparous mothers showed reduced levels of caretaking self-confidence ($P < .01$). Mothers allowed contact with their infants in the premature nursery had their initial deficits in caretaking self-confidence reduced by the time their infants were discharged; only one of the separated mothers had this positive gain. According to Seashore, the inclusion in the nursery care for the contact mothers was positive reinforcement, allowing this group a learning experience denied the separated mothers.

Finally, there was the work of Klaus and Kennell (1976a) which was summarized in Maternal-Infant Bonding. Included here were a number of studies following the same pattern as the Stanford research (i.e., comparing early contact mothers of premature infants with late contact mothers). This research went a step further, however. An attempt was made to understand the effects of mother-infant separation on later infant development. Findings were that, during films of feedings in the hospital, early contact mothers spent significantly more time looking at their infants than did late contact mothers. Mothers were filmed again during a feed at one month and these differences persisted. In a follow-up study of

the same mothers and infants when the infants were 42 months of age, the Stanford-Binet was administered to the children. Early contact children had significantly higher IQs, a mean IQ of 99 for early contact children compared to a mean IQ of 88 for late contact children ($p < .05$).

4. Interruptions in Mother-infant Bonding

Physical separation of the mother and infant during the postpartum period results in a "psychological estrangement" (Lancaster, 1976). Several studies verify this effect (Bidder, Crowe, & Gray, 1974; Kennell & Rolnick, 1960, Rose, Boggs, Adlerstein, Trigos, Riggs, & Crowther, 1960). These researchers reported a disturbance of affectional ties between the mother and infant, and they theorized a long lasting effect from this estrangement. Even relatively mild illnesses which are normally easily resolved, such as mild jaundice or brief incubator care, may disturb a mother's behavior toward her infant long after the problem is over (Kennell & Rolnick, 1960). Prematurity and the resulting separation of mother and infant are predisposing factors in the vulnerable child syndrome (Green & Solnit, 1964). For example, clinical features of the syndrome as it is expressed from the parent toward the child include: bodily overconcern, difficulty with separation, and infantilization. Parents behave toward the child as though it were "on a tenuous loan," with a resulting disturbance in the parent-child relationship.

The regional approach to caring for the high-risk neonate is growing; more often more infants are transported to distant centers for their specialized care. Such perinatal centers are typically located in high-density population areas where specialists in neonatology and the sophisticated, expensive equipment necessary for the care of the premature infant are available. At the same time, the premature infant's mother may be left behind after delivery in one of the outlying hospitals served by the perinatal center. Often she has been separated from her infant without ever having seen it before its transport to a perinatal center. One study looked at the attitudes of 101 families whose preterm infants were referred to such a center. Findings were that both parents suffered an "anticipatory grief response" (Benfield, Leib, & Reuter, 1976) resulting from the separation. Anticipatory grief is understood to mean a reaction expressed before the actual loss of a loved object (Schoenberg, Carr, Peretz, Kutscher, & Goldberg, 1974). With the infant's survival in doubt, it was common for the mother to withdraw and to withhold initiating a close relationship with the infant (Lancaster, 1976). Benfield (Benfield et al., 1976) urged the "building in" of supportive care for the infant's family during its hospital stay to alleviate the grieving process, as did Lancaster (1976).

Certainly the most obvious mothering disorder related to prematurity and the separation of mother and infant becomes apparent in cases of child abuse and failure-to-thrive. Researchers reporting

on the failure-to-thrive syndrome in infants (in which there is a lack of appropriate growth without organic cause) found a disproportionately high incidence of premature infants represented in the population of infants with this syndrome. Reports indicated that from 25% to 41% of the preterm infants investigated, depending on the study, developed failure-to-thrive syndrome (Ambuel & Harris, 1963; Kempe, 1971; Shaheen, Alexander, Truskowsky, & Barbero, 1968). Steele and Pollack (1974) conjectured that preterm infants contributed unwittingly to their own abuse since they required more care and offered less response. A number of studies supported the position that premature infants were more vulnerable to abuse than were healthy, full-term infants. Depending upon the researcher, the association of abuse with preterm birth varied from 24% to 50% (Elmer & Gregg, 1967; Fontana, 1968; Klein & Stern, 1971; Stern, 1973). Other researchers focused more on the infant's extended nursery stay and the resulting prolonged separation from the mother in searching out possible causes of abuse (Fomofud, Sinkford, & Louy, 1975; Lynch, 1975; ten Benseel & Paxson, 1977). Hunter (Hunter, Kilstrom, Kraybill, & Loda, 1978) illustrated this approach. Families with 255 high-risk infants were studied prospectively to assess child abuse and neglect. Out of the group of 255 infants, 10 were reported as child abuse victims in their first year of life. The study supported similar findings in earlier retrospective studies. Given as an essential component contributing to child abuse was limited parent-infant contact during the infant's hospitalization.

Fanaroff's attempt (Fanaroff, Kennell, & Klaus, 1972) to "bracket" mothers who were at risk for developing later "mothering disorders" centers on mother-infant separation during the infant's hospital stay. Using maternal visiting patterns as a global measure of a mother's psychological readiness to take on her infant, investigators divided mothers into one of two groups depending on the numbers of their calls and visits. Findings were that those mothers who were infrequent visitors (an average of less than three times in two weeks) evidenced mothering disorders exclusively. Recommendations were for a careful recording and inspection of all calls and visits as a possible means of preventing abuse.

Mother-infant Interactional Styles

Research on interactions between premature infants and their mothers (or other primary caregivers) is of recent origin. Historically, the high-risk infant was regarded as a passive recipient of whatever the environment did or did not offer. This view has changed! Now a transactional or interactional model of development is used, in which the organism and environment affect the other reciprocally (Sameroff, 1979); that is, there is a reciprocal reading and responding to each other's cues which forms the core of the complex interactional system between infant and parent (Bromwich, 1981). It is by now well-accepted that an infant's behaviors and characteristics can affect the parent's style and quality of caregiving (Beckwith, 1974; Bell, 1971; Korner, 1974; Lewis & Rosenblum, 1974; Sameroff & Chandler, 1975; Thomas, Chess,

& Birch, 1963, 1968; Thomas & Chess, 1977). Furthermore, findings indicate that different mother-infant interactional styles are associated with later differences in cognitive development (Beckwith, 1974; Bromwich, 1981).

A number of obstacles to interaction between the mother and the premature infant are present. There is, for example, the "incubator barrier" surrounding the baby (Bidder et al., 1974), the knowledgeable, specially trained personnel within the intensive care unit to whom the mother may unfavorably compare herself (Lancaster, 1976), the infant's own lack of responsiveness (Brown & Bakeman, 1977a), as well as the fragile, wasted, physically unattractive appearance of the baby. The premature baby is a less competent social partner for interacting with its mother, probably because its energy is directed toward meeting survival demands (Quinn & Goldberg, 1977). Quinn and Goldberg (1977) compared interactions of mothers of full-term and premature infants over the first four months of life. Mothers of full-term infants touched their infants more, vocalized more, and held the baby more closely than did mothers of preterm infants. As the premature babies showed significant improvements in health and growth, the actions of their mothers more closely matched those of the full-term mothers. Conjecture was that the preterm infant's medical condition and uncertain survival modified the quality and appropriateness of the mother's response (Wolff, 1976).

In a similar study, Brown and Bakeman (1977a) observed two groups of dyads: mothers and their premature infants in one group and mothers and their full-term infants in the other. Observations of the dyads were made at two points, in the hospital before the infant's discharge and in the home when the infant had reached 9 months of age. In the hospital observation, findings were that mothers of premature babies acted alone 55% of the time (with no infant response to maternal intervention) compared to mothers of full-term infants, who acted alone 44% of the time. When the Home Observation for the Measurement of the Environment Scale (HOME) (Caldwell, 1975) was used when the baby was 9 months of age, mothers of premature infants were found to be more "persistent" in behaviors directed at their infants, in the absence of any response from the infant, than were mothers of full-term infants. The authors suggested that the attachment of a mother with her preterm infant was "less than optimal." Brown and Bakeman (1977b) advised further that the observation of the "deviant" infant and his or her mother might be the most productive approach for understanding the onset of disturbed mother-infant interactions.

Goldberg (1979) argued that premature birth hampered the "interactive skills" of both parents and infants. Parents were faced with an infant lacking the care-soliciting and social behaviors that the full-term infant possessed. This researcher noted that there were at least two "qualifying circumstances" faced by parents of preterm infants. One was the limited opportunity parent and

infant had to become acquainted and to "practice" interactive skills, since the infant was typically isolated from the parents by the incubator and accompanying life-sustaining medical apparatus, thereby deleting holding, rocking, etc. A further constraint was the requisite knowledge to make compensatory adjustments, since the infant's repertoire was limited. Often parents lacked any knowledge whatsoever of the developmental level and capability of their premature infant. Goldberg (1977) suggested that competence motivation was of importance in understanding interactional styles in parents and preterm infants. Parents were seen as monitoring their infant's behavior and evaluating their effectiveness positively or negatively, based on the infant's subsequent behavior. In interactive episodes where the infant was unresponsive, unpredictable, or unreadable, the parent evaluated the episode as a failure and experienced subsequent infant behaviors as more aversive.

Minde (Minde, Trehub, Corter, Boukydis, Celhoffer, & Martin, 1977) also observed interactional styles of mothers and premature infants. He found that mothers were consistent in their behaviors directed toward their infants--smiling, touching, vocalizing, en face--both in the hospital and in a home visit when the infant was 3 months of age. Minde roughly grouped mothers according to their interactional styles into High, Medium, and Low Activity Mothers. Low Activity Mothers tended to visit their infants less often than did mothers in the other two groups. Speculation was that such designations, Low, Medium, or High Activity, might provide a useful

mechanism in identifying at-risk mothers who could use extra support.

Various other theorists (Brazelton, 1973c; Klaus & Kennell, 1976) agreed that activities of the mother as she touched, handled, and cared for her infant should be evaluated both formally (e.g., behavioral observations, assessment scales, interviews, questionnaires) and informally (e.g., staff observations, clinical impressions, "hunches") in order to predict her ability to relate to her newborn infant. As Brazelton (1973c) wrote:

Changes in these behaviors over time are stressed as indicators of recovery or nonrecovery of maternal capacity to attach to the baby by mothers who have been depressed and unable to function optimally by having produced an infant at risk (p. 372).

In other words, Brazelton's posture was one of prevention or very early evaluation and subsequent correction of "mothering disorders" which accompanied delivery of a high-risk infant.

In summary, these and other researchers (Frodi & Lamb, 1978; Osofsky & Danzger, 1974; Prechtl, 1963) found that premature infants did not provide as much positive feedback to the mother as did full-term infants, and this lack of feedback resulted in a general lack of mothering responses. Unfortunately, behaviors that premature infants did emit appeared to the mother to be negative (punishing or aversive) when compared to the behaviors of the normal infant.

CHAPTER III

A BRIEF EDUCATIONAL STRATEGY FOR PARENTS OF PRETERM INFANTS: ITS EFFECTS ON PARENT-INFANT BONDING AND INFANT DEVELOPMENT

1. Introduction

Researchers report an "acute emotional crisis" when a family has a preterm infant (Benfield et al., 1976; Caplan, 1960, Caplan et al., 1965; Cramer, 1976, Harper, Sokal, & Sia, 1976; Kaplan & Mason, 1960; Klaus & Kennell, 1970, 1976a; Kopelman, Simensson, Smaldone, & Gilbert, 1978; Solnit & Stark, 1961). As mentioned on page 76, resolution of this crisis can only follow successful coping with four psychological tasks: (1) mastering anticipatory grief, which means to both express the desire for the preterm infant to survive, and to prepare for its death; (2) acknowledging the failure of the mother to deliver a "normal" or full-term infant; (3) dealing with the protracted separation of the infant from the family; and (4) understanding the atypical needs of the preterm infant versus the full-term infant (Kaplan & Mason, 1960).

Often the preterm infant is transported very early in the postpartum period to a regional perinatal center for life-saving care. The resulting removal from the family may delay resolution of the aforementioned psychological tasks and interfere with the development of attachment, the delicate equilibrium between infant and parent (Brazelton, 1973c; Sander, 1975; Stechler, 1973). Parents

of preterm infants have few opportunities for intimate contact with their infant, even though there is clear indication that the early postpartum period is a sensitive time for the initiation of attachment behaviors (Barnett et al., 1970; Klaus & Kennell, 1976a).

In fact, the mother of a premature infant has to surrender nurturing needs to a technically specialized staff while she is forced into the role of bystander (Harper et al., 1976; Prugh, 1953).

Obstacles to an orderly advancement of maternal attachment behavior are: (1) the small, fragile, and even frightening appearance of the infant, (2) delayed contact with the infant and little or no opportunity for caregiving, and (3) the tension and strangeness of the environment within the intensive care unit (Klaus et al., 1970).

Consideration must be given to psychological problems within the mother herself. She may view herself as inadequate since she failed to produce a normal, full-term infant (Kaplan & Mason, 1960); she may suffer from feelings of guilt and anxiety (Prugh, 1953); she may experience psychological estrangement upon physical separation from her infant (Lancaster, 1976); and she may display symptoms of shock, denial, and depression (Drotar, Baskiewicz, Irvin, Kennell, & Klaus, 1975).

Recently, research has focused on the parents as they experience their infant's prematurity, termed by some investigators a "critical illness" (Klaus & Kennell, 1970, 1976a; Klaus, Jerauld, Kreger, McAlpine, Steffa, & Kennell, 1972; Leifer et al., 1972); these same

researchers have delineated the long-term traumatic effects of the premature birth on the family. Numerous researchers (Benfield et al., 1976; Breslin, 1976; Fanaroff et al., 1972; Klaus & Kennell, 1970, 1976a; Klein & Stern, 1971) have suggested increased support for all families of premature infants in the following areas: (1) presentation of information on infant development, particularly as it applies to preterm infants; (2) teaching of appropriate parenting skills; and (3) emotional support and guidance, even a kind of family crisis care. Instead, what is often found is a family and infant whose psychological needs are lost in the preoccupation of the nursery staff with the physical survival of the infant. In other words, medical staff in perinatal centers focus on saving the preterm infant's life, and either because of a lack of staff and time, or because of the medical staff's "ignorance" of the family's need for emotional support, assistance in "starting off" the bonding process is not forthcoming. At least one researcher viewed the premature infant as "slipping out" of the parental system and into the intensive care nursery constellation, with the unit staff providing "surrogate attachments" to the exclusion of the parents (Kachoris, 1977). Results may be that parents are often left with a sense of guilt, anger, and frustration at not having been more assertive about the medical decisions made about their baby and about their own psychological needs (for support, understanding, etc.). A further frustration may be their lack of involvement with their infant's day-to-day care (Sugarman, 1977).

Despite the fact that the postpartum period offers a unique opportunity to observe parents and infants together, to provide them with information needed to understand the special needs of their preterm infant, and to assess the psychosocial support available to them, little is being offered parents (Gray, Dean, & Kemp, 1976). Mother and infant are a captive audience during the time of the infant's hospitalization, yet neither observation nor intervention are a part of the normal routine of the majority of special care units.

Care offered by intensive care nurseries strives to release the infant in the best possible physical condition. However, there is no parallel objective of facilitating the mother's sense of self-confidence in her maternal role (Greenberg et al., 1973; Richards, 1978; Warrick, 1971). Cause for encouragement is the groundbreaking suggestion made by both English (Brimblecombe, Richards, & Robertson, 1978) and American researchers (American Medical Association, 1977; Brazelton, 1973b; Goldston, 1979; Interprofessional Task Force on Health Care of Women and Children, 1978; National Association for Mental Health, 1978) that parents be allowed to retain responsibility for their infants, caring for them against a background of expert medical support. The study which follows seeks to support this suggestion.

2. The Present Study

The present study was based on the assumption that the presentation of information to parents of preterm infants on the development of their infant--strengths, organizational abilities, states of consciousness, responsiveness to stimulation, etc. (all of which are delineated and scored numerically in the Brazelton Scale)--through the use of the Brazelton Neonatal Behavioral Assessment Scale (Brazelton, 1973a) as a teaching device would make a difference in both parent-infant attachment behaviors and the preterm infant's early development. Brazelton suggested that the use of the Scale (BNBAS) was of particular importance in helping parents understand their preterm infant (Brazelton, 1978b) since the BNBAS offered pertinent information on the preterm infant's ability to habituate to aversive stimuli, "organize" its responses to both animate and inanimate environmental stimuli, etc., in a comprehensive format not found elsewhere (Erickson, 1976). That is, the BNBAS carefully administered, then evaluated for the parents, can "introduce" them to their infant, filling a gap in their understanding of a premature infant's development and capacities. Brazelton (1978a) recommended using the BNBAS to teach mothers and fathers of preterm infants "how to become parents in a hurry." A number of investigators (Brazelton, 1975; Erickson, 1976; Kennell et al., 1975) have reported on the usefulness of the BNBAS as a method for teaching parents of both full-term and of preterm infants about their infant's individual behavioral patterns. Brazelton pointed out that through

the use of the BNBAS the mother of an at-risk infant was offered a much-needed channel for attaching to her infant (Brazelton, 1975). In other words, the BNBAS enabled the mother to see her infant as less deviant and more "normal," offering her information about her infant's strengths and individual style of responding to its environment. Thereby, the mother's sense of self-confidence was enhanced as were her feelings of competence, facilitating bonding. The use of the BNBAS to teach parents of preterm infants about their babies can be seen as reflective of current pioneering programs which use parents as an integral component of treatment (Barnard, 1976a; Gutelius & Kirsch, 1972). A further assumption of the present study is that reinforcing the BNBAS information presented to the parents of preterm infants through the teaching of an appropriate parenting skill in the form of suitable stimulation activities acceptable for the infant's state of physiological recovery will also positively influence both parent-infant bonding and early infant development.

Investigators found that if parents were to develop self-confidence in their parenting skills, they needed early contact with their baby and adequate opportunities to give the infant care (Klaus & Kennell, 1970; Seashore et al., 1973). Barnard (1976b) claimed that assigning parents a regular part in their infant's care (such as handling, rocking, and feeding) promoted frequent visitation to the intensive care unit and encouraged parental attachment. Research supports Barnard's hypothesis. Various

investigators have produced a large body of literature pointing to positive gains made when infants were given specific stimulation programs in a systematic fashion (Barnard, 1973; Brazelton, Tronick, & Als, 1977; Rice, 1977; Rosenfield, Vohr, Cowett, & Oh, 1977; Scarr-Salapatek, & Williams, 1972; Segal, 1972; Solkoff, Waffe, Weintraub, & Blase, 1969; Solkoff & Matuszak, 1975). Premature infants, surrounded by the plastic shell of their isolettes, typically suffer sensory deprivation and isolation from all but minimal human contact during their hospitalization. Full-term infants have opportunities for many varieties of stimulation--visual, auditory, tactile, and kinesthetic--as they interact with their parents; these opportunities premature infants lack. In fact, parents of preterm infants often follow the model provided them by the intensive care unit personnel, touching and handling their infant as little as possible during the hospital stay and later in their homes (Rice, 1977).

Characteristic of stimulation programs currently in use in special care units are those using tactile, visual, auditory, or kinesthetic stimulation, alone or in some combination (Solkoff & Matuszak, 1975). Barnard (1976a), however, suggested that modality of stimulation was not the critical issue, but a "systematic plan of stimulation" was. A recent review of the literature indicated that in at least three areas--sensorimotor development, muscle tonus, and motor skills development--infants who had been stimulated performed at higher levels in the aforementioned areas than did control infants (Cornell & Gottfried, 1976). One group of investigators made an interesting

observation at the successful conclusion of their early intervention program of stimulation for preterm infants (Scarr-Salapatek & Williams, 1972): "Although prematures are often treated as extra-uterine fetuses, they seem capable of benefiting from considerably more stimulation than is usually provided in premature nurseries" p. 666). Questions related to the efficacy of the BNBAS and a program of stimulation to be provided by parents of preterm infants were dealt with in this study. The purpose of the study was to determine whether or not the presentation of information to parents on the development of their infant, through the use of the Brazelton Neonatal Behavioral Assessment as a teaching device, would make a difference in both parent-infant attachment behaviors and in the infant's early development. To be determined as well was whether or not the reinforcement of the BNBAS information through the teaching of an appropriate parenting skill in the form of suitable stimulation activities acceptable for the infant's state of recovery would influence both parent-infant bonding and early infant development.

3. Experimental Hypotheses

In this investigation a brief educational strategy was utilized with parents and their preterm infants in the experimental group during the time the infant was hospitalized. In the control group parents and their infants received routine hospital care. As a result of the investigation, the following hypotheses were formulated:

1. There would be no differences in maternal perceptions of the infant, as measured by Broussard's Neonatal Perception Inventory (NPI) (Broussard & Hartner, 1971), between experimental and control groups. When multiparous mothers (having previously borne children) of both groups were compared on the NPI there would be no differences in their perceptions of their infant. The same would also apply for primiparous mothers (having never borne infants previously) of both groups.
2. When parents and infants in the experimental and control groups were observed, using the Parent-Infant Behavioral Observation procedure, there would be no differences in the frequency and types of attachment behaviors observed.
3. When the infants have been discharged home to their families, there would be no differences in the infant's home environment in the experimental and control groups, as measured by the six subscales of the Home Observation for the Measurement of the Environment (HOME) (Caldwell, 1975).
4. Throughout the infant's hospitalization there would be no differences in the frequency of parental visits and/or telephone calls between the experimental and control groups.
5. There would be no differences between families in the experimental and control groups on the following variables related to the crisis of premature birth and its effects on family structure: child abuse, spouse abuse, separation and/or divorce, change of residence, job loss.

6. Finally, when the experimental and control groups of infants were evaluated on their individual performance on the Brazelton Neonatal Behavioral Assessment Scale (BNBAS), there would be no differences between the two groups of infants as to their scoring profiles.

CHAPTER IV

METHOD

1. Subjects

The subjects in this study were 40 preterm infants, 25 male and 15 female, who had been admitted to the Intensive Care Nursery (ICN) of The University of Tennessee Memorial Hospital, Knoxville, Tennessee, with a primary diagnosis of prematurity and with respiratory distress syndrome (RDS). Infants so admitted but with a physical deformity, congenital anomaly, neurological damage, or who had undergone a major surgical procedure were excluded from this subject group. All subjects were appropriately grown for gestational age and were between 29 and 37 weeks of age.

A random assignment of subjects to either the experimental or control groups was used. The method used was similar to assigning subjects alternately to experimental or control groups based on their sequential order. However, a modification of this assignment method was employed to make the composition of the experimental and control groups more nearly homogenous with respect to the following variables:

Parents: age, marital status, gravida, para, obstetrical complications (Littman & Parmelee, 1974b), social class (Hollingshead & Redlich, 1958).

Infants: sex, weight, height, gestational age (Dubowitz,

Dubowitz, & Goldberg, 1970), postnatal complications (Littman & Parmelee, 1974a), Apgar scores (Apgar, 1953).

This modification consisted of assigning subjects in sequential order pairwise; one member of the pair was assigned to one group and the other member was assigned to the remaining group in such a way that the experimental and control groups were most nearly homogenous after the assignment, as judged by the differences in the means of the variables.

The resulting groups had 20 infants each, with 12 males and 8 females in the experimental group and 13 males and 7 females in the control group. All infants were singleton births, and none weighed less than 1000 grams (Rodgers, 1979). Mean birth weight for the experimental group was 1804 grams (range: 1000-2700 grams); for the control group it was 1792 grams (range: 1134-3005 grams). Mean birth heights were 42.9 centimeters for the experimental group and 43.5 centimeters for the control group. The mean gestational age in the experimental group was 33.1 weeks (range: 29-36 weeks); mean gestational age in the control group was 34 weeks (range: 31-37 weeks). The mean Apgar scores (Apgar, 1953) at one and five minutes for the experimental group were 6.4 and 7.7, respectively; for the control group, Apgar scores were 6 at one minute and 7 at five minutes. The Apgar test allows immediate assessment of a neonate's basic physical and behavioral status. The evaluation is done at one and five minutes after birth. A numerical value

of 0, 1, or 2 is assigned to each of five indicators of status--heart rate, respiration, muscle tone, reflex irritability, and color. The more vigorous an infant is the higher the score obtained. A summed score of 0-3 indicates severe difficulty; 3-6 suggests moderate difficulty; 7-10 means an absence of stress. Littman-Parmelee Postnatal Complications Scale scores averaged 82 for the experimental group (range: 77-87) and 81.7 for the control group (range: 71-87) (Littman & Parmelee, 1974a). The Postnatal Complications Scale measures 10 items reflective of increased risk of mortality for an infant (e.g., respiratory distress syndrome, sepsis, ventilatory assistance, etc.). Raw scores are converted to scaled scores, with higher scores representing more optimal courses for newborn infants. The mean length of hospital stay for the experimental group of infants was 28.9 days (range: 8-89 days). The mean for the control group was 23.8 days (range: 10-64 days). Table 1 contains all pertinent infant demographic data. There were no significant differences found on any of the infant characteristics. The typical ICN census was Caucasian; therefore, only Caucasian infants were included in the study.

Families of infants in the study came from a 27-county area in East Tennessee comprising Region IV of the Tennessee Perinatal Regionalization Care System (Tennessee Department of Public Health, Division of Maternal and Child Care, 1978). Tennessee has recently compartmentalized health care services for high risk newborns and mothers; intensive care nursery facilities together with specialized

TABLE 1

INFANT DEMOGRAPHIC DATA

INFANT CHARACTERISTICS	Experimental Group	Control Group	t-test
Sex	N = 20 12 M, 8 F	N = 20 13 M, 7 F	
Birth Wt. (grams)	$\bar{X}$ = 1804.2 Range: 1000-2700	$\bar{X}$ = 1792.6 Range: 1134-3005	t = .19 n.s.
Birth Ht. (centimeters)	$\bar{X}$ = 42.9	$\bar{X}$ = 43.5	t = -.18 n.s.
Dubowitz Score (gestational age in weeks)	$\bar{X}$ = 33.1 Range: 29-36	$\bar{X}$ = 34.0 Range: 31-37	t = -.82 n.s.
Apgar Score: 1 Minute 5 Minutes	$\bar{X}$ = 6.4 $\bar{X}$ = 7.7	$\bar{X}$ = 6.0 $\bar{X}$ = 7.0	t = .19 n.s. t = .28 n.s.
Length of Hospital Stay (days)	$\bar{X}$ = 28.9 Range: 8-89	$\bar{X}$ = 23.8 Range: 10-64	t = .49 n.s.
Littman-Parmelee Postnatal Complications Scale Score	$\bar{X}$ = 82 Range: 77-87	$\bar{X}$ = 81.7 Range: 71-87	t = .11 n.s.
Medical Diagnosis at Birth: Prematurity with RDS	20	20	Same

obstetrical care for high risk mothers-to-be have been located at various hospital sites serving multi-county regions (i.e., Memphis, Nashville, Chattanooga, Knoxville, Johnson City). The Obstetrics Department of The University of Tennessee Memorial Hospital, along with the Intensive Care Nursery, are the nucleus for specialized care of these mothers and infants in Region IV. Family demographic data are shown in Table 2. There were no significant differences found between families in the experimental and control groups on any variable considered. Mean maternal age in the experimental group was 23.1 years (range: 17-32 years). In the control group the mean age was 22.1 years (range: 17-32 years). There were seven Caesarean sections in the experimental group and three in the control group. The Littman-Parmelee Obstetrical Complications Scale score did not vary significantly between the experimental and the control groups (Littman & Parmelee, 1974b); the mean score for the experimental group was 84.7 (range: 63-112) and 86.6 for the control group (range: 50-112). There were an equal number of employed heads of households and "paying patients" in both groups. Evaluation of residence, occupation, and education for the experimental and control groups showed no significant differences. The mean weighted Hollingshead scores (Hollingshead & Redlich, 1958) were 99.75 (range: 55-129) for the experimental group and 98.3 (range: 69-124) for the control group.

All of the infant subjects were from intact families, meaning either an intact marriage or a stable co-habitant relationship in

TABLE 2
FAMILY DEMOGRAPHIC DATA

	Experimental Group	Control Group	t-test*
<u>Maternal Characteristics</u>	N = 20	N = 20	
Age	$\bar{X}$ = 23.1	$\bar{X}$ = 22.1	t = 1.33 n.s.
Littman-Parmelee Obstetrical Complications Scale Score	$\bar{X}$ = 84.7	$\bar{X}$ = 86.6	t = -.67 n.s.
Caesarean Sections	7	3	n.s.**
Gravida	$\bar{X}$ = 1.7	$\bar{X}$ = 2.4	t = -.24 n.s.
Para	$\bar{X}$ = .65	$\bar{X}$ = 1.2	t = -.22 n.s.
<u>Paternal Characteristics</u>			
Age	$\bar{X}$ = 25.8	$\bar{X}$ = 24.5	t = .155 n.s.
Employed	20	20	t = 0.00
Paying Patient/Charity	14/6	14/6	t = 0.00
<u>Family Characteristics</u>			
Residence	$\bar{X}$ = 4.8	$\bar{X}$ = 4.5	t = .20 n.s.
Occupation	$\bar{X}$ = 5.5	$\bar{X}$ = 5.4	t = .55 n.s.
Education	$\bar{X}$ = 4.2	$\bar{X}$ = 4.4	t = .14 n.s.
Weighted Hollingshead Score	$\bar{X}$ = 99.75 Range: 55-129	$\bar{X}$ = 98.3 Range: 69-124	t = .68 n.s.
Composite Hollingshead Social Class Index***	IV (Lower Middle)	IV (Lower Middle)	t = 0.00

* t_{40} = 2.021, significant at .05

**Mainland and Murray Tables for use in fourfold contingencies.

J. P. Guilford, & B. Fruchter, Fundamental statistics in psychology and education (p. 529). New York: McGraw-Hill, 1973.

***Hollingshead Scoring Method for computing social class, from A. B. Hollingshead & F. C. Redlich, Social class and mental illness. New York: John Wiley & Sons, Inc., 1958.

which the parents of the infant had lived together continuously for at least a 12-month period prior to the pregnancy. All participating families had the use of a car and a telephone.

In conclusion, the experimental and control groups were homogeneous on the demographic variables evaluated.

2. Setting

The data were collected in the Intensive Care Nursery of The University of Tennessee Memorial Hospital. The ICN was one component of the organized tertiary care center (Level III Center) at the hospital. Such a center offered a system of education, consultation, referral, transportation, and evaluation for all of Region IV. Patients (infants and/or mothers) were referred from one facility to another in the region, depending upon their medical needs.

The nursery proper, built to serve approximately 25 patients at a time, consisted of three adjoining rooms: a glassed-in critical care area, an intermediate care area which was actually a long hallway and storage area, and a relatively large discharge area. Infants were usually hospitalized within the ICN for periods ranging from two to twelve weeks (with an average stay being around four weeks), according to the nature and severity of their medical condition. The ICN staff consisted of the following: licensed practical nurses, registered nurses, technicians, a ward clerk, rotating pediatric house staff, and a supervising neonatologist. Other medical consultants were called as needed.

The space was crowded often since the census was frequently above 25 infants. Visiting hours for parents were limited (one hour three times daily), and opportunities for visiting parents to interact with their infants were similarly constrained. Telephoning to the unit was allowed only twice daily. Parents had no opportunities to be alone with their infants due to the nursery arrangement, their infant's medical condition, and the required presence of medical personnel.

In addition to the hospital (ICN) data collection site, additional data were gathered in the home one month after the infant had been discharged, $\pm$ two days.

3. Experimental Design

Having divided the subjects into experimental and control groups as previously described, tests were administered as shown in Figure 1. Figure 1 delineates the times (i.e., pre-intervention or Time #1, post-intervention or Time #2, and post-discharge or Time #3) and shows which tests were administered at each time. With respect to the six hypotheses tested (see Chapter III), the timing of data collection is summarized in Table 3. Note that the experimental design used for this study was of the pretest-posttest control group variety (Campbell & Stanley, 1963; Huck, Cormier, & Bounds, 1974) in the case of Hypotheses 1a, 2, and 6. The experimental group received the intervention and the control group did not. The experimental design for Hypotheses 1b, 3, 4, and 5 was posttest

only since the DBI and the HOME could only be administered post-discharge, at home, and visits/calls and family disruptions were sparse prior to Time #2. Visits/calls and family disruptions happened over an extended period of time; therefore, there would have been too few instances occurring prior to Time #2 to evaluate.

TABLE 3
DATA COLLECTION

Hypothesis	Test	T1	Intervention	T2	T3
1a	NPI	X			X
1b	NPI/DBI				X
2	P-IBO	X		X	X
3	HOME				X
4	Visits and Calls		-----		
5	Family Disruptions		-----		
6	BNBAS	X		X	X

4. Materials and Procedures

Information concerning the new arrival of preterm infants in the Intensive Care Nursery was gathered from two sources. Each day the charge nurse for each of the two day shifts (7:00 a.m.-3:00 p.m.; 3:00 p.m.-11:00 p.m.) was consulted, and the nursery census record

kept at the ward clerk's station was monitored for new entries. The census record contained a brief summary of relevant demographic and medical data. Medical charts on each infant were then scanned for other, more detailed pertinent information. This procedure was consistently followed as outlined throughout the six months data were collected in the hospital.

Once it had been determined that the infant met study selection criteria, the researcher contacted the infant's parents and obtained consent prior to their inclusion in the study. An explanation of the study was given by the researcher, verbally and in writing, to all would-be participants. (Appendices C and D are forms and booklets used to explain the study to parents). Parents of subjects were informed that they were free to ask questions at any time, and that they were free to withdraw from the study at any point. The anonymity of all research subjects was protected. The data sheets, scoring forms, inventories, and observation forms were coded, and names and specific identities were obliterated.

Following this, all infants were evaluated for gestational age using the Dubowitz assessment (Dubowitz, Dubowitz, & Goldberg, 1970). The criteria on which this clinical assessment of gestational age is based are 11 external signs and 10 neurological signs, all readily definable, easily reproduced, and least influenced by neurologic abnormality or state of consciousness of the infant. The Dubowitz assessment allows for precision in assessment of infant mortality and in correct clinical management of prematures. (See

Appendix E for the Dubowitz format). The rationale for using the Dubowitz was the need to distinguish between the short-gestation infant and the small-for-date, but not preterm, infant. The assessment yielded consistent results within the first five days of life and was equally reliable in the first 24 hours of life.

Infants were further evaluated using the Littman-Parmelee Postnatal Complications Scale (Appendix G). This scale is limited to 10 conditions whose presence is reflective of increased risk of mortality for the infant. High scores (indicating the absence of a complicating condition) are predictive of healthy development in an infant. The scale has been used in research on populations of both term and preterm infants. The span of time covered by the scale is from birth to one month of age. Recent research suggests that the Littman-Parmelee Scale is an accurate, efficient indicator of continuing risk in a high risk population of infants (Field, 1978; Parmelee et al., 1976).

Simultaneously, the infant's mother was evaluated regarding complicating factors in her medical history. A related scale, the Littman-Parmelee Obstetrical Complications Scale (1974b) was used (Appendix F). It has been suggested that the total number of perinatal complications, more than a particular combination, is predictive of an infant's early neurologic status and subsequent development (Bakeman, 1977; Beckwith, 1974; Sameroff & Chandler, 1975). The Obstetrical Complications Scale, assessed at birth, consists of 41 yes-no questions. For example: Is maternal age

between 18 and 30? have there been previous premature births? What type delivery? Again, higher scores represent a more optimal course for the infant.

A cover sheet, coded to insure anonymity, was kept on each unit of infant and parents (Appendix A). The sheet handily summarized demographic facts about the family--age, occupation, address, paying status, etc.--and necessary information about the infants--height, weight, diagnosis at admission, Dubowitz score, Apgar scores, etc. The sheet also contained spaces for recording the family's phone calls and visits to the ICN. Calls and visits were obtained from the Social Contacts Record kept by the attending nurse. Visiting hours were: 10:00-11:00 a.m., 1:00-2:00 p.m., and 7:00-8:00 p.m. Parents could call the unit from 1:00-2:00 p.m. and from 7:00-8:00 p.m. Research into the effects of prematurity on mothers suggest that a mother's mastery of the situation is related to the frequency with which she calls or visits the nursery (Caplan et al., 1965; Minde et al., 1977). The absolute frequency of calls and/or visits can predict which mothers are at risk for future child abuse and neglect. High frequencies of visiting and phoning suggest a mother's beginning attachment to her infant in spite of its illness; such patterns point also to the mother's being low risk for developing future "parenting disorders."

Included in this study were data on the following variables which have been found to be related to the crisis of premature birth and its effects on family structure: child abuse (Elmer & Gregg,

1967; Hunter et al., 1978; Klein & Stern, 1971; ten Benseel & Paxson, 1977), spouse abuse and separation and divorce (Leifer et al., 1972; Prugh, 1953), change of residence and job loss (Kaplan & Mason, 1960; Mason, 1963). Information sources were the following: (1) the pediatric social worker's regular reports to the ICN, (2) the Social Contact Record kept on each family with an infant in the ICN, and (3) the self-report of the families themselves. The premature birth of an infant has been described by a number of researchers as a time of multiple stresses with a resulting high incidence of divorce and separation (Leiderman, 1974; Leifer, 1972; Prugh, 1953). Recent notice has been taken also of the economic pressures attendant to the birth of a premature infant and its meaning in terms of job loss and relocation (Barnard, 1976a; Brazelton, 1974). The most obvious stress experienced by families with a premature infant is shown by the higher incidence of child abuse and neglect (Elmer & Gregg, 1967; Hunter et al., 1978; Klein & Stern, 1971; ten Benseel & Paxson, 1977). A checklist to aid in tracking each parent-infant unit was kept throughout the time period they were involved in the study (Appendix B). Noted on the checklist would be any items related to the aforementioned family disruptions.

The Neonatal Perception Inventory, Form I (Broussard & Hartner, 1971) was administered to the mother 1-4 days postpartum, at Time #1; Form II of the NPI-DBI was administered at Time #3, one month $\pm$ two days after the infant was discharged. This procedure was in accordance with the NPI instructions (Appendix H). Instructions

for completing the inventory were read to the mother by the experimenter and were a part of the form. The mother then filled the form out without assistance.

The NPI was designed to evaluate the mother's perception of her infant in comparison with her perception of the average infant. Each inventory was made up of two forms: the "Average Baby" and "Your Baby" forms. Behavioral items reflected the state of functioning of the mother-infant dyad in crucial areas in the neonatal period. Included were: sleeping, crying, spitting up, feeding, elimination, and predictability (Broussard, 1979). A number of researchers used this easily administered screening device in identifying infants at risk for subsequent developmental or emotional difficulties (DuHamel, Lin, Skelton, & Hantke, 1974; Erickson, 1976; Klaus, 1978). Infants may be categorized as high risk if their mothers do not perceive them as "better than average."

Observations of parents and their infants, utilizing the Parent-Infant Behavioral Observation procedure, were made at three different times. The observational form used and the behavioral definitions are included in the Appendices (Item I). All parents and their infants were observed by either of two observers who had been trained to a criterion 80% of inter-observer reliability level in the ICN prior to data collection. This level of reliability was maintained throughout the study by regular biweekly checks. (Reliability was strictly determined by counting only time slots in which it was mutually agreed that a behavior had happened, divided by the sum

of observer agreements and disagreements. Not counted as agreements were observations in which both observers agreed a behavior was absent.)

The observational form was divided into 30-second time slots (15 seconds observe, 15 seconds record) where behaviors were checked off if they occurred. Two sheets were used at each observational session for a total of 20 minutes of observed behavior. Typically, parents did not hold their infants for longer than this period. Each observer was equipped with a tape recorder, ear plug, and audio cassette of timed instructions for observing and recording. Nine infant behaviors were included on the form, together with a category for the infant's state of consciousness; 20 parent behaviors made up the remainder of the form, along with categories for "no interaction" and "other interaction." The behavioral categories are defined in Appendix I. Included on the behavioral form were behaviors frequently noted in naturalistic observations of mother-infant interactions in the neonatal period (Brown & Bakeman, 1977a; Moss, 1965; Parke, O'Leary, & West, 1972; Rheingold, 1960; Richards & Bernal, 1971; Thoman, Leiderman, & Olson, 1972). Behaviors categorized were held to be "species typical" and functional (Richards & Bernal, 1972).

Generally, mothers and infants have not been studied using time-sampling, direct observation methods as in this study (Ainsworth & Bell, 1969; Beckwith, 1971; Clarke-Stewart, 1973; Yarrow, 1963a), in spite of researchers having pointed out the obvious limitations

of questionnaires and interviews (Moss, 1965; Yarrow, 1963b) and of expensive, restrictive, time-consuming filming and video-taping methods (de Chateau, 1979). Brazelton (1973b) and others (Minde, Ford, Celhoffer, & Boukydis, 1975; Osofsky & Danzger, 1974) have commented on the importance of regular, repeated observations of parent-infant interactive situations. A number of the parent behaviors such as gazing, en face, holding, touching, smiling, talking, and kissing, have been shown to be indicators of maternal attachment (Klaus & Kennell, 1976a) and typically occur naturally as parents and infants interact (Klaus et al., 1970). Maternal variables such as spatial distance between the mother and infant, the mother's holding style, and the variety of social gestures designed to "engage" the infant were also held to have important implications for mother-infant attachment (Kulka, Walter, & Fry, 1966; Price, 1977; Quinn & Goldberg, 1977). Parental behaviors which indicated spatial distance between parent and infant were those such as cradling, holding to shoulder, lap-sit proximal, lap-sit distal, and lap-lie. Relevant social gestures meant to capture or engage the infant were those such as vocalizing, stimulating visually and/or auditorily, bouncing, and parent manipulation. Numerous categories on the form--en face, gazing, shields eyes, widening of eyes, etc.--addressed the important role eye-to-eye contact played in implementing attaching. Research suggested that eye-to-eye contact could be an innate releasing mechanism of maternal behavior (Robson, 1967). Brazelton noted

that eye-to-eye contact provided feedback for the mother and helped to give an identity to the infant (1976a).

Infant behaviors included were those shown to occur naturally, to increase over time, and to determine the "social competence" of the infant (i.e., those behaviors which showed the infant's ability to respond to the mother's gestures designed to engage the infant, by smiling, gazing, moving, etc.) (Quinn & Goldberg, 1977). Stress indicators which were included, in contrast, decrease over time. The states-of-consciousness categorization was taken from the Brazelton Neonatal Behavioral Assessment Scale (1973a) and described the infant's alertness.

Behavioral observations were made at three separate times for the groups. Time 1 observations were made as soon as the infant's medical condition allowed the parents to hold and handle the child. Typically, this observation occurred three or four days after the infant had been placed in the ICN. Time 2 observations were made two days prior to discharge from the ICN. Time 3 observations occurred in the infant's home $\pm$ two day after the infant was discharged.

Both groups of infants were evaluated using the Brazelton Neonatal Behavioral Assessment Scale (1973a). Evaluations occurred at three different times. Time 1 evaluations occurred as soon as the infant's medical condition allowed the infant to be handled by the investigator (usually six to eight days after the infant had been placed in the ICN); Time 2 and Time 3 evaluations occurred as described for the parent-infant behavioral observations. The

Brazelton Scale assessed an infant on 26 items of behavior rated on a nine-point scale. Additionally, 20 elicited reflexes and movements were observed and rated on a three-point scale. All behavioral items were administered according to the infant's state of consciousness. The assessment documented an infant's interactive capabilities, providing a measure of his potential effect on those who care for him. The Scale allowed neurologic adequacy and behavioral responses to environmental stimuli to be evaluated (Brazelton, 1979). Research has demonstrated its usefulness in diagnosis and preventive treatment of the at-risk infant (Tronick & Brazelton, 1975). The Scale evaluated the infant's ability: to organize states of consciousness and habituate to aversive stimuli; to control motor behavior and perform integrated motor actions; and to respond to social stimuli by orienting, consoling, or cuddling. Physiological responses to stress were also assessed. Two naive evaluators were trained to an 80% reliability level prior to data collection. Regular biweekly checks were held to maintain reliability levels for the duration of the study.

Caldwell's (1975) Home Observation for the Measurement of the Environment (HOME) was administered to both experimental and control parents in their homes one month $\pm$ two days after their infant's discharge from the ICN. The HOME is an inventory of 45 items which yield six factors, and the subscales of the inventory are so named. This combination observation-interview scale was formulated to assess the amount and quality of social, cognitive, and emotional support

available to the infant in the home. Items in the HOME were based on empirical evidence that particular experiences were necessary for the behavioral development of an infant or young child (e.g., minimum of restriction and punishment, opportunity to form a basic attachment to a mother or a mother-figure, etc.) (Bradley & Caldwell, 1976; Elardo, Bradley, & Caldwell, 1975). It is now commonly understood that in any intervention effort not only the infant but also the environment in which the infant is developing must be assessed (Meier, 1975). The HOME has been used recently as an index of emotional involvement in comparing premature and full-term infants and mothers. Indications were that mothers of premature infants were less emotionally involved with their babies for the first 12 months, when they were compared to mothers of full-term infants (Brown & Bakeman, 1977b), using the HOME. Appendix J contains the scoring form for the HOME. A naive observer/interviewer was trained to 90% reliability using this instrument, prior to data collection. Reliability was maintained through the use of biweekly checks during data gathering.

The sequence of events for all home visits was as follows. One week before a home visit was due parents were contacted by telephone, and a visit was scheduled during the day, at their convenience. The day of the visit the family was again contacted by telephone for final permission. It was suggested to the mother that the visit occur when the infant normally slept, approximately half-way between feedings (in order to facilitate data gathering).

The entire visit took from one and one-half to two hours. The order of assessment was as follows: the mother self-administered the Neonatal Perception Inventory while a research assistant evaluated the infant, using the Brazelton Neonatal Behavioral Assessment Scale. Following this, the mother was observed by a research assistant using the Parent-Infant Behavioral Observation format, as she fed her infant. Finally, the HOME was used to evaluate the infant's home environment. The principal investigator interviewed the mother while a research assistant observed and scored the form.

The intervention for the experimental group consisted of two teaching sessions. Included in the sessions were Part A: teaching the parents information which had been gained from a previous administration of the Brazelton Scale to their infant and Part B: teaching stimulation activities to parents. The intervention occurred after parents had been observed (Time 1) with their infant, and after the infant had had an initial evaluation using the Brazelton Scale (Time 1).

Part A: Parents were taught information gained when their infant had been assessed by the investigator or an assistant, using the Brazelton Scale. A checklist, outline, and script were used consistently during the teaching sessions. The checklist and outline were for the benefit of the examiner, and the script was presented verbatim as it appears in Appendix K. The following eight areas were covered: (1) habituation, (2) alertness, (3) orientation, (4) irritability/consolability/stress, (5) self-quieting activities,

(6) reflexes, (7) motor maturity, and (8) social behaviors. Time taken for the intervention, Part A, was 20 to 30 minutes. All teaching sessions were conducted by the principal investigator, and neither of the two research assistants who were responsible for data collection were permitted to view the teaching sessions. In order not to bias the data gathering, parents were approached for a teaching session after they were in the ICN for a visit with their infant.

The Brazelton Scale has been used clinically to teach parents about their full-term infants during the mother's lying-in period (Erickson, 1976). Brazelton has suggested that the Scale aids parents in the early acquaintance process with their infants. A further use of the Scale has been as a tool in diagnosis and preventive treatment of the at-risk infant (Brazelton, 1979; Tronick & Brazelton, 1975), as has already been mentioned. Recently, Brazelton (1978a) has specified the use of the Scale to train parents to interact optimally with their premature infants. As Erickson (1976) has written:

The Brazelton tool can serve as an adjunct in effective modeling for parents, for teaching parents, for imparting information, and for helping parents perceive themselves as the most significant resources for the maximal well-being of their infant (p. 68).

Part B: Intervention for experimental parents consisted of a teaching session which explained and demonstrated stimulation activities which they could use with their infant. Part B occurred immediately following Part A, during a parent visit to the ICN.

During the Part B teaching session, a Stimulation Activities Booklet was presented to each experimental family. Information from the preface of the booklet was paraphrased for the parents. A demonstration of the stimulation activities was conducted with the parent holding the infant on his or her lap. Parents were then asked to participate by going over some of the stimulation activities themselves. It was also suggested that they practice the stimulation activities both when they came to visit their infant in the ICN and later when they had taken their infant home. The time taken for the intervention was 20 minutes. The Stimulation Activities Booklet is included in Appendix L.

Barnard (1976a) and others (Brown, 1975; Klaus & Kennell, 1976a) have pointed to the positive gains made by premature infants when parents and infants were involved in a systematic plan of stimulation. Supportive of this view were those studies pointing to fewer apneic episodes, greater weight gain, and increased periods of alertness (allowing for more positive interaction between parent and infant) for premature infants involved in supplementary stimulation programs (Powell, 1974; Scarr-Salapatek & Williams, 1972; Solkoff & Matuszak, 1975; Wright, 1971). Furthermore, gains made by infants in such programs were reflected in later developmental tasks and tests (Lipsitt, 1979). Perhaps most effective of all such stimulation programs were those designed to make the infant more socially responsive to his or her environment, or, as Brown (1975) wrote, those which "bring out the human qualities of the infant." This

researcher and others (Barnard, 1976a; Kennell, 1976) have effectively used parents to provide the necessary supplementary social stimulation for the premature infant.

CHAPTER V

RESULTS

1. Experimental Findings

All experimental findings will be presented in the order in which the experimental hypotheses were posed in Chapter III.

Neonatal Perception Inventory (NPI)

Broussard (1979), Broussard & Hartner (1971), Broussard & Sturgeon (1970) developed the Neonatal Perception Inventory as a self-administered screening device for comparing the mother's perception of her own newborn infant to her perception of the "average baby." The rationale for the development of the NPI was the prevention of "psychosocial failure" related to disorder in the early mother-infant relationship (Broussard, 1979). Longitudinal follow-up studies have shown that the NPI can predict the adaptive potential of a mother-infant unit, identifying infants at high risk for subsequent psychosocial difficulty. Briefly stated, infants considered to be high risk were those who were not perceived by their mothers as being "better than average" at Time 3 (as shown by a zero or negative NPI score).

The experimental question to be determined was whether or not there would be any differences in maternal perceptions of the infant between the experimental and control mothers at Time 3 (one month

$\pm$ two days post-discharge). Two subcategories of mothers from both groups were of interest--those who had previously borne infants (multiparous mothers), and those who had not (primiparous mothers). It should be noted that none of the multiparous mothers had previously delivered a premature infant. Thus the main question was whether there would be differences between the primiparous mothers of the experimental and control groups in their perception of their infant, measured by the NPI at Time 3. The same question applied to the multiparous mothers of the two groups.

There were too few subjects ($N_p = 8$, $N_m = 12$) in either the primiparous or multiparous mother categories to show significant differences. However, when the primiparous and multiparous groups were combined, there were some significant differences in the total NPI scores at Time 3 (see Table 4). To obtain the NPI score, the mother rated her baby and the "average baby" on a scale of 1 to 5 on six items. Thus raw scores could range from 6 to 30. The NPI score is the difference between the two ratings ($NPI = \text{"average baby's" score} - \text{her baby's score}$). The extreme range is -24 to +24, but typical values are -4 to +8. A high score (+) indicated that the mother perceived her baby as better than the "average baby." The Degree of Bother Inventory is also included in the NPI, and is an evaluation of her baby only on a scale of 1 to 4 on six items (i.e., spitting up, eating, sleeping, etc.). Therefore, the DBI scores vary from 6 to 24. A high score indicates that the mother was bothered by her infant's behavior. See Table 4 for a summary of the scores obtained from the NPI and the DBI.

TABLE 4
NPI-DBI SUMMARY OF SCORES

	Experimental Group			Control Group			t test	
	N	Mean	S.D.	N	Mean	S.D.	t	df
DBI(T3) ^a								
Primiparous	8	8.50	1.92	5	13.20	6.10	-1.672	11 n.s.
Multiparous	12	9.25	2.99	15	11.53	3.33	-1.873	25 n.s.
Total Mothers	20	8.95	2.58	20	11.95	4.07	-2.78	38 **
NPI(T1) ^b								
Primiparous	8	4.25	2.76	5	1.60	4.16	1.261	11 n.s.
Multiparous	12	3.00	1.65	15	2.60	2.42	0.522	25 n.s.
Total Mothers	20	3.50	2.19	20	2.35	2.80	1.44	38 n.s.
NPI(T3) ^b								
Primiparous	8	4.62	2.07	5	1.80	3.11	1.796	11 n.s.
Multiparous	12	4.83	3.45	15	3.13	3.33	1.295	25 n.s.
Total Mothers	20	4.75	2.90	20	2.80	3.25	2.001	38 *

*Significant at $p < 0.05$ (two-tailed).

**Significant at $p < 0.01$ (two-tailed)

^aDBI was scored only at T3.

^bNPI was scored at T1 and T3.

There were no significant differences between the mothers in the experimental and control groups at Time 1, prior to the intervention ($t_{38} = 1.44$, n.s.). At Time 3 those mothers in the experimental group perceived their infants significantly more positively than did the mothers in the control group ($t = 2.00$, 38 d.f., $p < .05$). Furthermore, mothers in the experimental group perceived their infants' behaviors as significantly less bothersome than did the mothers in the control group ($t = 2.78$, 38 d.f., $p < .01$). This was reflected in the lower DBI scores for mothers in the experimental group at Time 3. Broussard found that the NPI and DBI for primiparous mothers of normal, full-term infants were negatively correlated at one month (χ^2 , significant at $p < .001$) (Broussard & Hartner, 1971). Analysis of the data for experimental mothers in this study did not show a significant correlation ($r = +.17$, χ^2 n.s. at $p < .1$). In Broussard's study, mothers who perceived their infants as being better than average also saw the behaviors of their infant as being less bothersome. In the present study this was not necessarily the case. Broussard evaluated normal, full-term infants and mothers, while the present study analyzed only premature infants and their mothers. In this study it appeared as though the mothers expected or understood that their infants might be more "troublesome" for a time, due to their prematurity, and had managed to adapt positively to this knowledge. That is, they managed to perceive their infants positively while acknowledging that premature infants did have behaviors that were

often more problematic for mothers. One can speculate that the intervention might have accounted for the experimental mothers' profile of scores. Broussard's mothers had not had any intervention prior to her data collection. Klaus (1978) and others, addressing the issue of perception of a premature infant, have recently begun a modification of the NPI meant especially for mothers of premature infants. The scale compares the average premature baby to your premature baby; a form for the average full-term infant is also included.

Even though one of the questions of interest was whether or not there would be a significant difference between the primiparous mothers of the experimental and control groups in their perceptions of their infant at Time 3, data were insufficient to establish a correlation of the $p < .05$ level ($t = 1.80$, 11 d.f.). The same held true for the multiparous mothers of both groups ($t = 1.30$, 25 d.f.). Although there were insufficient data to make fine distinctions between the primiparous and multiparous mothers, data showing the change in perceptions from Time 1 to Time 3 are shown in Table 5, along with data obtained from Broussard's original study of 85 families and their full-term infants (Broussard & Hartner, 1971).

Parent-Infant Behavioral Observation (P-IBO)

One significant question asked whether or not there would be any differences in the frequency and types of attachment behaviors when parents and infants in the experimental and control groups were observed, using the Parent-Infant Behavioral Observation

TABLE 5
CHANGES IN THE MOTHER'S PERCEPTION OF HER BABY FROM TIME 1
TO TIME 3 USING THE NPI SCORES

Mothers with Positive (+)* and Negative (-)** Perceptions of Infant				
		Present Study		Broussard Study***
		Experimental Group (N = 20)	Control Group (N = 20)	(Broussard & Hartner, 1971) (N = 85)
Time 1	Time 3			
<u>Primiparous Mothers</u>				
+	+	7	2	17
+	-	0	1	14
-	+	1	2	32
-	-	0	0	22
	Total	8	5	85
<u>Multiparous Mothers</u>				
+	+	11	10	
+	-	1	3	No
-	+	0	1	data
-	-	0	1	available
	Total	12	15	

*Indicates that mother perceived her baby as "better than average" (score >0).

**Indicates that mother perceived her baby as average or "worse than average" (score <0).

***Broussard evaluated only primiparous mothers.

procedure. As described previously in the Methods section, parent-infant interactions were observed for a 20-minute time interval at Time 1 (usually 3-4 days after the infant had been hospitalized), at Time 2 (two days prior to hospital discharge), and at Time 3 (in the home, one month $\pm$ two days after discharge). The occurrence of 22 parent behaviors and 10 infant behaviors was observed and recorded in each of forty 30-second intervals (15 seconds for observing, 15 seconds for recording). Data analysis utilized the comparison of the performance of the control group with that of the experimental group ($N = 20$ in both groups) by means of the Mann-Whitney test. Use of the Mann-Whitney test was especially appropriate since the individual scores for the groups did not follow a normal distribution. Indeed, for some few behaviors all subjects scored 0 occurrences, and for other behaviors subjects scored 40 (the maximum corresponding to the behavior observed in every 30-second interval). Table 6 summarizes the Mann-Whitney U statistic and the levels of significance. If the value is less than 200 (the mean U for $n_1 = n_2 = 20$) then the frequency of observations for the experimental group is higher than for the control group, and conversely.

The P-IBO analysis will be presented as the observations were made, sequentially at Times 1, 2, and 3. At Time 1 the intervention had not yet occurred. Therefore, if the experimental and control groups were correct as to random assignment, there should have been no significant differences between the two groups. Table 6 shows only four behaviors significantly different at $p < .1$ and no behaviors

TABLE 6
THE STATISTIC U FOR THE PARENT-INFANT BEHAVIORAL OBSERVATIONS^a

	Time 1		Time 2		Time 3	
Parent's behaviors:						
Widening of eyes	198	n.s.	80	***	210	n.s.
Gazing	210	n.s.	43.5	****	30	*****
En face	200	n.s.	80	***	171	n.s.
Smiling	162	n.s.	64.5	***	131.5	*
Kissing	191.5	n.s.	152.5	n.s.	212.5	n.s.
Cradle	245.5	n.s.	118.5	*	124	*
Shoulder	204	n.s.	178	n.s.	174	n.s.
Lap-sit proximal	205.5	n.s.	219.5	n.s.	131	*
Lap-sit distal	239.5	n.s.	267	*	248	n.s.
Cushions body	153.5	n.s.	119	*	95	**
Touch with hand	228	n.s.	65.5	***	140	n.s.
Holds part body	247	n.s.	74.5	***	185.5	n.s.
Parent manipulates	158	n.s.	87.5	**	144.5	n.s.
Shields eyes	183.5	n.s.	94.5	**	148	n.s.
Lap-lie	262.5	*	225	n.s.	355.5	*****
Rocking	237.5	n.s.	96	**	151	n.s.
Bouncing	169	n.s.	103.5	**	152	n.s.
Stimulates v/a	166	n.s.	181.5	n.s.	211.5	n.s.
Vocalization	223.5	n.s.	64	***	41	****
Consoles	200	n.s.	200	n.s.	200	n.s.
No interaction	218.5	n.s.	260	*	200	n.s.
Other interaction	251.5	n.s.	324	***	277	*
Infant's behaviors:						
State 1	170	n.s.	180	n.s.	200	n.s.
State 2	286	*	362	****	325.5	***
State 3	213	n.s.	140.5	n.s.	166.5	n.s.
State 4	117	*	93.5	**	80	***
State 5	200	n.s.	170	n.s.	200	n.s.
State 6	200	n.s.	200	n.s.	200	n.s.
Smile	200	n.s.	159	n.s.	174.5	n.s.
Voc./babb.	221.5	n.s.	165.5	n.s.	155	n.s.
Vis./aud. search	209.5	n.s.	143	n.s.	200	n.s.
Gazing	171	n.s.	73.5	***	125.5	*
Movement	231	n.s.	129.5	*	188.5	n.s.
Fuss	197.5	n.s.	223	n.s.	215	n.s.
Tremors	263.5	*	262.5	*	224	n.s.
Startles	241.5	n.s.	244	n.s.	240	n.s.
Stress	216	n.s.	257.5	n.s.	232	n.s.

^aThe following two-tailed critical values are from the tables of Milton (1964):

$\alpha = 0.1$	$\alpha = 0.1$	$\alpha = .001$	$\alpha = .0001$	$\alpha = .0001$
≥ 262 or ≤ 138	≥ 295 or ≤ 105	≥ 319 or ≤ 81	≥ 344 or ≤ 56	≥ 363 or ≤ 37
(*)	(**)	(***)	(****)	(*****)

significantly different at $p < .01$. It can thus be concluded that the experimental and control groups were homogeneous at Time 1 with respect to the evaluated behaviors.

Before proceeding with a series of post-hoc comparisons at Time 2 and Time 3, it was necessary to first make an overall comparison of the experimental group to the control group. If the overall measure of the groups was found to be statistically significant, it would then be appropriate to proceed with post-hoc comparisons to see which particular behaviors accounted for the overall difference in the population.

The measure adopted was the sum of all the frequencies (pooling all parent and infant behaviors at Time 2 and Time 3). Since a high score might have a different interpretation for different behaviors (e.g., a high "fuss" score was not considered to be as good as a high "smile" score), the different behavior frequencies were weighted with either a +1 or a -1 so that an algebraically higher score indicated a more positive behavior. This implied that certain behaviors observed were more 'positive'; that is, these behaviors were held by previous researchers to be indicative of attachment in its early stages (Klaus et al., 1970; Richards & Bernal, 1972). The choice made was not critical; in fact, any values for the weights could have been used, including a special set of weights that maximized the significance of the difference between the experimental and the control groups. The signs used are shown in Table 7. The weighted scores were designated the Attachment Behavior

TABLE 7
PARENT-INFANT BEHAVIORAL OBSERVATION

Parent Behaviors		Infant Behaviors	
Widening of eyes	+	State 1	-
En face	+	State 2	-
Smiling	+	State 3	+
Kissing	+	State 4	+
Cradle	+	State 5	-
Shoulder	+	State 6	-
Lap sit proximal	+	Smile	+
Lap-sit distal	-	Voc./babble	+
Cushions body	+	Vis./aud/search	+
Touch with hand	+	Gazing	+
Holds part body	+	Movement	+
Manipulates	+	Fuss	-
Shields eyes	+	Tremors	-
Lap-lie	-	Startles	-
Rocking	+	Stress	-
Bouncing	+		
Stimulates v/a	+		
Vocalization	+		
Consoles	+		
No interaction	-		
Other			
interaction	-		

Index (ABI). Please see Appendix I for the full behavioral definitions of both parents and infants. As can be seen in Table 7, most parent behaviors were weighted positively. Negatively weighted parent behaviors were lap-sit distal, lap-lie, no interaction, and other interaction. Earlier research found such behaviors indicated difficulty with attachment in mothers of premature infants (Brown & Bakeman, 1977a; Klaus & Kennell, 1976a; Price, 1977). Positive infant behaviors were States 3 and 4 of consciousness, smiles, vocalization and babbling, visual and auditory search, gazing, and movement. Infant behaviors such as these are typical of responsive, alert infants and are ordinarily seen in optimal mother-infant interactions in the early stages of attachment (Brazelton, 1973a; Klaus et al., 1970; Robson, 1967). Negative infant behaviors were States 1, 2, 5, and 6 of consciousness and various indicators of stress--fuss, tremors, startles, etc. The states of consciousness just mentioned were those in which minimal interaction with the mother would be possible, either because of sleepiness or crying and irritability (Brazelton, 1973a).

The weighted score (ABI) was calculated for each mother-infant dyad. The resulting overall scores are shown in Table 8 for the experimental and control groups. Note that the range of the experimental group ABI scores is 349 to 562, and the range of the control group ABI scores is 48 to 305. Since the highest score in the control group is lower than the lowest score in the experimental group, the two ranges are disjoint, and the difference was highly significant ($p < .00001$).

TABLE 8
ATTACHMENT BEHAVIOR INDEX SCORES

Experimental Group				Control Group			
# 1	503	#11	435	# 1	87	#11	118
# 2	401	#12	467	# 2	232	#12	258
# 3	384	#13	391	# 3	80	#13	196
# 4	491	#14	382	# 4	141	#14	134
# 5	562	#15	544	# 5	117	#15	262
# 6	464	#16	380	# 6	305	#16	268
# 7	351	#17	463	# 7	168	#17	48
# 8	349	#18	443	# 8	62	#18	188
# 9	513	#19	498	# 9	272	#19	146
#10	508	#20	476	#10	230	#20	195

Prior to Time 2, the experimental group had received the intervention, Parts A and B, which consisted of teaching parents information gleaned from a prior administration of the Brazelton Neonatal Behavioral Assessment Scale to their infant and presentation of a demonstration of appropriate stimulation activities for their infant. The control group, meantime, had received routine ICN care. At Time 2, group differences were highly significant for the following behaviors ($p < .001$, except for gazing and State 2 of consciousness, where $p < .0001$):

Parent--widening of eyes, gazing, en face, smiling, touching with hand, holding part of body, vocalizing, and other interactions;

Infant--State 2 of consciousness and gazing.

The following group differences reached a .01 level of significance at Time 2:

Parent--parent manipulation, shields eyes, rocking, and bouncing;

Infant--State 4 of consciousness.

At Time 2, experimental group parents spent significantly more time gazing at their infant than did control group parents ($p < .0001$). Additionally, experimental group parents were more often in the en face position, with their eyes in the same vertical plane of rotation as that of their infant ($p < .001$). In other words, they were looking at their infant "head on" more frequently. Particularly noteworthy was the appearance of en face behavior at Time 2, since this position increases opportunities for social interaction between

a parent and infant (Barnard, 1976b). Related to the aforementioned looking behaviors, the experimental parents spent significantly more time shielding their infant's eyes in attempts to have the infant open his or her eyes and "take in" the environment ($p < .01$). One other "looking" behavior was observed in the experimental group of parents at Time 2. This group spent significantly more time with their eyes widened as they observed their infant ($p < .001$). These findings were similar to those reported by Klaus and Kennell (1976a). In a pilot study of early intervention procedures planned for parents of premature infants, this experimental group received stimulation training and extra information on the needs and responses of the premature infant. The experimental group of parents kept their eyes on their infant significantly more often than did control parents ($p < .02$) during a videotaped feeding at the time of discharge.

At Time 2, experimental parents smiled at and vocalized to their infant significantly more often than did control parents ($p < .001$). Experimental parents stimulated their infants more by rocking and bouncing them significantly more often than did the control group of parents ($p < .01$). Experimental parents also touched ($p < .001$), held a part of their infant's body ($p < .001$), and manipulated their infant's extremities significantly more often ($p < .01$) than did the control parents. Interestingly, control parents were more often involved in other interactions unrelated to interacting with their infant during the Time 2 observation period than were the experimental parents ($p < .001$). Researchers (Barnard, 1976b; Klaus

& Kennell, 1976a) had earlier noted that those parents who spent more time looking at their infant proved to be more sensitive to his or her cues and provided "more appropriate stimulation." This finding appeared to hold for the experimental group of parents in this study. More appropriate types of stimulation were observed more often at Time 2 for this group; furthermore, the infants in the experimental group appeared more responsive at Time 2. The experimental group of infants were significantly more alert, in a State 4 of consciousness, than were the control group ($p < .01$). The control group of infants instead spent significantly more time ($p < .0001$) while they were observed in a light state of sleep (State 2). The experimental group of infants also spent more time gazing at their parents during the observation period at Time 2 ($p < .001$).

At Time 3, group differences were highly significant for the following behaviors:

Parent--gazing, vocalization, lap-lie;

Infant--States 2 and 4 of consciousness.

Experimental parents continued to spend significantly more time gazing at their infants than did control parents ($p < .00001$), a trend that had first been noted at Time 2 ($p < .0001$). Further, experimental parents spent significantly more time vocalizing to their infant than did the control parents ($p < .0001$). This behavior had first been observed at Time 2 ($p < .001$); as with gazing, vocalization had increased in its level of significance from Time 2 to Time 3. Vocalizing and gazing have frequently been pointed

to as behavioral indicators of maternal attachment (Klaus & Kennell, 1976a). It should be noted that the experimental group significantly outperformed the control group on these two behaviors. In comparison to the experimental group of parents, the control parents held their infants more frequently in the lap-*lie* position, away from the trunk of their bodies ($p < .0001$). As previously noted, holding style and spatial distance from parent to infant have been posited as having important implication for mother-infant attachment (Kulka et al., 1966; Price, 1977; Quinn & Goldberg, 1977). It might here be speculated that the experimental parents felt closer to and more comfortable with their infants at Time 3 in allowing the infant closer contact with their body than did the control parents.

The control and experimental infants continued to differ as to their periods of alertness during the observations at Time 3. The control group of infants, as at Time 2, were significantly more often sleeping lightly or dozing in a State 2 of consciousness ($p < .001$) while the experimental infants had increased the frequency of their periods of alertness when observed from $p < .01$ at Time 2 to $p < .001$ at Time 3.

At Times 2 and 3, the experimental group of infants in this study were more frequently in State 4 consciousness, described as alert and adequately focused for social interaction (Brazelton, 1973a). Reciprocally, the experimental parents at both observation times (2 and 3) exhibited behaviors which enhanced and maximized attachment, such as gazing and vocalizing (Klaus & Kennell, 1976a).

The observed differences favoring the experimental group of parents and infants suggest the efficacy of an early intervention program designed to promote attachment behaviors between parent and infant in an environment, the hospital, which has frequently ignored the psychological needs of parents of premature infants.

Home Observation for the Measurement of the Environment (HOME)

As previously discussed, the HOME scale developed by Caldwell (1975) was used at Time 3 (one month $\pm$ two days post-discharge) to evaluate the amount of social, emotional, and cognitive support available to the infant in the home environment. The HOME had six subscales which were as follows:

1. emotional and verbal responsivity of the mother,
2. avoidance of restriction and punishment,
3. organization of physical and temporal environment,
4. provision of appropriate play materials,
5. maternal involvement with the child, and
6. opportunities for variety in daily routine.

One of the experimental questions asked by this study was whether or not there would be a difference in the home environments of the experimental and control infants as measured by the HOME. Schwartz (1977) had previously measured the increase in HOME scores using parent stimulation exercises alone as an intervention. Since this study used both stimulation and Brazelton (BNBAS) teaching sessions, it was anticipated that the HOME scores would increase as much or

more than they had when the Schwartz method of using only stimulation teaching sessions had been tried.

The HOME subscales data summary are shown in Table 9. All six subscale scores were significantly higher in the experimental group ($p < .01$, two-tailed). The Mann-Whitney test (which does not depend upon the normality of the data or homogeneity of variance) was also employed, with the same results ($p < .01$). The total of the scores for the six subscales is plotted in histogram form for the experimental and control groups and for Caldwell's data on 124 families of normal, full-term infants (1975), after an adjustment into stanine form (Figure 2).

Data were available for five different populations. The total scores on the HOME for these five populations are shown in Table 10. It should be noted that Schwartz's (1977) control group of premature infants was consistent with the present study's control group. Even though Schwartz (1977) did not give a S.D. for the total score, a lower bound may be estimated as the square root of the sum of the squares of the standard deviations for the individual scores. Using this estimate, the student's t -test for the difference in mean total scores gave $t_{29} = 1.20$, n.s. The Schwartz study (1977) intervention (training parents to provide stimulation for their infant) produced an increase in total score over the control group of 32%, while the present study, using Brazelton teaching plus stimulation teaching, produced an increase in total score over the control group of 76%. It would appear that

TABLE 9

HOME OBSERVATION FOR THE MEASUREMENT OF THE ENVIRONMENT DATA SUMMARY

Subscale	Experimental Group (N = 20)		Control Group (N = 20)		Student's t*	Mann- Whitney x/σ**
	Mean	S.D.	Mean	S.D.		
I. Emotional and Verbal Responsivity of Mother	6.45	1.66	3.25	.99	7.40	4.67
II. Avoidance of Restriction and Punishment	7.30	.73	6.20	.96	4.08	3.26
III. Organization of Physical and Temporal Environment	5.80	1.10	2.75	1.55	7.18	4.76
IV. Provision of Appropriate Play Materials	5.50	1.20	2.25	1.00	4.27	5.21
V. Maternal Involvement with Child	7.10	1.40	3.20	1.60	4.75	4.98
VI. Opportunities for Variety in Daily Routine	6.20	1.40	3.00	1.29	7.52	4.80

*t₃₈ (p<.01) = 2.71 (two-tailed).

**x/σ (p<.01) = 2.57 (two-tailed).

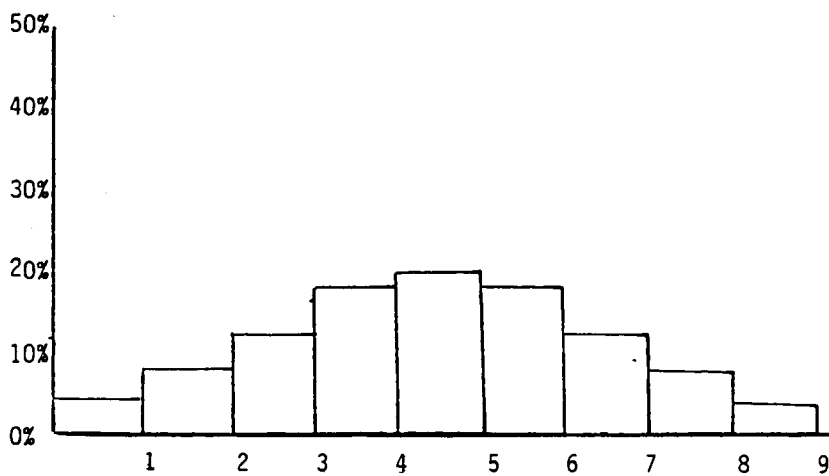
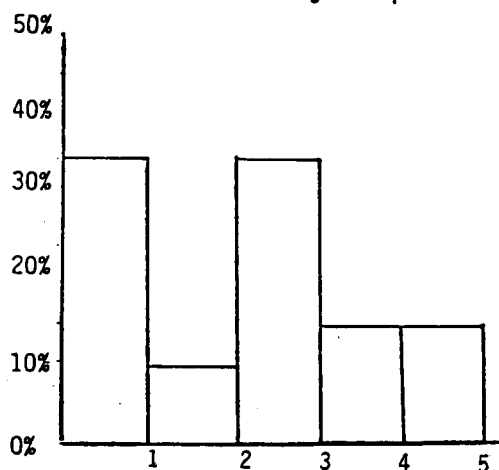
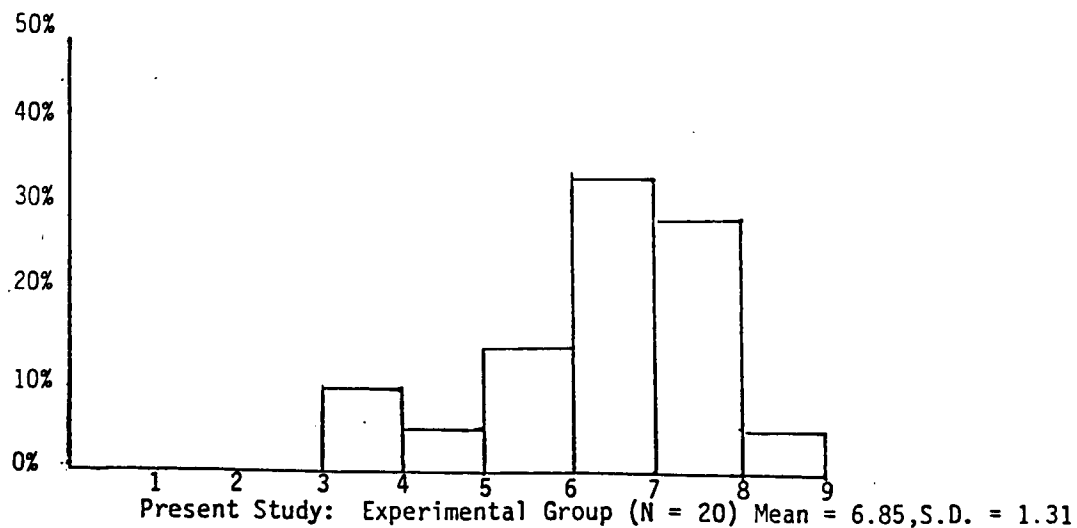


FIGURE 2. COMPARISON OF STANINE ADJUSTED SCORES FOR PRESENT STUDY AND CALDWELL STUDY (1975)

TABLE 10
HOME DATA

Population	Total Score	S.D.
This study: premature infants without intervention (Control)	21.4	4.18
This study: premature infants with intervention (Experimental); parents had both stimulation training and Brazelton training	37.7	4.79
Schwartz study (1977); premature infants without intervention (Control)	22.97	---
Schwartz study (1977): premature infants with intervention (Experimental); parents received stimulation training only	30.70	---
Caldwell study (1975): normal infants, no special training program	30.4	7.7

the additional increase in the total HOME scores in the present study over the Schwartz scores was due to the additional training the parents received in the Brazelton method. Thus it would seem that parent-infant bonding was facilitated by administering both types of parent training.

A possible future research topic would be an experiment designed to isolate the effects of the two types of training. Comparing the resulting HOME scores of this study and the Schwartz research (1977) to Caldwell's results (1975) for 124 families with full-term infants, the premature infants' home environments without any

intervention yielded up significantly lower scores. The results of Schwartz's study (1977) suggested that an intervention which taught the parents a stimulation technique, thereby facilitating bonding, resulted in a total HOME score (30.7) similar to Caldwell's findings for normal full-term infants with no special training program (30.4). Findings in the present study suggested that teaching both the stimulation exercises and the Brazelton material to the parents resulted in a HOME score for the experimental group which was higher than Caldwell's findings. The student's t-test for the difference in Caldwell's total HOME score and the present study's experimental group gave $t_{142} = 4.02$, significant at the $p < .01$ level. Even though Caldwell's interview and scoring methods were used in all five populations, the differences in setting and subjects (premature vs. full-term infants) make comparisons quite tentative. If comparisons were confirmed, then it would suggest that the intervention used in the present study might be of considerable value for normal infants as well as for premature infants, at least as far as the home environment is concerned.

There is also an open question as to whether the initial gain in HOME scores, using the present study's intervention technique, will persist, or whether the gain will wash out with time. For normal infants, Caldwell has shown that the HOME scores continued to correlate positively with IQ at 3 years, with increases in mental test performance between 6 and 36 months, and with language development (Bradley & Caldwell, 1975; Elardo et al., 1975). Another

future research topic would be to duplicate the current study's intervention and follow the families of premature infants for three years to ascertain if the permanence of the developmental results is similar to that previously observed for normal infants.

Telephone Calls and Visits from the Families

A coded cover sheet summarized the telephone calls and visits for each of the families in the experimental and control groups. The relevant experimental question asked whether or not there would be any differences in the number of calls and visits made by families in the two groups during the period when their infant was hospitalized. The average length of hospital stay for an infant in the control group was 23.8 days; for an infant in the experimental group the average length of stay was 26.6 days. Data found that experimental parents visited their infants significantly more often than did parents in the control group ($p < .001$), although there were no significant differences in the frequency of telephone calls made to the ICN by the parents. A data summary is presented in Table 11. Parents in the experimental group appeared to prefer "hands-on" experiences with their infants, choosing to visit the infant in the hospital rather than to telephone the unit for information. Data would appear to indicate less "distancing" of parents in the experimental group with greater frequency of visiting, rather than telephoning, being the norm. All families in both groups had telephones in their homes or had easy access to a telephone.

TABLE 11
FAMILY CALLS AND VISITS

	Experimental Group N = 20		Control Group N = 20		
	Mean	S.D.	Mean	S.D.	Mann-Whitney U
Phone Calls	.171	.218	.225	.198	243.5 n.s.
Visits	.885	.454	.430	.247	60.5***

***Significant at the .001 level, two-tailed.

Since experimental parents did visit their infants significantly more often ($p < .001$), it might be speculated that such visiting patterns were in part the result of the intervention strategy used with this group. Teaching the Brazelton (BNBAS) to the parents focused their attention on their infant's capabilities and individuality in a crucial period in the infant's life. Presenting appropriate stimulation activities literally gave these parents something to do for their infant that was uniquely theirs to accomplish during the times they visited the hospital. One happy problem was voiced by a staff nurse in the ICN who complained good-naturedly that some of the parents (experimental ones in this case) were there every time the doors to the nursery were opened for visiting hours. Writing recently, Barnard (1976a) mentioned provision of social stimulation by parents as being an "appropriate role" for them while their infants were hospitalized. Other researchers have suggested the usefulness of the BNBAS for providing

parents with behavioral feedback about their infant (Gorski, Davison, & Brazelton, 1979). The goal for such feedback would be a better focus for parenting the high-risk infant.

The importance of visiting and telephoning patterns and their relationship to "significant mothering disorders" has already been established. For example, Fanaroff (Fanaroff et al., 1972) found that mothers of low birth weight infants who visited or telephoned less than an average of three times in a two week period would subsequently exhibit various mothering problems such as abandonment, battering or neglect, and producing infants with failure-to-thrive syndrome. Once again, parents in the experimental group did visit their infants significantly more often than did parents in the control group ($p < .001$), although there were no significant differences found between the two groups in the frequency of telephone calls.

Family Disruptions

During this study attention was focused on the effects of the crisis of premature birth on family structure and stability. Would there be any differences from the time of hospitalization to Time 3 between the experimental and control group families on the following variables: child and/or spouse abuse, divorce or separation, change of residence, and job loss? Measures, as previously mentioned, were self-report, the social contact record kept on each infant and family, and the regular reports made to the ICN by the pediatric social worker.

Table 12 presents a summary of the findings. In the experimental group there were no cases of abuse of either children or spouses, no job losses, one change of residence, and one separation. Within the control group there were the following findings: two cases of wife abuse, two cases of child abuse, eight changes of residence, no job losses, two separations, and one divorce being processed. Although none of the individual family disruptions reached a statistical level of significance, when the various stress indicators were pooled the experimental and control groups were found to be significantly different at the .05 level (two-tailed), approaching the .02 level (one-tailed).

TABLE 12
FAMILY DISRUPTIONS

	Experimental Group N = 20 Case Count	Control Group N = 20 Case Count	Mann-Whitney U
Abuse/Neglect	0	4	240 n.s.
Separation/ Divorce	1	3	220 n.s.
Change of Residence	1	8	260 n.s.
Job Loss	0	0	200 n.s.
Pooled Stress Indicator	2	15	280 *

*Significant at .05 level, two-tailed.

This study's findings regarding the multiple stresses undergone by families who have delivered premature infants mirrored early research outcomes. For instance, the reports of marital separation and divorce agreed with earlier findings of the stresses placed on a couple's marriage by the crisis of premature birth (Leiderman et al., 1972). Other, more serious indicators of the stresses engendered by the birth crisis were the incidence of abuse and neglect of both spouses and infants found in this study's control group. Again, this trend is reflective of earlier findings (Klaus & Kennell, 1976a).

In the present study's experimental group, on the other hand, there were no incidences of abuse or neglect, nor were there any divorces, although there was one separation. It can be speculated that the intervention in the experimental group provided a variety of support for the families by teaching them needed parenting skills (i.e., appropriate stimulation activities for use with their infant) and by offering necessary information about their infant's development (i.e., a summary of items from the BNBAS). A further speculation was that the teaching strategy offered the families in the experimental group more than information. Apparently, it was emotionally gratifying for the parents in this group to be allowed to participate in the care of their infant instead of being forced into the role of "bystander," as had been previously suggested by other researchers (Campbell, 1979; Harper et al., 1976; Sugarman, 1977). It seems reasonable to assume that the teaching strategy

could be viewed as an integral component of any family crisis care plan (Benfield et al., 1976; Breslin, 1976, Fanaroff et al., 1970; Klaus & Kennell, 1970, 1976a; Klein & Stern, 1971).

Brazelton Neonatal Behavioral Assessment Scale (BNBAS)

As we have discussed, the intervention used in this study consisted of demonstrating stimulation activities appropriate for use with a premature infant and verbally reviewing with parents their infant's performance on the BNBAS. (The BNBAS was administered to both experimental and control group infants, but the results were not reviewed with the control group parents). The format used for the presentation of information appears in full in Appendix K. Brazelton himself (1978b) as well as other researchers (Caplan, 1960; Erickson, 1976), has described the necessity for parents of premature infants to "cognitively grasp" the developmental capability of their infant in any planned early intervention strategy. Recent studies have demonstrated that the BNBAS can be used to "introduce" parents of full-term newborn infants to their baby (Erickson, 1976; Tronick & Brazelton, 1975); the scale organizes for the new parent information about their infant's strengths and individuality. Further, Brazelton (1978a) has stated that one correct, important clinical application of the BNBAS would be to present information from the scale to the parents of one particular group of high-risk infants, that being the premature infant. As far as can be ascertained, this is the first study to follow Brazelton's suggestion that the BNBAS information be used with a group of

premature infants and their parents. Therefore, it was of interest whether or not the experimental group of infants would give a better performance on the BNBAS at Time 2 and Time 3 than the control group, thus supporting the ideas of Brazelton (1978a), Caplan (1960), and Erickson (1976).

As mentioned earlier, the BNBAS assessed infants on 26 behaviors rated on a nine-point scale; 20 elicited reflexes and movements were also evaluated on a three-point scale. Before analysis, the battery of 46 measurements made on each baby (at Times 1, 2, and 3) were pooled into four a priori clusters using the technique developed by the Brazelton group of researchers at Harvard (Adamson et al., 1975; Lester et al., 1978). The a priori clusters summarized observations made using the BNBAS, grouping them into four dimensions: (1) interactive processes, (2) motor processes, (3) organizational processes, and (4) physiological responses to stress. Cluster 1 measured the infant's interactive capabilities and included all orientation items on the BNBAS, the quality of alertness, and the infant's cuddliness and consolability. Cluster 2 evaluated motor processes. Included here were deviant reflexes, motor tone, hand-to-mouth activity, motor maturity, general activity level, pull-to-sit, and defensive reaction. Cluster 3 measured the infant's ability to organize his responses to increasingly aversive stimuli. The following items from the BNBAS were included: pin prick, habituation, peak of excitement, state lability, self-quieting, irritability, and rapidity of buildup. Finally, Cluster 4 summarized the infant's physiological response to stress. Measured here were startles,

tremulousness, and skin color change. The coding techniques used in the a priori clusters gave scores of 1, 2, and 3, with 1 being an "optimal" score, 2 being "average," and 3 being "worrisome" (Quinn & Goldberg, 1977). The raw data for the four clusters are presented in Table 13. Given are the scores for the experimental and control group subjects at Time 1, Time 2, and Time 3.

Before analyzing the differences between the experimental and control subjects on each of the four a priori clusters, the scores for clusters 1 through 4 were combined by summing them for each subject. The combined mean scores, their standard deviation, and the Mann-Whitney U statistic are shown in Row 5 of Table 14. At Time 1, there was no significant difference in the combined score. At Time 2, the combined score for the experimental and control groups was significantly different ($p < .01$); at Time 3, the combined score of the experimental and control groups was significantly different at the $p < .00001$ level.

An alternative analysis was also done in which the gains in combined scores between Time 1 and Time 2 and between Time 1 and Time 3 were compared, rather than the combined scores at Time 2 and Time 3. This alternative test did not show the differences to be as significant. Therefore, the analysis was completed based on the scores at Time 2 and Time 3.

In order to understand the source of the differences between the experimental and the control group, each of the four a priori clusters was also analyzed using the Mann-Whitney test at Time 2

TABLE 13
RAW BRAZELTON CLUSTER DATA

Subject	Pre-intervention				After Inter- vention				1 Mo After Intervention			
	Cluster #				Cluster #				Cluster #			
	1	2	3	4	1	2	3	4	1	2	3	4
Experimental												
1	3	2	3	1	2	2	3	1	1	2	1	1
2	3	3	2	1	3	2	1	1	1	1	1	1
3	3	3	2	1	2	1	1	1	1	2	1	1
4	3	3	1	3	2	2	3	1	1	2	2	1
5	2	2	2	1	2	2	2	1	1	2	1	2
6	3	3	3	3	2	2	3	1	1	1	1	1
7	3	3	1	3	3	3	2	3	3	3	2	1
8	2	2	3	2	2	2	2	1	1	1	1	1
9	2	2	1	2	1	1	2	1	1	1	2	1
10	3	3	3	3	3	2	2	1	1	1	1	3
11	2	3	3	3	2	2	3	3	1	1	1	1
12	2	3	3	1	2	2	3	1	1	2	2	1
13	1	2	2	3	1	1	1	1	3	2	2	1
14	1	2	2	1	1	2	1	1	2	3	2	1
15	3	3	2	1	2	2	2	3	1	1	1	1
16	3	2	2	1	2	2	2	1	1	2	2	1
17	1	2	2	1	1	1	1	1	1	1	1	1
18	3	3	2	1	2	2	1	1	2	2	1	1
19	3	3	3	1	3	2	1	1	1	2	2	1
20	1	1	2	1	1	2	1	3	1	2	1	1
Control												
1	2	1	2	1	3	3	2	1	3	3	2	3
2	3	2	2	1	3	2	2	3	3	3	2	3
3	2	2	1	1	3	2	2	1	3	2	3	1
4	3	2	2	1	2	2	2	1	3	3	2	3
5	3	3	2	1	3	2	2	3	3	2	2	3
6	3	3	2	1	3	2	2	1	2	3	2	3
7	3	3	2	1	3	3	2	3	3	3	3	3
8	3	2	2	1	3	3	1	1	3	2	2	3
9	3	3	2	3	2	3	2	1	2	2	2	1
10	3	3	2	1	3	3	2	1	3	3	2	1
11	3	3	3	1	2	2	2	1	3	2	3	1
12	2	2	2	3	1	2	2	1	2	2	2	3
13	3	3	3	1	3	3	2	3	3	3	2	3
14	3	3	3	3	3	3	2	1	3	2	2	1
15	3	3	3	1	3	3	2	1	3	3	3	1
16	3	2	2	3	3	3	2	3	3	2	1	1
17	3	2	2	1	3	3	3	1	3	3	3	3
18	3	2	2	3	2	2	2	1	3	2	3	1
19	3	3	2	1	3	2	3	3	3	3	2	1
20	3	3	2	1	3	3	2	1	3	2	2	1

TABLE 14

SUMMARY DATA FOR BRAZELTON A PRIORI CLUSTERS

	Time 1				Time 2				Time 3						
	Control		Experimental		Control		Experimental		Control		Experimental				
	$\bar{x}$	S.D.	$\bar{x}$	S.D.	$\bar{x}$	S.D.	$\bar{x}$	S.D.	$\bar{x}$	S.D.	$\bar{x}$	S.D.			
1. Interactive Processes	2.85	.366	2.35	.812	266*	2.65	.587	1.95	.686	307**	2.85	.366	1.30	.657	374*****
2. Motor Processes	2.50	.607	2.50	.607	200 n.s.	2.55	.510	1.85	.789	318**	2.50	.513	1.70	.657	320***
3. Organizational Processes	2.15	.489	2.20	.670	187.5 n.s.	2.05	.394	1.85	.813	234.5 n.s.	2.25	.550	1.40	.503	334***
4. Physiological Response to Stress	1.50	.889	1.70	.923	190 n.s.	1.60	.940	1.40	.821	220 n.s.	2.00	1.03	1.15	.489	285*
5. Combined Score (sum of all four clusters)	9.00	1.45	8.75	1.89	221 n.s.	8.85	1.57	7.05	1.85	306**	9.60	1.47	5.55	1.47	387*****

The following two-tailed critical values are from the tables of Milton (1964):

$$\frac{\alpha = 0.1}{>262 \text{ or } <138} \quad (*)$$

$$\frac{\alpha = .01}{>295 \text{ or } <105} \quad (**)$$

$$\frac{\alpha = .001}{>319 \text{ or } <81} \quad (***)$$

$$\frac{\alpha = .0001}{>344 \text{ or } <56} \quad (****)$$

$$\frac{\alpha = .0001}{>363 \text{ or } <37} \quad (*****)$$

and Time 3. The mean scores, standard deviations, and the U statistic for each of the four clusters are shown in Rows 1 through 4 of Table 14. At Time 2, the experimental infants were significantly different from the control infants with respect to scores obtained on clusters 1 and 2 ($p < .01$); these differences favored the experimental group. Cluster 1 evaluated the infant's quality of alertness, ability to be consoled, and readiness to orient and respond to social stimuli. Cluster 2 appraised the infant's ability to maintain and control motor behavior, his or her motor maturity, and reflexive responses. There were no significant differences found between the experimental and control groups on Clusters 3 and 4. Cluster 3, you will recall, assessed the infant's ability to organize states of consciousness, to habituate to increasingly aversive stimuli, and to self-quiet. Cluster 4 rated the infant's physiological responses to stress such as startles, tremulousness, and skin color lability. Both groups of infants were similar in their performances on these two clusters.

At Time 3, the experimental and control group differences in physiological response to stress scores (Cluster 4) were approaching significance ($p < .1$). Significant differences between the experimental and control infants were found in Clusters 2 and 3, motor processes and organizational processes, respectively ($p < .001$). The most significant differences between the two groups of infants were found for Cluster 1, interactive processes ($p < .00001$).

Summarizing, at Time 1, the two groups of infants, experimental and control, showed no differences on the a priori clusters at the $p < .01$ level of significance. At Time 2, all of the cluster mean scores for the experimental group decreased (were more favorable) from those at Time 1. The control group scores remained about the same as at Time 1. At Time 2, all of the experimental group scores were smaller than the control group scores, two of the differences (Clusters 1 and 2) being significant. At Time 3, all of the cluster scores for both the experimental and control groups were smaller than at Time 2. In the case of the control group of infants, it is assumed that this is due to maturation during the intervening month. The differences between the experimental and the control group became even larger at Time 3, and three of the differences (Clusters 1, 2, and 3) were significant; the other (Cluster 4) was approaching significance.

The statistical findings having now been presented, inferences as to their meaning and implications for future research will be offered in the concluding section of this study.

CHAPTER VI

CONCLUSIONS

1. "Acute Emotional Crisis" in the Families of Premature Infants

The present study presented an intervention strategy developed for use with the parents of premature infants during the period of the infant's hospitalization. Ample documentation exists attesting to the "acute emotional crisis" (Caplan, 1960) created for a family by the birth and subsequent hospitalization of a premature infant (Breslin, 1976; Kaplan & Mason, 1960; Klaus & Kennell, 1976a).

The unfinished pregnancy, the early separation of mother and infant necessitated by the infant's medical condition, and the fragile-looking, seemingly unresponsive infant all place the maternal-infant attachment process in jeopardy (Cramer, 1976; Sander, 1975; Stechler, 1973). Further, research has pointed out that the "optimal treatment time" for a family in crisis is during the crisis itself (Breslin, 1976), and any intervention planned for the family should come within this period (Caplan, 1961; Golan, 1978).

Caplan (1961) has written that "during the period of upset of a crisis, a person is more susceptible to being influenced by others than at times of relative psychological equilibrium" (p. 13). Golan (1978) concurred, noting that the family or individual in crisis is unusually amenable to help since the usual defense mechanisms were weakened, and typical coping patterns had proven to be inadequate.

Caplan (1962) pointed out that the "increased susceptibility" brought on by crisis meant that "by deploying helping services to deal with individuals in a crisis, a small amount of effort leads to a maximum amount of lasting response" (p. 82).

As previously mentioned, in order to successfully resolve the crisis of premature birth the premature infant's parents must master four psychological tasks: (1) anticipatory grief--maintaining a hope that the infant will survive while simultaneously preparing for its possible death; (2) acknowledging failure to deliver the planned-for, full-term, normal infant; (3) resuming the interrupted relationship with the infant once the medical condition improves; and (4) understanding the special needs and growth patterns of a premature infant and their temporary quality (Kaplan & Mason, 1960). Positing a need for "preventive intervention" methods (Caplan et al., 1965), Caplan theorized that a "healthy" or "unhealthy outcome" of the crisis of premature delivery was dependent in part on a mother's cognitive grasp of the situation and the availability to the family of assistance as they grappled with the crisis of premature birth (Caplan, 1960). Immediately after the birth of a premature infant, presenting parents with information about the development of premature infants and assisting them in learning appropriate parenting skills were among the "alterable determinants" that Klaus and Kennell (1976a) theorized as leading to effective caregiving and attachment.

In the present study the Brazelton Neonatal Behavioral Assessment Scale provided experimental parents with information about the development of their infant--the organizational capabilities, responsiveness to stimulation, motor abilities, and use of state behaviors. As Brazelton himself (1975) has written, the scale has proven effective not only in teaching parents about their infant's individuality and strengths, but also in "locking-in" mothers of high-risk infants to their babies before they are discharged from the hospital. The appropriate parenting skill referred to by a number of researchers as being useful in the resolution of crisis surrounding premature birth (Benfield et al., 1976; Fanaroff et al., 1970; Klaus & Kennell, 1970, 1976a; Klein & Stern, 1971) was represented in this study by the stimulation activities taught the parents for use with their infant both in the hospital and later in the home.

A general conclusion is that the results of this study have demonstrated that presenting information to parents on the development of their infant (i.e., by using the Brazelton Neonatal Behavioral Assessment Scale as a teaching device with parents) and reinforcing that information by teaching them an appropriate parenting skill (i.e., by demonstrating stimulation activities for them to use when they visited their infant and later in their homes) have made significant differences in both parent-infant bonding behavior and in the infant's early development. These differences favored the experimental group, parents and infants.

The following discussion of the study's findings will follow the order in which the experimental hypotheses were originally presented in Chapter III.

Neonatal Perception Inventory (NPI)

This study found that experimental mothers perceived their infants more positively than did control mothers. Experimental mothers also saw their infant's behaviors as "less bothersome" (Broussard & Hartner, 1971) than did control mothers. As mentioned in the Results section, there were no significant differences found between the groups in their perceptions of their infants prior to the intervention. Broussard (1979) had written repeatedly of the mother's concerns in the early weeks of life with her infant's basic activities--sleeping, feeding, spitting up, crying, predictability, and elimination; the need was for the new mother to see her infant as "better than average" in these areas. According to Broussard (1979), for optimal mother-infant interaction in the neonatal period there was a necessity for "reciprocal interchange, characterized by a periodicity, or rhythmicity" (p. 99). A requisite for the new mother was to be able to sense and meet her infant's needs; the extent to which she was capable of doing so facilitated what Broussard called "optimal mutuality between mother and child" (1979, p. 100).

It can be conjectured that the premature infant's unpredictability, fragility, and unresponsiveness would negatively affect the mother's perception of her infant. In fact, research

has pointed to the readable, responsive, or so-called "socially competent" infant's ability to "capture" the new parent into cycles of interaction (Goldberg, 1977), cycles which Broussard (1979) and others (Thoman et al., 1970; Thoman, 1975a) posited as necessary for a positive maternal perception of an infant. Reciprocal interchange is at work between a new mother and her infant. The manner in which a mother relates to her infant is colored by her perception of his or her behavior and appearance; in turn, the infant's behavior will affect and be affected by the mother's handling of him or her (Bromwich, 1981; Broussard, 1979).

Recent research (Bromwich, 1981) has focused on the mother-infant dyad in which the infant did not naturally evoke positive responses (e.g., the premature infant). Findings were that an early intervention could positively modify the mother's perception of her infant and subsequently her behaviors toward the infant, "thus preventing a downward spiral in their relationship" (Bromwich, 1981, p. 11).

The present study presented just such an early intervention aimed at "introducing" the premature infant to his or her parents through the information obtained from an administration of the Brazelton Scale. Experimental parents were then offered a unique way to participate in the care of their infant since the hospital had no such stimulation program. Experimental mothers measured on Broussard's Neonatal Perception Inventory did have a more positive perception of their infants than did control mothers. One might

assume that the early intervention performed with the experimental mothers contributed to their more positive perception of their infants.

Parent-Infant Behavioral Observation (P-IBO)

Results of this study showed that there were no differences between the experimental and control groups in the frequency and types of attachment behaviors at Time 1. Research has already shown that premature infants spend less time alert, cry less often, and are less responsive to sights and sounds than are full-term infants (Goldberg, 1979). As for the parents of premature infants, when they are compared to their full-term counterparts, the parents of "premies" appear "less actively involved" with their infant (Goldberg, 1979). Parents of premature infants touch, talk to less, hold their infants farther from their body, and place him or her in the en face position less often (Kennell et al., 1976). It can be concluded that both the premature infant and his or her parents are less skillful as attachment partners than are full-term infants and parents, with the premature infant emitting few clear signals and with the parent interpreting the infant's behaviors with difficulty. With the attachment process thus threatened, researchers (Brown & Bakeman, 1977a; Klaus & Kennell, 1976a; Price, 1977) have initiated parent-infant interventions while the premature infant is hospitalized. Writing of such strategies, Goldberg (1979) has pointed out:

Ordinarily, an interactive pair in which one member has limited competence can continue to function effectively if the partner is able to compensate for the inadequate or missing skills. In the case of parent-infant pairs, because the infant's repertoire and flexibility are limited, the burden of such compensatory adjustments necessarily falls upon the parent (p. 218).

The results of this study suggest that the experimental parents were able to make the posited "compensatory adjustments," in the form of various attachment behaviors exhibited during the parent-infant behavioral observation periods. Parents in the experimental group, as early as Time 2, exhibited behaviors considered indicative of beginning attachment (Klaus & Kennell, 1976a); this group of parents gazed at and shielded their infant's eyes from overhead lights, engaged in en face behaviors, talked to and smiled at their infant, and touched and rocked their infant significantly more often during the observation periods than did the parents in the control group. Reciprocally, the infants in the experimental group responded by gazing at their parents and alerting to a state of consciousness in which social interaction could most readily occur (State 4).

Certain researchers (Brown & Bakeman, 1977a; Klaus & Kennell, 1976a) have noted the need parents of premature infants have for some sort of "signal" or response from their infant when he or she is held or touched. Troublesome for such parents, in view of this need, is the research which indicates that the premature infant has a "high stimulus threshold" (Minde et al., 1975), making him or her a seemingly unresponsive social partner. Experimental parents were persistent in their directing of attachment behaviors toward

their infant both in the hospital and later, when they were observed in their home at Time 3. Similarly, their infants, as a group, continued to show more signs of alertness (State 4) than did the control group of infants. Brown and Bakeman (1977a) had written earlier of the need for persistence on the part of mothers of premature infants since the mother must act alone the majority of the time as she attempted to communicate with her infant in its early weeks of life. It is submitted that the necessary required persistence and compensatory adjustments just mentioned (perhaps different names for the same critical parental skill) were aided by the intervention strategy used with the experimental group of parents. Brazelton (1973a) had consistently warned that unresponsive babies severely impaired the feedback mechanism needed to fuel mothering behavior. He also issued a further caveat: that being the need to observe regularly, in the neonatal period, potentially high risk mother-infant pairs in their attachment interactions. The Parent-Infant Behavioral Observation was designed to fill such a need. Prugh (1953), a respected pioneer in researching parents and premature infants, specifically urged hospital interventions designed to increase interaction between mother-infant pairs. Instruments such as the P-IBO would make it possible to more effectively intervene with at-risk mother-infant pairs, pointing out, as it does, those dyads which are exhibiting attachment behaviors and those which are not.

Home Observation for the Measurement of the Environment (HOME)

During the study, at Time 3, the environment in which both the control and the experimental groups of infants were developing was evaluated using the HOME. Caldwell's (1975) Home Observation for the Measurement of the Environment was designed to pin-point areas in which intervention might be needed by professionals in child health (Erickson, 1976). Of concern were those infants vulnerable for being at risk if they were not getting adequate sensory inputs, both animate and inanimate, from their environment. What the HOME offered in this study was a "profile" within a specific home environment of what a typical day held for the infant and his or her family. The HOME scales measured the following: whether or not the physical environment was restrictive or stimulating; whether it offered appropriate sensory experiences; whether the infant was offered opportunities to explore and master surroundings; whether or not there was an orderly daily routine; and whether there was an opportunity to form an attachment to a mothering figure.

With a population of infants who have already been labeled potentially at risk by virtue of their premature birth, a device sensitive enough to measure the subtle aspects of the environment is of crucial importance. Brown and Bakeman (1977a, 1977b), as noted previously, have already used the HOME to compare the emotional responsivity of mothers to premature infants with those of full-term infants. (Results favored mothers of full-term infants). Frequently, studies of premature infants and their parents have measured behavior

in the hospital environment, but there the observations have ended; alternatively, follow-up studies of premature infants and parents have observed behavior in the home without having followed the parents and infants through the hospital system. The HOME, in this study, was useful in allowing measurements to be made across settings. The P-IBO was used both in the hospital and later in the home; when such observations across environments are combined with information from the HOME (incorporating observation/interview format), a more sensitive evaluation of the developmental outcome for the infant is possible, and potential problems related to attachment can be spotted early.

Considering the relative homogeneity of the experimental and control groups in this study (see Tables 1 and 2, pp. 101 and 103), one would have expected home environments to have been somewhat similar as well. That is, there should have been no significant differences as to nurturance, enrichment, or organization within the homes. This was not the case. Experimental families had significantly higher scores on all six subscales of the HOME. These findings were similar to those found by Schwartz (1977) in a related study; Schwartz's intervention, training parents of premature infants to use stimulation activities with their infant in the hospital and later in the home, resulted in an overall increase in total scores on the HOME of 32% over the control group. In the present study the intervention (BNBAS teaching plus teaching stimulation activities) produced a 76% total score increase over the control group.

As in the Schwartz study, this study found the home environment of the experimental group to be measurably more positive in terms of organization, stimulation, and opportunities afforded for attachment to occur. Sameroff (1979) has written of the need for "supportive, compensatory, normalizing environments"; it is his claim that such environments help eliminate effects of early complications in child growth and development, such as prematurity. Experimental parents, as measured by the HOME, provided such an environment. One might speculate that the provision of this environment is merely another example of the "compensatory adjustments" parents of premature infants must make in order to successfully cope with the stresses engendered by such a birth.

Telephone Calls and Visits from the Families

In this study infants from both the experimental and control groups were hospitalized for similar periods of time. The average length of stay in the experimental group was 26.6 days; in the control group it was 23.8 days. While their infants were hospitalized, parents from both groups in the study called the ICN for information about the condition of their infant with approximately the same frequency. There were no significant differences found here when the data were analyzed. However, the visiting patterns were very different in the two groups. There were significantly more ($p < .001$) visits from experimental group parents than there were from control group parents (see Table 11, p. 145, for data summary).

Already it is an accepted fact that there is a relationship between visiting and telephoning patterns and deviant mothering behaviors (i.e., abandonment, failure-to-thrive syndrome, abuse and neglect) (Fanaroff et al., 1972). In other words, parents who visit or telephone the hospital less than an average of three times in a two-week period are held to be at risk for developing "mothering disorders." As has already been discussed in the data analysis in Chapter V, experimental parents "distanced" themselves less from their infants than did control parents. Both groups called with approximately the same frequency but experimental parents came with greater frequency. It can be conjectured that utilization of the Brazelton Scale served to "humanize" the infant to parents in the experimental group, "locking-in" these parents to their infant and helping them see their infant's strengths and individuality. Furthermore, the premature infants in the ICN were receiving no patterned social stimulation other than holding by the nurse as they were tube-fed; therefore, parents in the experimental group had a task which was uniquely theirs when they presented stimulation activities to their infant. Both strategies, it can be said, were useful in assisting parents in the mastery of their difficult situation, aiding them in feeling more competent and useful while they were in the ICN and relieving some of their feelings of helplessness. It seems plausible to assume that the intervention made visits to the nursery less aversive for the experimental group of parents; the data appear to support this statement.

Both Klaus and Kennell (1970) and Seashore and co-workers (Seashore et al., 1973) had argued earlier for the need for parents to have early contact in caregiving to their premature infants to increase their self-confidence in parenting. If, as research tells us (Barnard, 1976a; Sameroff, 1975), the mother's task of relating to her infant has been interrupted by the premature birth, then two vehicles through which the mother can come to know her infant quickly are the Brazelton Scale, which "introduces" the mother to her infant, and the stimulation activities, which familiarizes her further with her infant. Sameroff (1975) posited that the task of those specializing in care of the newborn must consist of focusing on both parent and infant. The chore here was to help the parent see the infant not as deviant but as "part of a continuous spectrum of developmental maturity or temperament" (Sameroff, 1975, p. 1041). As other neonatal specialists (Barnard, 1976b, Klaus & Kennell, 1976a) have written, the thrust of any intervention must be aimed at helping the parents feel competent in caring for their infants from the outset. Writing about the mother of a premature infant, Brazelton (1975) summarized it accurately and well:

It is partly her own self image which is at stake, not just her image of the baby. By giving her an active therapeutic role, you are giving her credit for having the capacity to respond to even a damaged baby (p. 99).

Family Disruptions

Throughout the study, from the time of hospitalization to Time 3, both groups of parents and infants were scrutinized for the effects

of the crisis of prematurity on family structure. Would there be any incidences of child abuse and/or neglect (Elmer & Gregg, 1967; Klein & Stern, 1971; Shaheen et al., 1968), spouse abuse, separation and/or divorce (Leiderman et al., 1973, Leifer et al., 1972), or job loss and/or change of residence (Barnard, 1976a; Brazelton, 1974)? Earlier research had included reports of some or all these obvious indicators of families under severe stress. Would the same findings hold true for these families? As it turned out, the results were remarkably similar. (See Table 12, p. 147, for a data summary). As previously mentioned, in the experimental group there was one separation and one relocation. In the control group a sadder set of events was recorded: two cases of wife abuse, two cases of child abuse, eight relocations, and two separations. About the only optimistic note that could be sounded, in view of the statistics, was that no family head in either group lost a job! Statistical analysis found that the control group exhibited significantly more family disruptions, at the .05 level (two-tailed), approaching the .02 level (one-tailed).

Certainly what was being seen in this study was only a small part of the multiplicity of factors figuring into premature birth (e.g., various antenatal events, early history of parents, previous modes of coping with stress, and previous employment records, etc., were not considered). Nevertheless, families in both groups were matched evenly as to demographic variables (see Table 2, p. 103). In fact, all the families in the study were lower middle class

(Hollingshead & Redlich, 1958). Why then did the groups differ as to family disruption? A partial answer may be the intervention and the concomitant emotional support offered the experimental group. Clearly, earlier warnings had been sounded concerning the need for parents of high risk infants to receive care as well as the infant itself (Arney, Nagy, & Little, 1978; Breslin, 1976). As Breslin (1976) had written, failure to care for families in the midst of the crisis of prematurity could "result in the disintegration of the families' physical, emotional, and social health" (p. 447). It was already apparent that the disintegration Breslin had written about was turning up in the control families. While it is necessary to avoid simplistic solutions to complex problems, it is nonetheless necessary to offer families facing the crises related to premature birth at least two things: a sensitive evaluation of their ability to handle such a crisis and an intervention during the crisis impact aimed at encouraging parents to see themselves as partners in the care of their sick infant.

In the present study, the data suggested that the parents in the experimental group did see themselves as actively participating in the care of their infant, with fewer resulting stresses related to an undeniably painful event; they experienced fewer of the measured family disruptions than did the control group of parents as a result.

Brazelton Neonatal Behavioral Assessment Scale (BNBAS)

The Brazelton Scale was used to evaluate infants in both groups, experimental and control, at three points: Time 1, prior to the

intervention with the experimental group, Time 2, prior to the infant's discharge from the hospital, and Time 3, during the follow-up visit in the home. Twenty-six behaviors were assessed, together with 20 reflexes and movements. Following this a priori clusters, developed by Brazelton's group at Harvard (Adamson, Als, Tronick, & Brazelton, 1975; Lester, Als, & Brazelton, 1978), were then used to summarize the information from the 46 measures. Briefly, the clusters categorized the information as follows: (1) Cluster 1--interactive processes--measured orientation items, the quality of the infant's alertness, cuddliness, and consolability; (2) Cluster 2--motor processes--evaluated deviant reflexes, motor maturity, general activity level, and motor tone; (3) Cluster 3--organizational processes--gauged the infant's ability to organize responses to increasingly aversive stimuli; and (4) Cluster 4--quantified the infant's physiological responses to stress.

Time 1 found no significant differences between the groups of infants when the BNBAS was administered. Scores from the four a priori clusters were combined by summing them, and the results were included in Table 14, p. 153. This finding was as expected since the two groups of infants were not dissimilar (see Table 1, p. 101), hospital care of the infants was relatively standardized, and the intervention had not as yet occurred. At Time 2, however, the combined scores for the experimental and control groups were significantly different ($p < .01$), favoring the experimental group. Looking at the scores of each of the clusters

separately at Time 2 for the two groups, the following distinctions could be made: experimental infants made significantly better scores on Clusters 1 and 2 while there were no significant differences between the two groups of infants on Clusters 3 and 4. Cluster 1, it will be recalled, appraised the infant's responsiveness to social stimuli and the quality of alertness. In other words, the experimental infants were more alert and responsive to human interaction at Time 2 than were control infants. As for the other significant difference favoring the experimental group at Time 2, Cluster 2 scores had these infants making better reflexive responses and showing more control of their motor behavior. To be equitable, both groups of infants still had approximately the same abilities in organizing responses to increasingly aversive stimuli (Cluster 3) and in their physiological responses to stress (i.e., startles, tremulousness, and skin color lability) (Cluster 4).

At Time 3, the differences between the experimental and control groups of infants were more pronounced. Again, the differences favored the experimental infants. As previously reported, on Clusters 2 and 3, motor processes and organizational processes respectively, the experimental group made significantly better scores ($p < .001$). The most notable gains, however, were those related to the quality of alertness in the experimental infants and their orientation and responsiveness to social stimuli (Cluster 1); here the experimental group scores were so significant as to be surprising ($p < .00001$).

During the study the Brazelton Scale had an unusual dual function. In its first application, the Scale was simply a data gathering device, a basic research tool used at three points: pre-intervention, post-intervention, and at a one-month follow-up. As for the second function, the Scale was also used clinically to "introduce" the experimental group of parents to their infants; that is, it was an essential part of the early intervention strategy made while the infants were still hospitalized in the ICN. (Please see the format for the presentation of information in Appendix K). It can be conjectured that the information gleaned from the BNBAS and presented to the experimental parents did prove effective in helping them "cognitively grasp" (Erickson, 1976) their infant's developmental capabilities. Such knowledge also helped to make the infant appear less deviant, its prematurity better understood. Brazelton had noted earlier that using the Scale helped parents become parents "in a hurry" (1978a). That appeared to be happening here. Simply put, experimental parents were interacting more when they were observed with their infants, regardless of the setting (home or hospital). Similarly, there were more reciprocal responses from the experimental infants as well. A similar profile of responsiveness came from the BNBAS (Cluster 1 scores). Beginning at Time 2 and continuing at Time 3, the experimental infants were more alert and responsive to human interaction (social stimuli). These are qualities already known to be of importance in the full term infant's being perceived as "attractive" by its parents (Klaus & Kennell, 1976a).

Here these same qualities were "working" for the experimental group of babies as well. Results found with the experimental group appear to validate Brazelton's confidence in the Scale as an appropriate, much needed tool for use with the parents of premature infants.

A Final Conclusion

It can be concluded, then, that the results of this brief study have demonstrated the efficacy of both the BNBAS and stimulation activities in helping parents of premature infants toward Caplan's (1960) posited "healthy outcome" of the crisis of premature birth. Experimental parents were offered information from the Brazelton Scale about their infant, allowing them a cognitive grasp of the situation; they were also given an opportunity to learn and practice an appropriate parenting skill, stimulation activities, when they visited their infant in the hospital and later in their homes. The parenting skill so offered, together with the Brazelton information, constituted the "alterable determinants" theorized as leading to effective caregiving and attachment. Data reported briefly here in the concluding chapter and presented fully earlier in Chapter V point to the success of the intervention for the experimental group.

This study was intended, from its inception, to be short-term only, following parents and infants from hospital admission through to dismissal and evaluating them again 30 days after hospital discharge. Even in this brief period of time significant behavioral changes favoring the experimental group of parents and infants could

be seen. While this study cannot presume to determine whether these observed differences will endure, future research aimed at long-term follow-up could. At that time, should the results validate these early findings, we would then be in a position to judge whether it would be advantageous to encourage premature nurseries, as a matter of routine, to implement such interventions.

LIST OF REFERENCES

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- Adamson, L., Als, H., Tronick, E., & Brazelton, T. B. (1975). A priori profiles for the Brazelton neonatal assessment. Unpublished manuscript. Child Development Unit, Children's Hospital, Boston.
- Ainsworth, M. D. S. (1969). Object relations, dependency, and attachment: A theoretical review of the infant-mother relationship. Child Development, 40, 996-1025.
- Ainsworth, M. D. S. (1973). The development of infant-mother attachment. In B. M. Caldwell & H. N. Ricciuti (Eds.), Review of child development research (Vol. 3). Chicago: University of Chicago Press.
- Ainsworth, M. D. S., & Bell, S. (1969). Some contemporary patterns of mother-infant interaction in the feeding situation. In A. A. Ambrose (Ed.), Stimulation in early infancy. London: Academic Press.
- Ainsworth, M. D. S., Blehar, M. C., Waters, E., & Wall, S. (1978). Patterns of attachment. Hillsdale, NJ: Lawrence Erlbaum Associates.
- Ambrose, J. A. (1961). The development of the smiling response in early infancy. In B. M. Foss (Ed.), Determinants of infant behavior I. New York: John Wiley & Sons, Inc.
- Ambrose, J. A. (1963). The concept of a critical period for the development of social responsiveness in early infancy. In B. M. Foss (Ed.), Determinants of infant behavior II. New York: John Wiley & Sons, Inc.
- Ambuel, J., & Harris, B. (1963). Failure to thrive: A study of failure to grow in height or weight. Ohio Medical Journal, 59, 997.
- American Medical Association. (1977, December). News Release: AMA adopts statement of parent-newborn bonding. Chicago.
- André-Thomas, C. Y., Chesni, Y., & Saint-Anne Dargassies, S. (1960). The neurological examination of the infant. London: Spastics Society.
- Apgar, V. (1953). A proposal for a new method of evaluation of the newborn infant. Current Research in anesthesiology and analgesia, 32, 260-267.

- Arney, W. R., Nagy, J. N., & Little, G. A. (1978). Caring for parents of sick newborns. Clinical Pediatrics, 1, 35-39.
- Avery, G. (Ed.). (1975). Neonatology: Physiology and management of the newborn. Philadelphia: J. B. Lippincott Co.
- Bakeman, R. (1977, March). Perinatal risk, maternal-infant interaction, and early developmental outcome of preterm and fullterm infants. Paper presented at Society for Research in Child Development, New Orleans.
- Barnard, K. E. (1973, March). A program of stimulation for infants born prematurely. Paper presented at Society for Research in Child Development, Philadelphia.
- Barnard, K. E. (1976a). Nursing: High risk infants. In T. D. Tjossem (Ed.), Intervention strategies for high risk infants and young children. Baltimore: University Park Press.
- Barnard, K. E. (1976b). Critical commentary, (p. 108). In M. H. Klaus & J. H. Kennell, Maternal-infant bonding. St. Louis: C. V. Mosby.
- Barnett, C. R., Leiderman, P. H., Grobstein, R., & Klaus, M. H. (1970). Neonatal separation: The maternal side of interactional deprivation. Pediatrics, 45, 197-205.
- Beckwith, L. (1971). Relationships between attributes of mothers and their infants' IQ scores. Child Development, 42, 1083-1097.
- Beckwith, L. (1974, May). Caregiver-infant interaction and the development of the risk infant. Paper presented at Conference on Early Intervention for High-Risk Infants and Young Children. Chapel Hill, NC.
- Bell, R. Q. (1971). Stimulus control of parent or caretaker behavior by offspring. Developmental psychology, 4, 63-72.
- Bell, S. M., & Ainsworth, M. D. S. (1972). Infant crying and maternal responsiveness. Child Development, 43, 1171-1190.
- Benfield, D. G., Leib, S. A., & Reuter, J. (1976). Grief response of parents after referral of the critically ill newborn to a regional center. New England Journal of Medicine, 294, 975-978.
- Bernal, J. F., & Richards, M. P. M. (1972). In A. Barnett (Ed.), Ethology and Development Vol. II. London: Little Club Clinics in Developmental Medicine.

- Bidder, R. T., Crowe, E. A., & Gray, O. P. (1974). Mothers' attitudes to preterm infants. Archives of Disease in Childhood, 49, 766.
- Birch, H., & Gussow, G. D. (1970). Disadvantaged children. New York: Grune & Stratton.
- Blauvelt, H., & McKenna, J. (1961). Mother-neonate interaction: Capacity of the human newborn for orientation. In B. M. Foss (Ed.), Determinants of infant behavior I. New York: John Wiley & Sons, Inc.
- Bowlby, J. (1958). The nature of the child's tie to his mother. International Journal of Psychoanalysis, 39, 350-373.
- Bowlby, J. (1960). Ethology and the development of object relations. International Journal of Psychoanalysis, 41, 313.
- Bowlby, J. (1969). Attachment and loss (Vol. I): Attachment. New York: Basic Books, Inc.
- Bowlby, J. (1973). Attachment and loss (Vol. II): Separation. New York: Basic Books, Inc.
- Bradley, R. H., & Caldwell, B. M. (1976). Early home environment and changes in mental test performance in children from 6 months to 36 months. Developmental Psychology, 12, 93-97.
- Brazelton, T. B. (1973a). Neonatal behavioral assessment scale. Philadelphia: J. B. Lippincott Co.
- Brazelton, T. B. (1973b). Effect of maternal expectations on early infant behavior. Early Child Development and Care, 2, 259-273.
- Brazelton, T. B. (1973c). Assessment of the infant at risk. Clinical Obstetrics and Gynecology, 16, 361-375.
- Brazelton, T. B. (1975). Roundtable Discussion Following: Kennell, J. H., Trause, M. A., & Klaus, M. H. Evidence for a sensitive period in the human mother. In Parent-Infant Interaction. Ciba Foundation Symposium (No. 33). New York: Elsevier.
- Brazelton, T. B. (1976a). Critical commentary, (p. 70). In M. H. Klaus & J. H. Kennell, Maternal-infant bonding. St. Louis: C. V. Mosby.
- Brazelton, T. B. (1976b). Critical commentary, (p. 74). In M. H. Klaus & J. H. Kennell, Maternal-infant bonding. St. Louis: C. V. Mosby.

- Brazelton, T. B. (1978a, March). Parent education and counseling: Suggestions. Paper presented at At-Risk Infant Conference co-sponsored by UT Hospital Department of Pediatrics and UTK Department of Psychology, Gatlinburg, TN.
- Brazelton, T. B. (1978b), March). Newborn assessment and future prognosis. Paper presented at At-Risk Infant Conference co-sponsored by UT Hospital Department of Pediatrics and UTK Department of Psychology, Gatlinburg, TN.
- Brazelton, T. B. (1979). Behavioral competence of the newborn infant. Seminars in Perinatology, 3, 35-43.
- Brazelton, T. B., Koslowski, B., & Main, M. (1974). The origins of reciprocity: The early mother-infant interaction. In M. Lewis & L. A. Rosenblum (Eds.), The effect of the infant on its caregiver. New York: John Wiley & Sons, Inc.
- Brazelton, T. B., Scholl, M. L., & Robey, J. S. (1966). Visual responses in the newborn. Pediatrics, 37, 284-290.
- Brazelton, T. B., Tronick, E., Adamson, L., Als, H., & Wise, S. (1975). Early mother-infant reciprocity. In Parent-infant interaction. Ciba Foundation Symposium (No. 33). New York: Elsevier.
- Brazelton, T. B., Tronick, E., & Als, H. (1977). Newborn learning and the effect of appropriate stimulation. In L. Glock (Ed.), Intrauterine asphyxia and the developing fetal brain. Chicago: Year Book Medical Publishers.
- Breslin, L. (1976). Family crisis care. Clinics in Perinatology, 3, 448.
- Bridger, W. H. (1962). Sensory habituation and discrimination in the human neonate. American Journal of Psychiatry, 117, 991-996.
- Brimblecombe, F. S. W., Richards, M. P. M., & Robertson, N. R. C. (1978). Suggestions for the future. In Clinics in developmental medicine, No. 68: Separation and special-care baby units. Philadelphia: J. B. Lippincott Co.
- Bromwich, R. (1981). Working with parents and infants: An interactional approach. Baltimore: University Park Press.

- Bronstein, A. I., & Petrova, E. P. (1967). An investigation of the auditory analyzer in neonates and young infants. In Y. Brackbill & G. G. Thompson (Eds.), Behavior in infancy and early childhood: A book of readings. New York: Free Press.
- Broussard, E. R. (1979). Assessment of the adaptive potential of the mother-infant system: The neonatal perception inventories. Seminars in Perinatology, 3, 91-100.
- Broussard, E. R., & Hartner, M. (1971). Further considerations regarding maternal perception of the firstborn. In J. Hellmuth (Ed.), Exceptional infant: Volume II. New York: Brunner/Mazel.
- Broussard, E. R., & Sturgeon, M. (1970). Maternal perception of the neonate as related to development. Child Psychiatry and Human Development, 1, 16-25.
- Brown, J. V. (1979). Aberrant development in infancy: Overview and synthesis. In N. R. Ellis (Ed.), Aberrant development in infancy. Hillsdale, NJ: Lawrence Erlbaum Associates.
- Brown, J. V., & Bakeman, R. (1977a, March). Antecedents of emotional involvement in mothers of premature and fullterm infants. Paper presented at Society for Research in Child Development, New Orleans.
- Brown, J. V., & Bakeman, R. (1977b). Behavioral dialogues between mothers and infants: The effect of prematurity. Paper presented at American Pediatric Society and the Society for Pediatric Research, San Francisco.
- Bruner, J. (1969, July). Strategies in learning and cognitive processing. Paper presented at 19th International Congress of Psychology, London.
- Burns, P., Sander, L. W., Stechler, G., & Julia, H. (1972). Distress in feeding: Short term effects of caretaker environment of the first 10 days. Journal of the American Academy of Child Psychiatry, 11, 427-439.
- Caldwell, B. M. (1975). Home observation for the measurement of the environment. Unpublished manuscript. Center for Early Development and Education, Little Rock, AR.
- Campbell, D., & Stanley, J. (1963). Experimental and quasi-experimental designs for research. Chicago: Rand McNally and Co.
- Campbell, S. B. G., & Taylor, P. M. (1979). Bonding and attachment: Theoretical issues. Seminars in perinatology, 3, 3-15.

- Caplan, G. (1960). Patterns of parental response to the crisis of premature birth. Psychiatry, 23, 365-374.
- Caplan, G. (1961). Prevention of mental disorders in children. New York: Basic Books.
- Caplan, G. (1962). Manual for psychiatrists participating in the Peace Corps Program, Medical Program Division. Peace Corps, Washington, D.C.
- Caplan, G., Mason, E., & Kaplan, D. (1965). Four studies of crisis in parents of prematures. Community Mental Health Journal, 1, 149-161.
- Caputo, D. V., & Mandell, W. (1970). Consequences of low birth weight. Developmental psychology, 3, 363-383.
- Cassel, Z. K., & Sander, L. W. (1975). Neonatal recognition processes and attachment: The masking experiment. Paper presented at Society for Research in Child Development, Denver.
- Clarke-Stewart, K. A. (1973). Interactions between mothers and their young children: Characteristics and consequences. Monographs of the Society for Research in Child Development, 38, 153.
- Cohen, R. L. (1979). Maladaptation to pregnancy. Seminars in Perinatology, 3, 15-24.
- Cohen, L. B., DeLoache, J. S., & Strauss, M. S. Infant visual perception. In J. Osofsky (Ed.), The handbook of infant development. New York: John Wiley & Sons, Inc.
- Collias, N. E. (1956). The analysis of socialization in sheep and goats. Ecology, 37, 228-239.
- Condon, W. S., & Sander, L. W. (1974). Neonate movement is synchronized with adult speech: Interactional participation and language acquisition. Science, 183, 99-101.
- Cornell, E. H., & Gottfried, A. W. (1976). Intervention with premature infants. Child Development, 47, 32-39.
- Cramer, B. (1976). A mother's reactions to the birth of a premature baby. In M. H. Klaus & J. H. Kennell, Maternal-infant bonding. St. Louis: C. V. Mosby.
- Crosse, V. (1975). The preterm baby and other babies with low birth weight. New York: Churchill Livingstone.

- Crowell, D. H. (1967). Infant motor development. In Y. Brackbill (Ed.), Infancy and early childhood. New York: Free Press.
- Culbertson, J. L. (1978). Caregiver-infant attachment: A study of premature neonates and their nurse-caregiver. Unpublished doctoral dissertation, The University of Tennessee.
- Dayton, G. O., Jones, M. H., Aiu, P., Rawson, R. A., Steele, B., & Rose, M. (1964). Developmental study of coordinated eye movements in the human infant. I. Visual acuity in the newborn human: A study based on induced optokinetic nystagmus recorded by electrooculography. Archives of ophthalmology, 71, 865-870.
- de Chateau, P. (1976). The influence of early contact on maternal and infant behaviour in primiparae. Birth and the Family Journal, 3, 149-155.
- de Chateau, P. (1979). Effects of hospital practices on synchrony in the development of the infant-parent relationship. Seminars in Perinatology, 3, 45-60.
- de Chateau, P., & Wiberg, B. (1977a). Long-term effect on mother-infant behaviour of extra contact during the first hour postpartum. I. First observations at 36 hours. Acta Paediatrica Scandinavica, 66, 137-144.
- de Chateau, P., & Wiberg, B. (1977b). Long-term effect on mother-infant behaviour of extra contact during the first hour postpartum. II. A follow-up at three months. Acta Paediatrica Scandinavica, 66, 145-151.
- Douglas, J. W. B. (1960). Premature children at primary schools. British Medical Journal, 1, 1003-1013.
- Drillien, C. M. (1961). The incidence of mental and physical handicaps in school-age children of very low birth weight. Pediatrics, 27, 452-464.
- Drillien, C. M. (1964). The growth and development of the prematurely born infant. Baltimore: Williams and Wilkins.
- Drillien, C. M. (1967). The incidence of mental and physical handicaps in school-age children of very low birth weight. Pediatrics, 39, 238.
- Drotar, D., Baskiewicz, A., Irvin, N., Kennell, J. H., & Klaus, M. H. (1975). The adaptation of parents to the birth of an infant with a congenital malformation: A hypothetical model. Pediatrics, 56, 710-717.

- Dubowitz, L., Dubowitz, V., & Goldberg, C. (1970). Clinical assessment of gestational age in the newborn infant. Journal of Pediatrics, 77, 1-10.
- DuHamel, T. R., Lin, S., Skelton, A., & Hantke, C. (1974). Early parental perceptions and the high risk neonate. Clinical Pediatrics, 13, 1052.
- Edwards, A. L. (1972). Experimental design in psychological research. New York: Holt, Rinehart and Winston.
- Eisenberg, R. B. (1965). Auditory behavior in the human neonate. I. Methodological problems and the logical design of research procedures. Journal of Auditory Research, 5, 159-177.
- Eisenberg, R. B. (1970). The organization of auditory behavior. Journal of Speech and Hearing Research, 13, 461-464.
- Elardo, R., Bradley, R. H., & Caldwell, B. M. (1975). The relation of infants' home environments to mental test performance from six to thirty-six months: A longitudinal analysis. Child Development, 46, 71-76.
- Elmer, E., & Gregg, G. S. (1967). Developmental characteristics of abused children. Pediatrics, 40, 596-602.
- Erickson, M. L. (1976). Assessment and management of developmental changes in children. St. Louis: C. V. Mosby.
- Fanaroff, A., Kennell, J. H., & Klaus, M. H. (1972). Follow-up of low birth weight infants--the predictive value of maternal visiting patterns. Pediatrics, 49, 287.
- Fantz, R. L. (1963). Pattern vision in newborn infants. Science, 140, 296-297.
- Fantz, R. L. (1965). Visual perception from birth as shown by pattern selectivity. Annals of the New York Academy of Sciences, 118, 793-814.
- Fantz, R. L. (1966). Pattern discrimination and selective attention as determinants of perceptual development from birth. In A. H. Kidd & J. J. Rivoire (Eds.), Perceptual development in children. New York: International University Press.
- Fantz, R. L., & Nevis, S. (1967). Pattern preferences and perceptual-cognitive development in early infance. Merrill-Palmer Quarterly, 13, 77-108.

- Field, T. (1977, March). Effects of early separation, interactive deficits, and experimental manipulations of mother-infant interaction. Paper presented at Symposium on Disturbances of Early Parent-Infant Interaction: Symptoms and Origins, Society for Research in Child Development. New Orleans.
- Field, T. (1978). A first-year follow-up of high-risk infants: Formulating a cumulative risk index. Child Development, 49, 119-131.
- Fitzhardinge, P. M., & Ramsey, M. (1973). The improving outlook for the small prematurely born infant. Developmental medicine and Child Neurology, 15, 447-459.
- Fomofud, A. K., Sinkford, S. M., & Louy, V. E. (1975). Mother-child separation at birth: A contributing factor in child abuse. Lancet, 2, 549.
- Fontana, V. J. (1968). Further reflections on maltreatment of children. New York Journal of Medicine, 68, 2214-2215.
- Formby, D. (1967). Maternal recognition of infant's cry. Developmental Medicine and Child Neurology, 9, 293-298.
- Freedman, D. G. (1964). Smiling in blind infants and the issue of innate vs. acquired. Journal of Child Psychology and Psychiatry, 5, 171-184.
- Freedman, D. G. (1966). Hereditary control of early social behavior. In B. M. Foss (Ed.), Determinants of infant behavior III. New York: John Wiley & Sons, Inc.
- Freedman, D. G. (1974). Human infancy: An evolutionary perspective. Hillsdale, NJ: Lawrence Erlbaum Associates.
- Freedman, D. G., Loring, C. B., & Martin, R. M. (1967). Emotional behavior and personality development. In Y. Brackbill (Ed.), Infancy and early childhood. New York: Free Press.
- Frodi, A. M., & Lamb, M. E. (1978). Fathers' and mothers' responses to the faces and cries of normal and premature infants. Developmental Psychology, 14, 490-498.
- Gentry, E. F., & Aldrich, C. A. (1948). Rooting reflex in the newborn infant: Incidence and effect on it of sleep. American Journal of Diseases of Children, 75, 528-539.
- Gewirtz, J. L. (1961). A learning analysis of the effects of normal stimulation, privation, and deprivation on the acquisition of social motivation and attachment. In B. M. Foss (Ed.), Determinants of infant behavior I. New York: John Wiley & Sons, Inc.

- Gewirtz, J. L. (1965). The course of infant smiling in four childrearing environments. In B. M. Foss (Ed.), Determinants of infant behavior III. London: Methuen.
- Golan, N. (1978). Treatment in crisis situations. New York: Free Press.
- Goldberg, S. (1977). Social competence in infancy: A model of parent-infant interaction. Merrill-Palmer Quarterly, 23, 163-177.
- Goldberg, S. (1979). Premature birth: Consequences for the parent-infant relationship. American Scientist, 67, 214-220.
- Goldston, S. (1979, January). Overview of prevention programs. Paper presented at Primary Prevention Workshop sponsored by Overlook Mental Health Center, Knoxville.
- Gorman, J. J., Cogen, D. G., & Gellis, S. S. (1959). A device for testing visual acuity in infants. Sight-saving Review, 29, 80-84.
- Gorski, P. A., Davison, M. F., & Brazelton, T. B. (1979). Stages of behavioral organization in the high risk neonate: Theoretical and clinical considerations. Seminars in Perinatology, 1, 61-72.
- Gray, J., Cutler, C., Dean, J., & Kempe, C. (1976). In R. E. Helfer & C. H. Kempe (Eds.), Child abuse and neglect: The family and the community. Cambridge, MA: Ballinger.
- Green, M., & Solnit, A. J. (1964). Reactions to the threatened loss of a child: A vulnerable child syndrome. Pediatrics, 34, 58-66.
- Greenberg, D. J. (1971). Accelerating visual complexity levels in the human infant. Child Development, 42, 905-918.
- Greenberg, M., Rosenberg, I., & Lind, J. (1973). First mothers rooming-in with their newborns: Its impact upon the mother. American Journal of orthopsychiatry, 43, 783-788.
- Greenman, G. W. (1963). Visual behavior of newborn infants. In A. J. Solnit & S. A. Provence (Eds.), Modern perspectives in child development. New York: Hallmark.
- Gutelius, M. F., & Kirsch, A. D. (1972, November). Factors promoting success in infant education. Paper presented at American Public Health Association, Atlantic City, NJ.
- Hales, D., Trause, M. A., & Kennell, J. H. (1976). How early is early contact? Defining the limits of the sensitive period. Pediatric Research, 10, 448.

- Hamilton, M. L. (1972). The evaluation of a parent and child center program. Child Welfare, 51, 248-258.
- Harlow, H. F., & Harlow, M. K. (1969). Effects of various mother-infant relationships on rhesus monkey behaviors. In B. M. Foss (Ed.), Determinants of infant behavior IV. London: Methuen.
- Harlow, H. F., Harlow, M. K., & Hansen, E. W. (1963). In H. R. Rheingold (Ed.), Maternal behavior in mammals. New York: John Wiley & Sons, Inc.
- Harper, R. G., Sokal, M. M., & Sia, C. G. (1976). Mothers in the neonatal intensive care unit. Clinics in Perinatology, 3, No. 2, 441-446.
- Haynes, H., White, B. L., & Held, R. (1965). Visual accommodation in human infants. Science, 148, 528-530.
- Herbart, M. (1974). Emotional problems of development in children. New York: Academic Press.
- Hershenson, M., Munsinger, H., & Kessen, W. (1965). Preference for shapes of intermediate variability in the newborn. Science, 147, 630-631.
- Hersher, L., Richmond, J., & Moore, A. (1963). Maternal behavior in sheep and goats. In H. R. Rheingold (Ed.), Maternal behavior in mammals. New York: John Wiley & Sons, Inc.
- Hess, E. H. (1970). Ethology and developmental psychology. In P. H. Mussen (Ed.), Carmichael's manual of child psychology. New York: John Wiley & Sons, Inc.
- Hollingshead, A. B., & Redlich, F. C. (1958). Social class and mental illness. New York: John Wiley & Sons, Inc.
- Hooker, D. (1952). The prenatal origin of behavior. Lawrence, KS: Kansas University Press.
- Huck, S., Cormier, W., & Bounds, W. (1974). Reading statistics and research. New York: Harper and Row.
- Hunter, R., Kilstrom, N., Kraybill, E., & Loda, F. (1978). Antecedents of child abuse and neglect in premature infants: A prospective study in a newborn intensive care unit. Pediatrics, 61, 629-635.
- Illingworth, R. S. (1955). Crying in infants and children. British Medical Journal, 1, 75-79.
- Illingworth, R. S. (1972). Development of the infant and young child: Normal and abnormal. Baltimore: Williams and Wilkins.

- Interprofessional Task Force on Health Care of Women and Children. (1978, June). Joint position statement on the development of family-centered maternity/newborn care in hospitals. Interprofessional Task Force Secretariat, Chicago.
- Jones, S. J., & Moss, H. A. (1971). Age, state, and maternal behavior associated with infant covalizations. Child Development, 42, 1039-1051.
- Kachoris, P. J. (1977). Psychodynamic consideration in the neonatal intensive care unit. Critical Care Medicine, 5, 62-65.
- Kagan, J., Henker, B. A., Hen-Tov, A., Lenine, J., & Lewis, M. (1966). Infants' differential reactions to familiar and distorted faces. Child Development, 37, 519-532.
- Kaplan, D. N., & Mason, E. A. (1960). Maternal reactions to premature birth viewed as an acute emotional disorder. American Journal of Orthopsychiatry, 30, 539-552.
- Karmel, B. Z. (1969). Complexity, amount of contours, and visually dependent preference behavior in hooded rats, domestic chicks, and human infants. Journal of Comparative and Physiological Psychology, 69, 649-657.
- Katz, C. M., & Taylor, P. M. (1967). The incidence of low birthweight in children with severe mental retardation. American Journal of Diseases of Children, 114, 79-87.
- Kempe, C. H. (1971). Pediatric implications of the battered baby syndrome. Archives of Disease in Childhood, 46, 28.
- Kempe, C. H., Silver, H. K., & O'Brien, D. (Eds.), Current pediatric diagnosis and treatment. Los Altos, CA: Lange Medical Publications.
- Kennell, J. H. (1976). Parenting in the intensive care unit. Birth and Family Journal, 5, 223-226.
- Kennell, J. H., Jerauld, R., Wolfe, H., Chesler, D., Kreger, N. C., McAlpine, W., Steffa, M., & Klaus, M. H. (1974). Maternal behavior one year after early and extended post-partum contact. Developmental Medicine and Child Neurology, 16, 172-179.
- Kennell, J. H., & Rolnick, A. (1960). Discussing problems in newborn babies with their parents. Pediatrics, 26, 832-838.
- Kennell, J. H., Trause, M. A., & Klaus, M. H. (1975). Evidence for a sensitive period in the human mother. In Parent-Infant Interaction. Ciba Foundation Symposium (No. 33). New York: Elsevier.

- Kennell, J. H., Voos, D., & Klaus, M. H. (1976). Parent-infant bonding. In R. E. Helfer & C. H. Kempe (Eds.), Child abuse and neglect: The family and the community. Cambridge, MA: Ballinger.
- Kessen, W., Haith, M. M., & Salapatek, P. H. (1970). Human infancy: A bibliography and guide. In P. H. Mussen (Ed.), Carmichael's manual of child psychology. New York: John Wiley & Sons, Inc.
- Kessen, W., & Mandler, G. (1961). Anxiety, pain, and the inhibition of distress. Psychological Review, 68, 396-404.
- Klaus, M. H. (1978). Modified Broussard scale. Unpublished research inventory. Case Western Reserve School of Medicine, Cleveland, OH.
- Klaus, M. H., Jerauld, R., Kreger, N. C., McAlpine, W., Steffa, M., & Kennell, J. H. (1972). Maternal attachment: Importance of the first postpartum days. New England Journal of Medicine, 286, 460-463.
- Klaus, M. H., & Kennell, J. H. (1970). Mothers separated from their newborn infants. Pediatric Clinics of North America, 17, 1015-1037.
- Klaus, M. H., & Kennell, J. H. (1976a). Maternal-infant bonding. St. Louis: C. V. Mosby.
- Klaus, M. H., & Kennell, J. H. (1976b). Parent-to-infant attachment. In V. Vaughan III & T. B. Brazelton (Eds.), The family--can it be saved? Parents and children in a complex society. Chicago: Year Book Medical Publishers.
- Klaus, M. H., Kennell, J. H., Plumb, N., & Zuehlke, S. (1970). Human maternal behavior at first contact with her young. Pediatrics, 46, 187-192.
- Klaus, M. H., Leger, T., & Trause, M. (Eds.). (1974). Maternal attachment and mothering disorders: A roundtable. Sausalito, CA: Johnson and Johnson Baby Products Company.
- Klaus, M. H., Trause, M. A., & Kennell, J. H. (1975). Does human maternal behavior after delivery show a characteristic pattern? In Parent-Infant Interaction. Ciba Foundation Symposium (No. 33). New York: Elsevier.
- Klein, M., & Stern, L. (1971). Low birth weight and the battered child syndrome. American Journal of the Diseases of Children, 122, 15-18.
- Klopfer, P. (1971). Mother love: What turns it on? American Scientist, 49, 404-407.

- Klopfer, P., Adams, D., & Klopfer, M. (1964). Maternal "imprinting" in goats. Proceeds of the National Academy of Science, 52, 911.
- Knobloch, H., Rider, R., Harper, P., & Pasamanick, B. (1956). Neuropsychiatric sequelae of prematurity. Journal of the American Medical Association, 61, 581-585.
- Kopelman, A. E., Simensson, R. J., Smaldone, A., & Gilbert, L. (1978). Does a photograph of a newborn about to be transferred to an intensive care center promote maternal-infant bonding? Clinical Pediatrics, 17, 15-16.
- Korner, A. F. (1971). Individual differences at birth: Implications for early experience and later development. American Journal of Orthopsychiatry, 41, 608-619.
- Korner, A. F. (1974). The effect of the infant's state, level of arousal, sex, and ontogenetic stage on the caregiver. In M. Lewis & L. A. Rosenblum (Eds.), The effect of the infant on the caregiver. New York: John Wiley & Sons, Inc.
- Korner, A. F., Chuck, B., & Dontchos, S. (1968). Organismic determinants of spontaneous oral behavior in neonates. Child Development, 39, 1145-1157.
- Korner, A. F., & Grobstein, R. (1966). Visual alertness as related to soothing in neonates: Implications for maternal stimulation and early deprivation. Child Development, 37, 867-876.
- Korner, A. F., & Thoman, E. B. (1972). The relative efficacy of contact and vestibular-proprioceptive stimulation in soothing neonates. Child Development, 43, 443-453.
- Korones, S. B. (1976). High-risk newborn infants: The basis for intensive nursing care. St. Louis: C. V. Mosby.
- Kron, R. E. (1967). Instrumental conditioning of nutritive sucking behavior in the newborn. In J. Wortis (Ed.), Recent advances in biological psychiatry (Vol. 9). New York: Plenum Press.
- Kron, R. E., Ipsen, J., & Goddard, K. E. (1968). Consistent individual differences in the nutritive sucking behavior of the human newborn. Psychosomatic Medicine, 30, 151-161.
- Kron, R. E., Stein, M., & Goddard, K. E. (1966). Newborn sucking behavior affected by obstetric sedation. Pediatrics, 37, 1012-1016.
- Kuhn, T. S. (1962). The structure of scientific revolutions. Chicago: University of Chicago Press.

- Kulka, A. M., Walter, R. D., & Fry, C. P. (1966). Mother-infant interaction as measured by simultaneous recording of physiological processes. Journal of the American Academy of Child Psychiatry, 5, 496-503.
- Lancaster, J. (1976). Impact of intensive care on the maternal-infant relationship. In S. B. Korones, High-risk newborn infants: The basis for intensive nursing care. St. Louis: C. V. Mosby.
- Lang, R. (1972). Birth book. Ben Lomond, CA: Genesis Press.
- Leiderman, H. (1974). Maternal-infant separation: Delayed consequences. In M. H. Klaus, T. Leger, & M. Trause (Eds.), Maternal attachment and mothering disorders: A roundtable. Sausalito: Johnson and Johnson Baby Products Company.
- Leiderman, P. H., Leifer, A., Seashore, M., Barnett, C., & Grobstein, R. (1973). Mother-infant interaction, effects of early deprivation, prior experience and sex of infant. Early Development, 51, 154-175.
- Leiderman, P. H., & Seashore, M. J. (1975). Mother-infant neonatal separation: Some delayed consequences. Parent-Infant Interaction. Ciba Foundation Symposium (No. 33). New York: Elsevier.
- Leifer, A. D., Leiderman, P. H., Barnett, C. R., & Williams, J. A. (1972). Effects of mother-infant separation on maternal attachment behavior. Child Development, 43, 1203-1218.
- Lester, B., Als, H., & Brazelton, T. B. (1978). Scoring criteria for seven clusters of the Brazelton scale. Unpublished manuscript. Child Development Unit, Children's Hospital Medical Center, Boston.
- Leventhal, A. S., & Lipsitt, L. P. (1964). Adaptation, pitch discrimination, and sound localization in the neonate. Child Development, 35, 759-767.
- Lewis, M., & Rosenblum, L. A. (1974). The effect of the infant on its caregiver. New York: John Wiley & Sons, Inc.
- Lipsitt, L. P. (1975). The synchronicity of respiration, heart rate, and sucking behavior in the newborn. In Biologic and clinical aspects of brain development. Mead Johnson Symposium on Perinatal and Developmental Medicine (No. 6). Evansville, IN: Mead Johnson and Co.
- Lipsitt, L. P. (1979). The newborn as informant. In R. B. Kearsley & I. E. Sigel (Eds.), Infants at risk: Assessment of cognitive functioning. Hillsdale, NJ: Lawrence Erlbaum Associates.

- Lipsitt, L. P., & Kaye, H. (1964). Conditioned sucking in the human newborn. Psychonomic Science, 1, 29-30.
- Littman, B., & Parmelee, A. H. (1974a). The postnatal complications scale. Unpublished manuscript. (Available from Department of Pediatrics, Division of Child Development, School of Medicine, UCLA, Los Angeles, CA 90024).
- Littman, B., & Parmelee, A. H. (1974b). The obstetrical complications scale. Unpublished manuscript. (Available from Department of Pediatrics, Division of Child Development, School of Medicine, UCLA, Los Angeles, CA 90024).
- Lozoff, B., Brittenham, G. M., Trause, M. A., Kennell, J. H., & Klaus, M. H. (1977). The mother-newborn relationship: Limits of adaptability. Journal of Pediatrics, 91, 1-12.
- Lubchenco, L. O. (1976). The high-risk infant. Philadelphia: W. B. Saunders Co.
- Lubchenco, L. O., Horner, F. A., Reed, L. S., Hix, I. E., Metcalf, D., Cohig, R., Elliot, H. C., & Bourg, M. (1963). Sequelae of premature birth. American Journal of Disabled Children, 106, 101-115.
- Lynch, M. A. (1975). Ill-health and child abuse. Lancet, 2, 317.
- Maccoby, E. E., & Masters, J. C. (1970). Attachment and dependency. In P. H. Mussen (Ed.), Carmichael's manual of child psychology (Vol. 2). New York: John Wiley & Sons, Inc.
- MacFarlane, A. (1975). Olfaction in the development of social preferences in the human neonate. In Parent-Infant Interaction. Ciba Foundation Symposium (No. 33). New York: Elsevier.
- Martin, P. C., & Vincent, E. L. (1960). Human development. New York: Ronald Press.
- Mason, E. A. (1963). A method of predicting crisis outcome for mothers of premature babies. Public Health Report, 78, 1031-1035.
- Maurer, D., & Salapatek, P. (1976). Developmental changes in the scanning of faces by young infants. Child Development, 47, 523-527.
- McBryde, A. (1951). Compulsory rooming-in in the ward and private service at Duke Hospital. Journal of the American Medical Association, 45, 625.
- McNemar, Q. (1969). Psychological statistics. New York: John Wiley & Sons, Inc.

- Meier, G. W. (1965). Maternal behavior of feral and laboratory-reared monkeys following the surgical delivery of their infants. Nature, 206, 492-493.
- Meier, J. H. (1975). Screening, assessment and intervention for young children at developmental risk. In B. Z. Friedlander, G. M. Sterritt, & G. E. Kirk (Eds.), Exceptional infant, Vol. 3: Assessment and intervention. New York: Brunner/Mazel.
- Milton, R. C. (1964). An extended table of critical values for the Mann-Whitney (Wilcoxon) two-sample statistic. Journal of the American Statistical Association, 591, 925-934.
- Minde, K., Ford, L., Celhoffer, L., & Boukydis, C. (1975). Interactions of mothers and nurses with premature infants. Canadian Medical Association Journal, 113, 741-745.
- Minde, K., Trehub, S., Corter, C., Boukydis, C., Celhoffer, L., & Martin, P. (1977, March). Mother-child relationships in the premature nursery -- an observational study. Paper presented at Society for Research in Child Development, New Orleans.
- Mitchell, R. G., & Farr, V. (1965). The meaning of maturity and the assessment of maturity at birth. In M. Dawkins & W. G. MacGregor (Eds.), Gestational age, size and maturity. London: Spastics Society Medical Education and Information Unit.
- Moore, A. (1968). Effects of modified care in the sheep and goat. In G. Newton & S. Levine (Eds.), Early experience and behavior. Springfield: Charles C. Thomas.
- Moore, B. C. (1965). Relationship between prematurity and intelligence in mental retardates. American Journal of Mental Deficiency, 70, 448-453.
- Moss, H. A. (1965). Methodological issues in studying mother-infant interaction. American Journal of Orthopsychiatry, 35, 482-486.
- Moss, H. A. (1967). Sex, age, and state as determinants of mother-infant interaction. Merrill-Palmer Quarterly, 13, 19-36.
- National Association for Mental Health, Inc. (1978). Primary prevention of mental disorders with emphasis on prenatal and perinatal periods: Action guidelines. Publication of National Mental Health Association, Arlington, VA.
- O'Connor, S. M., Vietze, P. H., Hopkins, J. B., & Altmeier, W. A. (1977, March). Postpartum extended maternal-infant contact: Subsequent mothering and child health. Paper presented at Society for Research in Child Development, New Orleans.

- Osofsky, J. D., & Connors, K. (1979). Mother-infant interaction: An integrative view of a complex system. In J. D. Osofsky (Ed.), Handbook of infant development. New York: John Wiley & Sons, Inc.
- Osofsky, J. D., & Danzger, B. (1974). Relationships between neonatal characteristics and mother-infant interaction. Human Development, 10, 124-130.
- Papoušek, H. (1967). Experimental studies of appetitional behavior in human newborns and infants. In H. W. Stevenson, E. H. Hess, & H. L. Rheingold (Eds.), Early behavior: Comparative and developmental approaches. New York: John Wiley & Sons, Inc.
- Parke, R. D., O'Leary, S. E., & West, S. (1972). Mother-father-newborn interaction. Effects of maternal medication, labor, and sex of infant. Proceedings of the APA, pp. 85-86.
- Parmelee, A. H., & Haber, A. (1973). Who is the "Risk infant"? Clinical Obstetrics and Gynecology, 16, 376-387.
- Parmelee, A. H., Sigman, M., Kopp, C. B., & Haber, A. (1976). Diagnosis of the infant at high risk for mental, motor, and sensory handicaps. In T. D. Tjossem (Ed.), Intervention strategies for high risk infants and young children. Baltimore: University Park Press.
- Pasamanick, B., & Knobloch, H. (1960). Brain damage and reproductive casualty. American Journal of Orthopsychiatry, 30, 298-305.
- Pasamanick, B., & Knobloch, H. (1966). Retrospective studies on the epidemiology of reproductive casualty: Old and new. Merrill-Palmer Quarterly, 12, 7-26.
- Pasamanick, B., Rogers, M. E., & Lilienfeld, A. M. (1956). Pregnancy experience and the development of behavior disorder in children. American Journal of Psychiatry, 112, 613-618.
- Patten, B. M. (1953). Human embryology. (2nd Ed.). New York: Blakiston.
- Powell, L. F. (1974). The effect of extra stimulation and maternal involvement on the development of low-birth-weight infants and on maternal behavior. Child Development, 45, 106-113.
- Prechtl, H. F. R. (1958). The directed head turning response and allied movements of the human baby. Behavior, 13, 212-242.
- Prechtl, H. F. R. (1963). The mother-child interaction in babies with minimal brain damage (a follow-up study). In B. M. Foss (Ed.), Determinants of infant behavior II. New York: John Wiley & Sons, Inc.

- Prechtl, H. F. R., & Beintema, D. (1964). The neurological examination of the fullterm newborn infant. London: Spastics Society in association with William Heinemann Medical Books, Ltd.
- Price, G. M. (1977). Factors influencing reciprocity in early mother-infant interaction. Paper presented at Society for Research in Child Development, New Orleans.
- Prugh, D. G. (1953). Emotional problems of the premature infant's parents. Nursing Outlook, 1, 461-464.
- Quinn, B., & Goldberg, S. (1977, March). Feeding and fussing: Parent-infant interaction as a function of neonatal medical status. Paper presented at Society for Research in Child Development, New Orleans.
- Rebelsky, F. G., Starr, R. H., Jr., & Luria, Z. (1967). Language development: The first four years. In Y. Brackbill (Ed.), Infancy and early childhood. New York: Free Press.
- Rheingold, H. L. (1956). The modification of social responsiveness in institutional babies. Society for Research in Child Development Monograph, 21, (63, Serial No. 2).
- Rheingold, H. L. (1960). The measurement of maternal care. Child Development, 31, 565-575.
- Rheingold, H. L. (1961). The effect of environmental stimulation upon social and exploratory behavior in the human infant. In B. M. Foss (Ed.), Determinants of infant behavior I. New York: John Wiley & Sons, Inc.
- Rheingold, H. L. (1968). Infancy. In D. L. Sills (Ed.), International encyclopedia of the social sciences. New York: MacMillan.
- Rheingold, H. L. (1969). The social and socializing infant. In D. A. Goslin (Ed.), Handbook of socialization theory and research. Chicago: Rand McNally.
- Rheingold, H. L., Gewirtz, J. L., & Ross, H. W. (1959). Social conditioning of vocalizations in the infant. Journal of Comparative and Physiological Psychology, 52, 68-73.
- Rice, R. D. (1977). Neurophysiological development in premature infants following stimulation. Developmental Psychology, 13, 69-76.
- Richards, M. P. M. (1971). A comment on the social content of mother-infant interaction. In H. R. Schaffer (Ed.), The origins of human social relations. New York: Academic Press.

- Richards, M. P. M. (1978). Possible effects of early separation on later development of children --a review. In F. S. W. Brimblecombe, M. P. M. Richards, & N. R. C. Robertson (Eds.), Clinics in developmental medicine, No. 68: Separation and special-care baby units. Philadelphia: J. B. Lippincott Co.
- Richards, M. P. M., & Bernal, J. F. (1971). Social interactions in the first days of life. In H. R. Schaffer (Ed.), The origins of human social relations. London: Academic Press.
- Richards, M. P. M., & Bernal, J. F. (1972). An observational study of mother-infant interaction. In N. Blurton Jones (Ed.), Ethological studies of child behavior. Cambridge: Cambridge University Press.
- Ringler, N. M., Kennell, J. H., Jarvella, R., Navojosky, B. J., & Klaus, M. H. (1975). Mother to child speech at 2 years - effects of early postnatal contact. Journal of Pediatrics, 86, 141-144.
- Ringler, N. M., Trause, M. A., & Klaus, M. H. (1976). Mother's speech to her two-year-old: Its effect on speech and language comprehension at 5 years. Pediatric Research, 10, 307.
- Robson, K. S. (1967). The role of eye-to-eye contact in maternal-infant attachment. Journal of Child Psychology and Psychiatry, 8, 13-25.
- Robson, K. S., & Moss, H. A. (1970). Patterns and determinants of maternal attachment. Journal of Pediatrics, 77, 976-985.
- Rodgers, L. (1979). Personal communication.
- Rose, J., Boggs, T. R., Adlerstein, A., Trigos, W., Riggs, I., & Crowther, P. (1960). The evidence for a syndrome of mothering disability consequent to threats to the survival of neonates. American Journal of Diseases of Children, 100, 776-777.
- Rosenblatt, J. S. (1965). The basis of synchrony in the behavioral interaction between the mother and her offspring in the laboratory rat. In B. M. Foss (Ed.), Determinants of infant behavior III. London: Methuen.
- Rosenblatt, J. S. (1975). Prepartum and postpartum regulation of maternal behavior in the rat. In Parent-Infant Interaction. Ciba Foundation Symposium (No. 33). New York: Elsevier.
- Rosenfield, A. G., Vohr, B. R., Cowett, R. W., & Oh, W. (1977, March). The effects of an intervention program on parental visiting in a special care nursery. Paper presented at Society for Research in Child Development, New Orleans.

- Rubin, R. (1963). Maternal touch. Nursing Outlook, 11, 828-831.
- Sackett, G. P., & Ruppenthal, G. C. (1974). Some factors influencing the attraction of adult female Mecaque monkeys to neonates. In M. Lewis & L. A. Rosenblum (Eds.), The effect of the infant on its caregiver. New York: John Wiley & Sons, Inc.
- Salapatek, P. (1969, December). The visual investigation of geometric pattern by the one-and-two-month-old infant. Paper presented at American Association for the Advancement of Science meeting, Boston.
- Salapatek, P. (1975). Pattern perception in early infancy. In L. B. Cohen & P. Salapatek (Eds.), Infant perception: From sensation to cognition: Basic visual processes (Vol. 1). New York: Academic Press.
- Sameroff, A. J. (1975). Psychological needs of the mother in early mother-infant interactions. In G. B. Avery (Ed.), Neonatology. Philadelphia: J. B. Lippincott Co.
- Sameroff, A. J. (1979). The etiology of cognitive competence: A systems approach. In R. B. Kearsley & I. E. Sigel (Eds.), Infants at risk: Assessment of cognitive functioning. Hillsdale, NJ: Lawrence Erlbaum Associates.
- Sameroff, A. J., & Chandler, M. J. (1975). Reproductive risk and the continuum of caretaking casualty. In F. D. Horowitz, M. Hetherington, S. Scarr-Salapatek, & G. Sigel (Eds.), Review of child development research, Vol. 4. Chicago: University of Chicago Press.
- Sander, L. (1975). Infant and caretaking environment: Investigation and conceptualization of adaptive behavior in a system of increasing complexity. In E. Anthony (Ed.), Explorations in child psychiatry. New York: Plenum Press.
- Sander, L. (1976). Issues in early mother-child interaction. In E. N. Rexford, L. W. Sander, & T. Shapiro (Eds.), Infant Psychiatry: A new synthesis. Journal of the American Academy of Child Psychiatry Monograph (No. 2). New Haven: Yale University Press.
- Sander, L., Stechler, G., Burns, P., & Julia, H. (1970). Early mother-infant interaction and 24-hour patterns of activity and sleep. Journal of the American Academy of Child Psychiatry, 9, 103-123.
- Scarr-Salapatek, S., & Williams, M. L. (1972). A stimulation program for low birthweight infants. American Journal of Public Health, 62, 662-667.
- Schaffer, H. R., & Emerson, P. E. (1964a). The development of social attachments in infancy. Society for Research in Child Development Monograph, 29, (3 Serial No. 94).

- Schaffer, H. R., & Emerson, P. E. (1964b). Patterns of response to physical contact in early human development. Journal of Child Psychology and Psychiatry, 5, 1-13.
- Schoenberg, B., Carr, A. C., Peretz, D., Kutscher, A. H., & Goldberg, I. K. (Eds.). (1974). Anticipatory grief. New York: Columbia University Press.
- Schwartz, S. B. (1977). The results of a supplemental social stimulation program on preterm infants and their parents. Unpublished dissertation, The University of Tennessee.
- Seashore, M. H., Leifer, A. D., Barnett, C. R., & Leiderman, P. H. (1973). The effects of denial on early mother-infant interaction on maternal self-confidence. Journal of Personality and Social Psychology, 26, 369-378.
- Segall, M. E. (1972). Cardiac responsivity to auditory stimulation in premature infants. Nursing Research, 21, 15-19.
- Shaheen, E., Alexander, D., Truskowsky, M., & Barbero, G. (1968). Failure to thrive - a retrospective profile. Clinical Pediatrics, 7, 255.
- Siqueland, E. R., & DeLucia, C. A. (1969). Visual reinforcement of nonnutritive sucking in human infants. Science, 165, 1144-1146.
- Smith, N., Schwartz, J. R., Mandell, W., Silberstein, M., Dalack, J. D., & Sacks, S. (1969). Mothers' psychological reactions to premature and full-size newborns. Archives of General Psychiatry, 21, 177-181.
- Solkoff, N., & Matuszak, D. (1975). Tactile stimulation and behavioral development among low-birthweight infants. Child Psychiatry and Human Development, 6, 33-37.
- Solkoff, N., Waffe, S., Weintraub, D., & Blase, B. (1969). Effects of handling on the subsequent development of premature infants. Developmental Psychology, 1, 765-768.
- Solnit, A. J., & Stark, M. H. (1961). Mourning and the birth of a defective child. In The psychoanalytic study of the child (Vol. 16). New York: International Universities Press.
- Spears, W. C., & Hohle, R. H. (1967). Sensory and perceptual processes in infants. In Y. Brackbill (Ed.), Infancy and early childhood. New York: Free Press.
- Stechler, G. (1954). Newborn attention as affected by medication during labor. Science, 144, 315-317.

- Stechler, G. (1973, January). Infant looking and fussing in response to visual stimuli over the first two months of life in different infant-caretaking systems. Paper presented at Society for Research in Child Development, Philadelphia.
- Steele, B. F., & Pollock, C. B. (1974). A psychiatric study of parents who abuse infants and small children. In R. E. Helfer & C. H. Kempe (Eds.), The battered child. Chicago: University of Chicago Press.
- Stern, D. N. (1974). Mother and infant at play: The dyadic interaction involving facial, vocal, and gaze behaviors. In M. Lewis & L. A. Rosenblum (Eds.), The effect of the infant on its caregiver. New York: John Wiley & Sons, Inc.
- Stern, L. (1973). Prematurity as a factor in child abuse. Hospital Practice, 8, 117-123.
- Stewart, A. L., & Reynolds, E. O. R. (1974). Improved prognosis for infants of very low birthweight. Pediatrics, 54, 724-735.
- Stewart, A. L., Turcan, D., Rawlings, G., Hart, S., & Gregory, S. (1978). Outcome for infants at high risk of major handicap. In Major Mental Handicap: Methods and Costs of Prevention. Ciba Foundation Symposium (No. 59). New York: Basic Books.
- Sugarman, M. (1977). Paranatal influences on maternal-infant attachment. American Journal of Orthopsychiatry, 47, 407-420.
- ten Bensel, R. W., & Paxson, C. L. (1977). Child abuse following early postpartum separation. Journal of Pediatrics, 90, 490.
- Tennessee perinatal care system: Guidelines for regionalization, hospital care levels, staffing, and facilities. (1978, March). Tennessee Department of Public Health, Division of Maternal and Child Care.
- Thoman, E. (1975a). How a rejecting baby affects mother-infant synchrony. In Parent-Infant Interaction. Ciba Foundation Symposium (No. 33). New York: Elsevier.
- Thoman, E. (1975b). The role of the infant in the early transfer of information. Biological Psychiatry, 10, 161-169.
- Thoman, E., Leiderman, P., & Olson, J. (1972). Neonate-mother interaction during breast-feeding. Developmental Psychology, 6, 110-118.
- Thoman, E., Turner, A., Leiderman, P., & Barnett, C. (1970). Neonate-mother interaction: Effects of parity on feeding behavior. Child Development, 41, 1103-1111.

- Thomas, A., Chess, S., & Birch, H. G. (1963). Behavioral individuality in early childhood. New York: New York University Press.
- Thomas, A., Chess, S., & Birch, H. G. (1968). Temperament and behavior disorders in children. New York: New York University Press.
- Trincker, D., & Trincker, I. (1967). Development of brightness vision in infants. In Y. Brackbill & G. G. Thompson (Eds.), Behavior in infancy and early childhood. New York: Free Press.
- Tronick, E., Als, H., & Brazelton, T. B. (1977, March). The structure of face-to-face interaction and its developmental function. Paper presented at Society for Research in Child Development Symposium: The Structure of Infant-Adult Social Reciprocity. T. B. Brazelton & E. Tronick, co-chairmen, New Orleans.
- Tronick, E., & Brazelton, T. B. (1975). Clinical uses of the Brazelton neonatal behavioral assessment. In B. Z. Friedlander, G. M. Sterritt, & G. E. Kirk (Eds.), Exceptional infant Vol. 3: Assessment and intervention. New York: Brunner/Mazel.
- Vernon, M. (1967). Prematurity and deafness: The magnitude and nature of the problem among deaf children. Exceptional Children, 30, 289-298.
- Walters, R. H., & Parke, R. D. (1965). The role of distance receptors in the development of social responsiveness. In L. P. Lipsitt & C. C. Spiker (Eds.), Advances in child development and behavior (Vol. 1). New York: Academic Press.
- Warrick, L. H. (1971). Family-centered care in the premature nursery. American Journal of Nursing, 71, 2134-2138.
- Wertheimer, M. (1961). Psychomotor coordination of auditory-visual space at birth. Science, 134, 1692.
- Wiener, G. (1962). Psychologic correlates of premature birth: A review. Journal of Nervous and Mental Diseases, 134, 129-144.
- Wiener, G. (1968). Scholastic achievement at age 12-13 of prematurely born infants. Journal of Special Education, 2, 237-250.
- Wiener, G., Rider, R. V., Oppel, W. C., Fischer, L. K., & Harper, P. A. (1965). Correlates of low birth weight: Psychological status at 6-7 years of age. Pediatrics, 35, 434-444.
- Wiener, G., Rider, R. V., Oppel, W. C., & Harper, P. A. (1968). Correlates of low birth weight: Psychological status at eight to ten years of age. Pediatric Research, 2, 110-118.

- Wolff, P. H. (1959). Observations on newborn infants. Psychosomatic Medicine, 21, 110-118.
- Wolff, P. H. (1963). Observations on the early development of smiling. In B. M. Foss (Ed.), Determinants of infant behavior II. New York: John Wiley & Sons, Inc.
- Wolff, P. H. (1965). The development of attention in young infants. Annals of the New York Academy of Sciences, 118, 815-830.
- Wolff, P. H. (1966). The causes, controls, and organization of behavior in the neonate. Psychological Issues, 5, 7-11.
- Wolff, P. H. (1969). The natural history of crying and other vocalization in early infancy. In B. M. Foss (Ed.), Determinants of infant behavior IV. London: Methuen.
- Wolff, P. H. (1971). Mother-infant relations at birth. In J. G. Howels (Ed.), Modern perspectives in international child psychiatry. New York: Brunner/Mazel.
- Wolff, P. H. (1976). Mother-infant interactions in the first year. New England Journal of Medicine, 395, 999-1000.
- Wright, L. (1971). The theoretical and research base for a program of early stimulation, care, and training of prematures. In J. Hellmuth (Ed.), The exceptional infant, Vol. 2. New York: Brunner/Mazel.
- Yarrow, L. J. (1963a). Research in dimensions of early maternal care. Merrill-Palmer Quarterly, 9, 101-114.
- Yarrow, M. R. (1963b). Problems of methods in parent-child research. Child Development, 34, 215-226.

APPENDICES

APPENDIX A

PARENT-INFANT RESEARCH PROJECT

Code No. _____

Infant's Name _____ Sex: M F Birthdate _____

Hospital No. _____ Pay Status _____

Gravida _____ Para _____ County _____

Birthweight _____ Current Height _____

Apparent Race _____ Apgar Score (1) _____ (5) _____

Dubowitz Score (Gestational age at birth) _____

Diagnosis at admission _____

Demographic Data:

Mother's name _____ Age _____ Occup. _____

Father's name _____ Age _____ Occup. _____

Address _____

Phone number _____

Dates of evaluations _____

General comments _____

Record of phone calls to ICN:

1.	8.	15.
2.	9.	16.
3.	10.	17.
4.	11.	18.
5.	12.	19.
6.	13.	20.
7.	14.	21.

Record of visits to ICN:

1.	6.	11.
2.	7.	12.
3.	8.	13.
4.	9.	14.
5.	10.	15.

APPENDIX B

PIEP CHECKLIST

EVENT	DATE	NOTES
1. <u>Check infant admissions</u>		
Charge Nurse:	_____	
Census Log:	_____	
2. Dubowitz Assessment of Gestational Age (External and neurological signs)		
Date administered:	_____	
Gestational age in weeks:	_____	
3. Littman-Parmelee Postnatal Complications Scale		
Score:	_____	
4. Littman-Parmelee Obstetrical Complications Scale		
Score:	_____	
5. Informed consent of parents		
Documentation	_____	
Code number:	_____	
6. Broussard Neonatal Perception Inventory		
Score:	_____	

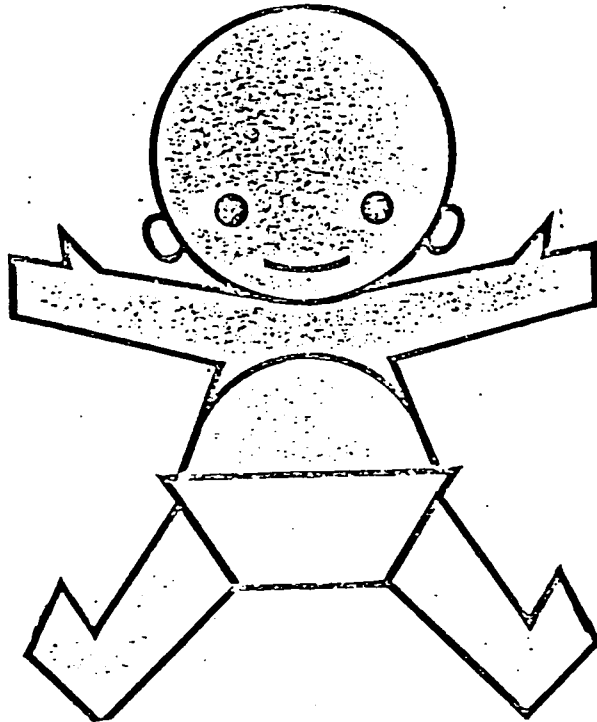
EVENT	DATE	NOTES
7. Behavioral Observations		
Time #1:	_____	
Time #2:	_____	

8. BNBAS administered		
Time#1:	_____	
Time #2:	_____	

9. BNBAS Teaching: _____		
Stimulation Materials: _____		

10. Home Visit, 1 month ($\pm$ 2 days)		
BNBAS administered: _____		
Behavioral observation: _____		
Broussard NPI: _____		
Home Observation for Measurement of the Environment: _____		

APPENDIX C



PARENT-INFANT EDUCATION PROJECT
HANDBOOK FOR PARTICIPATING FAMILIES
UNIVERSITY OF TENNESSEE MEMORIAL HOSPITAL
INTENSIVE CARE NURSERY

QUESTIONS AND ANSWERS

We have included a few questions and answers that we hope will prove useful to you now that we've met and talked. We hope you'll keep this booklet to refer to during the next several weeks. If you have other questions or wish to leave a message when we're out of the nursery, please call 974-4361 between 9:00 a.m. and 4:00 p.m. Be sure to leave your name and number. We thank you for your willingness to help us learn about premature babies and their families.

1. Who will be working with me and my baby?

Dr. Harvey P. Kaufman is the director of the project. He is a psychologist and is on the faculty of the University of Tennessee. He is also affiliated with the Department of Pediatrics at U-T Memorial Hospital. Ms. Doris Burrus, Mr. Paul Long, and Mr. Dirk Hightower are Dr. Kaufman's research assistants and will be working directly with you and your baby, under his direction.

2. How many times will my baby be examined?

Your baby will be examined twice in the hospital, when his medical condition stabilizes, and once in your home, one month after your baby has been discharged from the nursery.

3. How many times will my baby be observed?

Your baby will be observed as you hold him/her for feeding twice during his/her hospitalization and once in your home at one month post-discharge.

4. What happens during the visit to my home?

You will be called 5 days prior to your visit-time to remind you that a visit is due. Two research assistants will come to your home at a pre-arranged time for the session; the time of day for the visit will be at your convenience. Your baby will be examined, using the Brazelton Neonatal Behavioral Assessment Scale; you will be observed as you feed your baby at

a regularly scheduled feed; you will be interviewed by one of the research assistants about the baby's home environment. Finally, you will be asked to check off a brief questionnaire about your perceptions of your newborn. The entire visit takes about two hours.

Consent Form
for
Parent-Infant Education Project

Dear _____,

The purpose of this form is to ask you to take part in a project which will study you, as parents of a premature infant, and your infant, at two different times and in two different environments: (1) during the time your infant is hospitalized in the Intensive Care Nursery and (2) one month after your infant's discharge from the ICN, in your home.

In the course of the next several months, we will be developing some new materials and techniques to help parents and babies, too, during the time they are in the ICN. In order to do this, we need to share some teaching materials with you and to observe you as you interact with your baby.

The Executive Director of the project is Dr. Harvey P. Kaufman, whose teaching affiliation is with the Department of Psychology at the University of Tennessee. He also serves as a consultant to the Department of Pediatrics at U-T Memorial Hospital. His staff research assistants who will be working directly with you are: Doris Sharpe Burrus, Paul C. Long, and A. Dirk Hightower. They are all doctoral students in Psychology at the University of Tennessee. All procedures have been approved by the Department of Pediatrics and will not hurt your baby in any way.

We will need to examine your infant twice in the hospital using the Brazelton Neonatal Behavioral Assessment Scale, and once in your home, using the same scale. We will also need to observe you as hold and feed your baby, twice while he/she is hospitalized and once in your home. We will ask you to check off some answers concerning your perceptions of your newborn twice, once in the hospital and once in your home. Finally, we

will conduct an interview with you during which we will ask you some questions about your baby's home environment.

The intervention which we have planned for you and your baby, the Parent-Infant Education Project, about which we have already talked, takes place in the hospital during the normal visiting hours. It involves both you and your baby. The intervention is composed of two parts and each part will take from 20-40 minutes of your time as you visit; Part I consists of a teaching sessions involving you and the baby. The interventionist will be teaching you about the strengths and the individuality of your baby using the information she has gathered from her administration of the Brazelton Neonatal Behavioral Assessment Scale. You will be participating with the baby as she teaches you; Part II consists of a tutoring or teaching session during which the interventionist shares some stimulation activities designed to facilitate your baby's early development. You will then have an opportunity to practice the stimulation activities with your baby.

The information we collect will be available only to qualified persons associated with this project and your name or specific identity will not be released.

I (We), _____, have read the Consent Form and agree to take part in this project. I understand that I am free to withdraw my consent and to stop taking part at any time. I also understand that I may ask questions of the project staff and that they will answer any questions that I may have about the project. They will be glad to explain the procedures used with my infant and what they mean. If I have any questions about my infant's behavior, they will gladly try to answer my questions.

Legal Guardian (Parent) _____

Witness _____

Date _____

APPENDIX D

CONSENT FORM

Dear _____,

The purpose of this form is to ask you to take part in a project which will study you, as parents of a premature infant, and your infant, at two different times and in two different environments: (1) during the time your infant is hospitalized in the Intensive Care Nursery, and (2) one month after your infant's discharge from the ICN, in your home.

The Executive Director of the project is Dr. Harvey P. Kaufman, whose teaching affiliation is with the Department of Psychology at the University of Tennessee. He also serves as a consultant to the Department of Pediatrics at U-T Memorial Hospital. His staff research assistants who will be working directly with you are: Doris Sharpe Burrus, Paul C. Long, and A. Dirk Hightower. They are all doctoral students in Psychology at the University of Tennessee. All procedures to be used during this project have been approved by the Department of Pediatrics and will not hurt your baby in any way.

We will need to examine your infant twice in the hospital using the Brazelton Neonatal Behavioral Assessment Scale, and once in your home, using the same scale. We will also need to observe you as you hold and feed your baby, twice while he/she is hospitalized and once in your home. We will ask you to check off some answers concerning your perceptions of your newborn twice, once in the hospital and once in your home. Finally, we will conduct an interview with you during which we will ask you some questions about your baby's home environment.

The information we collect will be available only to qualified persons associated with this project and your name or identity will not be released.

I (We), _____, have read the Consent Form and agree to take part in this project. I understand that I am free to withdraw my consent and to stop taking part at any time. I also understand that I may ask questions of the project staff and that they will answer any questions that I may have about the project. They will be glad to explain the procedures used with my infant and what they mean. If I have any questions about my infant's behavior, they will gladly try to answer my questions.

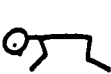
Legal Guardian (Parent) _____

Witness _____

Date _____

APPENDIX E

Patient's Name _____ Hospital Number: _____
 Gestational Age by History _____
 Gestational Age by Physical Examination _____

NEUROLOGICAL SIGN	SCORE					
	0	1	2	3	4	5
POSTURE						
SQUARE WINDOW	 90°	 60°	 45°	 30°	 0°	
ANKLE DORSIFLEXION	 90°	 75°	 45°	 20°	 0°	
ARM RECOIL	 180°	 90-180°	 <90°			
LEG RECOIL	 180°	 90-180°	 <90°			
POPLITEAL ANGLE	 180	 160°	 130°	 110°	 90°	 <90°
HEEL TO EAR						
SCARF SIGN						
HEAD LAG						
VENTRAL SUSPENSION						

SOME NOTES ON TECHNIQUES OF ASSESSMENT OF NEUROLOGIC CRITERIA

POSTURE: Observed with infant quiet and in supine position. Score 0: Arms and legs extended; 1: beginning of flexion of hips and knees, arms extended; 2: stronger flexion of legs, arms extended; 3: arms slightly flexed, legs flexed and abducted; 4: full flexion of arms and legs.

SQUARE WINDOW: The hand is flexed on the forearm between the thumb and index finger of the examiner (Fig. 3). Enough pressure is applied to get as full a flexion as possible, and the angle between the hypothenar eminence and the ventral aspect of the forearm is measured and graded according to diagram. (Care is taken not to rotate the infant's wrist while doing this maneuver.)

ANKLE DORSIFLEXION: The foot is dorsiflexed onto the anterior aspect of the leg, with the examiner's thumb on the sole of the foot and other fingers behind the leg (Fig. 4). Enough pressure is applied to get as full flexion as possible, and the angle between the dorsum of the foot and the anterior aspect of the leg is measured.

ARM RECOIL: With the infant in the supine position the forearms are first flexed for 5 seconds, then fully extended by pulling on the hands, and then released. The sign is fully positive if the arms return briskly to full flexion (Score 2). If the arms return to incomplete flexion or the response is sluggish it is graded as Score 1. If they remain extended or are only followed by random movements the score is 0.

LEG RECOIL: With the infant supine, the hips and knees are fully flexed for 5 seconds, then extended by traction on the feet, and released. A maximal response is one of full flexion of the hips and knees (Score 2). A partial flexion scores 1, and minimal or no movement scores 0.

POPLITEAL ANGLE: With the infant supine and his pelvis flat on the examining couch, the thigh is held in the knee-chest position by the examiner's left index finger and thumb supporting the knee. The leg is then extended by gentle pressure from the examiner's right index finger behind the ankle and the popliteal angle is measured (Fig. 5).

HEEL TO EAR MANEUVER: With the baby supine, draw the baby's foot as near to the head as it will go without forcing it. Observe the distance between the foot and the head as well as the degree of extension at the knee. Grade according to diagram. Note that the knee is left free and may draw down alongside the abdomen (Fig. 6).

SCARF SIGN: With the baby supine, take the infant's hand and try to put it around the neck and as far posteriorly as possible around the opposite shoulder. Assist this maneuver by lifting the elbow across the body. See how far the elbow will go across and grade according to illustrations. Score 0: Elbow reaches opposite axillary line; 1: Elbow between midline and opposite axillary line; 2: Elbow reaches midline; 3: Elbow will not reach midline.

HEAD LAG: With the baby lying supine, grasp the hands (or the arms if a very small infant) and pull him slowly towards the sitting position. Observe the position of the head in relation to the trunk and grade accordingly. In a small infant the head may initially be supported by one hand. Score 0: Complete lag; 1: Partial head control; 2: Able to maintain head in line with body; 3: Brings head anterior to body.

VENTRAL SUSPENSION: The infant is suspended in the prone position, with examiner's hand under the infant's chest (one hand in a small infant, two in a large infant). Observe the degree of extension of the back and the amount of flexion of the arms and legs. Also note the relation of the head to the trunk. Grade according to diagrams.

If score differs on the two sides, take the mean.

Table III. Scoring system for external criteria

External sign	Score*				
	0	1	2	3	4
Edema	Obvious edema of hands and feet; pitting over tibia	No obvious edema of hands and feet; pitting over tibia	No edema		
Skin texture	Very thin, gelatinous	Thin and smooth	Smooth; medium thickness. Rash or superficial peeling	Slight thickening. Superficial cracking and peeling especially of hands and feet	Thick and parchment-like; superficial or deep cracking
Skin color	Dark red	Uniformly pink	Pale pink; variable over body	Pale; only pink over ears, lips, palms, or soles	
Skin opacity (trunk)	Numerous veins and venules clearly seen, especially over abdomen	Veins and tributaries seen	A few large vessels clearly seen over abdomen	A few large vessels seen indistinctly over abdomen	No blood vessels seen
Lanugo (over back)	No lanugo	Abundant; long and thick over whole back	Hair thinning especially over lower back	Small amount of lanugo and bald areas	At least $\frac{1}{2}$ of back devoid of lanugo
Plantar creases	No skin creases	Faint red marks over anterior half of sole	Definite red marks over $>$ anterior $\frac{1}{2}$; indentations over $<$ anterior $\frac{1}{3}$	Indentations over $>$ anterior $\frac{1}{3}$	Definite deep indentations over $>$ anterior $\frac{1}{3}$
Nipple formation	Nipple barely visible; no areola	Nipple well defined; areola smooth and flat, diameter $<$ 0.75 cm.	Areola stippled, edge not raised, diameter $<$ 0.75 cm.	Areola stippled, edge raised, diameter $>$ 0.75 cm.	
Breast size	No breast tissue palpable	Breast tissue on one or both sides, $<$ 0.5 cm. diameter	Breast tissue both sides; one or both 0.5 - 1.0 cm.	Breast tissue both sides; one or both $>$ 1 cm.	
Ear form	Pinna flat and shapeless, little or no incurving of edge	Incurving of part of edge of pinna	Partial incurving whole of upper pinna	Well-defined incurving whole of upper pinna	
Ear firmness	Pinna soft, easily folded, no recoil	Pinna soft, easily folded, slow recoil	Cartilage to edge of pinna, but soft in places, ready recoil	Pinna firm, cartilage to edge; instant recoil	
Genitals Male	Neither testis in scrotum	At least one testis high in scrotum	At least one testis right down		
Female (with hips $\frac{1}{2}$ abducted)	Labia majora widely separated, labia minora protruding	Labia majora almost cover labia minora	Labia majora completely cover labia minora		

Adapted from Farr and associates, Develop. Med. Child Neurol. 8:507, 1966.

*If score differs on two sides, take the mean.

DUBOWITZ GESTATIONAL AGE EQUIVALENTS

Total Score using Dubowitz x .2642 + 24.595 = Gestational Age

Total	Gest. Age	Total	Gest. Age
10	27.2 wks.	56	39.3 wks.
11	27.5	57	39.6
12	27.8	58	39.9
13	28	59	40.1
14	28.2	60	40.4
15	28.5	61	40.7
16	28.8	62	40.9
17	29	63	41.2
18	29.3	64	41.4
19	29.6	65	41.7
20	29.8		
21	30.1		
22	30.4		
23	30.6		
24	30.9		
25	31.2		
26	31.4		
27	31.7		
28	31.9		
29	32.2		
30	32.5		
31	32.8		
32	33		
33	33.3		
34	33.5		
35	33.8		
36	34.1		
37	34.3		
38	34.6		
39	34.9		
40	35.2		
41	35.4		
42	35.6		
43	35.9		
44	36.2		
45	36.4		
46	36.7		
47	37.0		
48	37.2		
49	37.5		
50	37.8		
51	38		
52	38.3		
53	38.5		
54	38.9		
55	39.1		

APPENDIX F

OCS SCORING SHEET

Infant's Name _____
 Hospital Number _____
 Birth Date _____ Sex M ____ F ____
 E.D.C. _____
 Date Form Completed _____
 Mother's Name _____
 Mother's Hospital Number _____

<u>ITEM</u>	<u>Optimal Response</u>		
1. Gestational Age	>37 Weeks	☐	<37 Weeks ☐
2. Birth Weight	2500 gms	☐	< 2500 gms ☐
3. Marital Status	Married	☐	Other ☐
4. Maternal Age	18 - 30	☐	Other ☐
5. Previous Abortions	2 or less	☐	3 or more ☐
6. Previous Premature Births	No	☐	Yes ☐
7. Previous Stillbirths	No	☐	Yes ☐
8. Prolonged Unwanted Sterility	No	☐	Yes ☐
9. Length of Time Since Last Pregnancy	> 12 mos.	☐	< 12 mos ☐
10. Parity	6 or less	☐	7 or more ☐
11. Pelvis	No Disproportion	☐	Disproportion ☐
12. Rh Antagonism or Other Blood Group Incompatibility	No	☐	Yes ☐
13. Bleeding During Pregnancy	No	☐	Yes ☐
14. Infections or Other Acute Medical Problems During Pregnancy	No	☐	Yes ☐

15. Drugs Given to Mother During Pregnancy	No	☐	Yes	☐
16. Maternal Chronic Diseases	No	☐	Yes	☐
17. Chronic Drug Abuse	No	☐	Yes	☐
18. Blood Pressure During Pregnancy	<140/90	☐	>140/90	☐
19. Albuminuria	No	☐	Yes	☐
20. Hyperemesis	No	☐	Yes	☐
21. Hemoglobin Level at End of Pregnancy	10 or more	☐	< 10	☐
22. Twins or Multiple Birth	No	☐	Yes	☐
23. Membranes Ruptured Prior to Delivery	0-12 hours	☐	>12 hours	☐
24. Delivery	Spontaneous	☐	Other	☐
25. Forceps	None or Elective, Low Forceps	☐	Other	☐
26. Duration, First Stage	3-20 hours	☐	<3 or >20 hrs.	☐
27. Duration, Second Stage	10-120 mins.	☐	<10 or >120 mins.	☐
28. Induced Labor	No	☐	Yes	☐
29. Drugs During Labor and Delivery	No	☐	Yes	☐
30. Amniotic Fluid	Clear	☐	Other	☐
31. Fetal Presentation - Delivery	Vertex	☐	Other	☐
32. Fetal Heart Rate During Labor	100-160/Min.	☐	<100 or >160 (per min.)	☐
33. Nuchal or Knotted Cord	No	☐	Yes	☐
34. Cord Prolapse	No	☐	Yes	☐
35. Placental Infarction	No	☐	Yes	☐
36. Placenta Previa or Abruption	No	☐	Yes	☐
37. Onset of Stable Respiration Within 6 minutes	Yes	☐	No	☐

38. Resuscitation Required	No	☐	Yes	☐
39. Prenatal Care During First Half of Pregnancy	Yes	☐	No	☐
40. Apgar Score - One minute	7-10	☐	0-6	☐
41. Apgar Score - Five minutes	7-10	☐	0-6	☐

a. Total (Raw Score)

b. Number of Items Recorded

c. % Raw Score (a/b)

d. Converted % Raw Score

CONVERSION TABLE

100	160	71	63
99	146	70	63
98	146	69	60
97	135	68	57
96	131	67	54
95	131	66	54
94	122	65	54
93	121	<65	50
92	115		
91	112		
90	112		
89	104		
88	103		
87	98		
86	98		
85	98		
84	93		
83	92		
82	89		
81	87		
80	87		
79	81		
78	80		
77	78		
76	76		
75	74		
74	73		
73	71		
72	66		

SOURCE:

Bruce Littman, M.D.
 Infant Studies Project
 UCLA, October 1974

APPENDIX G

POSTNATAL COMPLICATIONS SCORING SHEET

Infant's Name: _____ Sex M ____ F ____

Hospital Number: _____

Birth Date: _____

Expected Date of Confinement (EDC): _____

Date Form Completed: _____

ITEM

1.	Respiretory Distress	NO	☐	YES	☐
2.	Positive or Suspected Infection	NO	☐	YES	☐
3.	Ventilatory Assistance	NO	☐	YES	☐
4.	Noinfectious Illness or Anomaly	NO	☐	YES	☐
5.	Metabolic Disturbance	NO	☐	YES	☐
6.	Convulsion	NO	☐	YES	☐
7.	Hyperbilirubinemia or Exchange Transfusion	NO	☐	YES	☐
8.	Temperature Disturbance	NO	☐	YES	☐
9.	Feeding Within 48 Hours	NO	☐	YES	☐
10.	Surgery	NO	☐	YES	☐

TOTAL ☐
(Raw Score)

CONVERSION TABLE

<u>Raw Score</u>	<u>Converted Score</u>
10	160
9	104
8	87
7	81
6	77
5	72
4	67
3	55
2	50
1	-

(Converted Score) ☐

SOURCE:

Bruce Littman, M. D.
Infant Studies Project
UCLA, August 1974

APPENDIX H

NEONATAL PERCEPTION INVENTORY (TIME 1)

Code No: _____

Average Baby

Although this is your first baby, you probably have some ideas of what most little babies are like. Please check the blank you think best describes the AVERAGE baby.

How much crying do you think the average baby does?

a great deal a good bit moderate amount very little none

How much trouble do you think the average baby has in feeding?

a great deal a good bit moderate amount very little none

How much spitting up or vomiting do you think the average baby does?

a great deal a good bit moderate amount very little none

How much difficulty do you think the average baby has in sleeping?

a great deal a good bit moderate amount very little none

How much difficulty does the average baby have with bowel movements?

a great deal a good bit moderate amount very little none

How much trouble do you think the average baby has in settling down to a predictable pattern of eating and sleeping?

a great deal a good bit moderate amount very little none

NEONATAL PERCEPTION INVENTORY (TIME 1)

Code No: _____

Your Baby

While it is not possible to know for certain what your baby will be like, you probably have some ideas of what your baby will be like. Please check the blank that you think best describes what your baby will be like.

How much crying do you think your baby will do?

a great deal a good bit moderate amount very little none

How much trouble do you think your baby will have feeding?

a great deal a good bit moderate amount very little none

How much spitting up or vomiting do you think your baby will do?

a great deal a good bit moderate amount very little none

How much difficulty do you think your baby will have sleeping?

a great deal a good bit moderate amount very little none

How much difficulty do you expect your baby to have with bowel movements?

a great deal a good bit moderate amount very little none

How much trouble do you think that your baby will have settling down to a predictable pattern of eating and sleeping?

a great deal a good bit moderate amount very little none

NEONATAL PRECEPTION INVENTORY (TIME 3)

Code No: _____

Average Baby

Although this is your first baby, you probably have some ideas of what most little babies are like. Please check the blank you thing best describes the AVERAGE baby.

How much crying do you think the average baby does?

a great deal a good bit moderate amount very little none

How much trouble do you think the average baby has in feeding?

a great deal a good bit moderate amount very little none

How much spitting up or vomiting do you think the average baby does?

a great deal a good bit moderate amount very little none

How much difficulty do you think the average baby has in sleeping?

a great deal a good bit moderate amount very little none

How much trouble do you think the average baby has in settling down to a predictable pattern of eating and sleeping?

a great deal a good bit moderate amount very little none

NEONATAL PERCEPTION INVENTORY (TIME 3)

Code No: _____

Your Baby

You have had a chance to live with your baby for a month now. Please check the blank you thing best described your baby.

How much crying do you think your baby done?

a great deal a good bit moderate amount very little none

How much trouble has your baby had feeding?

a great deal a good bit moderate amount very little none

How much spitting up or vomiting has your baby done?

a great deal a good bit moderate amount very little none

How much difficulty has your baby had in sleeping?

a great deal a good bit moderate amount very little none

How much difficulty has your baby had with bowel movements?

a great deal a good bit moderate amount very little none

How much trouble has your baby had in settling down to a predictable pattern of eating and sleeping?

a great deal a good bit moderate amount very little none

DEGREE OF BOTHER INVENTORY (TIME 3)

Code No: _____

Listed below are some of the things that have sometimes bothered other mothers in caring for their babies. We would like to know if you were bothered about any of these. Please place a check in the blank that best described how much you were bothered by your babies behavior in regard to these.

Crying	<u> </u> a great deal	<u> </u> somewhat	<u> </u> very little	<u> </u> none
Spitting up or Vomiting	<u> </u> a great deal	<u> </u> somewhat	<u> </u> very little	<u> </u> none
Sleeping	<u> </u> a great deal	<u> </u> somewhat	<u> </u> very little	<u> </u> none
Feeding	<u> </u> a great deal	<u> </u> somewhat	<u> </u> very little	<u> </u> none
Elimination	<u> </u> a great deal	<u> </u> somewhat	<u> </u> very little	<u> </u> none
Lack of a predict- able schedule . . .	<u> </u> a great deal	<u> </u> somewhat	<u> </u> very little	<u> </u> none
Others:(Specify)				
_____	<u> </u> a great deal	<u> </u> somewhat	<u> </u> very little	<u> </u> none
_____	<u> </u> a great deal	<u> </u> somewhat	<u> </u> very little	<u> </u> none
_____	<u> </u> a great deal	<u> </u> somewhat	<u> </u> very little	<u> </u> none
_____	<u> </u> a great deal	<u> </u> somewhat	<u> </u> very little	<u> </u> none

SOURCE: Broussard, E.R., & Hartner, M. Further Considerations Regarding Maternal Perception of the Firstborn.
In J. Hellmuth (Ed.), Exceptional Infant: Volume II.
New York: Brunner/Mazel, 1971

APPENDIX I

INFANTS NAME: _____ ACTIVITY: _____ DATE: _____
 OBSERVER: _____ CODE NO: _____ SESSION: _____

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
PARENT BEHAVIORS																				
WOE																				
GAZING																				
EN FACE																				
SMILING																				
KISSING																				
CRADLE																				
SHOULDER																				
LAP-SIT PROXIMAL																				
LAP-SIT DISTAL																				
CUSHIONS BODY																				
T. W. HAND																				
HOLD PART BODY																				
PARENT MANIP.																				
SHIELDS EYES																				
LAP-LIE																				
ROCKING																				
BOUNCING																				
STIMULATES V/A																				
VOCALIZATION																				
CONSOLES																				
NO INTERACTION																				
OTHER INTERACTION																				
INFANT BEHAVIORS																				
STATE																				
SMILE																				
VOC./BABBLING																				
VIS./AUD. SEARCH																				
GAZING																				
MOVEMENT																				
FUSS																				
TREMORS																				
STARTLES																				
STRESS																				

OTHER PARENT: PRESENT? ABSENT? _____ DESCRIBE BEHAVIOR: _____
 NOTES OR COMMENTS: _____

PARENT-INFANT OBSERVATION
BEHAVIORAL DEFINITIONS

I. Parent Behaviors

- W.O.E. (Widening of eyes) - Parent's eyes widen while looking at infant. Forehead may wrinkle, but there is a relaxed expression in the lower face. It is usually a quick movement and may/may not be accompanied by a smile.
- Gazing - Parent gazes at infant for a period of five consecutive seconds or more. There may be direct eye contact with infant, but this is not necessary.
- En face - The position in which the parent's face is rotated so that his/her eyes and those of the infant meet fully in the same vertical plane of rotation. The infant's eyes must be open.
- Smiling - Parent smiles at the infant; there is an upward curving of the mouth. The smile may/may not be accompanied by eye expressions.
- Kissing - Parent's lightly protruding lips are brought in contact with any part of the infant.
- Cradle - Infant is held more or less horizontally against parent's body, supported by his/her arms.
- Shoulder - Infant is held more or less vertically against parent's body, supported by his/her arms.
- Lap-sit proximal - Infant is supported on parent's lap (area from patella to waist) with infant's torso (area from neck to waist) parallel to parent's torso, and in contact with parent's torso.
- Lap-sit distal - Infant is supported on parent's lap with infant's torso parallel to parent's torso but not in contact with parent's torso.
- Cushions body - When changing infant's position, parent supports his/her head and back in such a way as to absorb the shock or jolt of motion.
- T.W. hand (Touches with hand) - Parent touches infant with hand in a patting, rubbing, tickling, or stroking motion. Stroking motions are long, gentle hand motions against any part of the infant's body. Patting motions are flat, tapping movements with the hand several times on any part of the body.
- Holds part body - Parent holds infant's hand, arm, leg, and/or foot. This may be accompanied by touching with the hand.
- Parent Manip. (Parent manipulates infant's extremities) - Parent manipulates

- Parent Manip. (cont'd.) - infant's arms, legs, hands, stomach, face, etc. using gross movements.
- Shields eyes - Parent uses hand(s) and/or arm(s) to protect infant's eyes from glare or overhead lights. This motion may be accompanied with verbalization to this effect.
- Lap-lie - Infant rest on parent's lap; infant may be parallel or perpendicular to line of thighs.
- Rocking - Swaying motion of parent's body backward, forward, or sideways, while infant is in any cradle, shoulder, or lap-lie position.
- Bouncing - Parent moves infant's whole body by jiggling, bumping, or bouncing.
- Stimulates V/A { Stimulates visual/auditory search) - Parent stimulates infant to search with eyes by moving face or part of body across infant's visual field; parent may use voice or inanimate object to cause infant to attend by searching or head turning.
- Vocalization - Parent speaks to infant. This may take the form of praise or approval of something the infant has done, his/her attributes, or how he/she looks, for example. This also includes cooing, tongue-clicking, and other inarticulate sounds.
- Consoles - Many of the preceding behaviors may be used to quiet a fussy infant. If parent is exhibiting a behavior in order to lower the infant's state, or level of agitation, mark C in appropriate slot, instead of the usual check mark.
- No interaction - Parent has not interacted in any way with child; not touching the child.
- Other interaction - Parent interacts with infant in ways other than behaviors listed in previous categories. Note these at bottom of page. Interruption causes parent not to pay attention to infant is also scored here.

II. Infant Behaviors

- State - The state of consciousness of the infant is described by Brazelton in the monograph describing the Brazelton Neonatal Behavioral Assessment Scale.
- Sleep states - (1): Deep sleep with regular breathing, eyes closed, no spontaneous activity except startles or jerky movements at quite regular intervals; external stimuli produce startles with some delay; suppression of startles is rapid and state changes are less likely than from other states. No eye movement.
(2): Light sleep with eyes closed; rapid eye movements can be observed under closed lids; low activity level with

random movements and startles; movements likely to be smoother and more monitored than in State 1; responds to internal and external stimuli with startle equivalents, often with a resulting change of state. Respirations are irregular, sucking movements occur on and off.

Awake states - (3): Drowsy or semi-doing; eyes may be open or closed, eyelids fluttering; activity level variable, with interspersed mild startles from time to time; reactive to sensory stimuli but response often delayed; state change after stimulation frequently noted. Movements usually smooth.

(4): Alert with a bright look; seems to focus attention on source of stimulation; impinging stimuli may break through but with some delay in response. Motor activity is at a minimum.

(5) Eyes open; considerable motor activity, with thrusting movements of the extremities, and even a few spontaneous startles; reactive to external stimulation with increase in startles or motor activity, but discrete reactions difficult to elicit.

(6): Crying; characterized by intense crying (at least 15 seconds) which is difficult to break through with stimulation.

Smile - Upward curving of the mouth. Eyebrows may lift and eyes may brighten.

Voc./Bab/ (Vocalization/babbling) - Vocal sounds aside from crying and/or fussing; cooing, incoherent sounds.

Vis./Aud. Search (Visual/auditory searching) - Goal directed eye movements toward parent; this may be in response to cues given by parent.

Gazing - Prolonged looking at parent's face for five consecutive seconds or more. This may be due to visual, auditory, or tactile cues given by the parent.

Movement - Any movement by the infant; may be specific or random (not tremors or startles).

Fuss - Can occur in state 3, 4, or 5. Not as intense as full crying; occurs for less than 15 seconds. Face and body may redden.

Tremors - Quivering of the extremities or chin.

Startles - A sudden, jerky, total body movement. Usually, the hands and arms are thrown backward. This may be result of loud noise, or non-support of the head.

Stress indicators - Mark abbreviation in appropriate slot.

sneeze (s)	cough (c)	color change (cc)	eye averting (ea)
grunt (gr)	gag (g)	headturning (ht)	breath-holding (b)
hiccup (h)	eye rolling (er)		yawn (y)

On observation sheet, note if other parent is present/absent. Describe what she/he is doing during observation period. Please mark if parent holding infant hands the infant to his/her partner, then continue observing the "new" parent.

APPENDIX J

HOME INVENTORY (Birth to Three)
(Home Observation for Measurement of the Environment)

CHILD'S NAME: _____ DATE OF INTERVIEW: _____
 CHILD'S BIRTHDATE: _____ INTERVIEWER: _____
 RELATIONSHIP OF PERSON INTERVIEWED TO CHILD: _____
 PLACE OF INTERVIEW: _____ FAMILY COMPOSITION: _____

(Indicate persons living in household, including sex and age of children)
 PERSONS PRESENT IN HOME AT TIME OF INTERVIEW: _____
 COMMENTS: _____

STANINES (N = 124)											
	1	2	3	4	5	6	7	8	9	Mean	STD DEV
I	1-3	4	5-6	7	8	9	10	11	-	7.8	2.3
II	1-2	3	4	5	-	6	7	8	-	5.5	1.5
III	1-2	3	-	4	5	-	6	-	-	4.8	1.2
IV	1	2	3-4	5	6	7	8-9	-	-	6.1	2.5
V	-	1	2	-	3	4	5	6	-	3.4	1.7
VI	-	1	-	2	3	-	4	5	-	2.8	1.3
TOTAL	-20	20-21	22-24	25-28	29-32	33-36	37-40	41-43	44-45	30.4	7.7

FACTOR	RAW SCORE	STANINE
I Emotional and Verbal Responsivity of Mother	_____	_____
II Avoidance of Restriction and Punishment	_____	_____
III Organization of Environment	_____	_____
IV Provision of Appropriate Play Materials	_____	_____
V Maternal Involvement with the Child	_____	_____
VI Opportunities for Variety in Daily Routine	_____	_____
TOTAL	_____	_____

From the Center for Early Development and Education,
 314 Sherman, Little Rock, Arkansas 72202

APPENDIX K

CHECKLIST FOR BNBAS TEACHING SESSION

1. Habituation
2. Alertness
3. Orientation
4. Irritability, Consolability, Stress (Variation)
5. Self-Quieting Activities
6. Reflexes
7. Motor Maturity
8. Social Behaviors (i.e., Cuddliness, etc.)

Family Code No.: _____

Hospital No.: _____

OUTLINE FOR BNBAS TEACHING SESSION

- I. Introduction
 - A. Specifics concerning TBB/Scale
 - B. Use in nursery; time-frame, rationale
 - C. Dependence, not helplessness
 - D. Infant's strengths, organization of behaviors, interaction with environment
- II. Habituation
 - A. Presence of light/noise in ICN
 - B. Typical infant response
 1. shutdown or arousal
 - C. Demonstration with light, rattle, bell, pinprick
- III. Alertness
 - A. As a social behavior
 - B. Ease or difficulty of arousing infant
 - C. Alert/asleep periods
 - D. Mention: Stages 1 through 6
- IV. Orientation
 - A. Preference of infant for either sight or sound
 - B. "All eyes" infant - preference for visual stimulation
 - C. "All ears" infant - preference for auditory stimulation
 - D. Demonstration: face and voice, face, voice, rattle, bell
- V. Irritability, Consolability, Stress
 - A. Evidences of stress
 - B. Irritability buildup - exhaustion, endurance, etc.
 - C. Lability of color and states
 - D. Consolability (need for, and type of intervention)
- VI. Self-quieting Activities
 - A. Insertion, sucking finger(s), fist(s)
 - B. Touch
 - C. Quieting by focusing on face, voice, touch, or combination thereof
- VII. Reflexes
 - A. Demonstration of some examples
- VIII. Motor Maturity
 - A. Differences in individual infants
 - B. Quality of movement - startles, tremors, general tonus
 - C. Large, controlled movements/close-to-body movements/ continuous movement
- IX. Social Behaviors
 - A. Cuddliness
 - B. Alertness
 - C. State Robustness
 - D. Orientation - Visual/Auditory

SCRIPT FOR BNBAS TEACHING SESSION

A very well-known pediatrician, Dr. T. Berry Brazelton, about whom you may have read (his column frequently appears in LHM, McCall's, Redbook), has developed an assessment scale, a unique and special way of looking at and describing newborn babies' behavior. This device allows us to look more closely at how a newborn can organize his/her behavior and interact with his/her environment. We now know that while your new baby may be dependent he/she is far from being helpless. The BNBAS allows us to look at what your new baby can do and how he/she acts in his/her first days of life. We've been using this scale here in the ICN to learn more about your new baby and we'd like to share with you what we've learned.

For example:

1. Habituation: As you have probably noticed, there is a lot of noise present in the ICN at all times - music on the intercom, voices, monitors, equipment being shuffled about, and the movement of the staff. Babies respond to the noise and to the presence of all the lights in the nursery in a variety of ways. Some babies typically shut-out the bothersome stimuli (noise/lights) by shutting down; they grow very still and quiet and retreat into sleep. Other babies will arouse, become more alert and awake when lights or noise are presented to them. When we presented the stimuli of a light, a rattle, and a bell to your baby, he/she typically _____ . (Demonstrate briefly the maneuvers involved with the light, bell, and rattle. Have parents try same maneuvers.) Neonates can even organize their behavior and become habituated to an unusually unpleasant stimulus, a pinprick. For instance, when we used this response measure with your baby boy/girl typically, he/she _____. (Again, demonstrate briefly for the benefit of the parent(s).)
2. Alertness: You may have noticed that sometimes your baby is sleeping very soundly and is hard to awaken; other times he/she is alert, with eyes wide open and shining, and with body still. Some babies arouse easily and stay awake for rather extended periods; other babies are quieter, preferring to sleep more often and requiring a little more of their parents' efforts to become awake and alert. Your baby seems to _____. (Offer a brief explanation of states 1 and 2 of sleep and states 3 through 6 of wakefulness). When your baby is alert and quiet with eyes open and shining and with body movement at a minimum, he is in what Brazelton calls a state 4 of wakefulness. This is one of the best times for you to interact with him/her.
3. Orientation: Once your baby is awake, you may notice him/her looking around and listening. Some babies prefer to awake and to alert to sound, your voice, for instance, or a rattle. He/she may seem to be especially interested in sounds and may respond readily to them. Other babies prefer things they can focus on and look at; they're "all eyes". They prefer to look at your face, particularly your eyes. Your baby, at this time, seems to prefer _____. (Demonstrate briefly the orientation activities from the BNBAS, using face and voice, face, voice, ball, and rattle for the parent(s). If it is convenient, they may be asked to assist or practice the activities themselves.)
4. Irritability, Consolability, and Stress (Variation): Once they are upset, babies have many ways of letting us know it. They may do any or all of the following things: hiccup, hold their breath, fuss, cough, gag, grunt, change skin tone, or cry aloud. Some babies become stressed very quickly; others can tolerate more stress. Once they do become upset some babies can calm down rather

quickly on their own. Other babies require some outside 'help' to become calm again. Some ways that are useful in calming and consoling a baby are: showing him your face, your voice, your touch on the baby's trunk, holding, or holding and rocking. Your baby appears to _____.

To calm him/her, you might try _____.

5. Self-quieting Activities: Often babies are able to self-console. For example, once they are upset, they may comfort themselves by putting their finger(s), or entire fist into their mouth and sucking. Some babies will quieten and calm themselves at the sound of your voice or the sight of your face, without any further intervention from you. Your baby appears to _____.

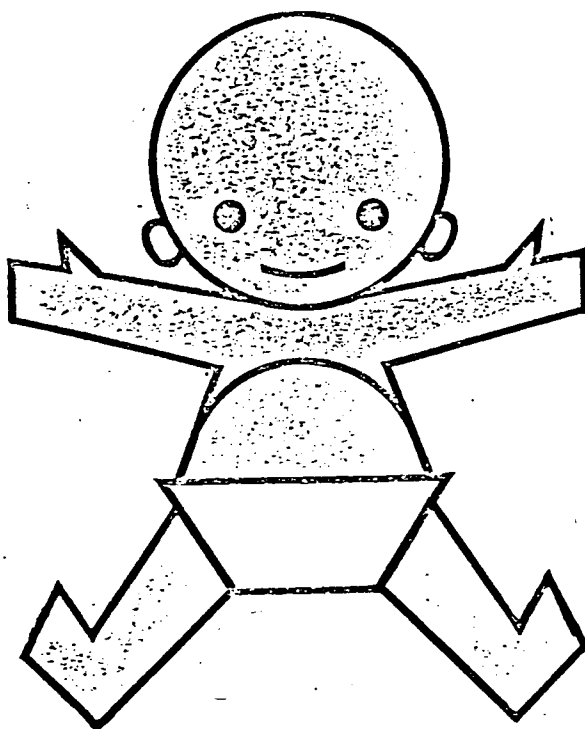
6. Reflexes: Reflexes are present in your baby from birth. For example, I'm sure you've noticed your baby rooting toward your hand when you touch the area around his/her mouth. Let me demonstrate a few of your baby's reflexes for you. (Demonstrate Babinski, Palmar grasp, Moro, incurvation, and Plantar.)

7. Motor Maturity: Some babies, we've noticed, have vigorous, smooth, wide-arcing movements of their legs and arms. Other babies may have relatively more jerky, quick motions of their extremities. Some babies move continuously - arms, legs, whole body. Other babies are relatively calm and quiet. These babies may move quietly and in a rather relaxed fashion. Your baby seems to _____.

8. Social Behaviors: Different babies respond differently to being picked up and held. Some prefer to be held and cuddled horizontally, in your arms and across your body. Others prefer to be held up to your shoulder. (Demonstrate, then have parent(s) try both ways.) Some babies enjoy being held and carried a lot; others enjoy more having you talk or sing to them, or simply make eye contact with them, without their being held. It's simply a matter of how the baby is most comfortable. Your baby seems to prefer, at this time, _____.

Remember, too, that your best time to interact with your baby in the way that you and he/she work at as most comfortable for the both of you is when he/she is quiet and alert. (Help the parent(s) recall the information about state 4.)

APPENDIX L



PARENT-INFANT EDUCATION PROJECT

· STIMULATION ACTIVITIES

DESIGNED ESPECIALLY FOR YOU AND YOUR BABY

UNIVERSITY OF TENNESSEE MEMORIAL HOSPITAL

INTENSIVE CARE NURSERY

You'll remember that together we've learned something about your baby's unique strengths and individuality through the use of the Brazelton Scale during the first teaching session. To extend that new knowledge and to offer you an opportunity to provide some very special care, we've developed some stimulation activities for you to use with your baby. We now know that there are some helpful things parents can begin to do even while their "premie" is hospitalized, to aid in his/her growth and development. One very effective method for helping is to have you, as parents, learn and use stimulation activities with your baby during your regular visiting-time.

It is hoped that the stimulation activities that follow will be used by you as you give care to and as you express your love and concern for your baby while he/she is in the ICN and later on when you finally have your baby at home. One important way for you to nurture and encourage your baby's emotional and mental growth is through the use of the provided stimulation activities.

STIMULATION ACTIVITIES FOR YOU AND YOUR PREMIE

Touch (Tactile Stimulation)

1. Stroke your baby's arms, legs, trunk and face, using a variety of materials, such as cotton puffs, a terry cloth wash cloth, a very soft brush, or a bit of baby powder or lotion (materials are under the Isolette or open crib). Begin stroking the hands and arms and work towards the trunk. Do this activity for about 2-4 minutes, or as long as your baby seems to be enjoying it.
2. While you are stroking your baby, hold his/her hands and smile at him/her and talk to him/her.
3. Place a small rattle or plastic ring in your baby's grasp. Gently close his/her fingers over it. Alternate placing these objects, first in one hand and then in the other.
4. Put your finger in your baby's hand and gently pull away with it. You may also place in his/her hand a rattle or plastic ring and repeat the same process. These activities will strengthen your baby's hand grasp.

Movement and Balance (Kinesthetic and Vestibular Stimulation)

1. At various times during the day, take your baby out of the crib and hold him/her upright against your shoulder while you sit in a rocking chair. Rock gently while talking, singing, or cooing to your child. This will serve to alert your baby and will give him/her the opportunity to look around the room.
2. Try placing your baby in a sitting position on your lap, making sure to support his/her head and back. Gently move your legs. Do this activity only for a few minutes (1-2).
3. When your baby is alert and content, hold him/her while you walk around his/her room or other rooms in your house. This will allow your baby to explore his/her surroundings and to begin paying attention to interesting objects and people.
4. Hold a small toy, such as a rattle, in front of your baby and encourage him/her to reach for it. If he/she cannot yet reach, gently touch his/her hand with the object to see if he/she will grasp it.

5. If your baby is lying on his/her back, show him/her an interesting toy or rattle, then move it slowly over to one side of his/her body. Encourage him/her to turn his/her body toward the toy or rattle.

Vision(Visual Stimulation)

1. Try to obtain a mobile to hang over your child's crib. You can make your own by cutting out brightly colored construction paper, and attaching shapes such as a circle or a square to strings to hang over your child's crib. Move the dangling objects around to attract your baby's attention. Provide him/her with brightly colored stuffed toys as well.

2. Whenever your baby smiles, return his/her smile and talk to him/her.

3. Either sit your baby upright in your lap or leave him/her in the crib placed on his/her back. If you prefer to let your infant lie in your lap, outstretched, support his/her head with one hand. Then, practice this activity with your baby:

A. After your baby focuses on your face, move your face slowly to the right and then the left. Let your baby follow the movement of your face. You may need to vary the speed and the distance of movement. After using your own face, try using bright or shiny objects such as a ball, mobile, or a stuffed animal, to attract your baby's attention and encourage him/her to move his/her eyes from left to right.

B. Try the same as in A., except move your face or the toy in an up and down direction. Allow your baby to follow this movement.

Hearing (Auditory Stimulation)

(For these activities, your baby may be either in his/her crib or lying or sitting on your lap.)

1. Talk to your baby, keeping your face in the baby's line of vision. Vary the tone of your voice. If your baby responds by quieting or focusing on your face, you can move your face up, down, to the left or right, or in a circle. Keep talking to your baby as you move your face.

2. Move out of your baby's line of vision, and talk to him/her with your mouth 8" to 10" from his/her ear. Your baby may begin to turn his/her head to search for the direction of your voice. Alternate talking to your baby first on one side and then the other.

3. Shake a rattle to the left or right of your baby's head. If he/she responds, move the rattle into his/her line of vision and try to get him/her to find it and follow its motion. Do not shake the rattle loudly.
4. Occasionally play music, if your baby has a radio or phonograph in his/her room.
5. Play a toy music box near to or in your baby's crib on occasion; play a musical mobile if you have one available.

IN PRACTICING ANY OR ALL OF THE STIMULATION ACTIVITIES, REMEMBER THAT YOUR INFANT MAY SIGNAL YOU WHEN HE/SHE IS TIRED OR NEEDS A "BREAK" IN ONE OR MORE OF THE FOLLOWING WAYS: COUGHING, GAGGING, HICCUPING, A NOTICEABLE COLOR CHANGE, EYE ROLLING OR AVERTING, OR A NOTICEABLE CHANGE IN BREATHING PATTERNS. BE OBSERVANT. DISCONTINUE THE ACTIVITIES UNTIL YOUR BABY IS RECOVERED.

VITA

Doris Sharpe Burrus was born in Savannah, Hardin County, Tennessee on January 22, 1938. She grew up and attended primary and middle schools in Memphis, Shelby County, Tennessee and in Mumford, Tipton County, Tennessee. During her senior high school years her parents moved to Oak Ridge, Anderson County, Tennessee, and she was graduated from Oak Ridge High School in 1955.

The following fall she entered The University of Tennessee at Knoxville as a Journalism major. She was elected president of the Freshman women's academic honorary society, Alpha Lambda Delta. Further awards included initiation into the French language honorary, Pi Delta Phi, and membership in the Women's Student Government Association. She interrupted her college career to marry in 1956.

She re-entered The University of Tennessee, Knoxville in 1972, with a major in Psychology and a minor in English. Honors included election to Phi Beta Kappa, Mortarboard, and Phi Kappa Phi. She was also awarded a Phi Kappa Phi Scholarship to continue her studies. She was graduated from The University of Tennessee, Knoxville in June 1972.

She began her graduate studies at The University of Tennessee, Knoxville in September 1973 in Psychology. Her initial internship was served with the Sevier County School System; her second internship was undertaken at The University of Tennessee Memorial Hospital, Knoxville in affiliation with the Department of Pediatrics. Her

research assistantship was served in the Intensive Care Nursery of the Department of Pediatrics. During her graduate program, she was awarded the Chancellor's Citation for Outstanding Community Service and was elected to the board of Overlook Mental Health Center. She is currently teaching in the Department of Behavioral Science at Tennessee Wesleyan College, Athens, Tennessee, where she was elected the Outstanding Teacher for 1982 by the campus honor society, Alpha Chi. She received the Doctor of Philosophy degree with a major in Psychology in March 1985.

The author is married to Dr. Walter Ross Burrus and lives in Lenoir City, Tennessee. She has two sons, Steven and Scott, and two step-daughters, Nell and Laura.