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MATERNAL RESPONSE TO THEIR CHRONICALLY ILL INFANT'S ATTACHMENT BEHAVIOR OF CRYING

by

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DISSERTATION

Submitted in partial satisfaction of the requirements for the degree of

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ABSTRACT

This study was designed to examine patterns of chronically ill infant crying and maternal response to those cries. Over a three month period, beginning when the infant reached four months of age, four observations, each four hours long were made of six mother-chronically ill infant pairs as they carried out their usual activities in the home. The method of observation was a continuous, running account of all ongoing mother-infant interactions. Maternal beliefs and attitudes about child rearing practices were probed through an interview at the completion of the observations. Dr. Mary Ainsworth's system for coding infant attachments and reciprocal maternal response was used to categorize the data on infant crying and maternal response patterns used in this study. Bell and Ainsworth's (1972) study of well infant crying and subsequent patterns of maternal response was used as a literature control group to compare and note differences in patterns of infant crying and maternal response between the ill and well groups.

In analyzing the results of this study, different patterns were found between well and ill infants patterns of crying. Chronically ill infants cried more frequently and for a shorter duration than well infants. Within the ill group there were no significant differences in either pattern of infant crying related to the infant's sex, ordinal position or type of illness. Two of the seriously ill infants were also found to exhibit atypical crying.
patterns because they fussed weakly rather than cried on many occasions.

Maternal response patterns were also examined. Mothers of chronically ill infants kept their infants in proximity more than mothers with well infants, and they also responded to their cries much more quickly than the mothers with well infants. Within the ill group that mothers were significantly more prompt in their response to male and first born infants' cries. Specific maternal interventions to an infant's cry were very similar between the ill and well groups. On some occasions mothers of seriously ill infants responded with a series of interventions. Maternal attitudes and beliefs about child rearing practices were similar to those of mothers with well infants.

An examination of the relationship between infant crying and subsequent maternal response patterns was also done. Like the Bell and Ainsworth study, this study also found a significant correlation between the length of maternal response and the duration of infant crying. Mothers who responded promptly to their infant's cry had infants who cried for shorter periods of time. However, unlike the Bell and Ainsworth study prompt maternal response did not lessen the frequency to ill infant crying. A critical path analysis, using multiple regression, demonstrated that maternal response patterns are determined by the infant's behavior and not by the infant's sex, ordinal position or type of illness.

In conclusion, based on the results of this study it
seems that a chronically ill infant's atypical crying behavior has an affect on patterns on maternal response, and that a mother-ill infant dyad is at risk for maladaptive patterns of mother-infant interaction.
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Chapter I
INTRODUCTION AND THEORETICAL FRAMEWORK

Introduction

What is it like for mothers to care for infants with a chronic illness? Do they act much the same as they would with well infants? Do they love and interact with their infants in similar ways, or does the fact that an infant is ill substantially change interaction patterns? How do mothers of ill infants feel about them? What do they say about them? And what are their worries about the future? After working with parents with chronically ill infants for six years these are the kinds of questions that constantly recurred.

Some of these questions are asking for a realistic picture of "how" a mother interacts with her ill infant. During interaction sequences, behaviors are displayed by both mother and infant which elicit response patterns from the other. Thus, it is possible to study a part of this interactive process by selecting one infant behavior, such as smiling or crying, and studying patterns of maternal response in relation to this behavior.

The addition of the theoretical construct of attachment as developed by Bowlby (1969) gives added meaning to mother-infant interactional processes. Bowlby (1969) believes that maternal response to infant attachment behaviors, such as crying or smiling, mediates the development
of the attachment or affectional bond between the pair. Thus, maternal response to infant attachment behaviors can be used to study the attachment patterns of a mother to an ill infant. The general questions posed in the opening paragraph can now be rephrased into the following research questions: (1) How do mothers respond to the attachment behaviors of their chronically ill infants? (2) Are there patterns of response which distinguish mothers with well infants from mothers with chronically ill infants?

Attachment is an "affectional tie that one person forms to another specific person, binding them together in space and enduring over time. Attachment is discriminating and specific" (Ainsworth, 1973, p. 1). The process by which an infant becomes attached to his mother has been studied over the past fifteen years, and the phenomenon of attachment is emerging as a fundamental process of the first year of life (Ainsworth, 1973; Bowlby, 1969; Lamb, 1974; Robson & Moss, 1970; Schaffer & Emerson, 1964; Yarrow, 1972). There is general consensus that maternal-infant attachment is crucial to the survival and development of any infant (Ainsworth, 1973; Bowlby, 1969; Crains, 1977; Gewirtz, 1972; Klaus & Kennell, 1976; Yarrow, 1963).

In this study attachment is viewed as developing out of an interactional process between a series of innate infant behaviors -- crying, sucking, smiling, vocalizing, clinging, following and visual-motor orientating -- and the reciprocal maternal responses. From this perspective the
developing infant is able to modify the environment, including the mother's behavioral reaction. In this research on the mother-chronically ill infant attachment process, early infant behaviors, such as crying and smiling, that may regulate the mother's responses are of particular interest. Such behaviors may function as signals regarding the infant's state, as discriminative stimuli that the infant needs care, or as interactive social behaviors. Because it has been hypothesized that maternal behavior is at least partially under the control of the young infant (Kagan, 1971; Moss, 1967; Yarrow, Rubenstein & Pedersen, 1975) it is of interest to assess the role of such signals in the attachment process when the infant is chronically ill. Because the cry of a human infant is considered an attachment behavior (Ainsworth, 1973; Bowlby, 1969) and is probably the most powerful cue the infant can provide the infant's cry will be the behavior used to evaluate maternal response.

Each year approximately 60,000 infants are born with a chronic disease (Norris, 1975), and yet the process of attachment between mother and chronically ill infant remains largely unexplored. At present we do not know how a mother responds to an ill infant's attachment behaviors, nor how the attachment process develops and matures, or how the infant's illness may enhance or disturb the attachment process. Therefore, the purposes of this study are: (1) to describe the patterns of maternal behavior that are made in response to a chronically ill infant's attachment behavior
of crying during the second quarter of life (from four to six months of age); (2) to compare these patterns of maternal behavior to those of mothers with well babies; (3) to provide rationale and management guidelines for nurses who work with mothers with chronically ill infants.

The theoretical approach directing this study is ethology, the biological study of behavior. An ethological study is characterized by the use of observation of the species in its natural habitat for the data collection, and the analysis of large numbers of described items of behavior. In contrast to the use of questionnaires, interviews and psychological testing which have been the methods of data collection used so frequently in the past, the observational method allows for evaluation of a complex inter-active relationship which is the proposed topic of study.

**Theoretical Framework**

**The Concept of Attachment**

The theoretical position upon which this study is based is the concept of attachment as it evolved from the work of Bowlby (1958; 1969) and Ainsworth (1964; 1967; 1973). Both believe that attachment behaviors are best viewed in the ethological-evolutionary theory of social development. This approach stresses the importance of genetically programmed infant social behaviors that both establish and subsequently mediate the child's early tie to its principal attachment figure (usually the mother).

An attachment is defined as an affectional tie or bond,
enduring in nature and specific in its focus (Ainsworth, 1973). Such a bond is commonly formed to the mother during the latter part of the first year of the infant's life.

The main point of Bowlby's position is that attachment behavior has biologic origin which serve an adaptive purpose for the species and can be understood within an evolutionary context. Bowlby (1969) believes that in the course of evolution anatomical, physiological and behavioral components necessary for survival were transmitted through the gene pool. When man emerged in evolution, it was necessary for the helpless infant to maintain proximity to its caretaker (usually the mother) in order to be protected from danger (Bowlby, 1969). Therefore some stable behavioral system was needed which would give the human species some survival advantage in this harsh environment. Bowlby finds attachment behavior in the young to be such a behavioral system. He postulates that the biologic function of attachment behavior is to protect the infant from danger, especially attack by predators. Secondary outcomes of attachment behavior are that the infant gains nutrition and stimulation.

Bowlby (1969) proposes that an infant's attachment to its mother originates in a number of species-specific behavioral systems some of which are functioning when the infant is born and others which emerge as the infant matures. These behaviors serve to orient the infant to mother, signal to her, or actively maintain contact with her. Bowlby (1958; 1969) characterizes attachment behavior as instinctive, but
points out that instinctive behavior is not inherited; that only the potential to develop is inherited. Bowlby (1958) identified five precursor attachment behaviors which contribute to the development of the attachment bond as: crying, smiling, sucking, following and clinging. Bowlby (1969) argues these diverse behaviors are functionally related because they all lead to the same predictable outcome, mother-infant proximity. The form of these behavioral systems will differ according to each mother-infant environment.

Ainsworth's (1964; 1967) later research identified a more detailed list of attachment behaviors. The thirteen patterns she proposes are: crying, smiling, vocalization, visual-motor orientation, crying when mother leaves, following, scrambling, burying face in lap, exploration from a secure base, clinging, lifting arms in greeting, clapping hands in greeting and approach through locomotion. These behaviors are variable and situationally determined in regard to both activation and intensity. They also emerge at different times and at first are relatively independent of each other, but during the course of development become integrated.

It is conceptually important to distinguish the difference between Bowlby's (1958) precursor attachment behaviors and Ainsworth's (1964) attachment behaviors. Bowlby's reflex like behaviors are adaptively functional because they bring about proximity which promotes the development of
attachment. While the infant's behavior does become focused on the mother it is displayed in a time period before the attachment bond has been formed. In contrast, the patterns of attachment referred to by Ainsworth (1964; 1967) differ in that the infant now responds differentially towards the mother. In addition the infant's behavior clearly suggests that he has a goal in mind and actively works to achieve it. The attachment bond to the mother cannot exist until the child is cognitively capable of conceiving of an attachment figure as existing while not actually in his presence. With the formation of the attachment bond the infant derives feelings of security from mother's presence and feelings of affection for her.

Thus attachment does not emerge suddenly in a mature form, but involves a process in which several phases have been described. Bowlby (1969) outlines the four major phases as:

1. **Phase of Undiscriminating Social Responsiveness**
   
   This phase consists of the first two to three months of life. Some of the infant's orienting behaviors include visual fixation, visual tracking, listening, rooting and postural adjustments when held. Sucking and grasping allow the infant to gain and maintain contact. Signaling behaviors include smiling, crying and other vocalizations which tend to bring the adult caregiver into proximity or contact. At this time the infant does not discriminate between persons who respond to its signals.

2. **Phase of Discriminating Social Responsiveness**
   
   The baby continues to orient and signal but clearly discriminates between familiar figures and those who are strangers and responds differently to them.
3. **Phase of Active Initiative in Seeking Proximity and Contact**

The phase begins with the onset of locomotion as the baby becomes more active in proximity seeking and contact maintaining behaviors. Bowlby (1969) believes the baby is now guided by feedback and will alter the direction and nature of behavior in accordance with the figure to whom he has become attached. In this phase the baby is first described as being attached. During this phase the baby, to some extent, can predict mother's behavior but does not understand the factors which influence her behavior.

4. **Phase of Goal-Corrected Partnership**

In this phase the child comes to understand something about mother's "set-goals" and can begin to attempt to alter them to fit his own. This phase has been least investigated by Bowlby and Ainsworth, but they believe this phase does not begin until about three years of age.

The development of the attachment bond is a prolonged process, and the maternal response to the early precursor attachment behaviors and later response to the infant's attachment behaviors play an important part in its development. The failure of the precursor attachment behaviors or the attachment behaviors to achieve the functional consequence of proximity will disrupt the development of the attachment bond. The failure of the mother to respond or an inappropriate responses can also disrupt the formation of an adaptive attachment bond.

**Individual Differences in Attachment Behaviors**

Individual differences in attachment behaviors due to the sex of the infant have been evaluated in several studies and the results were equivocal. Many studies have not found sex-of-infant differences in attachment behavior (Bell & Ainsworth, 1972; Coates, Anderson & Hartup, 1972; Maccoby &
Feldman, 1972; Rheingold & Eckerman, 1969). However, all of these studies were limited to middle class, educated subjects. Three studies using subjects with varied backgrounds found differences in attachment behaviors related to the sex of the infant. One reported that girls established attachment relationships with their mothers earlier and were more receptive to the stimulation she provided (Kagan, 1971). In a study of 13 month old infants Goldberg and Lewis (1969) found girls expressing more attachment behaviors in both the proximal and distal modes, and in a similar study Messer and Lewis (1972) also found females demonstrating more attachment behaviors in the proximal mode. However, they conclude that social class and background might play an important part in determining sex differences in attachment behaviors because social class is related to maternal caretaking style.

One study which investigated individual differences in attachment behaviors due to ordinal position was found. First borns were more upset than later borns when separated from their mothers, and after reunion with their mothers they maintained proximity and contact with her longer than later borns (Fox, 1977). Authors were also of the opinion that ordinal position does influence maternal response patterns (Jacobs & Moss, 1976; Mussen, Conger & Kagan, 1974; Schooler, 1972; Thorman, Barnett & Leiderman, 1971). The first born was more likely to receive more attention than the later born infant.
Control Systems and the Concept of Attachment

Bowlby's (1958) original conceptualization of the concept of attachment did not include the use of systems theory. In 1969 his classic work cast attachment in control systems terms and provided a developmental construct which could be used to study an important area of infancy. Through the use of control system theory Bowlby (1969) was able to show how a behavioral system can be both goal directed and genetically biased.

Bowlby (1969) cites the anti-aircraft missile as an example of a complex control system. The missile's "set-goal" is to seek out the enemy aircraft and despite its evasive maneuvers intercept it and destroy it. Thus while tracking the enemy aircraft the missile will correct its behavior, via a feedback loop, to achieve its goal (goal corrected behavior). Bowlby compares this to the stoop of the falcon in intercepting its prey -- a behavior which is instinctive and goal directed. The genetic make-up of the falcon has given it the sensorimotor equipment which enables it to stoop in such a way that changing visual input guides the movements which control the course and speed of flight so the goal of interception of prey is achieved.

This same control system model can also be used to examine human behavior. The set-goal of the infant is to obtain or maintain proximity with mother, and proximity promoting behaviors are automatically activated when information reaches the infant that proximity is needed. The
The infant's signaling persists until proximity is reestablished. The young infant does not have the cognitive structures necessary to carry out such a plan, but as the review of literature indicated the infant's initial repertoire of behavior patterns seem to be genetically programmed to achieve this outcome. The older infant's behavior becomes more goal-directed as the infant formulates simple plans and uses the outcomes, obtained via the feedback process, to direct future behavior. The earlier and simpler patterns are not lost, but are overridden by new patterns of a more mature nature.

This organizational perspective illustrates the complexity of mother-infant interaction. It also implies that a great deal of infant learning takes place within mother-infant interaction. The infant must learn to evaluate and coordinate a wide variety of behavioral responses into an adaptive and flexible goal-corrected response repertoire. Within mother-infant interaction the infant develops the ability to discriminate mother from others, anticipate her behavior, and to interpret additional environmental stimuli. This appraisal is a "complex process which includes comparing the input to inner "set points" or standards and selecting certain forms of behavior in preference to other forms in accordance with these comparisons" (Ainsworth, 1969, p. 1002). The mother's reciprocal responses tell the infant she is reliable and supportive, and provides the infant with a secure base for exploration of his environment.
Summary

Bowlby's ethological concept of attachment proposes that an infant is genetically biased to behave in ways that promote proximity with an adult caregiver, and these attachment behaviors are adapted to the reciprocal maternal response behaviors. The infant is not attached to anyone at first and only gradually learns to discriminate mother from others. As this discrimination is learned, the infant's attachment behaviors become increasingly differentiated and specifically directed towards mother. The infant's attachment behaviors and reciprocal maternal response patterns to these behaviors mediate the development of the attachment bond which forms in the second half of the first year of life.

Johnson Behavioral System Model

The Johnson (1968) behavioral system model for nursing practice will be used to permit focusing on maternal response to infant attachment behaviors from a viewpoint of behavioral system balance. It will also permit a closer examination of the effective use of a systems model for nursing in solving behavioral problems in nursing practice, and to provide guidelines for management.

On characteristic of behavioral systems is stability which persists over time. There is a goal or standard toward which it is directed. The goal of action in the Johnson model is to maintain behavioral system balance. Ms. Johnson (1968) describes this as "a condition of general
harmony with and between the behavioral subsystems, such that behavior is orderly and predictable." To maintain an overall steady state, the model delineates the role of the nurse as follows: "to act external to the patient environment to provide the conditions and resources and controls necessary to restore behavioral system balance. The nurse acts within and upon the external environment and the internal interactions of the subsystems to create change and restore stability," (O'Brien, 1972). Thus, the nurse's ultimate responsibility is to take action that influences the system.

The Johnson Behavioral System Model is composed of the following eight subsystems: Achievement, affiliative, aggressive/protective, dependency, eliminative, ingestive, restorative, and sexual. The structure of each subsystem consists of the goal, set (tendency to act in a certain way), choice (alternative behaviors which are compatible with set), and action of each subsystem. These subsystems are linked and open, and are interactive and interdependent. The subsystems are integrated in a balanced relationship (equilibrium).

"A disequilibrium in a subsystem is caused by ineffective goal achievement. The disequilibrium may be caused by a structural stressor, which deals with internal control mechanisms, or by a functional stressor, which arises from the environment. The nurse may diagnose the problem as an insufficiency or discrepancy within the subsystems, or as an incompatibility or dominance between subsystems," (Holaday,
If the nurse is to take some action which will influence the behavioral system the nurse must have knowledge and understanding of the mother's behavioral set and choice, which are the areas of interest in this study. The behavioral set and choice were partially defined in a preceding paragraph. The set can be further subdivided into two types: Preparatory and perseverative sets. The preparatory set is a consistent tendency to select certain aspects of a situation to attend to, and the perseverative set is a consistent tendency to react to certain stimuli with a similar pattern of behavior. The set plays a major role in both a person's choice and ultimate behavior. Therefore one's set also influences one's selection of goals. The combination of Bowlby's concept of "set-goal" and Johnson's concept of behavioral "set" presents a situation which is observable in terms of conducting a research study to identify relevant input variables related to the development of the mother's set-goals, conditions which shift set-goals, and identifying individual differences in regard to the range of set goals. Identification of these behaviors is necessary for the nurse to understand how and what variables and other environmental factors influence the mother's behavior. Successful nursing interventions for behavioral problems require an understanding of behavior which comes from being able to explain how key components in the system behave, and in being able to explain what variables caused the behavior.
Summary and Statement of Hypotheses

This research study is designed to observe the precursor attachment behavior of crying in chronically ill infants and maternal response patterns to this behavior. Some of the data obtained will be used to describe patterns of chronically ill infant crying and subsequent patterns of maternal response. Other data generated from this study will be used to compare patterns of response of the mothers with chronically ill infants to mothers with well infants. Other parts of the data will be used to statistically evaluate maternal response patterns.

The available literature provided no compelling reasons to state a directional hypothesis; therefore the null form is used. The hypotheses to be tested in this study are as follows:

Within the Ill Group

1. There is no difference in maternal response time to male infants versus female infants crying.

2. There is no difference in maternal response time to first borns versus later born infants crying.

3. There is no difference in maternal response time to the crying of seriously ill infants versus the crying of visibly ill infants crying.
Chapter II

REVIEW OF LITERATURE

Introduction

The review of literature was guided by the following three questions: (1) How do mothers respond to their chronically ill infant's behavior, especially attachment behaviors, during the first six months of life? (2) Are the behavior patterns, such as smiling, crying, visual-motor orientation displayed by an ill infant different from those of well infants? (3) If the ill infant's behaviors are different do they elicit different types of maternal response?

Ainsworth (1963, 1973), Bowlby (1969) and Gewirtz (1972) all stressed the fact that during the first six months of life certain patterns of infant behavior seemed to help in the development of the attachment bond. Ainsworth (1963) and Bowlby (1969) identified these precursor attachment behaviors as smiling, crying, rooting and sucking, grasping and visual motor orientation. A review of the literature found so few articles on maternal response to an ill infant's behavior that it was necessary to turn to the literature on well infant's behavior. There is growing pool of research studies which demonstrates the critical role certain infant behaviors play in mediating mother-infant interaction and the attachment process during the first six months of life. Throughout this review of literature the mother-well infant interaction will serve as the norm and will permit some
comparison between the well and ill infants behaviors and subsequent maternal response.

While the literature on maternal response to an ill infant's behavior was sparse there was an extensive amount of literature on the mother's emotional responses to the birth of the ill baby, and on her later emotional responses. These are included because maternal attitudes, feelings and beliefs are relevant to consider when evaluating a mother's response to her chronically ill infant.

The review begins with a discussion on early well infant behavior and maternal response. Next the review turns to the mother's emotional response to the ill infant. The chapter ends with a summary of the main points, and some conclusions regarding the ill infant's behavior and the effect such behavior might have on maternal response.

The reader should note that in this review the terms chronically ill, defective, handicapped, abnormal and congenital illness are all used to describe chronic illness. In addition, articles about infants who were blind, deaf, or mentally retarded were excluded because they would not be included in sample population.

**Early Infant Behaviors and Maternal Response**

From birth on it seems both infant and mother have behavioral patterns which are particularly likely to catch the attention of the other. On his part the infant is born with perceptual sensitivities that are functional for the earliest
encounters with the environment. In addition the behavioral repertoiré of the newborn seems to ensure some response from the caregiver. As the infant matures these simple behaviors evolve into complex sequences of behavior which are organized in terms of a goal or plan.

This section of the review of literature will discuss the infant's auditory and visual capacities and maternal response to these behaviors. The review continues with a discussion of the infant's signaling behaviors of smiling, babbling and crying.

**Infant Audition and Maternal Response**

The newborn infant can hear and can localize a sound. In his study Wertheimar (1961) presented a series of sounds randomly to the right and left of the subject. The infant correctly looked in the direction of the sound source. Later research by Bower (1974) concurred with this finding, but concluded the infant was unable to precisely locate the source of the sound.

Newborns and infants were selectively responsive to sounds used in human speech (Eimas, Siquelano, Jusczyk & Vigorito, 1971; Eisenberg, 1965). Low frequency sounds tended to cause an increase in motor behavior if the infant was alert, and they also tended to inhibit the distress of the infant if he was crying (Birns, Blank, Bridger & Escalona, 1965). Young infants also became quieter in response to rhythmic sounds than to dysrhythmic sounds (Bower, 1974). Loud, high frequency sounds (like a whistle) tended to bring
about distress rather than inhibit it, and elicited a freezing behavior and an alerting reaction (Eisenberg, 1969). In related research Turkewitz, Birch, Moreau, Lew and Cornwall's (1966) study of infants found that loud sounds caused eye movements away from the sound source, whereas soft sounds produced eye movement toward the source. In a fascinating study Condon and Sander (1974) found the motor movements of newborns coordinated to adult speech patterns.

Research in the area of speech discrimination indicated that infants are sensitive to phonemic contrasts at a very early age (Moffitt, 1971; Morse, 1972; Trehub, 1972 & 1973). Using the high amplitude sucking (HAS) procedure, researchers found a sensitivity to consonant contrasts of \([ba]-[ga], \[pa]-[pi]\) and \([ta]-[ti]\) as early as one month (Morse, 1972; Trehub, 1972 & 1973). These findings suggested that the human infant may be sensitive from birth to some acoustic sounds from other human beings (Eisenberg, 1976).

Research also indicated that there was a relation between audition and vision. Mendelson and Haith (1976) found sounds presented at midline caused a newborn to increase eye opening, to centralize fixations, to constrain fixations and to manifest more eye control. Appropriate head-eye coordination toward a sound source did not consistently occur before the infant was six months old (Lyons-Ruth, 1975; McGluck & Lewis, 1974), but by six months of age the infants spatially correlated particular sounds with objects and expected them to move together in space (Lyons-Ruth, 1975).

Bergman, Haith and Mann (1971) investigated the
development of eye to eye contact in infants ranging from three to seventeen weeks of age. Infants observed mother's face reflected in a mirror with the face stationary, face moving and face talking. By seven weeks of age the infants scanned the face talking image most of the time, and most of their attention was on the eyes. Donnee (1972) used a similar design and also found by eight weeks sound reduced eye movement and increased fixation, which suggested sound increased attention to a stimulus.

The infant's auditory abilities appeared to orient him to his mother, and her responses seemed to reinforce the infant's behavior. The infant's usual response to the sound of the human voice was to look at the source of the sound which could lead to a face to face encounter. These recurring face to face encounters between mothers and their infants provided part of the foundation for Bowlby's (1969) description of the attachment process' later. As the infant matured the auditory-visual configuration of the mother became a very familiar one and acquired effective importance for both. Much to mother's delight her four month old smiles, babbles and gazes at her as she infant talks playfully to him. Furthermore the infant, from birth, can be soothed by her soft rhythmic voice. It is clear that characteristics of both the infant and the mother contributed to this ongoing reciprocal interaction.

**Infant Vision and Maternal Response**

Infant vision has been the subject of intense investigation over the past two decades and presents a detailed
body of knowledge of the infant's visual capacities. The newborn is able to see light and dark at birth (Atkinson, Braddick & Braddick, 1974; Slater, 1972), color by two months (Peeples, 1975), and has remarkably good visual acuity (Atkinson, Braddick & Braddick, 1974). A recent study (Fantz & Miranda, 1975) gave clear evidence of form discrimination and selection by term infants under seven days of age. After several days of life infants identified the direction of objects relative to themselves if it was presented in the straight on direction (Bell & Tronick, 1971). In conducting this study the investigators found that young infants were quite unwilling to look at anything presented off the straight ahead position.

Mendelson and Haith's (1975) research found that newborns scanned in darkness in a prototypical manner which was different from scanning in light. In darkness, compared to light, newborns opened their eyes more widely, scanned with better eye control and made slightly smaller eye movements. To Mendelson and Haith (1976) visual activity in darkness clearly reflected the functioning of an inherent scanning routine that was independent of a specific visual input.

Frantz (1958) and Berlyne (1960) were the first to demonstrate that infants fixated longer on certain types of visual stimuli. Continued research over the years has demonstrated that infants prefer to look at patterned stimuli over unpatterned stimuli (Frantz, 1966; Kogan, 1972) contour (Bond, 1972; Karmel & Moisel, 1975; Kessen, Salapatek, &
Haith, 1972) a preference for curved versus straight contour, and a preference for circular versus linear configurations by two to four months (Fantz & Nevis, 1967; Karmel, Hoffman & Fegy, 1974; Fantz, Fagin & Miranda, 1975).

Another group of studies has been concerned with the infant's response to visual figures with social significance, especially the human face. At birth patterns of faces are no more preferred than geometric figures (Hirshenson, 1964). Shortly after birth newborns preferred a schematic face to a diagonal of three dots (Stechler, 1964). Infants from ten hours to five days of age fixated longer on a black and white face than newsprint (Fantz, 1963) and between one and six months of age the face is preferred over other stimuli (Frantz & Nevis 1967; Fantz, Fagan & Miranda, 1975; Haaf & Bell, 1967). The work of the neurophysiologists indicated the infant's tendency to look at a contour is because areas of the cortex are responsive to contour edges (Hubel & Weisel, 1962). They postulated that this leads the infant to focus on the mother's face and particularly her eyes because of their black and white contrast.

Using the visual fixation technique (Fantz, 1963) researchers have demonstrated that during the first six months of life distinctive features of the face are gradually differentiated. At four months of age the eyes are a more salient feature than the nose and mouth (Caron et al., 1973; Gibson, 1969). The two eyes are perceived as a structural unit in the upper half of the head, and the head (including
face contour and hair is more prominent than the inner face pattern (Caron, Caron, Caldwell & Weiss, 1973). By five to six months of age the mouth is as salient as the eyes, the head no longer predominates over the interior face and the face configuration (eyes, nose and mouth) has emerged as a distinct visual entity (Caron et al., 1973; Fantz & Nevis, 1967).

The visual system occupies an important position in mother-infant interaction. As the review of literature indicates the visual mode is well developed at birth and provides a major channel through which the external world is taken in. In addition the infant's visual preferences are likely to draw his attention towards the mother's face. The mother's corresponding interest in her infant's eyes and face lead her to hold the infant in a face to face orientation which gives each the opportunity to gaze at the other. Robson's (1967) study was one of the first to document the importance of the infant's eyes and mutual gazing in the development of the attachment bond. In a more detailed study Moss and Robson (1970) found that around four to six weeks of age when true eye contact and social smiling began to emerge that mothers found an increased sense of pleasure and affection for their babies. The mothers described the infant's response to their visual and auditory stimulation to be an acknowledgement of their presence.

Other research demonstrates the complex interplay between the infant's visual endowment and the care that the
mother provides. Korner and Thoman (1970) found that in 88% of all trials in which crying infants are picked up and held upright on mother's chest, they not only stopped crying but opened their eyes and alerted. The "pick-up" also provides the infant with tactile and vestibular stimulation. Assuming that visual exploration is one of the most important pathways at the infant's disposal for getting acquainted with mother, the vestibular stimulation and the upright position which attend maternal care appear to be highly effective vehicles for providing such opportunities.

The research of Fraiberg (1974) further documents the importance of the visual system. Mothers of blind infants stated they had difficulty developing a strong feeling for the infant because the infants would not look into their faces. This study clearly demonstrates that the perceptual-motor abilities of the infant which permit a reciprocal social exchange with the mother is an important aspect of the attachment process.

**Smiling and Babbling in Infants and Maternal Response**

The earliest smile can appear as early as the first day of life and has been called a spontaneous or reflex smile (Spitz, Emde & Metcalf, 1970; Sroufre & Waters, 1976; Wolff, 1963). It occurs spontaneously during sleep and is limited to the area just around the mouth. The first elicited smile comes around two weeks of age in response to mild tactile or acoustic stimulation. Wolff (1963) assumed that this smile is precursor to the later social smile.
The true social smile begins to occur in infants between the fourth and eighth week of life (Sroufre & Waters, 1976; Wolff, 1963). The mother's voice and/or physical stimulation are effective in eliciting a bright smile involving the face and eyes. Other authors (Mussen, Conger & Kagan, 1974; Spitz, Emde & Metcalf, 1970) believe the human face and especially the eyes are an essential stimulus to evoke an infant smile. Between four and eight weeks Ambrose (1961) noted an infant would smile at an oval stimulus card with a pair of black dots almost as readily as at a human face. However, during the second and third months of life smiling in response to a human face stimulus increases rapidly. Thus during the first six months the infant might smile at other stimuli (Kagan, 1971), but the longest and most vigorous smile occurs in response to the human face (Watson, 1966).

Smiling in response to a social stimuli follows a specific developmental sequence (Ambrose, 1961; Gewirtz 1965). Prior to three to four months of age infants smile readily at strangers. However at age of three to four months of age infants begin to smile differentially to familiar and strange adults (Ambrose, 1961; Gewirtz, 1965; Wahler, 1967). The infant of six to eight months made clear cut distinctions between familiar and unfamiliar persons through differential smiling and vocal distress when separated from the familiar person.

The smile is the first positive signal an infant
provides for the mother. The mother might interpret the smile as a sign that the baby is happy, that she has done something right and concluded she is an effective mother. If the infant is an infrequent smiler the mother might begin to doubt her competence (Brackbill, 1958).

Most people find an infant's smile irresistible and they react by approaching, touching and/or talking to the infant, and by picking up the infant (Ainsworth, 1973; Bowlby, 1969; Gewirtz, 1965). Both Bowlby (1969) and Ainsworth (1973) supported the ethological viewpoint that smiling serves to encourage proximity between mother and infant. The smile also rewards the mother and increases her involvement with the infant (Mussen, Conger & Kagan, 1974). Therefore if some babies are more predisposed to be easy and frequent smilers it might be concluded that these babies are more apt to elicit approach behavior from their mothers than non smiling infants.

The role of babbling is similar to that of smiling since the outcome is usually that the mother responds in a pleasant sociable manner and encourages the behavior by talking back to the infant (Beckwith, 1971). Both smiling and babbling are elicited by the same stimuli and tend to occur together (Beckwith, 1971; Wolff, 1963). The infant first coos around four weeks of age and by six weeks of age the mother's imitation of the babies sounds causes the babbling to continue (Beckwith, 1971; Brazelton, Tronick, Adamson, Als & Weise, 1975; Wolff, 1963).
Prior to five months of age babbling can be easily elicited by visual stimulation such as a toy or interesting event (Kagan, 1971; Papousek & Papousek, 1975; Rheingold, Gewirtz & Ross, 1959). After that time humans are far more likely to be an effective stimuli to elict babbling. Human presence alone does not affect vocalization rate, and studies emphasize that the combination of visual (human face), auditory (voice), and tactile (touch) are effective in eliciting and reinforcing vocalizations (Rheingold et al., 1959; Weisberg, 1978).

Several researchers (Beckwith, 1971; Brazelton et al., 1975; Ramey & Ourth, 1971; Rheingold et al., 1959) found that by responding verbally to an infant's vocalizations the number of vocalization increases, only under an immediate reinforcement schedule. Thus the mother-infant "talking games" provide the appropriate feedback. Besides mutual stimulation and reinforcement both members also learn how each can influence the others behavior.

Smiling and babbling aid in the development of mother-infant reciprocity, by promoting interactive chains. The conclusions drawn from the theoretical articles and empirical studies are that smiling and babbling clearly play a role in eliciting approach from others, and in promoting interaction essential to the development of the attachment bond (Ainsworth, 1973; Bowlby, 1969; Gewirtz, 1972).

Infant Crying and Maternal Response

Crying is another of the behaviors which Bowlby (1969)
classifies as a social signal behavior. It has the predictable outcome of increased proximity of mother to infant. Bell and Ainsworth (1972) also consider the cry to be the earliest signal provided by the infant that promotes proximity to the mother. They believe the cry is at first expressive but later became focused on the attachment figure. Moss's (1974) study of crying also found that mothers described the cry as a signal that the infant needed attention. His observations revealed that 77% of the infant's cries elicited a maternal response.

Crying is unlike smiling, babbling and other social behaviors in two respects. First, crying is effective immediately from birth in eliciting a response from mother. Second, the infant cries when in pain, hungry or lonely and in general crying transmits a message of distress. The maternal response to crying is also quite different than it is for smiling or babbling. Instead of talking, stroking, smiling and other behaviors designed to encourage the behavior, the mother's response to crying is to protect, feed and comfort, the infant to stop the crying. Thus the role of crying is opposite of what it is for smiling and babbling.

Wolff's (1969) study of the natural history of crying in fourteen infants identified several distinctive crying patterns. He found a rhythmical or hungry cry, a mad cry and a pain cry. After the third week of life there is an attention seeking cry. Using spectrograms Wolff (1969) found each baby cried in its own individual pattern.
Mothers respond to these crying patterns appropriately (Bernal, 1972; Moss, 1974; Wolff, 1969). The pain cry elicits an emergency reaction from the mother and she typically rushes into the room looking worried. Once she makes sure the infant is fine she reports a sense of relief (Moss, 1974; Wolff, 1969). The mad cry brings mother to baby's side quickly, but there is no sense of alarm. If the mother knows the baby is crying because it is hungry the response is delayed (Bernal, 1972; Wolff, 1969). Wolff (1969) found that multiparous mothers response time is slower than primiparous mothers.

Investigators do not agree as to whether a mother can identify her own infant's cry. Valanne, Vuorenkoski, Partanen, Lind, Was-Hacker (1967) found that only one-third in the sample of thirty-five were able to identify their own infant's cry. Formby (1967) and Wisenfeld and Klorman (1978) found that the majority of their forty-eight mothers could identify their own infant's cry, and in addition Wisenfeld and Klorman (1978) found mothers responded to their own infant's cry with marked cardiac acceleratory reactions.

Several response behaviors have been identified as effective in quieting a crying infant, and it is interesting that these are most often of human origin. Response behaviors include the sound of the human voice (Bell & Ainsworth, 1972; Etzel & Gewirtz, 1967; Wolff, 1969), touch and related proprioceptive stimuli that arise from being held and rocked (Ainsworth, 1963; Kessen & Mandler, 1961; Kornor & Thorman,
1970; Wolff, 1969), and sucking (both nutritive and non-nutritive) Kessen & Leutzendroff, 1963; Wolff, 1969). The mother's response actions not only meet the infant's needs, but also provide stimulation for the infant.

There is also a range of findings on the impact of maternal response to the infant's cry which indicate that a mother's immediate response to her infant's cry has a significant effect on the infant's later behavior. Several researchers found that responses from the mother which are contingent to the infant's cry increase the frequency of infant crying behavior (Gewirtz, 1976; Moss, 1974). Other researches of mother-infant interaction have found that prompt maternal response to a cry is associated with less frequent crying (Beckwith, 1971; Bell & Ainsworth, 1972). Still other researchers suggest that through prompt, contingent and consistent response to the infant's cry the infant learns that his behavior does have consequences and that his actions can control his environment (Clarke-Stewart, 1973; Lewis & Goldberg, 1969). Clarke-Stewart (1973) suggests that this early response-contingent stimulation sets in a condition which fosters the development of competency in infancy.

There is no general agreement on an appropriate maternal response time to an infant's cry or what are the given outcomes of contingent maternal responses, but there is a general conclusion that ignoring an infant's cry is not beneficial for the infant's later personality development.
(Bell & Ainsworth, 1972; Clarke-Stewart, 1973; Gewirtz, 1976; Moss, 1974). It is difficult for these investigators to determine what is an appropriate response. If the mother is oversensitive to minimal cues the child's developing sense of autonomy and initiative can be impaired. The elusive optimal response develops within the infant an attachment to the mother and a positive interest in the environment, and ignoring the infant's cry leads to failure to thrive.

In summary, the infant cry at first appears to be expressive of a legitimate need whether this is for the relief of hunger, pain or for contact. By six months of age the cry starts to become goal directed and is used purposely to influence the behavior of another. The consequence of an episode of crying is usually to bring mother in proximity of the infant. Mother responds to the cry with comfort measures such as picking up the infant, talking, rocking etc., providing food, or removing the source of distress. Therefore, the mother's response brings the pair close together and provides useful stimulation for the infant. In addition, several of the researchers believe the mother's contingent response to the infant's cry aids in the infant's affective and cognitive development.

Summary

This chapter dealt with the infant's perceptual-cognitive skills and their role in the development of the attachment bond. Several questions were asked about the dynamics of this process and these were answered in regard to well
infants behavior and maternal response. For his part the infant is born with every sensory system functioning, which tends to orient him towards his mother. The infant is also equipped with social signaling behaviors which promotes communication and interaction with others. Although the infant's signaling repertoire of smiling, babbling and crying is not large, a surprising wealth of information can be conveyed. The infant is no passive bystander in the environment. The review clearly demonstrated that the infant is capable of promoting and regulating mother's behavior, and maternal caretaking seems to be affected in a number of ways by stimulation from the infant's behavior.

It was equally clear that the mother is a highly complex multidimensional stimulus who interacts with her infant in a reciprocal fashion. She supplies nurturance, stimulation and stimulus variation. She also acts as a social stimulus and as a reinforcer. The mother is interested and/or attracted by the infant's social signals which serve as releasers for her responses. The researchers are clear that each mother's response is unique in some sense and by six months the mother-infant pair has probably developed a highly characteristic pattern of interaction. What causes one mother to respond in one way and another mother to respond in a different way to similar infant behavior is not known. However evidence suggests that mother's behavior will play a large part in the pattern of attachment that develops (Ainsworth, 1969; Yarrow, 1963).
The development of the mother-infant attachment process is due to a number of response systems evolved specifically to bring the infant into proximity. The examples of interactive effects suggest the general rule is that the earliest organization of the mother-infant system occurs as a function of the capacities of both. The infant has abilities for indicating his status, signaling his needs and responding to maternal actions. The mother has the ability to perceive the cues provided and to respond appropriately. Thus the infant-mother attachment process evolves from interaction sequences in which the behavior of one partner affects and is affected by the behavior of the other.

**Behavioral Patterns of Chronically Ill Infants and Maternal Response**

Descriptions of the behavioral repertoire of a chronically ill infant and of the mother's subsequent response to these behaviors is scanty. Anyone examining the literature in this area cannot fail to be struck by the scarcity of material. This lack of available research literature on the ill infant's behavior determined the direction this review of literature had to take. The main source of literature to describe an ill infant's behavior would come from a group who had been observing and describing sick infants behavior since the 16th century, the pediatricians. This information confirmed with the dozen studies which did examine the ill infant's behavior and subsequent maternal response will permit some basic conclusions to be drawn.
No attempt will be made to delineate the characteristics of a large number of different chronic illnesses. Instead the signs, symptoms and behaviors of two different categories are presented. The first category is congenital malformations of the heart and represents a serious, life threatening illness which requires long-term management by the parents. The second category is comprised of visible anomalies of the extremities and skeleton and represents a long-term nonlife threatening illness which also requires long-term management by the parents. This is followed by an examination of the twelve studies which evaluated maternal response to chronically ill infants behaviors. The section concludes with a summary discussion of how these illnesses might influence the infant's behavior patterns, such as smiling, crying, visual-motor orientation etc. described in the first part of this review of literature.

The first category of illness discussed, congenital malformation of the heart can be classified as a serious illness. At birth the infant develops tachypnea, cyanosis, grunting respirations and marked tachycardia. Surgical and/or medical intervention takes place shortly after birth. Regardless of the type of intervention some signs and symptoms of the congenital heart disease will remain until the child is old enough to have the lesion repaired.

Barnett (1972, p. 1403) offers this description of the clinical findings of infants with tetrology of Fallot, the most common cyanotic heart lesion.
In the infant, attacks of paroxysmal hyperpnea and increased cyanosis may occur spontaneously or following early morning feedings or prolonged crying. The attacks may last only a few moments and have no significant sequence; may be prolonged and followed by limpness, deep exhaustion, or sleep; or rarely may end fatally.

In addition, these infants may fatigue easily and the infant may limit his own activity by stopping, assuming the knee-chest position, or lying down until he acquires enough strength to go on.

About one-third of these infants will begin to have severe anoxic spells by four or five months of age and/or will have symptoms of congestive heart failure. These symptoms include clubbing of the fingers and toes, growth and motor retardation, restlessness, irritability, a preference for the knee-chest position and hyperventilation with minimal exertion (such as during feeding). The others remain severely cyanotic but the frequency of spells subsides. Only about one-third of the patients show only moderate cyanosis during infancy and have infrequent episodes of paroxipnal dyspnea.

Not infrequently, growth and development are delayed. The degree depends on the severity of the cyanosis which reflects the extent of systemic arterial oxygen unsaturation. Surgical procedures which improve the arterial oxygen levels improve growth rates in infants. However, such improvement is evident only over a six to twelve month period.

Medical management for the parents includes protection from infection, medications such as vitamins, antibiotics and digitalis, special diets, and provding interventions to
relieve paroxysmal dypsnea and cyanotic spells. With later corrective surgery the long-term prognosis for infants with tetrology of Fallot is excellent.

The second category consists of infants born with observable anomalies of the extremities. This would include such deformities as partial or total absence of digits as limbs, syndactyly, split hand or foot and clubfoot. These malformations may result in reduced function or a lack of function for a year or a lifetime. In some instances surgical correction or the use of artificial limbs may resolve the problem. At birth the amount of limb deformity or loss is not necessarily the most critical issue, but rather the meaning of the observable imperfection for the parents.

Aside from the defect infants in this category may show no other evidence of ill health. As the infant matures and begins to use his arms and legs the deformity can limit the types of behaviors the infant can attempt. Infants with deformities of the hands or arms may be unable to reach, or grasp objects, or to use their arms to balance, and infants with deformities of the feet and legs may be unable to kick, crawl or walk. The signs of ill health which do occur are usually due to medical or surgical intervention. Casting procedures and other surgical interventions are often uncomfortable and frequently makes the infant irritable and fussy.

This is a brief description of the types of behaviors which may occur in infants born with these two types of chronic illness. This review provides no evidence to suggest
that any of the behaviors (auditory, visual, crying, smiling and babbling) mentioned in the first half of the chapter are not occurring. However, the possibility of qualitative and quantitative differences in the ill infants behavior cannot be ruled out. Is there a difference in the intensity of behavior between ill and well infants? Do ill infants smile less and cry more? What would such differences do to a mother's response patterns? The review of medical textbook literature does not answer these questions.

A dozen studies conducted by nurses, doctors and psychologists were found which did address these questions. Since the studies are few in number the description of the results of each study is provided in some detail. This is done to illustrate the effects of the ill infant's appearance and behaviors on the varied kinds of maternal response.

In several studies mothers with infants with a visible defect were interviewed and the results indicated that the attractiveness of the infant was an important variable to the mother (Roskies, 1972; Mercer, 1973; Waechter, 1977). In Roskies' (1972) study of twenty thalidomide infants and Mercer's (1973) longitudinal case study, mothers were reluctant to see and hold their infants. Only slowly over a period of four or five days did the mothers assume responsibility for the care of the infant. In Roskies study the mothers stated that their infant's "perfect face", "alert eyes", "intelligent eyes" or "untouched face" were the factors which helped them form an initial bond with the
infant. Another article noted that one mother whose infant had a cleft lip and palate readily admitted she "could not stand the way he looked", and she had as little physical contact as possible with the infant until cosmetic surgery was performed at age one month. These visible illnesses make the infant look "different" and unpleasant to look at, and both factors seem important in determining some aspects of maternal response.

Other studies provide more detailed information about the infant's patterns of behavior and of the mother's responses. In a longitudinal research study of seven infants with esophageal atresia and their mothers Dowling (1977) found the infants to be restless, fussy and generally lacking in vitality. The mothers admitted their anxiety about taking care of the infants and of their dislike of the unpleasant medical tasks they had to carry out. He noted the mother's readiness to respond to the infant, but the infant's lack of initiative, blandness of affective and motor responses, and lack of intensity of response left the mothers frustrated and worried.

In two other longitudinal studies (Brazelton, 1961; Prechtl, 1963) followed infants with hyperkinetic or hypokinetic behavior. These infants spend a great deal of time in a deep sleep state, but once aroused because hyperactive, screamed and could not be consoled. Seven of the eight mothers (Prechtl, 1963) were over anxious when caring for their infants and although they were not consciously aware
of it were more protective of their infants. The mothers did not think the source of trouble was in the infant, but was due to their mishandling of the child and felt ineffectual as mothers.

Data from two studies suggest the cry of an ill infant is an important variable in determining maternal response patterns. A high pitched, shrill and inconsolable cry has a negative effect on the mother (Robson & Moss, 1970). A mother with an irritable infant with this type of crying was described as feeling estranged from the infant and wanting little to do with her infant. Using an observational approach, Greenberg (1971) compared the mother-infant interaction in forty-two infants with atypical behavior and sixteen normal infants. Mothers with atypical infants were threatened by the infant's crying and either attempted to keep the infant constantly pacified by holding the infant for long periods, or on other occasions they chose to ignore the crying. These mothers were more apprehensive about caring for their infants, and verbal accounts of playing and talking with the atypical infants was practically non-existent.

The results of two other studies suggested that caring for a chronically ill infant is not a rewarding experience for the mothers, and that as time goes by the mother's responses may lose some of their warmth (Freeman, Fox-Kulenda & Brown, 1970; Mercer, 1974). Mercer observed five mothers who gave birth to infants with a chronic illness for a three month period and found percentages of care activities which
indicated attachment decreased at two and three months and care activities which indicated aversion increased.

A case study conducted by Freeman et al., (1970) evaluated the first eighteen months of life of a baby multi-handicapped due to maternal rubella. The mother had three other children and the investigators assumed she had at least average mothering skills. The infant was difficult to feed, did not like to cuddle, frequently kept its head retracted and back arched, responded poorly to sensory stimulation, and was ill much of the time. The mother was tired, frustrated and easily discouraged when the infant did not respond favorably to her actions. The mother cared for the child's physical needs but did little else. The authors noted the infant's behavior provided the mother with little incentive to do much else.

Summary

Both the review of medical textbook literature and the studies demonstrate that atypical behavior patterns occur in chronically ill infants. One of the most frequently mentioned was excessive crying. When an infant is uncomfortable and in pain he cries and there is often little the mother can do about it. Infant facial expressions, such as smiling or bright-eyed interest, can lack the vitality of a well infant's response. The disease such as a cleft lip, can also distort a facial expression. The infant's physical movements may also be distorted due to the illness. The infant may also display abnormal posturing and head and
body movements.

These variations from the expected interpersonal and physical infant behavior patterns may leave the mother confused. She is the one who must interpret the meaning of the infant behaviors and provide an appropriate response, and her behavior in turn will affect the infants later behavior. It seems the behavior of both parties lacks the repetitiveness which is necessary to build a mutually satisfying interactive relationship.

Patterns of Maternal Care

In order to further document maternal response patterns to chronically ill infants, articles and studies which considered maternal response without description of the ill infants behavior were also reviewed. These articles were characterized by a diversity of theoretical approaches and limited methodological approaches (interviews and questionnaires) but from these many studies a set of common themes has emerged. In this section I will attempt to bring these themes into focus.

One theme was implied rather than explicitly expressed in the articles. The mother was responsible for most, if not all, of the infant's care (Barsch, 1968; Battle, 1975; Debusky, 1970; Howell, 1973; Holaday, 1978; Hunt, 1976; Kanthor et al., 1974; Kessler, 1977; Mattsson, 1972). Despite societal pressures for child rearing to be a shared venture families with ill infants retained the traditional parental roles. It is not surprising then that these same
articles noted that the mothers were frightened of caring for the infant and/or were concerned with their competence as a mother. Two of the studies found a correlation between feelings of incompetence as a mother and inconsistent patterns of care for the child (Mac Keith, 1973; Voysey, 1973). In addition the articles offered considerable evidence that the mothers of chronically ill infants suffer from physical exhaustion because of their increased responsibility for providing care and because of the increased amount of care required by the infant.

Several studies and articles evaluate maternal response patterns over a period of months or years. Battle (1974) notes that it seems that as time passed the mothers tended to carry out procedures in a perfunctory manner and became discouraged if the child failed to respond to her actions. Other mothers commented growing feelings of the uselessness of some activities they were to carry out (Warren, 1974). As mentioned earlier Mercer (1974) noted that over a three month period there was a decrease in those care activities which suggested attachment and an increase in those which suggested aversion. An observational study of young cerebral palsied children found a gradual reduction in the amounts of positive and warm feelings by the mothers for their children (Kogan et al., 1974). They concluded that the infant's behavior patterns did little to reward the mother for all her efforts. The mother continued to care for the infant, but did it with less affect and with little sense of enjoyment.
The theme of maternal overprotection of chronically ill infants and young children is found frequently in the literature. The overprotection took the form of instant gratification of needs (McDermott & Okina, 1972; Steinhauer, Mushin & Rae-Grant, 1974; Waechter, 1975), restricted play and social encounters, (Battle, 1975; Kogan & Tyler, 1973; Warren, 1974) overindulgence and permissiveness (Boone & Hartman, 1972; Drotor, 1975; Mattsson, 1972; Richardsen, 1976), and watchfulness (Holaday, 1978; Howell, 1973). However, it was far from clear in these articles and studies what objective criteria the authors used to make their classification of overprotective and what degree of behavior counts as overprotective. There was consensus among the authors that accompanying these generous responses are the deprivations of mother-infant overprotection, the crippling consequences of the loss of autonomy and the loss of the ability to deal with frustration which are unknowingly imposed by the mother.

Although the parent's guilt feelings are usually suggested as the course of overprotectiveness, (Gonzales, 1971; Hewett, 1976; Pozanski, 1973; Waechter, 1975; Young, 1972) another cause needs to be considered. Earlier in this review material was presented which pointed out how certain of the infant's characteristics and behavior patterns set in motion the care activities of the mother. If the infant's behavior can stimulate maternal caretaking, it is possible that the behaviors and appearance of a sick infant could also stimulate maternal overprotective behaviors. The infant's appearance,
the mother's feelings about the ill infant, and her knowledge of the disease are a potent combination of factors to consider when evaluating maternal overprotectiveness. A mother who is caring for a small, listless five month old cyanotic infant may understandably classify the infant as helpless and be overresponsive to its signals. In this case it would be difficult to say this was overprotective care.

These studies and articles were all done within the last nine years and illustrate a major problem in the study of parents and their chronically ill children. Thirty years of this type of research has done little to increase our understanding of precisely how and why things go wrong in the mother-chronically ill child relationship. We still know little of the actual dynamics of maternal reaction patterns to chronic illness. The "acceptance", "overprotective" and "rejection" labels which are subjectively applied are of little help.

The Mother's Emotional Response to Her Chronically Ill Infant

Since one of the aims of this literature review is to increase our understanding of maternal response patterns to her ill infant, a brief discussion of the mother's emotional response to the infant is included. Maternal attitudes, feelings, and beliefs about the sick infant becomes internalized and over time become incorporated into the mother's decision-making structure and play a part in determining the mother's response patterns. These cognitive elements can influence the way the mother interprets the infants smiling
and crying, and the action she will take in response to those signals. The mothers' attitudes and beliefs are communicated in both her deliberate actions and in her comments as well as in her non-verbally communicated unconscious acts.

During pregnancy a woman experiences a series of feelings about the unborn infant. First the cognitive capacities of the human species permit an anticipatory process of developing an image of the hoped for baby, and this recognized as part of the normal preparation process for motherhood (Anthony & Benedek, 1970; Lax, 1972; Solnit & Stark, 1961). Shortly after the mother feels the infant move she begins to have fantasies about what the baby will be like, and begins to attribute some human personality characteristics to the unborn child (Anthony & Benedek, 1970; Bibring, 1961). More and more she thinks about mothering this infant. Many have reached the conclusion that at the time of birth the mother has already established an affectional bond with the infant (Anthony & Benedek, 1970; Klaus & Kennell, 1976; Solnit & Stark, 1961).

When the birth of the chronically ill infant the normal progression of developing a relationship with the newborn infant is dramatically alerted. Confronted with the birth of an infant with a chronic illness instead of a healthy infant the majority of mothers initial response is shock and disbelief (Battle, 1975; Drotar, Baskiewicz, Irvin & Kennell, 1975; Holaday, 1978; Hosey, 1973; Kessler, 1977; Mercer, 1973; Waechter, 1977). The duration of the state of
shock is believed to be brief (Drotar et al., 1975; Mercer, 1973). Accompanying and following the shock and disbelief are feelings of anger, denial, guilt, grief and anxiety (Drotar et al., 1975; Hewett, 1976; Jackson, 1974; McDermott & O'Kina, 1972; Mercer, 1973; Pozanaski, 1973; Steinhauer et al., 1974; Waechter, 1977). Of these behaviors, repeated discussions of maternal guilt and grief are found throughout the literature. The clinicians conclude that many if not all of the mothers experienced some feelings of guilt about the illness of their infants (Rozansky Linde, 1971; Richardson, 1976; Mattsson, 1972; Yancy, 1972; Waechter, 1977; Warren, 1974). As mentioned earlier feelings of guilt might lead to maternal overprotection of the infant.

Many of the researchers report that the birth of a chronically ill infant brings about feelings of grief. The mothers grieve the loss of the expected normal infant (Freud, 1967; Lax, 1972; Kessler, 1977; MacKeith, 1973; Solnit & Stark, 1961; Waechter, 1977). The grieving is viewed as normal and needed for the mourning process and permits a withdrawal of attachment from the lost object. The acknowledgement of the loss allows the mother to form a new bond with the ill infant. There is consensus that when there is persistent unresolved grief feelings about the loss of the expected infant the mother is unable to full reinvest affectionate feelings for the ill infant. The time period needed for the resolution of the loss of the expected child ranged from several weeks to a year or more.
At each level of development the parents may be reminded of the goals they must relinquish, and Olshansky (1962) portrays this reaction to the continued loss as chronic sorrow. The intensity voices from time to time and from situation to situation as the care of a chronically ill child serves as an ongoing reminder of the loss of the normal child (Hosey, 1973; Kolin, Scherzer, New & Garfield, 1971; Mendelson, 1975; Poznanski, 1973; Richardson, 1976). There is consensus that the parents experience this chronic sorrow even though they have accepted the diagnosis, and these authors view it as a natural, normal reaction for the parents.

The usual duration of the stage of emotional disturbance of grief, denial, guilt, anxiety etc. is underdetermined, but may continue for an extensive period of time for some mothers. For many these feelings give way as the mothers move into a stage of developing awareness and adaptation. The actuality and meaning of the loss is realized and the mothers develop more realistic attitudes about the infant (Drotar et al., 1975; Holaday, 1978; Jackson, 1974; Kessler, 1977; McDermott & O'Kina, 1972; Voysey, 1972). This is a time of growth for the mothers as they confront the illness, gather information about the illness, find out what they could do for their infant, and gain confidence in their ability to care for the infant. In the final stage of reorganization the mothers are able to accept and accommodate to the increased needs of the sick infant. They have
recognized the consequences and causation of the illness and are able to accept themselves as mothers of infants with a chronic illness. Some researchers (Drotar et al., 1975 Poznanski, 1973; Rozansky & Linde, 1971; Steinhauer, 1974) believed that the stages of adaptation and reorganization are never completed or are repeated many times as the child matures, and the mother continues to experience disappointment and frustrations related to the child's illness.

The analysis of the psychological aspects of maternal response to an ill infant supports the contention that most mothers experience an emotional upset to the birth of the ill infant which follows a somewhat predictable sequence within an undertermined time span. The difficulty which arises is that the mother must resolve these feelings while they work to establish an affectional mothering role to the ill infant. The literature suggests that the essential threat to the mother-infant relationship stems from the mothers immobility to resolve her feelings about the ill infant which leads to a pattern of mother-infant interaction which is not conducive to the formation of a strong affectional bond. In these articles the infant is viewed as a passive bystander, and his behavioral characteristics are not viewed as playing a major role in the process.

In retrospect, the material presented in the second half of this review of literature suggests that mothers are optimally responsive to infants who respond to them, and respond in a manner they expect. All the infant behaviors discussed earlier are integrated into a complex pattern of
response. The mother speaks playfully and the infant turns, looks at her with wide bright eyes, and as the mother continues to speak the infant smiles, babbles, waves his arms and watches attentively. During this social interaction the mother's smiling, talking, and changing social expressions maintain the infant's attention and level of arousal. From the review of literature it is clear that these positive infant behaviors do affect the mothers current and later response patterns.

The ill infant seems to be as capable as a well infant in monitoring perceptual input and the response to mother's talking may be similar to the one just described. But given some ill infants listlessness the infant could break off the interaction not because he is disinterested, but because he is tired. Regardless of the infants motive the end result is an unpleasurable experience for the mother.

It may also be far more difficult for a mother with an ill infant to determine the infant's optimal range of attention and arousal. Infants with illnesses that do not leave them with a surplus of energy may be difficult to arouse, and once their attention is captured they may lose interest because they have tired. Hyperkintic infants may have a very low level of arousal and may overreact to maternal stimuli, and show negative expressions of affect such as crying. Ill infants are more likely to display irregularity in biological functioning which can cause frequent changes in their arousal thresholds. Such behaviors would disrupt
normal maternal-infant interaction because the mother could no longer predict how her infant would react.

**Summary**

This review examined three important factors which could influence a mother's response pattern to her ill infant, namely: 1) behavioral attributes of the infant which orient him to the mother, elicit care, and social responses from her, 2) from birth on the infant's behaviors are designed to initiate and facilitate an ongoing interactive relationship, and 3) the role of maternal attitudes, feelings and beliefs in determining her response patterns.

The effects of the infant's behavior influence two different aspects of mother-infant interaction. The first concerns maternal caregiving which provides the infant with life support and protection. The mother often interprets a cry, fuss, or startle reaction as a signal that the infant needs care. If the infant is chronically ill such behaviors as abnormal posturing, seizures, listlessness, tremors, coughing or poor color can also be signals that the infant needs attention. These signals are unpleasant to the mother, and at times imply an undesirable outcome if they are ignored. The mother responds to protect the infant, and to provide the care needed to prevent an undesirable outcome. This type of an encounter is usually not a happy one for the mother and frequently is not a rewarding one either. The second aspect of care which the infant's behavior can influence involves
reciprocal social interaction. Both mother and infant act in a manner which causes the other to remain in proximity and maintain their behaviors. Behaviors observed in such an exchange include mutual gazing, smiling, and babbling, and such interactions are usually rewarding for mother and infant.

If the infant is chronically ill there is an increased probability that more interactions described in the first category might be occurring than in the second. The tolerance of the mother to the increased demands shows a great range, but several of the studies reviewed clearly show that maternal tolerance levels had been exceeded. Excessive crying, for example, leads to a breakdown of the caretaking system. The need for the increased caretaking activities could be part of the reason for the decreased amount of social interaction which several of the articles alluded to. A mother who must spend much of her time caring for her infant may not have the time nor the energy to do much with him. The infant's level of arousal and energy level may also be decreased due to the illness. Therefore the infant's response to mother's sensory and tactile stimulation may lack the intensity of that shown by a normal infant and the duration of response may be short which is not rewarding for the mother. The illness may also cause behavior patterns which are difficult for the mother to interpret these may confuse, frustrate and alienate her. Thus the conclusion must be drawn that infant's behavior patterns have saliency
for the mother and that they can elicit and maintain caretaking and interaction processes within which the attachment bond is formed. Atypical infant behavior patterns seem to be capable of altering caretaking and social interaction processes and possibly altering the type of attachment bond that is formed.

The second part of the review of literature discusses the mother's and emotional caretaking response patterns to the chronically ill infant. There are clear indications from the review that the mother's emotional state can influence her response patterns. The mother's sensitivity to her infant's signals and her subsequent response patterns were related to her emotional upset, to her tolerance for such upset, and to her ability to resolve her feelings about the ill infant. If a mother was unable to resolve her feelings about the ill infant and inconsistent pattern of mothering might be expected.

In conclusion, for both well and ill infants the achievement of proximity of infant to mother is the outcome of several of the attachment behaviors reviewed in this chapter. Once in proximity the mother can protect the infant, feed the infant, relieve discomfort, or provide stimulation. Such responses are conducive to the infant's survival and development. The worrisome issue with a chronically ill infant is that this infant may exhibit atypical behavior patterns for the mother to respond to and this may make it difficult to establish a stable reciprocal
relationship. If an unstable pattern is formed the outcome for the type of attachment bond that is established may rest heavily on the mother's motivations for caretaking and other mothering functions. If the infant's signaling ability is impaired there seems to be an even higher risk for abnormal attachment bond, because the mother cannot interpret or mis-interprets these signals. These are speculative conclusions drawn from a literature review. What is needed is systematic observation to examine the mother-ill infant relationship with an emphasis on the role ill infant behavior patterns play in the development of the attachment bond.
Chapter III

METHODOLOGY

The following chapter will describe the overall design of the study and the nature of the sample population. The method of data collection will be explained and the data analysis procedures will be outlined.

Design of the Study

Two major questions guided the conduct of this study, How do mothers respond to the attachment behaviors of their chronically ill infants? Are there patterns of response which distinguish mothers with well infants from mothers with chronically ill infants? The aim of this research was to answer those questions by providing data which described some of the maternal response patterns in mother-chronically ill infant dyads. Although a mother-infant relationship is a two-way behavioral interaction between mother and infant with the behavior of each influencing the behavior of the other, the task of this study was to attempt to describe one part of the interaction in detail. The framework which guided this study was the ethological construct of attachment developed by Bowlby (1969); therefore the ethological method of observation of the species in its natural habitat (Hutt & Hutt, 1970) was chosen as the preferred method of study.

Each mother-infant pair was observed over a three month period beginning when the infant reached four months of age and ending at six months of age. The visitation protocol was the same as that used in the Bell & Ainsworth
study (1972). Over the three month period each mother was visited four times with each visit being three weeks apart. A visit consisted of four hours of baby awake observation: at the end of the period of study a total of sixteen hours of observation was obtained on each mother-infant pair. Continuous notes of all mother-infant behaviors were recorded. On the last visit the mother, and father if possible, was interviewed about current and future child rearing practices.

The Sample

The criteria for participation in this study were that the subjects be white, middle class mother-chronically ill infant pairs in intact families. What was desired was a mother-infant dyad in which the infant was born with a chronic illness which was diagnosed prior to the mother's discharge from the hospital. The infant's chronic illness much not be so severe that the physicians considered the prognosis to be fatal. Any infant whose diagnosis involved the possibility of mental retardation, deafness or blindness was also excluded from the study. The infant must also be discharged from the hospital by age fourteen days. For this study chronic illness was defined as:

All impairments or deviations from normal which have one or more of the following characteristics: are permanent, leave residual disability, are caused by non-reversible pathologic alterations, require special training of the patient for rehabilitation, may be expected to require a long period of supervision, observation or care.


Some examples of illnesses which would fit into this category
are congenital heart disease, cleft lip and palate, and severe club feet.

Three medical institutions—a university medical center, a children's hospital and a military regional medical center—in the San Francisco and East Bay area served as referral sources. These hospitals were visited periodically; and reviewed the Kardex and medical records were reviewed in the search for possible subjects. Once a mother-ill infant pair, who met all the criteria, was located the infant's medical history was reviewed with the pediatrician to validate the expected prognosis.

Since the birth of a chronically ill infant is a traumatic event the parents were not contacted about the study until the infant reached three months of age. Because the pediatrician knew the family he/she made the initial contact with family. The parents were told that a nurse working on her doctorate was conducting a study which involved observation in the home of mothers with ill infants. If the parents were interested I called and set up an appointment to explain the purpose and procedures of the study. A follow-up call was made several days later to obtain the parents decision regarding participation in the study. If both parents agreed to participate the visits began several weeks later when the infant reached four months of age.

A total of six mother-ill infant pairs volunteered to participate in the study. It was difficult to find mother-ill infant pairs who met all the criteria, but finding
mother-ill infant pairs who were willing to participate was even more of a challenge. Out of the fifteen mothers I discussed the study with, eight declined to participate, and one moved away prior to the time of data collection. The reasons for refusal to participate were vague, such as I am just too busy, or I am not interested.

It was interesting to note that of the mothers who declined to participate, six had infants whose illnesses were visibly evident. This raised the issue of stigma and parental embarrassment. Someone from outside the family would now see the infant and would observe how the mother responded to the infant. In addition, the parents knew that as a nurse I would be well informed about the nature of the illness and the type of care needed: this might have disturbed the parents.

The six mother-ill infant pairs were evenly divided into two smaller groups, seriously ill infants and visibly ill infants (See Table 1). Those with serious illnesses were assigned a case number in the 100's and those with visible illnesses were assigned a case number in the 200's. Unfortunately there was some overlapping of characteristics between the two groups. The infant with cystic fibrosis looked ill, had noisy respirations and a rapid respiratory rate. Exstrophy of bladder is both a serious and a visible illness.

Table 1 presents additional characteristics of the infant subjects. Note that male and female and first and
later born infants are evenly represented. The varied hospital course of each infant is summarized as are the home medical treatments the parents must carry out. A careful review of Table 1 reveals that all of the infants with a serious illness also suffered from other illnesses. The infant with tetrology of Fallot was ill every time I visited with ear infections, eye infections or upper respiratory infections. The infant with cystic fibrosis was also ill with upper respiratory infections on two of the four visits. The infant with extrophy of the bladder developed a serious formula allergy and it took four months to find a formula she could tolerate. During this time she experienced marked gastrointestinal upset and suffered from frequent bouts of diarrhea which left her buttocks raw and tender.

Table 2 presents demographic and other descriptive characteristics of the parents in the sample. All the mothers who volunteered to participate in this study were white, middle class, had at least a high school education and had been employed prior to the birth of their first child. A later finding also revealed that all of these mothers except one had worked in hospitals or other medical facilities. One mother (214) had been a candystriper and another (115) a volunteer aide in a rest home and the other three were employed as a nurse, practical nurse and dental hygenist. None of the mothers had worked with sick infants. However, this medical background might explain part of their willingness to participate in this study. They felt at ease
<table>
<thead>
<tr>
<th>Case #</th>
<th>Diagnosis</th>
<th>Hospital Course</th>
<th>Medical Treatments</th>
<th>Ordinal Position</th>
<th>Type of Feeding</th>
<th>Later Surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td>110</td>
<td>Tetralogy of Fallot</td>
<td>to ICN, OR Home day 9</td>
<td>Oral Medications Frequent URI</td>
<td>1st born Male</td>
<td>Bottle</td>
<td>Yes</td>
</tr>
<tr>
<td>115</td>
<td>Cystic Fibrous</td>
<td>Home with mother</td>
<td>Chest PT Suction Oral Medications Special Diet Frequent URI</td>
<td>Later born Female</td>
<td>Bottle</td>
<td>No</td>
</tr>
<tr>
<td>118</td>
<td>Exstrophy of the Bladder</td>
<td>to ICN Home with Mother</td>
<td>Oral Medications Dressing Changes Special Diet Formula Allergy</td>
<td>Later born Female</td>
<td>Bottle</td>
<td>Yes</td>
</tr>
<tr>
<td>214</td>
<td>Imperforate Anus, Abnormal foreskin on penis</td>
<td>OR, Home with mother day 4</td>
<td>Dilate anal sphincter</td>
<td>1st born Male</td>
<td>Breast</td>
<td>Yes</td>
</tr>
<tr>
<td>213</td>
<td>Bilateral Club Feet, Severe on the left</td>
<td>Home with Mother</td>
<td>Cast Care</td>
<td>Later born Male</td>
<td>Bottle</td>
<td>Yes</td>
</tr>
<tr>
<td>216</td>
<td>Partial Cleft of the Sternum</td>
<td>to ICN, OR Home day 6</td>
<td>None</td>
<td>1st born Female</td>
<td>Breast</td>
<td>Possibly</td>
</tr>
</tbody>
</table>

Key -
to ICN - Infant transferred to an Intensive care nursery
OR - Surgery required shortly after birth
URI - Upper respiratory infection
PT - Physical therapy
### Table 2 Profile of Mothers in Sample

<table>
<thead>
<tr>
<th>Case #</th>
<th>Parent's Age</th>
<th>Occupation</th>
<th>Religion</th>
<th>Dwelling</th>
<th>Mother Returned to work by 1 year</th>
</tr>
</thead>
<tbody>
<tr>
<td>110</td>
<td>M25 13, F25 12</td>
<td>M-Licensed Practical Nurse</td>
<td>Protestant</td>
<td>Own Home</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F-Grinder</td>
<td>Very Active</td>
<td></td>
<td></td>
</tr>
<tr>
<td>115</td>
<td>M22 12, F28 15.5</td>
<td>M-Housewife, F-Self Employed</td>
<td>Catholic</td>
<td>Own Home</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Part owner small business)</td>
<td>Inactive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>118</td>
<td>M32 15, F34 19</td>
<td>M-Registered Nurse, F-Lawyer</td>
<td>Protestant</td>
<td>Own Home</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Active</td>
<td></td>
<td></td>
</tr>
<tr>
<td>214</td>
<td>M22 13, F21 12</td>
<td>M-Housewife, F-Missle Repairman</td>
<td>Protestant</td>
<td>Rent Apt.</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Inactive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>213</td>
<td>M28 12, F52 12</td>
<td>M-Business Office Manager, F-Warehouseman</td>
<td>Protestant</td>
<td>Rent Home</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Inactive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>216</td>
<td>M21 14, F31 15</td>
<td>M-Dental Hygenist, F-Postal Supervisor</td>
<td>Protestant</td>
<td>Own Home</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Inactive</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
with medical personnel and might have had some knowledge about their infant's illness.

The comparison sample for this study consisted of twenty-six white, middle class mother-healthy infant pairs in stable intact families. This sample was obtained from the published (Bell and Ainsworth, 1972) and unpublished (personal communication) research of Dr. Mary Ainsworth. These mother-infant pairs were contacted through pediatricians in private practice, and these mothers also volunteered to participate in the study. Sixteen of the babies were boys; ten were girls. Six were first born; twenty were not. None of these infant subjects had a chronic illness.

To summarize: the present sample controls well for race, social class, sex ordinal position of infant, and number of infants in each diagnostic group. The problems result from the overlapping of the visible aspects of some of the serious illness and the varied hospital experiences of both the infants and the mothers.

Data Collection Instrument

The method chosen to measure both the independent variable of infant crying and the dependent variable of maternal response was naturalistic observation in the species natural habitat—the home. Just as the infant's cry is a naturally occurring event, so is the mother's response. Both events are readily observable in an experimental situation. Continuous notes, a running account, was made of all infant behaviors, maternal reactions and comments, and mother-infant
interaction. These notes were transcribed into a typed narrative record of infant and maternal behaviors and mother-infant interaction and were used as the raw data for this study.

The research questions which guided this study were asked in such a fashion that the most logical method to answer them was to observe mother-infant interaction in the home. This was done because there have been very few studies which observed mothers and ill infants in their natural environment. Thus material which would explain the why and the how of what mothers and ill infants do is absent and as a result we know little about the causal organization of behavior and of interactions between mothers and their ill infants. I hope this study will begin to provide some of the descriptive information which is needed about mothers and ill infants.

The approach to direct observation used in this study came from ethology. Ethology is characterized by a method of direct observation, and a particular approach to the research problem. The ethological approach is concerned with causation, development, survival value and ontogeny of the species under study. In this study interest was on observing and describing the behavior of mothers and their chronically ill infants. This situation may show us what effects the performance of certain maternal behaviors have upon the infant's physiologic condition and upon his later learning and personality development. It may also show us what effects an ill infant has on the performance of some maternal behavioral
patterns. Sufficient amounts of this type of descriptive information can also show us the survival value for the infant of certain aspects of maternal response patterns.

The running account is widely accepted by ethologists and is considered the basic tool of the observational method. It provides a detailed, sequential, narrative account of the behavior between mother and ill infant. This account was handwritten in a special short hand code which permitted the detailed account of the behavior. (For a sample narrative report of an observation see Appendix A.)

Who, what, where, when and how guided the observation as through the medium of words I attempted to represent, to reproduce mother-ill infant interactions. I held strictly to these guides and what was produced in the end was a somewhat overblown passage from a naturalistic novel which was theoretically neutral in character.

Two additional aspects of observational studies need to be discussed. First, when a running account is used some inferences about the attitudes, motives and intentions of the human subjects observed must be made if the data is to be useful. As Wright (1966, p. 40) stated:

A motion picture can show John throwing a ball to Jim. But it cannot show whether John is trying to hurt Jim or engage him in a game of catch...Only observation involving implicit or explicit inference can enable one to say what John is really doing.

Second, descriptive labels must be used. No infant just cries. He cries loudly, angrily or softly and the mother responded hurriedly, awkwardly or tenderly. The "how" of the
behavior permits inferences about the subjects feelings and motivations.

There are at least three imperfections in the running account technique which can affect the quality of the record. First, there is the speed of the interactions. There are occasions when the recording lags behind the action. Second, there is the consistency of the record. Even with extensive training you cannot ensure that all items are recorded with equal reliability. The observer's awareness of items may vary from day to day, or there may be "blind-spot" items which are consistently unrecorded.

Reliability and Validity of the Running Account

Reliability

The first and most important aspect of collecting useful information is having a reliable measurement. Any effort to measure a naturally occurring event is to some degree subject to error. Therefore, it behooves the experimenter to examine closely the reliability problems that may be related to the method of data collection and to control them.

There were two major reliability problems associated with the ethological observational method of data collection; both are related to the accuracy of the measures obtained. The first problem is related to the presence of an observer and her impact on the subject's behavior. Second, there are the problems related to the accurate recording of the observed behavior.

The first reliability problem dealt with the accuracy
of the behaviors sampled. Were the behavioral response patterns obtained during the observations a true measure of the mother's response patterns? Obviously the introduction of one or two observers into the home must affect the mother's response to some extent and is likely to produce some change in the mother-infant interaction. This change in "normal" behaviors was recognized by researchers (Ainsworth, 1972a; Caldwell, 1969; Croates et al., 1972; Moss, 1965), but the exact degree to which it affects the data is not known. The goal of researchers who use the ethological observational method is to minimize the impact of their presence as much as possible.

Following the guidelines of other researchers (Baumrind, 1967; Lytton, 1973; Moss, 1965), I took steps to lessen the impact of my presence. The purpose of the study was explained to the mother as a study of chronically ill infants and what their usual day was like. This was done to under-emphasize the role of the mother and to suggest that the main source of interest was the infant. Based on the results of my pilot study I also found it wise not to give the mother any medical or child rearing advice. This way I was not viewed as an expert coming into the home to give advice. Any feelings of nervousness or embarrassment the mother might experience was acknowledged and discussed before the study began. Bell and Ainsworth (1972) and my pilot study found that in order to sustain rapport with the mothers during the long period of study, a semi-participant role must be assumed.
During the infant's naps and after the visit the mother and I frequently talked over a cup of tea. To involve the mothers even more in the study they were promised feedback of the results.

My experiences visiting in the homes did not give me the impression that the mothers were making an extra effort to be a "good" parent. I visited four times over a three month period and was sometimes in the home for as long as eight hours to obtain four hours of baby awake observation. There was a pattern of consistency in the mother's response. One mother who became upset whenever the infant cried continued to do so throughout the visits. Mothers who tended to keep their infants close by followed this same pattern over the three month period. During the visits, infant's cries and other signals were ignored, and on a bad day when the mothers became exasperated they would verbalize their feelings about the ill infant. Siblings were also spanked in my presence. I do feel that some of the play periods may have been staged and/or extended for my benefit.

The infant's and sibling's behavior were almost unaffected by my presence. Infant babbling, crying, smiling and other naturally occurring events probably occurred at their usual rate and thus brought about at least a similar frequency of maternal response behaviors. But more importantly the mother had little control over the infant's behavior. I believe this factor made the observational method of data collection as dependable as the use of interviews and questionnaires. In interviews and questionnaires the mother's
description of her response patterns is under her control, and the researcher must depend on the mother for an accurate description of her behavior as well as the infants. It seemed likely that during an observation the infant's uncontrolled behavior was more apt to produce an accurate picture of maternal response patterns.

The second reliability problem was related to the accurate recording of observed events. Experimenter bias, "blind-spot" items and poor description can all decrease the accuracy of the running account. To combat these problems extensive pre-study training in the observational technique was undertaken, and repeated inter-observer reliability checks were done during the study.

My training consisted of 3 months of close supervision by an experienced observational researcher as I learned the technique. In addition three months were spent observing mothers and infants before the formal study began.

In this study reliability was checked by a schedule of joint visitations as suggested by Patterson et al., (1970) and Lytton (1971). The personnel used to check inter-observer reliability in this study were both graduate students in nursing who were familiar with the observational method of data collection. Both students identified pediatrics as their speciality area and both had done some work with chronically ill infants and their mothers. Since both were graduate students the training period was brief. A total of four visits were made with two observers present.

Three categories of behavior were used in analyzing
interobserver reliability. These categories were action, affect and verbal remarks. Action is defined as the act or process of doing something, such as to walk, jump, fall or talk. In this study affect refers to the "how" of the action and is usually conveyed by an adverb. It represents feeling or emotion as demonstrated in physical acts such as walking awkwardly or quickly, and in social acts such as talking loudly or angrily. Verbal remarks include only those words spoken by the mother. For example, rater A might record the following events: the mother walked slowly into the room. Rater B might describe the same event as: the mother walked quickly into the room. In analyzing inter-observer agreement the situation would be recorded as:

<table>
<thead>
<tr>
<th>Action Category</th>
<th>Affect Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rater A</td>
<td>mother walked</td>
</tr>
<tr>
<td>Rater B</td>
<td>mother walked $A$</td>
</tr>
</tbody>
</table>

$A$ $D$ $X$

The inter-observer reliabilities were analyzed using a method developed by Caldwell (1969). When both observers recorded the same behavior the same way, it was marked 'A' (agreement); when they recorded the same behavior differently, it was marked 'D' (disagreement); when one observer recorded an action and the other observer did not record it, it was marked 'X'. Agreement was worked out by the formula:

$$\frac{A}{A + D + \frac{1}{2}(X)} = \% \text{ of agreement}$$

(The X's from both observers are added together.) A second formula:
\[
\frac{A}{A + D} = \% \text{ of agreement}
\]

was also used to measure the extent of agreement on the recording of behavior which we both noted and recorded. Each category of behavior was analyzed using this method so three different reliability scores were obtained from each formula. A score combining all categories was also done.

In this study inter-observer reliabilities were compared by having two observers observe the same interactions, type up their reports, and then both observations were coded by a third person. The reliability was worked out from the formulas listed above. Table 3 gives the results of the reliability checks for the three areas: verbal, action and affect:

<table>
<thead>
<tr>
<th>Category</th>
<th>( \frac{A}{A + D + 1/2} (X) )</th>
<th>( \frac{A}{A + D} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal</td>
<td>88%</td>
<td>95%</td>
</tr>
<tr>
<td>Action</td>
<td>74%</td>
<td>89%</td>
</tr>
<tr>
<td>Affect</td>
<td>52%</td>
<td>81%</td>
</tr>
<tr>
<td>All Categories</td>
<td>71%</td>
<td>88%</td>
</tr>
</tbody>
</table>

It is clear that there exists far greater agreement when the only items considered are those both observers recorded. The low scores in the first column are probably due to the short training and practice sessions given to the observers who made the visits with me. I suspect this made it difficult for them to determine what behaviors to concen-
trate their attention on. The checkers also lacked my speed of recording and thereby lost the ongoing interaction and the stream of mutual contingencies between mother and infant. Therefore the expected happened. I recorded a number of behaviors the checkers missed, especially in the affect category. The checkers concentrated their attention on the mother's verbal comments and mother-infant action. The inter-observer reliabilities in the first column can only be classified as fair. The inter-observer reliabilities in the second column can be classified as good to excellent, and are comparable with those obtained in a similar situation with a similar code (Caldwell, 1969).

Validity

The validity of observational research is complex. Several issues of validity related to the behaviors measured and the measuring instrument, will be discussed. Two questions are addressed: (1) Are the behaviors sampled representative of the usual behavior of the subjects? (2) Does the instrument measure maternal response patterns to infant attachment behaviors?

The participants in this study knew that they were serving as subjects and the act of observation could produce changes in the mother's behavior patterns. Such reactions can render the obtained results unrepresentative of the natural situation. In addition the mother's response patterns might show a desire to please me or to gain my approval of her actions. Either of these occurrences can limit the generalizability of this research.
In this study, as discussed earlier, several actions were taken to reduce the impact of my presence. It was implied that the ill infant was the main source of interest, and I refrained from praising maternal action and from giving advice related to child care. The study was also conducted over a three month period which gave the mothers the opportunity to get to know me which may have reduced some of their anxiousness. The sixteen hours of observation also obtained an adequate sample of the mothers and the infants behavior.

Observational field studies tend to show low internal validity and high external validity. In this study to attempt to correct this imbalance some researcher selected controls were imposed in selecting the sample. The selection of white, middle class, stable intact families, the categorization of types of illness, and the selection of an equal number of male and female and first and later born infants lessened the number of plausible alternative hypotheses.

Another test of validity relevant to this study is that of construct validity which examined the extent to which a measure enters into a consistent relationship with expectations from theory. The variables measured in this study were derived from the theoretical framework. In this context behavior frequency counts, as indices of the attachment construct, can be used to demonstrate a relationship to the theory. In this respect the Ainsworth study (1972) demonstrates good construct validity, as did this study.

According to Bowlby (1969) crying is the earliest of a repertoire of proximity promoting behaviors. In the
Ainsworth studies (1972a and b) crying not only brought the mother into proximity but into contact as well. The pattern of infant crying throughout the first year of life also followed the four phases in the development of attachment hypothesized by Bowlby (1969). During the first three months of life the babies cried more frequently when the mother was out of visual, auditory and physical contact. By the end of the fourth quarter, a change had occurred. Crying occurred more frequently when the infant was in proximity to mother. Crying had become focused on a specific figure and was "goal-corrected". The study's results were in line with what the theory predicted would occur. Some of the infant's cried more than others, but the result was the same--mother moved into proximity of the infant.

Ainsworth's (1963) study of mother-infant interaction among the Ganda demonstrates that qualitative differences in the way attachment behaviors are organized, but that the resulting affective bond is stable. This early study showed it was not the particular behaviors that were stable across the period of study, but the category that showed stability. Infants who were securely attached might greet mother with a smile, vocalizations, or by approaching and touching. All of these behaviors are different yet all are positive signs of greeting mother on her return. They are adaptational patterns and all reflect a stable affectional bond.

This study provided additional support for the concept of qualitative differences in types of attachment behaviors
from the infant and subsequent maternal responses. There were no infants in the study who did not cry, but two of the infants were far more likely to fuss than cry. For these two seriously ill infants it was an adaptive response for the fuss requires less energy than the cry. The mother's usual response to the cry was to move into proximity or close proximity to the infant, but once in proximity each mother's behavior was qualitatively different. One mother might pick her baby up straightaway, another might offer a pacifier, and another might play with the infant. Thus, the functional response of proximity in response to a fuss or cry posited by attachment theory (Bowlby, 1969) occurred with the expected qualitative differences which make each mother-infant bond unique.

In summary, the review of attachment had an ethological base and described attachment as an active manner of relating to a specific figure rather than as a static trait. Individual differences in attachment and attachment behaviors are viewed in terms of "qualitative differences in the way attachment behaviors are organized rather than as differences in the strength of some generalized drive or trait." (Ainsworth, 1973, p. 24). Therefore, the validity of the attachment construct does not require high positive intercorrelations between behaviors which are considered to be indices of attachment (Ainsworth, 1973; Stoufee & Waters, 1977). As Ainsworth (1973, p. 124) stated "different patterns of correlations might well be grounds for distinguishing qualitative
differences in the organization of the attachment relationship."
What was necessary, and did occur in this study as well as in the Ainsworth study, was that the different attachment behaviors converged on the predicted outcome of attachment.

**Data Collection Procedures**

The six mother chronically-ill infant pairs were observed in their homes over a three month period beginning the week the infant turned four months of age. Each pair was then visited every three weeks until the infant reached six months of age. The visit consisted of four hours of baby awake observation, and the four visits yielded a total of sixteen hours of observation on each mother-infant pair. This was a replication of the visitation schedule of the Bell-Ainsworth study (1972).

The observations usually began in the morning at a time prearranged with the mother. She was instructed to proceed with her usual routines. I followed the pair from place to place, and usually observed from a distance of two to four feet. My goal was to be as inconspicuous as possible. If the mother left the infant, half the time I remained with the infant and half the time I joined the mother. This was done to make sure I was not being used to keep an eye on the ill infant.

Continuous notes of all ongoing infant behavior, maternal reaction and comments, and mother-infant interaction were taken on a steno pad. Prior to the study a descriptive catalog of behaviors of the mother and the infant was
developed to make the recordings as accurate as possible and to increase the speed of recording. The catalog of behavior elements provided a guide to what was observed as well as a code for recording. For example, the action of a mother looking at her baby would be recorded as MLAB. It meant the mother moved her head into a position where she could look at the baby for five seconds or longer. In addition, a watch with a second hand was used to note the length of time an infant cried, the length of time before the mother responded, and the length of time the baby was held.

The running account provided a record of behavior episodes, but some method was needed to break up the stream of behavior for analysis. To remain consistent with the Ainsworth design mother-infant behaviors were recorded in five minute blocks. This approach allowed me to note how episodes of behavior were related interpositionally, where overlaps occurred, or to note the length of an entire episode such as a bath or feeding. At the end of fifteen minutes of observation I took a five minute break, and also made a brief summary of any impressions I had about the interaction. The coded notes were transcribed into a typed narrative record as soon as possible, and were used as the raw data for the study. A sample of a narrative record can be found in Appendix A.

Several infant and maternal behaviors were of more interest than others because they would be used in the analysis of data. The specific definitions of these behaviors are listed below:
Infant Behaviors

1. Cry - intense continuous, negative vocalization—usually loud, prolonged, and tearful. It involves reddening and contorting of the face.

2. Fuss - a negative vocalization which is not as loud nor as intense as a cry. It involves less facial contortion; the face rarely becomes red.

3. Smile - an upward and outward movement of the corners of the mouth. It includes all smiles (simple, broad, laugh, and playface).

4. Look at - the infant gazes directly at a person or object and may visually follow its movements. The gaze lasts at least five seconds.

5. Vocalization - with the exception of crying and fussing any sounds the infant makes. This includes babbling, grunting, cooing and sighing.

Maternal Behaviors

1. Proximity - the infant can see and/or hear mother and perhaps also touch her and be touched by her.

2. No proximity - the infant can not see or hear mother.

3. Close proximity - the baby is in close physical contact with the mother, usually being held.

4. Pick-up - any situation in which the baby is lifted or taken up by an adult, who then proceeds to support his weight, however briefly.

5. Hold - an adult supports the child's weight entirely in her lap or arms for at least five seconds.

6. Feed - this includes all types of feeding—breast, bottle and solid foods and all attempts to feed.

7. Vocalization - maternal speech or sounds directed towards the infant.

8. Touch - touching the infant for any purpose other than to stimulate or burp.

9. Smile - an upward and outward movement of the corners of the mouth. This includes all smiles (simple, broad and laugh) directed at the infant.
10. Remove noxious stimuli - mother removes anything she believes is disturbing the baby. This includes everything from changing a wet diaper, stopping a treatment, or removing a toy.

11. Look at - to look directly at the eyes or face of the infant. This may occur with or without play or vocalization from the mother. It lasts five seconds or longer.

12. Enter room - the mother enters the room in response to an infant's signal. She may talk to him from a distance, but does not approach him.

13. Play with infant - the mother may use play material, talk playfully, or touch or pat in playful stimulation.

14. Routines - activities such as feeding, bathing and changing the baby.

15. Interaction - approaching a baby, and perhaps coming very close to him, talking, smiling to him, but not touching him.

At the completion of the observations a semi-structured interview was conducted with both parents whenever possible. The questions were directed towards the parent's belief about child rearing, their current and projected future practices, their reaction to the birth of the ill infant and their later coping strategies. (Refer to Appendix B for a complete list of the interview questions.) The interview was conducted to gain additional insight about how the mother perceived the baby. Did she view the infant as easy or difficult to care for, did he need special care or would she delay some task such as toilet training because the infant was ill? Was the mother's perception of the illness the same as the physician? Was what the mother said consistent with what she did? This interview data will be used in a qualitative analysis only.
In summary, with the exception of the interview, the data collection procedure was the same as that used in the Bell and Ainsworth study (1972). In addition, I was trained as an observer by a former graduate student of Dr. Ainsworth. This training permitted the close replication of Dr. Ainsworth's study and a qualitative comparison of Dr. Ainsworth's sample of mothers with well infants to my sample of mothers with ill infants.

Data Analysis Procedures

After the data were collected the information had to be broken down into a simpler form through coding to categorize the behaviors. One category of behavior, that of infant crying, was predetermined to allow a comparison of the results of this study with those of the Bell and Ainsworth (1972) study. Description of this category is as follows:

Infant Crying and Maternal Response
A. Coding Information

The critical event to be coded from the narrative reports of observation is each instance of infant crying and maternal response. A cry refers to any instance of a vocal distress signal, whether protest, fuss or full blown cry. A new episode is considered to have started when there is more than a momentary pause separating two instances of crying (Bell and Ainsworth, 1972, p. 1174).

The system of coding was developed by Dr. Ainsworth and her associates (unpublished report). Coding information and descriptions of the measures derived from them are described in Appendix C. The material presented was taken directly from manuscripts sent to me from Dr. Ainsworth. Reliability checks of the coding were done by a second coder who did not
know any of the hypotheses.

The goal of this study was to generate a detailed description of ill infant crying and the subsequent maternal response, and to compare these response patterns to mothers with well infants. Therefore, except where noted, the data analysis procedures are identical to those of the Bell and Ainsworth study (1972).

From the analysis of the codings of crying, two aspects of crying were used in the analysis: the frequency of crying expressed as the number of cries per hour, and the duration of crying as measured in minutes per hour. The frequency measure included all cries and fusses. The duration measure included all cries except those of extremely brief duration.

The measures of maternal responsiveness to crying included: the number of cries which a mother ignored, the length of time before the mother responded to the infant's cry, the types of maternal intervention, and the interventions which successfully terminated a cry.

The analysis also dealt with the relationship between ill infant crying and maternal responsiveness. T-tests on group means, Pearson correlation coefficients and Rho correlation coefficients were used to evaluate the characteristics of maternal response and patterns of infant crying. In addition, multiple regression was used to perform a critical path analysis to describe the relationship of the independent variables on the dependent variable maternal response. All
statistical analysis were done using the Statistical Package for the Social Services (SPSS).

The comparison of maternal and infant behaviors in the same quarter brought up the problem of confounding of measures. When correlating the frequency of infant crying with maternal ignoring of crying within the same quarter it was necessary to correct the infant crying. The corrected measure excluded episodes that the mother ignored. Also when correlating the duration of infant crying with the duration of maternal unresponsiveness within the same quarter, confounding was avoided by using as the measure of duration of infant crying the duration of the cry minus the period during which the mother was unresponsive to it.

Summary

This chapter has explained the study's design procedure and instruments used to collect the data. Data analyses procedures were also outlined. The design, data collection procedures and the data analysis procedures are the same as those of the Bell and Ainsworth (1972) study. This was done to permit the qualitative comparison of data between the two samples.
Chapter IV

RESULTS

Organization of Chapter

The results of this study will be presented in five sections. In the first section the coding reliability of the data is discussed. The second section involves a description of patterns of infant crying, and the third, patterns of maternal responsiveness. In the fourth section the relationship of infant crying to maternal responsiveness is presented. In sections two, three and four group differences due to sex, ordinal position and type of illness are also presented. The final section reports the interview data.

Coding Reliability

Coding reliability was examined by tabulating the coding decisions for two coders (working independently) into arrays of the form shown in Figure 1. (For coding information see Appendix I). For each code the $N$ action units coded by both coders were assigned to the cells of such a matrix and the cell frequencies $f_{ij}$ and marginals $A_i$ and $B_j$ were computed as indicated in Figure 1.
Two types of reliability indices can be constructed from the coding reliability matrix: marginals reliability which depends solely on the marginal frequencies; unit by unit reliability which is computed from the cell frequencies $f_{ij}$ as well as (in some cases) the cell frequencies. A unit by unit check will reveal how many units were coded into each category by both coders and will be used to discuss reliability coding in this section.

The reliability index used in this study is simply the percentage of agreement, the sum of the diagonal elements $f_{ii}$ of the array of Figure 1, divided by the total number of units $N$, expressed as a percentage.

Reliability results—Reliability data for the codes of this study are summarized in Table 4. These data were obtained on two mother infant pairs randomly selected from the sample and coded independently by two coders. All crying
episodes were coded. In Table 4 codes are organized by coding scheme (see Appendix C); percentage agreements are shown for each segment coded, the range of this index across reliability cases is indicated, and an overall percentage agreement (across all segments) is given.

### Table 4 Results of Coding Reliability Study

<table>
<thead>
<tr>
<th>Code</th>
<th>N</th>
<th>Average Reliability (Percent Agreement)</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proximity</td>
<td>93</td>
<td>90% - 96%</td>
<td></td>
</tr>
<tr>
<td>Routine</td>
<td>91</td>
<td>90% - 92%</td>
<td></td>
</tr>
<tr>
<td>Ongoing Activity</td>
<td>84</td>
<td>81% - 87%</td>
<td></td>
</tr>
<tr>
<td>Type of Cry</td>
<td>95</td>
<td>94% - 98%</td>
<td></td>
</tr>
<tr>
<td>Maternal Response</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Unsuccessful)</td>
<td>73</td>
<td>71% - 75%</td>
<td></td>
</tr>
<tr>
<td>Maternal Response</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Successful)</td>
<td>75</td>
<td>71% - 78%</td>
<td></td>
</tr>
<tr>
<td>All Segments</td>
<td>85</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The maternal response coding was the least reliable in this study as illustrated by the lower scores in these categories. These two categories were also the most difficult to evaluate because, from the running account the coder had to determine if a maternal response was successful or not, and which response or combination of responses was or was not successful in quieting the infant. The lack of reliability may in part be due to the brief training period the second coder received. The lack of precise recording of the sequence of events may also have played a part in the lack of agreement
between the coders. The reliability coding scores for these maternal response segments can only be classified as fair.

The evaluation of the other segments was easier and was reflected in the higher percentage of agreement. The reliability scores of these segments ranged from good to excellent, and the overall reliability of the coding of all segments was good.

Patterns of Infant Crying

This section presents the similarities and differences in the patterns of infant crying both within the chronically ill group and between the well infants in the Bell and Ainsworth (1972) study. From this point forward all references to well infants and their mothers will be to the Bell and Ainsworth study. Figure 2 shows the duration of infant crying for both groups.

**Figure 2** Duration of Infant Crying in the Second Quarter of life

--- Range

2.8 Median

<table>
<thead>
<tr>
<th>Minutes per Hour</th>
<th>Infants Between Groups</th>
<th>Male</th>
<th>Female</th>
<th>Born</th>
<th>Born</th>
<th>Illness Between</th>
<th>Illness Within Ill Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>2.8</td>
<td>2.8</td>
<td>3.0</td>
<td>3.0</td>
<td>2.5</td>
<td>2.5</td>
</tr>
<tr>
<td></td>
<td>First</td>
<td>Later</td>
<td>Serious</td>
<td>Visible</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Infants</td>
<td>Male</td>
<td>Female</td>
<td>Born</td>
<td>Born</td>
<td>Illness Between</td>
<td>Illness Within Ill Group</td>
</tr>
</tbody>
</table>
There was some differences between the median duration of crying in minutes per hour between the two groups, with the ill group crying 2.8 minutes per hour and the well group 3.9 minutes. Not enough data was received from Dr. Ainsworth so the degree of significant difference between the two medians could not be tested. However, large differences in the ranges were evidenced. The well infant's crying extended to seventeen minutes per hour while the ill infants just reached ten minutes per hour. It seems that mothers with ill infants will not permit them to cry for extended periods of time. Within the ill group there was no difference in duration of crying due to sex, ordinal position or type of illness.

Episodes of crying in this study occurred at a median frequency of four per hour as compared to 3.6 cries per hour in the Ainsworth study (see Table 5). The fact that this study included cries where an infant was protesting a medical procedure may account for some of this increase, but given the infrequency with which medical procedures occurred during the visits I doubt it accounts for all of it. Therefore, a general conclusion was drawn that there was a tendency for ill infants to cry more frequently than well infants. A within group analysis of episodes of frequency of crying per hour showed there was support for this conclusion, and that there was individual variability among the infants in frequency of crying (see Table 5). Of these subjects it was clearly evident that degree of illness accounted for part of the increase of the frequency of crying.
Table 5 Median Frequency of Cries per Hour

<table>
<thead>
<tr>
<th>Subject Category</th>
<th>Cries per Hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serious Illness</td>
<td>4.7</td>
</tr>
<tr>
<td>Visible Illness</td>
<td>3.3</td>
</tr>
<tr>
<td>Males</td>
<td>3.7</td>
</tr>
<tr>
<td>Females</td>
<td>4.3</td>
</tr>
<tr>
<td>First Borns</td>
<td>3.6</td>
</tr>
<tr>
<td>Later Borns</td>
<td>4.4</td>
</tr>
</tbody>
</table>

Type of illness, sex and ordinal position were evaluated to determine if they affected the amount of crying, either directly or through influencing maternal behavior. Using the rank-order coefficient of correlation no significant difference was found between type of illness, sex ordinal position and frequency of crying. All that can be said was that there was a tendency for seriously ill infants to cry more frequently. It is not clear, at this point, whether the increase was due to the fact that these infants did not feel well, or due to the fact that seriously ill infants required more medical treatments. The fact that two of the seriously ill infants are later born females may have accounted for the tendency for females and later borns to cry more frequently.

The between infant crying patterns and maternal proximity was also observed and analyzed. Table 6 presents the percentage of total infant cries emitted in no proximity, proximity and close proximity to the mother. Eighty-four
percent of all infant cries were emitted in proximity or close proximity to the mother. Thus, it is quite evident that mothers with ill infants spend a great deal of time in proximity to them. These findings are directly opposite of those of the Ainsworth study where only thirty-six percent of the cries took place in proximity to the mother (first quarter data).

Table 6 Crosstabulation of Type of Cry by Maternal Proximity

<table>
<thead>
<tr>
<th></th>
<th>No Prox</th>
<th>Prox</th>
<th>Close Prox</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prox</td>
<td>14</td>
<td>91</td>
<td>63</td>
</tr>
<tr>
<td>Fuss</td>
<td>8.4</td>
<td>53.6</td>
<td>37.4</td>
</tr>
<tr>
<td></td>
<td>168</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuss to Cry</td>
<td>22.2</td>
<td>42</td>
<td>58.3</td>
</tr>
<tr>
<td></td>
<td>43.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cry</td>
<td>3.6</td>
<td>23.5</td>
<td>16.2</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuss to Cry</td>
<td>26.5</td>
<td>52.9</td>
<td>20.6</td>
</tr>
<tr>
<td></td>
<td>68</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cry</td>
<td>28.6</td>
<td>16.5</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>17.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuss to Cry</td>
<td>4.6</td>
<td>9.2</td>
<td>3.6</td>
</tr>
<tr>
<td></td>
<td>3.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cry</td>
<td>31</td>
<td>90</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>152</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuss to Cry</td>
<td>20.7</td>
<td>58.7</td>
<td>20.7</td>
</tr>
<tr>
<td></td>
<td>39.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cry</td>
<td>49.2</td>
<td>41.4</td>
<td>28.7</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuss to Cry</td>
<td>8.0</td>
<td>23.3</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>100.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Indirectly these findings reflect what was quite evident during the observations. Mothers with chronically ill infants kept them in proximity or in close proximity most of the time. It was quite rare for a mother with an ill infant to leave the infant in a playpen and go off to work in another part of the house. These mothers devised various strategies to keep the
infants close by as they worked. The most common approach was to move the infant with them from room to room as they worked. Another frequently used strategy was to arrange it so that as much as possible household chores were brought to the infant's location. One mother performed tasks such as sorting the laundry or folding clothes seated on the sofa with the infant tucked between her legs. Another placed the baby in her infant seat and placed her nearby on the counter. Only one mother consistently left the infant in one room while she worked in another.

The breakdown of the crying behavior in the sample by type of illness, sex, and ordinal position reflected the same pattern as the overall sample. The only important discovery was that two of the seriously ill infants were more likely to fuss than to cry which was, for them, an adaptive energy saving response.

The findings related to infant crying and maternal proximity raised the question of why the infant was crying. Perhaps the high number of cries in proximity or close proximity occurred because the mother was carrying out unpleasant medical routines. Therefore, an evaluation of infant crying and maternal activity at the onset of the infant's cry was done. Maternal activity was placed into two categories: (1) the mother was engaged in a routine activity such as a diaper change or a medical treatment, or (2) the mother was engaged in nonroutine activities such as housework or playing with the infant. Nonroutine measures usually meant the mother
was attending to household chores, and although in the infant's sight was not interacting with him. Infant cries associated with hunger were excluded from this evaluation.

The results are presented in Table 7. The onset of the majority of infant cries occurred during nonroutine maternal activities. Only seriously ill and male infants showed a tendency to cry more during routine maternal activities. Thus even though these infants are ill and experience some uncomfortable procedures, the majority of their cries are due to other unidentified causes.

Table 7  Type of Maternal Behavior at the Onset of Infant Crying

<table>
<thead>
<tr>
<th>Infants</th>
<th>% of Infant Cries During Routine Behavior</th>
<th>% of Infant Cries During Nonroutine Behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Cases</td>
<td>39.6%</td>
<td>60.4%</td>
</tr>
<tr>
<td>N = 267</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Serious Illness</td>
<td>40.3%</td>
<td>59.7%</td>
</tr>
<tr>
<td>N = 154</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visible Illness</td>
<td>37 %</td>
<td>63 %</td>
</tr>
<tr>
<td>N = 113</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>44.5%</td>
<td>55.5%</td>
</tr>
<tr>
<td>N = 126</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Females</td>
<td>34.4%</td>
<td>65.6%</td>
</tr>
<tr>
<td>N = 1141</td>
<td></td>
<td></td>
</tr>
<tr>
<td>First Born</td>
<td>39.5%</td>
<td>60.5%</td>
</tr>
<tr>
<td>N = 120</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Later Born</td>
<td>38.8%</td>
<td>61.2%</td>
</tr>
<tr>
<td>N = 147</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A Chi-square test done to determine whether a significant systematic relationship existed between the two variables, infant crying and maternal behaviors indicated that
the relationship between the two variables was not significant ($X^2 = 6.46$). A breakdown by the infant's type of illness ($X^2 = 4.38$), sex ($X^2 = 6.59$) and ordinal position ($X^2 = 4.21$) also found no significant relationship.

**Summary**

Patterns of ill infant crying can be characterized as occurring somewhat more frequently but for a shorter duration than well infants. The reason for the increased frequency of crying has not been determined but may be due to the illness. The infant's response to medical procedures seems to account for only a part of the increase. It also seems that mothers of ill infants do not want them to cry for extended periods of time. The cry of an ill infant occurs within proximity more than three quarters of the time compared to a well infant whose cry occurs in proximity only thirty-six percent of the time.

**Patterns of Maternal Response**

This section is concerned with the patterns of maternal response to an infant's cry, and the nature and frequency of various maternal interventions. The analysis showed that the median percentage of ill infant cries ignored by the mother was twenty-two. The range was very narrow; the most responsive mother ignored 16.4% of the cries, while the least responsive ignored only 29.2%. The reverse of this means that the average mother of an ill infant responded to 78% of her infant's cries. In comparison to the Ainsworth study the median percentage of cries ignored by the mother was forty-two,
but the range was very wide; the most responsive mother ignored only 12% of the cries and the least responsive mother ignored 66%.

The duration of maternal unresponsiveness measured the length of time that the infant cried without obtaining a response from the mother. In this study the duration of maternal unresponsiveness to an ill infant's cry was 1.24 minutes per hour (median). The range varied from 0 seconds to 4.00 minutes per hour. The median duration of maternal unresponsiveness in the Ainsworth study was 2.9 minutes per hour with a range of 0 seconds to 11.3 minutes per hour. Given the high percentage of time ill infants are in proximity or close proximity to their mothers the quick maternal response time was not unexpected.

Another area of interest was the nature of maternal interventions which occurred in response to the infant's cry. Table 8 presents the relative frequency of the various interventions and their effectiveness.

In this study the most common response was to pick the baby up and usually to rock, pat and talk softly to the infant. Other frequent interventions in response to an ill infant's cry was to approach and touch, feed, give a toy or pacifier or remove noxious stimuli. This analysis showed that the mother's usual response decreased the distance between her and the infant, and therefore supported Bowlby's (1969) contention that infant crying promotes maternal proximity.
Table 8 Maternal Intervention to Infant Crying and Their Effectiveness

<table>
<thead>
<tr>
<th>Maternal Interventions</th>
<th>% of Total Interventions</th>
<th>% of Total Effectiveness</th>
<th>% of Total Interventions</th>
<th>% of Total Effectiveness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pick-up Hold</td>
<td>34</td>
<td>92</td>
<td>38</td>
<td>86</td>
</tr>
<tr>
<td>Approach, Touch</td>
<td>15</td>
<td>86</td>
<td>13</td>
<td>41</td>
</tr>
<tr>
<td>Interact, No Touch</td>
<td>7</td>
<td>41</td>
<td>22</td>
<td>40</td>
</tr>
<tr>
<td>Feed</td>
<td>14</td>
<td>89</td>
<td>14</td>
<td>77</td>
</tr>
<tr>
<td>Offer Toy, Pacifier</td>
<td>12</td>
<td>75</td>
<td>7</td>
<td>60</td>
</tr>
<tr>
<td>Remove Nox. Stimuli</td>
<td>10</td>
<td>90</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Enter Room</td>
<td>2</td>
<td>50</td>
<td>2</td>
<td>46</td>
</tr>
<tr>
<td>Other</td>
<td>6</td>
<td>70</td>
<td>7</td>
<td>75</td>
</tr>
</tbody>
</table>

The comparison of response patterns between the ill group and the well group reflects a general similarity in the mother's response patterns regardless of the infant's state of health. Only in two categories were there any important differences. The removal of a noxious stimulus was an important intervention for the ill infant because it meant an unpleasant procedure had ended in most cases. The other differences was the mothers with ill infants infrequent use of interacting with the infant from a distance. Given the frequency of the ill infants crying one might expect this approach to be used more often that it was. The breakdown of maternal response patterns by the infant's type of illness sex and ordinal position showed the same pattern of maternal response as the entire sample.
The comparison between the two groups in terms of the effectiveness of the interventions also demonstrated similar patterns. A maternal intervention was judged to be effective if the infant did not resume crying within the next two minutes (Bell & Ainsworth, 1973). Both studies showed that picking an infant up and holding him was the most effective intervention in terminating infant crying. The least effective intervention was to merely talk to the infant without coming any closer. For the ill infants, removing a noxious stimuli, feeding, and touching were also quite effective. In general it was remarkable that all modes of maternal intervention were effective. Even simply entering the room worked 50% of the time. Thus, even though physical contact was the most effective terminator of infant crying it was evident that types of non-contact intervention were capable of terminating a cry in 40 to 50% of its occurrences.

This analysis ignored the appropriateness of the intervention, and the figures cannot convey that some mothers were better able than others to choose an intervention to match the circumstances which activated the cry. During the observations I noticed that mothers of seriously ill infants sometimes utilized a rapid series of interventions before it was apparent that the first intervention had succeeded or failed. The first intervention might be related to the reason for the infant's cry, but those that followed were not.
Summary

The maternal response patterns to ill infant's cry can be characterized in the following ways. For the sample as a whole, the duration of maternal unresponsiveness illustrated that the mother's response time to an ill infant's cry was quicker than it was to a well infant's cry. In addition, mothers with ill infants ignored few of their cries. No differences were found in these patterns due to the infant's sex, ordinal position or type of illness. There was also little difference between the two groups in the types of maternal responses to an infant's cry. The main difference was that mothers with ill infants rarely interact with their infants from a distance. There was no evidence to suggest that maternal response patterns varied due to the infant's sex, ordinal position or type of illness.

Infant Crying and Patterns of Maternal Responsiveness

This section of the report deals with the relationship between infant crying and maternal responsiveness. Two questions are asked: first, is a mother's responsiveness influenced by the frequency and duration of her baby's cries and second, do response patterns vary according to one infant's sex, ordinal position and type of illness. In addition there is interest in how the mother's response pattern influences the infant's later crying patterns.

The frequency distributions of maternal response time to an infant's cry and the duration of infant crying after maternal response are presented in Figure 3 and Figure 4.
Both distributions are skewed, but a statistician advised that the distribution permitted the use of parametric statistics due to the large number of behaviors sampled.

Table 9 presents the distributional characteristics of maternal response time and the duration of infant crying after maternal response. The results are presented in seconds and minutes. A breakdown of the independent variables of sex, ordinal position and type of illness is included. Cases where the mother ignored the cry are not included. Since the frequency distributions for maternal response time and duration of infant crying were somewhat skewed the medians as well as the means are presented. The standard deviation is also included to reflect the variability of the scores.

The picture of the typical study subject which emerged from the data presented in Table 9 was that of a mother who responded very quickly to her infant's cry regardless of type of illness or sex. There was more of a delay in responding to a later born infant's cry. Another interesting pattern of maternal response also emerged. The range of maternal response time indicated the mother's reluctance to let infants with a serious illness cry for a prolonged period of time before they responded.

To determine if maternal response patterns varied according to the infant's sex, ordinal position and type of illness student "t" tests were done on the mean maternal response times. Three null hypotheses were stated in regard to this issue. The first stated there was no difference in maternal response time to male infants crying versus female
Table 9  Significance of Difference in Distributional Characteristics of Maternal Response Time and Duration of Infant Crying

<table>
<thead>
<tr>
<th>Subjects</th>
<th>N</th>
<th>Median</th>
<th>Mean</th>
<th>S.D.</th>
<th>Range</th>
<th>2 Tail Prob.</th>
<th>Median</th>
<th>Mean</th>
<th>S.D.</th>
<th>Range</th>
<th>2 Tail Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal Response Time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All Cases</td>
<td>303</td>
<td>.20</td>
<td>.34</td>
<td>.47</td>
<td>.02-4.00</td>
<td>.31</td>
<td>.54</td>
<td>.67</td>
<td>.04-4.42</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Serious Illness</td>
<td>183</td>
<td>.18</td>
<td>.35</td>
<td>.45</td>
<td>.02-3.00</td>
<td>.30</td>
<td>.55</td>
<td>.67</td>
<td>.04-4.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visible Illness</td>
<td>120</td>
<td>.21</td>
<td>.33</td>
<td>.50</td>
<td>.02-4.00</td>
<td>.32</td>
<td>.53</td>
<td>.68</td>
<td>.04-4.42</td>
<td></td>
<td></td>
</tr>
<tr>
<td>First Born</td>
<td>139</td>
<td>.18</td>
<td>.26</td>
<td>.43</td>
<td>.02-4.00</td>
<td>.29</td>
<td>.45</td>
<td>.62</td>
<td>.04-4.42</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Later Born</td>
<td>164</td>
<td>.26</td>
<td>.40</td>
<td>.49</td>
<td>.02-3.01</td>
<td>.35</td>
<td>.61</td>
<td>.70</td>
<td>.04-4.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>143</td>
<td>.18</td>
<td>.28</td>
<td>.48</td>
<td>.02-4.00</td>
<td>.28</td>
<td>.44</td>
<td>.63</td>
<td>.05-4.42</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>160</td>
<td>.26</td>
<td>.39</td>
<td>.45</td>
<td>.03-3.00</td>
<td>.36</td>
<td>.63</td>
<td>.70</td>
<td>.04-4.02</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
infants crying. The mean maternal response time to a male infant's cry was 28 seconds versus 39 seconds for a female. This difference was significant, \( p < .05 \), and this null hypothesis was rejected. Mothers responded more rapidly to male infants' crying than to females.

The second null hypothesis stated there was no difference in maternal response time to first born infants crying versus second born infants crying. The mean maternal response time to a first born infant's cry was 26 seconds versus 40 seconds for a later born infant. The difference was significant, \( p < .01 \), and this null hypothesis was also rejected. Mothers responded more rapidly to first born infants' crying than to later borns.

The third null hypothesis stated that there was no difference in maternal response time to seriously ill infants crying versus visible ill infants crying. The mean maternal response time to a seriously ill infant's cry was 35 seconds versus 33 seconds for a visibly ill infant's cry. The difference was not significant and the null hypothesis was accepted.

These findings indicated that the infant's sex and especially the infant's ordinal position played a role in determining the mother's response patterns. Maternal response was quickest to first born infants. Since only one of the first born infants was seriously ill the degree of illness was not a factor which determined maternal response. However, two of these infants were male and this may have played a part in determining maternal response. The mother's mean
response time to a male infant was almost as quick as it was for a first born. Once again there was only one seriously ill male infant in the group and one must assume that sex and not the degree of illness was a determining factor in the mother's response pattern. Given the pattern of results it is possible that a combination of sex and ordinal position are considered by the mother in deciding a pattern of response.

These findings also suggested a significant tendency for babies whose mothers delayed in responding to their cries to cry for longer periods than do infants whose mothers responded more promptly. Table 8 showed that female and later born infants cried significantly longer than male or first born infants. A within quarter correlational analysis of the relationship between the duration of maternal unresponsiveness and the duration of infant crying was done. (Maternal and infant measures were connected to avoid confounding.) These findings \( r = .77, p < .01 \) supported this contention. This finding also concurred with the finding of the Ainsworth study that maternal failure to respond promptly to a cry was associated with more persistent infant crying.

The episodes of crying ignored by the mother and the frequency of infant crying was also evaluated using Rho coefficients. (Maternal and infant measures were corrected to avoid confounding.) A correlation of \( p = .55 \) was found, but this was not significant. Therefore, the results only suggested that there was a tendency for infants who cry more frequently to have mothers who more frequently ignore their cries.
Thus far the analysis of the data has only looked at the relationship of one independent variable and the dependent variable, and the relationship between another independent variable and the dependent variable and so on, and then attempted to put all the pieces together. More information for understanding and explaining the complex interaction of the independent variables on patterns of maternal response is needed. In an attempt to overcome this problem a critical path analysis was done.

Critical path analysis was developed by Sewall Wright (Kerlinger & Pedhazur, 1973) to display a pattern of causal relations among a set of variables. A path analysis is not a method for discovering causes, but a method applied to a model formulated by the researcher on the basis of knowledge and theoretical considerations. In this study the path analysis is used only for descriptive purposes.

A four variable path model was developed for this analysis. (See figure 5) In this model, $X_1$ represents the dependent variable maternal response (MR). The independent variable of infant crying has been broken down into two different variables. One is the duration of infant crying (DOC) and is labelled $X_2$ and the other is the numbers of cries (NOC), $X_3$. It is assumed that all covariation between $X_2$ and $X_3$ is noncausal. In a causal relationship the duration of the infant's cry would determine the number of cries, or the number of cries would determine the duration of the cry. Neither relationship is justified. The variable $X_4$ will vary in each path analysis, and begins as the
type of illness (TOI), then ordinal position (OP), and then sex (SEX). Since the variables comprising $X_4$ are nominal scale variables they are assigned an arbitrary score and are treated as dummy variables in the regression analysis. For this analysis it is assumed that a weak causal order exists among the variables and the relationship among these variables are causally closed. A reciprocal causation between the variables is ruled out. Part of the covariation of $X_2$ and $X_3$ is assumed to be due to their common dependence on $X_4$ and the rest is due to common dependence on variables that are outside of the model and not correlated with $X_4$.

**Figure 5** Four Variable Path Model

![](path_model.png)

In this model $P_{12}$, $P_{13}$, and $P_{14}$ represent the standardized beta, as is customary in path analysis, instead of the simple standardized regression coefficient. In this analysis $P_{12}$, $P_{13}$, and $P_{14}$ are obtained by the regression of $X_1$ on $X_2$, $X_3$, and $X_4$. A noncausal relationship between $X_2$ and $X_3$ is assumed. The correlation between $X_2$ and $X_3$ may not be completely accountable by the paths from $X_4$, and in addition
other causes not in the system may be causing $X_2$ and $X_3$. Therefore $P_{24}$ and $P_{34}$ will be estimated using correlation coefficients.

A multiple regression analysis was performed and the results are presented in Table 10.

Table 10  Regression of Independent Variables on Maternal Response

<table>
<thead>
<tr>
<th>Equation</th>
<th>F test for significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>$MR = (.527)DOC - (.002)NOC - (.068)TOI + (.293)\text{constant}$</td>
<td>DOC .000; NOC .211; TOI .232</td>
</tr>
<tr>
<td>$MR = (.524)DOC - (.09)NOC - (.031)OP + (.496)\text{constant}$</td>
<td>DOC .0; NOC .460; OP .378</td>
</tr>
<tr>
<td>$MR = (.528)DOC - (.005)NOC - (.09)SEX + (.054)\text{constant}$</td>
<td>DOC .0; NOC .674; SEX .785</td>
</tr>
</tbody>
</table>

The path diagram is used to display graphically the pattern of relations among the variables presented in Table 9. The path diagrams of the different variables are presented in the same order as they were presented in the regression table. Figure 6 presents the path analysis of the role of type of illness on maternal response.
An interpretation of Figure 5 would be that there is no correlation between maternal response patterns and type of illness, such that a visibly ill or seriously ill infant's mother would respond more promptly to him. The fact that seriously ill infants cry more often has little influence on maternal response. This suggests other variables account for maternal response patterns, and in this model it is the duration of the infant's cry which determines the mother's response patterns.

The path analysis also shows that the duration of the cry has no relationship to type of illness, but that the number of cries is highly correlated with type of illness. It seems that seriously ill infants cry more frequently and that this is unrelated to maternal response. On the other hand, the duration of the infant's cry is unrelated to the type of illness, but is the determining factor of maternal response. Indirectly the model suggests that mothers of ill infants can do little about the number of cries because they
are due to the illness or related treatments. But the mothers can do something about the duration of crying which is unrelated to the type of illness.

Figures 7 and 8 reflect a slightly different pattern. Once again there is no correlation between maternal response patterns and sex or ordinal position, such that one could say a mother responded differentially to males over females or first borns over later borns or vice versa. In both figures the number of cries has little affect on maternal response. Again it is the duration of the infant's cry which determines maternal response.

Unlike Figure 6, Figures 7 and 8 show no clear relationship between the number and duration of cries with the infant's sex or ordinal position. It seems that the infants general behavior patterns and not the infant's sex or ordinal position influence maternal response.

Figure 7 Path Analysis - Ordinal Position
Summary

Regardless of the type of illness mothers respond very quickly to their ill infant's cry. Mothers responded significantly more quickly to male and first born infants than to female and later born infants. The findings also agreed with those of the Ainsworth study that maternal unresponsiveness was associated with more prolonged infant crying.

The critical path analysis showed that the infant's sex, ordinal position and type of illness were not significant factors in determining maternal response. Rather the duration of the infant's cry was the important factor in determining maternal response.

The Interview Data

An interview (See Appendix B) was designed to ascertain general child rearing practices among the parents of chronically ill infants in this study. The data obtained was used only to find common child rearing practices irrespective of
the nature of the illness, to note pronounced changes in child rearing practices due to the child's illness, to compare the mother's caretaking actions to her comments about caretaking, and to evaluate the parent's feelings about and understanding of the chronic illness. The results for this section were obtained by reviewing and analyzing the parent's responses to the interview questions and searching for common themes.

**General Results**

The following themes were drawn from the interviews:

1. There was a general tendency towards similarity in child rearing practices among the six mothers with only moderate variations which the infant's illness.

2. As a general rule the mother was the main caretaker, but the parents were in agreement on child rearing practices.

3. Parents of first borns and seriously ill infants frequently expressed their fears about the appropriateness of their child rearing practices.

4. The parents had an accurate understanding of the child's illness and future medical plans.

5. In none of these cases was there any evidence the parents had become socially isolated as a result of having an infant with a chronic illness.

The interview data gave little evidence that parents of chronically ill infants consciously alter their child rearing concepts to accommodate to the chronic illness of the infant. There is no manual available on parenting a chronically ill infant and it is probably not surprising that these parents adopt child rearing approaches they could use with all their children. They may vary the time schedule and
expectancies but the techniques are similar. However, the parents do question the appropriateness of the use of these techniques for ill infants.

In some areas the results of the interview data conflicted with the observational data. There was a complete mismatch between what the mother said she would do in response to infant crying and what she actually did in response to a cry. The mothers all agreed that at times the infant must be left to cry, but in reality this rarely occurred. The mothers also grossly underestimated their response time to an infant's cry.

The mothers also underestimated their infant's temperament. Based on the amount of crying of the seriously ill infants I would have classified them as average to difficult babies. The mothers classified them as easy to average babies.

One additional conclusion was also reached, and that was that the total investigation had therapeutic significance for most of the parents. The parents, especially the mother, had a chance to talk about her feelings about the birth of the ill infant, their struggles to adjust to the situation and the infant's later medical problems.

Every mother talked about these topics, without being asked by the investigator, throughout the course of the observations. The formal interview at the end of the study allowed both parents to share their feelings which was something that only two of the couples had done previously.
Chapter IV
DISCUSSION

The present study had two major goals: 1) to explore the patterns of chronically ill infant crying, and 2) to determine whether mothers of ill and well infants differed in their patterns of response to the infant's cry. This study yielded some information about these issues and the importance of these findings in the first section of this chapter is discussed. The limitations of the study will also be discussed in this section. The second section of this chapter will focus on the implications of the results for nursing practice using the Johnson model for nursing practice. Implications for future research will conclude the chapter.

The Infant's Crying Behavior

There was clear evidence that the crying patterns of chronically ill infants differed from those of well infants in three respects: 1) frequency of crying, 2) duration of crying, and 3) characteristics of the cry. Each of these findings will be discussed and the potential effect on maternal response will be reviewed.

One measure of infant crying in this study was the frequency of crying episodes per infant waking hour. This study found a tendency for seriously ill infants to cry more frequently than well infants. The ill infants increased frequency of crying was related to the illness and not
to medical procedures required by the illness. This finding concurred with the description of ill infants in the medical literature (Barnett, 1972) as irritable and fussy, and with the findings of several studies of chronically ill infants (Brazelton, 1961; Dowling, 1977; Freeman et al., 1970; Prechtl, 1963) who also noted the increased frequency of crying in these infants.

There was a less pronounced tendency for later born and female infants to cry more frequently than first born and male infants. However two of the infants in both the later born and female groups were seriously ill and this accounted for increased crying in these two groups. Therefore sex and ordinal position did not influence the amount of crying.

In recent years there has been a growing interest in the behavioral differences between male and female infants, but the results thus far are inconclusive. In regard to infant crying Moss (1974) and Phillips, King and DuBois (1978) found male infants were fussier than female infants. Two other studies found first born males were fussier than females and later born males (Bell & Ainsworth, 1972; Moss & Robson, 1968). This study and two others (Caldwell & Leeper, 1974; Clarke-Stewart, 1973) found no difference in crying between male and female infants.

The frequency of infant crying is important to consider because three different studies mentioned in the review of literature indicated that maternal tolerance
levels to ill infant crying had been exceeded (Brazelton, 1961; Freeman et al., 1970; Prechtl, 1963). Sometimes the infant's crying was so excessive that it threatened and broke down the maternal caregiving system. The tolerance limit was not exceeded for the mothers in this study, but since the evidence clearly indicated that some seriously ill infants cry excessively the chances of the crying exceeding maternal tolerance levels are increased.

A second measure of infant crying was the duration of ill infant crying, and the results indicated that due to the quick maternal response to the ill infant's cry that the duration of the ill infant's cry was brief. Furthermore, it was clear from the narrow range in duration of infant's cries that mothers with chronically ill infants did not permit them to cry for extended periods of time. In addition the brief duration of the ill infant's cry indicated that this group of infants was consolable. No other research has been done on the duration of chronically ill infant crying so its significance to other related research is yet to be determined.

The continuation and duration of the infant's cry after maternal response can also influence maternal caretaking patterns. If the ill infant is not easily consoled the mother may feel that her efforts to cope with the crying are inadequate, and as the infant's cry lengthens the mother may withdraw even more from the infant (Freeman et al., 1970). This was not the case in this study because all these infants
were easily consoled, but other studies with chronically ill infants indicated that some of these infants may be very difficult to soothe (Brazelton, 1961; Dowling, 1977; Greenberg, 1971).

The infant's cry is part of a repertoire of communication signals he is born with, and the characteristics of these cries are important to consider because the pattern and sound of these cries can influence maternal response. Previous research has found that from quite early on cries are differentiated into at least three distinct patterns—a basic cry which occurs when the infant was hungry, a mad cry and a pain cry (Wolff, 1969). In addition research with sound spectrograms has shown that these cries in infants with some diseases are characterized by atypical sound patterns. Infants with central asphyxia, brain damage, hyperbilirubinemia, hydrocephalus and prematures have high pitched cries (Michelsson, 1971; Prechtl, Theorell, Gamsbergen & Lind, 1969; Zeskind & Lester, 1978); infants with cleft palates have cries which showed more vibrato (Michelsson, Sirvio, Koivisto, Sovyarvi, & Was-Hockert, 1975) and low birth weight infants cried for only short periods (Michelsson, 1971). In this study, as noted earlier, one atypical sounding pattern of crying emerged. Two of the seriously ill infants fussed rather than cried in many situations. In addition, some of the ill infants cries were for discomfort or pain and these cries consistently varied in intensity and duration. Therefore, there exists a possibility
that the readability of a chronically ill infant's cry may be difficult for the mother, leading to considerable frustration for her.

From an ethological point of view the interpretability of an infant's cry is quite important. Crying is postulated (Bowlby, 1969; Hinde, 1972) to be a signaling behavior which serves as a releaser or elictor of maternal behavior. The results of this study illustrated that some chronically ill infants have impaired signaling ability. This could have considerable impact on the mother's response pattern to the cry and on her general caretaking patterns. In turn this could account for one mother's rapid movement from one behavior to another in an attempt to quiet the infant that was observed on several occasions in this study. The next part of this discussion examines the types of maternal response patterns to a chronically ill infant's cry.

Maternal Response Patterns

What was the meaning of the infant's cry and what action will the mother take in response to it? As Rheingold (1966, p. 12-13) noted, "so aversive, especially to humans is the crying of the infant that there is almost no effort we will not expend, no device we will not employ to change a crying baby into a smiling one—or just a quiet one." Most reported research has concurred with Rheingold's observation that the infant's cry was irritating and aversive to both mothers and fathers (Frodi & Lamb, 1978; Frodi, Lamb, Leavitt, & Donovan, 1978; Freeman et al., 1970; Wolff, 1969).
Although the infant's cry is unpleasant it is also quite effective in activating maternal attention and response. The mothers responded to the infant's cry motivated not only by empathy but also apparently by a desire to terminate an aversive signal from the infant (Frodi & Lamb, 1978). In this study the mothers of chronically ill infants responded more quickly to their infant's cries than did Ainsworth's mothers of well infants. Therefore, it seemed that another factor besides empathy and the desire to stop an unpleasant sound, motivated these mother's responses. The mothers of the ill infants may have perceived the cry not only as unpleasant, but also as conveying a message of urgency or distress. Thus a quick response was in order. This study evaluated maternal response to all types of cries and fusses and found the mothers were consistently quick in their responses. It would have been interesting to evaluate maternal response times to infants with impaired signaling ability versus those with clear signals because the results of this study did not permit a judgment as to whether maternal response time was affected by interpretation of the cry.

One reason for the quick response time was that mothers and their chronically ill infants were in proximity to one another about three-quarters of the time. This is an interesting pattern of maternal caretaking and is opposite of the one found with well infants in the Bell and Ainsworth (1972) study. Some speculative conclusions can be drawn about the usefulness of this method for mothers with ill infants.
First, the results have shown that it may be difficult to interpret the chronically ill infant's cry. If the infant is in sight the mother can use both auditory and visual cues to determine why the infant is crying and thus it is easier to determine an appropriate response. Second, a chronically ill infant tends to cry frequently and by placing him close-by the mother saves herself both time and energy.

An interesting facet of this situation was that even though the mother could see the infant was in no distress her response was still prompt. The reason for this was not quantitatively examined, but two maternal response patterns were evident from the observations. First, the sense of urgency in the mother's response to many of the seriously ill infant's cries was obvious as the mothers sometimes wondered out loud about "why" the infant was crying. There was always a chance that something might be wrong. Second, the mothers empathized with the infant's discomfort and did everything they could think of to make them comfortable and happy. When the infant with club feet was in bilateral below the knee leg casts he was uncomfortable, frustrated and easily upset. His cry consistently brought a quick response as mother changed his position, gave him new toys, held him, etc. in an attempt to soothe him. Both of these situations can be stressful ones for the mother.

One surprising finding of this study was that the maternal interventions in direct response to the infant's cry were remarkably similar between the well and ill groups.
Mothers have a repertoire of interventions to choose from when responding to an infant's cry. The activation of the elements in the repertoire depends on the mother's cultural background, which was very similar between groups, and the stimulation from the infant's behavioral characteristics, which was different between groups. Given the latter I expected that mothers' intervention patterns between the two groups would differ because the ill infant's cry would induce a somewhat different set of interventions which would be reflected in a higher score in the "other" category. That was not the case.

There are several possible explanations for this finding. First, different interventions were not needed to soothe a chronically ill infant. Standard interventions such as picking up and holding or touching and talking to a crying ill infant were successful so there was no need to experiment with novel interventions. Second, since no mother is prepared to be a mother of a chronically ill infant, and since resources to teach them different approaches are rare, one cannot expect the mother's intervention repertoire to contain a large number of novel responses. However, it is possible that these novel responses could have decreased the frequency of crying in some cases. For example, when the infant with club feet was in leg casts and his motor ability impaired modifications in the way the infant was positioned would have permitted more movement, eased his frustration, and perhaps he would have played longer without crying.
While little ingenuity was seen in maternal interventions to the infant's cry, some unique approaches were seen in general maternal caretaking patterns. The mothers had successfully developed strategies for keeping the infant in proximity while carrying out their household chores. In some cases physical aspects of the house were rearranged to care for the infant. For example, there was a spot set up for the infant in several locations around the house. This might consist of an infant seat or blanket and toys already arranged for the infant. Other mothers used older siblings to monitor the infant while they were out of the house or room. Several of the infants required frequent clothing changes during the day, and their mothers had carefully selected clothing that was easy to remove and put on. But once again while it was interesting that the caretaking actions showed some creativity the mother's child rearing practices (toilet training, feeding schedules, types of toys and activities) did not differ much from those used with their well siblings.

Another aspect of this study evaluated maternal response time to a chronically ill infant's cry to determine if maternal response time varied significantly according to the infant's sex, ordinal position or type of illness. The type of illness did not make any difference in maternal response time and the null hypothesis of no difference was accepted. There were significant differences in maternal response times related to the infant's sex and ordinal
position and these two null hypothesis of no difference were rejected.

As might be expected mothers of first borns responded more quickly to their infant's cries than did mothers of later borns. The mothers of male infants were also more responsive to their cries than were mothers of female infants. However, the shared characteristics of this small sample might account for some of this difference because two of the male infants were first borns and two of the female infants were later born. Perhaps it was the combination of sex and ordinal position that should be considered because some aspect of these variables was involved in determining maternal response patterns in this study.

The path analysis confused this picture even further because the results of this test implied that neither the infant's sex, ordinal position, or type of illness was the important factor. The path analysis showed that the infant's pattern of behavior determined the mother's pattern of response. However, since these observations did not begin until the infant was four months of age it is quite possible that previous maternal response patterns are determining the infant's behavior now (Bell & Ainsworth, 1972; Gewirtz, 1976). The results of this research and of Bell and Ainsworth indicated that delayed maternal response significantly prolonged the duration of the infant's cry. Thus, in four months a mother could have already effectively shaped her later born female infant's loud, lengthy cry because she
consistently delayed her response to previous cries. Therefore the results of this study provided no substantial evidence as to whether the infant's sex and ordinal position influenced maternal response patterns or whether particular inform patterns of infant behavior determined maternal response patterns.

One of Bell and Ainsworth's (1972) main conclusions was that prompt maternal responding is associated with a decreased duration of infant crying. The results of this study also found a significant correlation between maternal response time and duration of infant crying. Mothers who responded promptly to their chronically ill infant's cry had infants who cried for a shorter duration of time. However, in this study, unlike the Bell and Ainsworth study, there was no significant relationship between the promptness of the mother's response and the frequency of crying. A quick response to a chronically ill infant's cry did not mean the infant would cry less frequently.

The crying patterns of some chronically ill infants must be considered. From the mother's perspective the infant cries frequently and inexplicably, and in this study, is easily consolable but this is not always true of chronically ill infants. The mother may be highly responsive, but since the reason for the cry is related to the illness the high rate of crying will continue regardless of the speed of the mother's response. Given this fairly consistent frustrating situation, the rate of maternal response would
be expected to decrease, but in this study it did not. The mothers were consistently responsive and ignored a fewer percentage of cries than did mothers of well infants. Perhaps a combination of variables, the ill infant's cry, his helpless appearance, his consolable cry, and the mother's cognitive set about chronically ill infants, are involved in the mother's consistent patterns of response to a difficult and possibly unrewarding situation.

The Interrelationship of Infant Crying, Maternal Response and the Construct of Attachment

This study viewed the infant attachment behavior of crying and subsequent patterns of maternal response to this behavior. The mother's response to these cries has important outcomes for the chronically ill infant in terms of two very different aspects of infant-mother attachment. First, there is the biologic function of attachment behavior, and second there is the social interaction which takes place in response to an attachment behavior such as crying. The importance of both of these outcomes will be discussed beginning with the biologic function of attachment.

Bowlby (1969) proposed that the biologic function of attachment behaviors (and reciprocal maternal responding behavior) was to protect the infant from danger—especially attack from predators. The results of this study, and of others (Bell & Ainsworth, 1972, Coates et al., 1972; Gewirtz, 1976; Moss, 1974) have demonstrated that the achievement of proximity of the infant to its mother is the usual consequence of the attachment behavior of crying. Once the
mother and infant are in proximity the mother can provide the protective caretaking the infant needs. This protective function of attachment is conducive to the survival of any infant and this may be especially so for the chronically ill infant. The crying behavior of the infant with cystic fibrosis and the mother's response patterns provide some evidence for this conclusion.

The infant with cystic fibrosis was subject to episodes of non-specific vomiting. She had a loose, deep and productive sounding chronic cough, and during pulmonary infections loud wheezing was common. Obstruction of the airway was certainly possible. Second, this infant cried frequently and had an atypical pattern of crying in that she fusses weakly rather than emitting a loud cry. This mother kept this baby in proximity or close proximity 85% of the time by placing her in a position where she was closeby and easily seen. Very frequently the mother laid the baby next to her on the sofa or laid her on a blanket on the floor by her feet. When the baby emitted her typical weak fuss the mother used both auditory and visual input to interpret the reason for the infant's cry. The mother's response was consistently prompt.

Is this type of maternal response pattern protective or is it overprotective? For a seriously ill infant with impaired signaling capabilities the evidence from this study concludes that the mother's response patterns to the infant's attachment behavior of crying is protective and is needed.
For example, on two occasions during the observations this infant unexpectedly vomited large amounts of formula and mucus. A weak fuss attracted the mother's attention to the infant, but it was the visual input which classified the situation as an emergency. The mother's prompt intervention prevented the infant aspirating any of the material, and therefore prevented any deterioration in the infant's condition. The mother's pattern of response clearly served the function of protecting the infant.

The second aspect of infant crying, maternal response and the attachment construct to be considered is the social interaction which may evolve from the mother's response to the attachment behavior of crying. Once in proximity the infant's attachment behaviors interface with the reciprocal behaviors of the mother and from repeated interactions an attachment bond develops. The impetus to examine this early interaction between mother and ill infant comes from the belief that what occurs in the first six months of life significantly affects later psychosocial behavior (Lewis & Rosenblum, 1974; Sourfe & Waters, 1977).

According to Bowlby (1969) the stimulation from the interaction as a result of mother-infant proximity is only a secondary outcome of attachment, but this does not lessen its importance. Bruner (1969) states, "a function of mother-infant interaction is to establish for the infant a stable mutuality of relationship which is fundamental for the infant's future social and cognitive development". However,
the mother and infant jointly contribute to the regulation of the infant's state of attention and affect during the interaction, and the results of this study indicated that the infant's illness can adversely affect this interactive process.

First, for an interaction to take place it is necessary for the mother to perceive and correctly interpret the meaning of the signal emitted by the infant. The results of this study suggested that the infant's cry, and possibly other attachment behaviors, may have lacked the necessary eliciting powers because they lacked the intensity needed to attract the mother's attention, the pattern of sound of the signal have been atypical or aversive to the mother, or the signal may have been too frequent or infrequent. The infant's capacity to signal the mother affects the degree of the mother's involvement with the infant, which has been demonstrated to affect the quality of the developing attachment relationship (Fraiberg, 1974; Stern, 1977).

Once the mother has responded to the infant's signaling behavior the infant's pattern of response can continue to influence the mother's response patterns. The infant's general level of arousal (an alert, vigorous response versus a lethargic one), irritability and soothability appear to affect the maintenance of the interaction. The mother's success or failure in maintaining her infant's active interest is a contributing factor to her feelings of effectiveness and competence as a mother. These feelings
subsequently affect the quality of the mother's interaction with the infant. When a mother is confronted with this type of situation she must motivate herself to respond to this infant and must readjust her own behavioral repertoire and stimulus level to match the infant's. Given the chronically ill infant's unstable biological functioning this is no easy task.

It is also possible that the mother's behavior can influence the infant's behavior. If the mother is distressed, depressed or preoccupied with other thoughts she can miss infant cues. Research related to the mother's psychosocial response to the birth of a chronically ill infant has adequately demonstrated that the mother's period of emotional upset may be prolonged (Drotar et al., 1975; Kessler, 1977). During this time she may only be capable of providing the physical care the infant requires. But this is not sufficient for the building of an attachment bond (Ainsworth, 1973; Bowlby, 1969). What appears to be necessary is the infant's ability to signal as well as the mother's ability to respond appropriately to these signals (Ainsworth, 1973; Fraiberg, 1974; Stern, 1977) and the first six months are crucial for the development of these communication skills (Field, 1977).

These past paragraphs point out the reasons the mother-chronically ill infant pair seem to be a dyad at increased risk for impaired mother-infant interaction. This can lead to the development of a maladaptive attachment bond
which can impede the development of competence in the infant. Competence here refers to intelligence, an operative intelligence of knowing how to survive in this world. Maternal responsiveness to the infant's signaling behavior can demonstrate to the infant what influence he has over what happens to him. This White (1963) believes fosters a general "sense of competence", and influences the development of increased competence in other realms when viewed in age related terms.

A brief outline of behavioral competencies which are outcomes of mother infant interaction provides a background for later discussion. First, central to social competence is effective communication, and Bell and Ainsworth's (1972) study demonstrated that the responsiveness of mother to infant crying promoted the development of varied patterns of infant communication in the later half of the first year of life and thus promoted the development of social competence in the infant. Second, it seems reasonable to suppose that maternal interaction patterns can influence the infant's dealings with the physical environment as well. In the course of mother-infant interaction the mother picks the baby up which may help develop physical control over the trunk, arms and head. The mother may also provide the infant with interesting objects to touch and look at which aids both physical and cognitive development. Third, infant affective and cognitive behaviors are interrelated. Reciprocal mother-infant interactions occupy only a small part of a day, yet they appear to underlie the competencies in most
infant tests (Bayley mental scale, Gesell developmental schedules, Griffith's scale and Piagetian sensorimotor tests) (Ainsworth & Bell, 1973; Beckwith, 1971, 1976; Decaire, 1965). Thus an adaptive attachment relationship between mother and infant not only protects the infant, but also provides the stimulation needed for psychosocial and cognitive development.

Against this background, I want to discuss a interaction sequence taken from the observation to amplify some of the points made earlier in this section and to illustrate some of the problems that seem to point to mothers-seriously ill infants as a group at risk for impaired mother-infant interaction.

The following example is the simplest interaction between mother-seriously ill infant. The baby cries, the mother quickly goes and picks him up, cuddles him and gives him a pacifier. Several minutes later she puts him down close by, but four minutes later he is fussing again. Once again mother responds promptly to his cry and picks him up. As we can see, the mother must presume the baby's needs from the cry. Herein arises the first problem.

The most important contribution the infant makes to the mother-infant interaction are his signaling behaviors. The seriously ill infant's cry is apt to be atypical, and while it is effective in attracting mother's attention and bringing her into proximity the meaning it transmits may be quite unclear. In this study this meant that the mothers
of seriously ill infants sometimes responded with one intervention which was followed quickly by others before it was determined whether the first one was successful or not. Thus the frequency of physical interventions was high, and the mother's ability to interpret specific cries is in question. The mother may lack the appropriate conceptual set to interpret the cry, or the infant's cry is impossible to interpret.

One of the consequences of this pattern of mother-infant interaction was outlined earlier. If the baby's unclear signals are responded to promptly, but perhaps not appropriately from the infant's point of view, it is doubtful whether this interaction builds up confidence in the infant that the environment can be controlled through personal activity. The series of quick maternal responses may also prevent the infant from reacting to one intervention before he is faced with another, and sensory overload is possible. Also if crying is an unsuccessful method of communication for the infant will the infant attempt to use other methods as he matures and will these be successful?

The maternal interventions may also prevent the reciprocal coordination between mother and infant which develops from a "meshing" of maternal cues and infant responses (Sander, 1964).

The tendency to keep these babies in proximity serves to protect them from danger, but later it may inhibit the infant's exploration of the environment. These possible
adverse outcomes seem even more worrisome because of the research with older seriously chronically ill children which describe them as dependent, shy, external versus internal controllers, and oftentimes unsuccessful with age-mates (Battle, 1975; Holaday, 1974; Waechter, 1975).

The past paragraphs have painted a rather grim picture of the mother-chronically ill infant interaction. But this is not necessarily the case. Some of the mothers in this study were able successfully to interpret their ill infant's atypical cries and responded appropriately. For example, five month old David (heart defect) has been lying quietly in his rocker. His rocker stops and it is not long before he begins to fuss softly. His mother (M) responds by walking swiftly out of the kitchen and directly over to David. She looks down at him sympathetically and says, "Look at you. Do you need something to do?" M leans over so her face is less than a foot away from David and gently places a pacifier in his mouth. David quiets at once. M stays and watches for several seconds and then returns to the kitchen. The mother interpreted this seriously ill infant's nondescript fuss as a "bored fuss" and gave him his favorite pacifier to suck on. This intervention has worked well in the past, and was successful this time.

Mothers with chronically ill infants with a serious illness are more likely to have infants who will emit cries and fusses which are difficult to interpret, and this increases the risk for maladaptive patterns of mother-
infant interaction. Another example of interaction between the same mother-ill infant pair provides a good illustration of an inappropriate pattern of maternal response. David has been irritable all morning and was crying five minutes prior to this cry. David begins to cry softly. M is on the other side of the room and she looks at him. As she begins to walk slowly across the room she asks quietly, "What's the matter?" David is lying on his back on a blanket on the floor and M kneels down beside him and asks consolingly, "What's the matter?" B gazes at her and continues to cry softly. As M rubs his stomach tenderly and talks softly to him she places a rattle in each hand and gives him a pacifier. With the pacifier in his mouth B stops crying momentarily. "You must have no patience when your sick." M continues to look at, touch and talk softly to David. David begins to fuss softly again as he pushes the pacifier from his lips and drops the rattles. M quickly picks B up, rocks him gently back and forth, talks to him, and with B still fussing M places the pacifier back in B's mouth and he quiets. This sequence took about one minute. Once again the baby's cry is nondescript. It did not reflect anger, pain or hunger, and was probably difficult for the mother to interpret. This time the mother responded with a rapid series of interventions which did not permit the infant to respond to any one of them. This interaction section was not rewarding for mother or baby. The baby's needs were not met, and the mother questions her competence because she is unable to soothe her infant.
This was an example of an inappropriate maternal response to an ill infant's cry signal. How frequent must this type of inappropriate response be before it could be called a maladaptive pattern of mother-infant interaction? It is difficult to identify a maladaptive pattern of mother-infant interaction because we have little information about the range of normal mother-infant interaction patterns. To intervene implies that we are able to make a diagnosis of what is wrong. However, it is doubtful whether two nurses with similar training could watch a mother and chronically ill infant interact and agree on what was a potential maladaptive interaction pattern and what was just a distinctive and adaptive pattern of interaction. Until this can be done, interventions should be made when an infant's signaling behavior is grossly deviant and/or the mother's behavioral responses are obviously dangerous. Other interventions should be made with great care.

Summary

This study has examined the effect of the chronically ill infant's attachment behavior of crying and subsequent patterns of maternal response. The method of study was to observe mother-ill infant interaction in their homes over a three month period. The crying behavior of the chronically ill infants and the maternal response patterns were compared to Ainsworth's well-infant mother pairs to see if there were any differences between their behaviors.

One central finding of this research was that
chronically ill infants do have different patterns of crying than do well infants. Chronically ill infant crying patterns have some influence on maternal response patterns and on maternal caretaking patterns, but not on child rearing practices. Maternal response was faster to a chronically ill infant, but the specific interventions to a cry were similar to those of mothers with well infants. However, at times the mothers of seriously ill infants responded with a rapid series of interventions which was not reported in the Bell and Ainsworth (1972) study. Mothers of chronically ill infants also kept them in proximity more than mothers with well infants. Thus, the second central finding of this research was that maternal response patterns to chronically ill infants are both quantitatively and qualitatively different than maternal response patterns to well infants. This differentiability is the key for defining attachment behaviors and reciprocal maternal response and for determining the adaptiveness of each maternal-ill infant relationship.

Identifying stable adaptive individual differences in the organization of attachment behaviors between mother and chronically ill infant is important because these individual differences have developmental implications for the infant. Establishing a secure, adaptive attachment relationship is viewed as a major developmental task for the first year because it has consequences for later tasks such as exploration and mastery of the environment, achievement of autonomy, and competence in a peer group. These skills are important
for survival today and are of parallel importance to protection from danger as an outcome of attachment behavior in today's society. The results of this study indicated that the mother's response patterns aided the chronically ill infant in his quest to survive physically, but we still do not know if the maternal response patterns are adaptive or maladaptive for the chronically ill infant's psychosocial development. Future research should investigate this problem.

Methodological Issues and Limitations of the Study

Now that the study is complete a critical look at the method from a respectful distance reflects both strengths and limitations of this study. In general, mother-infant research is beset by problems of method, both theoretical and practical. In this study the design and methodology chosen alleviated some of these problems and created some others.

The advantage of the observational method is clear because it is the most direct way of studying mother-infant interaction. The description of mother-infant interaction forms a basis for understanding the dynamics of a relationship and can help specify the conditions necessary for the formation of one sort of relationship verses another. This type of information is especially needed about mother-chronically ill infant interactions because much of the research in this area has relied heavily on interviews with
the mother.

The interview lacks the immediacy of the observational approach, but it is far more convenient. But as Yarrow (1963, p. 217) noted, "Mothers' interview responses represent self description by extremely ego involved reporters." They are also asked to make difficult discriminations and generalizations and to recall bygone days. The interview in this study was used to supplement and confirm the observational data. The interview data was informative, but there was also a lack of agreement between interview based data and observation based data. None of the mothers gave accurate estimations to their speed of response to the ill infant's cry. These results provide further evidence of the dangers of relying solely on interviews as a source of information.

There were also some problems with the observation based data. Due to the unstructured nature of the running account there were some problems with interobserver reliability. Some of the reliability was lower (.75 and below) than is usually desired and obtained in more structured observation procedures such as time sampling (.80-.99). The richness and complexity of the data provided by the running account seemed to justify accepting a lower level of reliability, but reliability remains a problem in this type of observational research.

There were two major problems related to the sample of this study. The first was its small size. If this study
is repeated the sample size needs to be increased. The six infants cried or fussed 388 times during the course of the observations and these cries and fusses and subsequent maternal response served as the data for this study. But during crossbreak analysis of the six infant's crying behavior such as male versus female or first born versus later born infants crying patterns, it was difficult to really demonstrate the relationship between the two variables due to the low N. It was also difficult to demonstrate a relationship because the data was not independent.

Second, the mothers who participated in this study were volunteers. During the course of the observations I found that all of the mothers, with one exception, had worked in hospitals or other medical facilities. This medical background might have explained part of their willingness to participate in this study and might explain some of their skills in caring for an ill infant. Another reason might be that these mothers felt competent enough in their ability to care for their ill infant and were therefore comfortable with an observer in the home. It is also quite possible that the mothers who volunteered to participate in this study had resolved, to some extent, their feelings of grief, guilt and anger about the birth of their chronically ill infant. Therefore, a strong possibility exists that this sample reflected the optimal in maternal ill infant caretaking. It is unlikely that a mother who considered herself as an incompetent caretaker would accept, nor is it
likely that a mother who had not resolved her guilt feelings about the birth of the ill infant would volunteer for this study. Researchers in this area must accept the fact that the sample will not be representative of the entire spectrum of maternal response patterns towards chronically ill infants. This situation would lessen the chance of finding significant differences in maternal response patterns which would strengthen the significance of any that were found, but more importantly it lessens the possibility of finding any.

If mother-infant pairs are to be studied in their natural habitat, the key principle of ethology, then you must take what you get in the way of behavior instead of relying on the power of the experimental design to produce the behavior. However, the resulting data from the observational approach, as illustrated in this study, are complex. One approach to solve this problem is to apply more sophisticated quantitative analysis techniques such as econometric approaches, cluster analysis, scaling, modeling and other multivariate methods. This study relied heavily on univariate methods of analysis and while they uncovered some significant and conceptually meaningful relationships between ill infant crying and maternal response patterns, they also caused some confusion.

In the real world variables operate together in different ways, sometimes enhancing each other's impact and sometimes diminishing or negating each other's impact. The
analysis of relationships between single dimensions, such as maternal response time, and the duration of a male infant's cry can be misleading. The "t" tests done in this study found a significant relationship between maternal response time to a male versus female infants cry. The critical path analysis, which is a multivariate technique, permitted an examination of the combined impact of several independent variables on maternal response. This analysis showed that it was not the sex of the infant which determined maternal response time but the duration of the infant's cry. It is quite possible that other variables associated with infant crying were interacting and influencing maternal response, but the approaches used in this study's data analysis did not reveal those relationships.

Implications for Nursing

One of the hopes of this study was that the findings would have some implications for nursing practice. To heighten the probability of this occurring, the Johnson Behavioral System model (1968) was of parallel importance to the construct of attachment as a part of the theoretical framework. The combination of Bowlby's "set-goal" and Johnson's concept of behavioral "set" have identified some of the variables related to the development of the mother's set-goals and have also suggested some reasons for individual differences in regard to the mother's behavioral set.

As nurses we are concerned with problems that patients are likely to experience. In this case the patient is the
mother of a chronically ill infant. This study has gathered some information about the crying patterns of chronically ill infants and subsequent patterns of maternal response. Now through the use of a model for nursing practice this information can be organized into a framework to gain some insight into why the mother behaved as she did. This will aid the nurse and other medical personnel in planning interventions for the mother-ill infant dyad.

A system is defined as a whole with interrelated parts. Structure refers to the arrangement and the organization of the parts of the system. In this study the structural component of "set" was examined by using the Johnson model's (1968) concept of behavioral set (a consistency of response to certain environmental stimuli) and Bowlby's (1969) concept of set-goal ("a time limited event or ongoing condition either of which is brought about by the action of behavioral systems that are structured to take account of discrepancies between instruction and performance" Bowlby, 1969, p. 69). This helped to identify directional qualities and dispositions towards a course or direction of maternal action. This approach denoted some important aspects of the mother's perseveratory set and preparatory set, and lead to the development of a new component of behavioral set--conceptual set. All of these terms will be defined and discussed in the sections that follow.

The perseveratory set, refers to habitual responses, is the tendency to react to certain stimuli with certain
patterns of behavior. The perseveratory set represents routine patterns of behavior. This set provides behavior patterns that are stable and predictable. The preparatory set, refers to what one attends to or focuses on in a situation and is contingent on the function of the perseveratory set. In familiar situations the perseveratory set dominates because we have already developed adaptive responses, and we attend only to the critical stimuli. The more novel the situation, the less we are able to rely on our perseveratory set, and we become very dependent on the information obtained via the preparatory set for determining what type of response should be made. I believe that the two components, perseveratory set and preparatory set come together to form the conceptual set (see figure 9). The conceptual set is derived from the organized perceptions, thoughts, concepts, attitudes, and beliefs and values of the preparatory and perseveratory sets. It is the conceptual set which serves as the basis for motivation for action.

Figure 9 The Components of Conceptual Set

Perseveratory Set  Conceptual Set — Choice — Action
Preparatory Set

The development of the mother's perseveratory, preparatory and conceptual set in relation to her chronically ill infant's behavior patterns are important for the nurse to understand if appropriate interventions are to be planned.
This study has drawn some conclusions about the formation of these sets from the observations and interviews of this study and they are presented in the following sections of this chapter.

Pattern Recognition and the Preparatory Set

Behavioral systems can not operate without the ability to organize and classify incoming information into coherent wholes or patterns (part of the function of the preparatory set). The vast amount of information presented at any one time to the mother demands constant classification and recognition of patterns. Most of the time it is the pattern (irritability) to which the mother must respond, not the individual variable (cry).

The term pattern recognition covers a broad range of capabilities and a simple example will isolate some of these capabilities. The recognition of the meaning of an irritable infant's cry will illustrate some of the aspects of pattern recognition. Wolff (1969) identified three basic cries—a hunger cry, a pain cry, and a mad cry. A pain cry can be part of a group, which may be defined by a membership function whose values are either zero or one (it is a pain cry (1) or it is not (0)). But further research (Michelesson, 1971; Zeskind & Lester, 1978) using sound spectrograms found that some chronically ill infant's pain cries sound different than a healthy infant's. Therefore a chronically ill infant's cry could form a "fuzzy set" (Zadeh, 1973), which is defined by a membership function
u(x) that includes intermediate values between zero and one. Thus, we are no longer dealing with a "black and white" categorical issue, but one with various parameters. Therefore, an important aspect of pattern recognition activities is the fact that they are related to cognitive activities.

The analysis of this pattern and its eventual meaning is determined by the mother's conceptual set. As mentioned earlier, the structure of this conceptual set is an organized cluster of intertwined perceptions, attitudes, values, thoughts, beliefs and concepts which evolve from the perseveratory and preparatory sets. These differ in both number and in the degree of organization exhibited from mother to mother. Based on the observations and interviews of this study, several other dimensions of a mother's conceptual set have been identified.

The first deals with how well a mother can break down undifferentiated information (a fuzzy set) into more clearly defined parts. In other words the mother can define a pattern class to be a fuzzy subset of the universe U (pain cries). The mother of a newborn chronically ill infant is in a situation in which her perseveratory set provides little or no information. She must expend large amounts of energy to respond to each cry she encounters until she learns to differentiate the various cry patterns. Since a seriously ill infant emits cries and fusses that are difficult to interpret it is going to be difficult for the mother to organize pattern classes of cries and fusses. Since the infant's behavior is not predictable it is difficult for the
mother to develop a perseveratory set and she is forced to rely on the preparatory set to determine her pattern of response. The inability to form a perseveratory set also precludes the formation of a useful conceptual set.

Judging from the results of this study the formation of the perseveratory is a very difficult process and will occur sporadically over several months time. At times the mothers of the seriously ill infants responded with one intervention which soothed the infant, but at other times they responded with a rapid series of interventions. It seems plausible that at these times the mothers were unable to classify the cry and therefore just ran through a series of interventions hoping to find one which worked. It seems that six months after the birth of the ill infant, some of the mothers were still building a conceptual set to process the meaning of the infant's behavior patterns.

Second, the degree to which the mother is able to differentiate patterns and integrate them into her conceptual set seems to be related to the degree of abstract versus concrete thinking in which she is capable of engaging. The first characteristic which permits abstract thinking is the mother's receptiveness to varied interpretations of a pattern of behavior. Second, the mother must be able to see some degree of interrelatedness (to the extent to which the patterns are interconnected) of the infant's fusses or cries. The application of intermediate values of $u(x)$ may be interpreted as partial membership.
In this way a pattern class need not have a sharp cutoff but may have a general fadeout. In many cases it is arbitrary and artificial to classify one pattern as belonging to the pattern of "uncomfortable fuss" and to classify another pattern, that differs by a very small amount as not "uncomfortable fuss". If we consider a pattern recognition system as a dynamic system then such cutoffs can be diasterous in terms of appropriate maternal response. It is probable that mothers who fail to see the interrelatedness of some cries or fusses as the ones who are using very simple concrete processes to evaluate incoming behavioral signals and thus low levels of differentiation and integration would be expected.

The unanswered question is to what degree does incongruous information (a fuzzy set) from a chronically ill infant cause maternal concrete thinking? Later research will have to address this question.

Maternal Conceptual Set Development

This study observed maternal response patterns to a chronically ill infant's attachment behavior of crying between the ages of four to six months. The interview data provides some information of maternal response patterns during the first six months of the infant's life. From this information three stages of maternal conceptual set development are proposed.

Stage 1. **No conceptual set or an inadequate conceptual set.** This stage begins with the birth of the chronically
ill infant and may continue for a month or longer. At this point the conceptual set the mother developed during her pregnancy towards the healthy infant is lost. The mother may adhere to her old conceptual set, in which case she may fail to perceive the infant's cues, unconsciously distort the infant's signals, or attend to the wrong cues (preparatory set). The mother's choice of action is apt to be narrow and inappropriate. It is also doubtful whether an appropriate set-goal has been established. If no conceptual set exists the mother may withdraw from the infant and depend on others to meet the infant's needs. If the infant emits a signal in her presence, the mother may panic and quickly give the infant to someone else to care for it. Since the mother is mourning the loss of the expected infant, and has yet to establish a personality for the ill infant it is quite possible that she has yet to form a conceptual set for responding to this infant's behavior signals.

During stage one it is doubtful that the mother is able to break down the incoming behavior patterns into defined parts or is able to see the interrelatedness of behavior patterns because she lacks an adequate conceptual set. The mother is very likely to make categorical "black and white" decisions about the meaning of the infant's behavior patterns.

A nurse working with the mother of a newborn chronically ill infant should direct her efforts towards helping
the mother learn to interpret the infant's behavioral signals (developing the preparatory set). The nurse should acknowledge that some chronically ill infant's behavioral signals are going to be more difficult to interpret than a well infant's cries and not to get discouraged. The nurse's actions will help the mother learn what stimuli are important to attend to and how some patterns of stimuli are similar. This will help the mother start to form her perseveratory set. As the mother develops the perseveratory set less energy will be required in responding to the chronically ill infant's cries and fusses.

Stage 2. Beginning of the formation of a conceptual set. The mother begins to exert control and begins to develop her own internal conceptual set related to pattern recognition of this infant's behavior. This stage may begin very early for some mothers (day one) or may be delayed for others. The mother is in the process of developing her preparatory and preservative sets which aids in the formation of an adequate conceptual set. The mother is beginning to be able to define intermediate values of the infant's cry and has defined some pattern classes. She is also developing combining rules which also help to determine what type of crying pattern she is witnessing. Her thought is more abstract and she makes fewer "black-white" decisions about the infant's behavior. The mother's choice of action has broadened some and her set goal, in relation to attachment, involves protecting the infant from danger. Failure
to move into stage two would be seen as avoidance of the infant.

During stage two the mother still makes misinterpretations of the infant's behavior patterns. This was especially true of the mothers with seriously ill infants. This may be due to the chronically ill infant's atypical behavior patterns and the instability of their behavior patterns. This makes it much more difficult to differentiate and classify behavior patterns.

In the second stage of conceptual set development the nurse should help the mother refine skills related to the preparatory set, but more effort should be directed to the formation of the perseveratory set. The nurse should help the mother define related patterns of infant behavior so the mother can expend less energy and effort in defining specific cries. The nurse is helping the mother develop some routine patterns of response to some routine patterns of infant crying. If the nurse is successful in her interventions there should be a decrease in the indiscriminate use of maternal interventions over a wide range of situations seen in stage one, and instead see selective maternal interventions used in different situations.

Stage 3. Formation of a sophisticated conceptual set. A sophisticated conceptual set has been formed and a high degree of mutuality is seen between mother and infant. These mothers are able to break down undifferentiated behavior patterns into defined parts because they have
developed a sophisticated variety of rules to define behavior patterns. They are able to see the interrelatedness of various cries and fusses and respond appropriately. These mothers are able to differentiate and integrate large numbers of behavior patterns into a highly organized conceptual set. Their choice of action is broad and their set goals considers not only the infant's protection but also his need for exploring the environment.

In stage three the preparatory set functions to establish priorities for attending or not attending to an infant's cry. The mother's preparatory set now supplements the function of the perseveratory set by determining what stimuli the mother will respond to. However, the results of this study indicated that perhaps unlike mothers with well infants, who are selectively inattentive to some infant cries, mothers with chronically ill infants attend to almost every cry the infant makes.

Since the mother's conceptual set is well established the nurse should help broaden the mother's choice of action. Some mothers of chronically ill infants seem to have a narrow range of what they believe is an acceptable choice of action for the ill infant. The mother's choice of action may be restricted due to her lack of experience with chronically ill infants or her attitudes about acceptable behavior towards an ill infant. In both of these situations nursing interventions are possible.

These are only proposed stages in the development of
conceptual set development. There may be additional stages in this process, but this research study did not last long enough to identify them. Further research is needed to validate the steps of conceptual set development and to determine if there are other stages.

Implications for Future Research

This study took us one step further towards a better understanding of the characteristics of mother-chronically ill infant interaction by studying maternal response to an ill infant's attachment behavior of crying. Many more steps are needed before that understanding will be complete. Here are some guidelines for the direction those steps might take.

The usefulness of this description of the stages of maternal conceptual set development will ultimately be measured by its success in the description of the behavioral aspects of mother-chronically ill infant interaction. The need for adequate descriptions of behavioral aspects of patterns of mother-ill infant interaction has been brought out sharply by the shortcomings of merely labelling a mother's response pattern as "overprotective" with no description of how or why this occurred. Several hypothesis for future investigation have been drawn from the research findings and from the proposed stages of maternal conceptual set development. These are:
If a mother is confronted with atypical infant signaling behaviors which conflicts with her present concepts, beliefs or attitudes, then there exists a tendency for maternal distortion of these signals.

Infant behavioral signals in agreement with maternal expectations are more easily perceived by the mother.

Infant behavioral signals connected with positive affect are preferred by the mother.

If the simultaneous appearance of two or more cognitions (a fuzzy set) cannot be explained by the mother's conceptual set, disruption of mother-infant interaction results.

To carry out parts of this research will require the formation or location of reliable tools to measure maternal conceptual set.

The advantages and disadvantages of the design and method of data collection and analysis used in this study have already been outlined. Future research should refine those methods and techniques which were valuable and extend them to large numbers of mother-chronically ill infant dyads in a longitudinal study. A research study which begins at the birth of the chronically ill infant and lasts several years will provide valuable information about the differential relationships which exist between specific dimensions of maternal care and specific dimensions of infant development. It can also provide information regarding certain infant characteristics and their impact on maternal response patterns.

In summary, further research needs to be done to examine what contributions a chronically ill infant's
behavior makes in determining maternal caretaking style and pattern of interaction. This can be done with longitudinal ethological studies of mother-chronically ill infant behavior which integrates behavioral observations with data from other sources such as the Bayley mental test for infants and other psychological tests which examine maternal attitudes about child rearing. Unfortunately, we are just beginning to systematically document the degree to which a chronically ill infant's characteristics affect his mother's behavior.
Chapter 6
SUMMARY

The purpose of this study was to describe patterns of chronically ill infant crying and patterns of maternal response to those cries. Bell and Ainsworth's (1972) study of well infant crying and subsequent patterns of maternal response was used as a literature control group to compare and note differences in patterns of infant crying and maternal response between the ill and well groups.

The subjects included six mothers and their chronically ill infants who were observed as they carried out their usual activities in their homes. The mother-ill infant pairs were observed on four separate occasions over a three month period. Each observation was four hours long. A continuous, running account was taken of all ongoing mother-infant interaction. Maternal beliefs and attitudes about child rearing practices were probed through an interview at the completion of the observations. Dr. Ainsworth's system for coding infant attachments and reciprocal maternal response was used to categorize the data on infant crying and maternal response patterns used in this study.

Differences were found between well and ill infants patterns of crying. Chronically ill infants cried more frequently and for a shorter duration than well infants. Within the ill group there were no significant differences in either pattern of infant crying related to the infant's
sex, ordinal position or type of illness. Two of the seriously ill infants were also found to exhibit atypical crying patterns because they fussed weakly rather than cried on many occasions.

Maternal response patterns were also examined. Mothers of chronically ill infants kept their infants in proximity more than mothers with well infants, and they also responded to their cries more quickly than the mothers with well infants. Within the ill group mothers were significantly more prompt in their responses to male and first born infant's cries than to females or later born infant's cries. Specific maternal interventions to an infant's cry were very similar between the ill and well groups. On some occasions mothers of seriously ill infants responded with a rapid series of interventions. Maternal attitudes and beliefs about child rearing practices were similar to those of mothers with well infants.

An examination of the relationship between infant crying and subsequent maternal response patterns was also done. Like the Bell and Ainsworth study, this study also found a significant correlation between the length of maternal response and the duration of infant crying. Mothers who responded promptly to their infant's cry had infants who cried for shorter periods of time. However, unlike the Bell and Ainsworth study prompt maternal response did not lessen the frequency of ill infant crying. A critical path analysis, using multiple regression, demonstrated that
maternal response patterns were determined by the infant's behavior and not by the infant's sex, ordinal position or type of illness.

The fundamental significance of this study lies in the findings that some chronically ill infants have atypical crying patterns, when compared to well infants, and that these atypical cries affect maternal response patterns. These findings have implications for the ethological construct of attachment. The mother's quick response to the ill infant's cry and her tendency to keep the ill infant in proximity clearly served the biological function of attachment—protection of the infant.

A secondary outcome of attachment behavior is the learning that occurs in the mother-infant interaction sequences which takes place as a result of mother-infant proximity. For an interaction to take place the mother must be able to interpret the meaning of the signals emitted by the infant. The results of this study demonstrated that some chronically ill infants emitted some atypical cry signals which might have been difficult to the mother to interpret. This made it more difficult for the mother to determine an appropriate response to the signal. The results of the study indicated that the ill infant's capacity to signal the mother affected the degree and quality of the mother's involvement with the infant which affected the quality of the developing attachment relationship. The mother's response patterns aided the chronically ill infant
in his quest to survive, but it is possible that due to the ill infant's atypical cries that some maternal responses might have been inappropriate which could lead to maladaptive mother-infant interaction patterns.

This study demonstrated the advantage of using the observational method by producing rich descriptive data about mother-chronically ill infant interaction, and also demonstrated the disadvantage of the unstructured running account in the low inter-observer reliability scores. The results of this study also provided evidence of the dangers of relying solely on interviews as a source of information. There was a lack of agreement between interview based data and observation based data in several areas. None of the mothers gave accurate estimations as to their speed of response to the ill infant's cry. All of the mothers also said at times they would let the baby "cry it out", but during the course of the observation it was obvious that these mothers did not let these ill infants cry for extended periods of time.

The statistical analysis of this study relied on univariate techniques which uncovered some significant and conceptual meaningful relationships between ill infants crying and maternal response patterns. However, more insight into the complexities of mother-ill infant interaction could be gained by using multivariate analysis techniques.
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APPENDICES
Appendix A

Running Account of Home Observation

Case: 110
Visitor: BJH
Quarter: II

Mr. and Mrs. P have been married 3-1/2 years and C is their first child. They live in a subdivision of tract homes just outside of town. The houses look like they were built in the late 1950's or early 1960's. Typical suburbia, well cared for shoulder to shoulder lawns. Some dense foliage around the house and toys scattered around the driveway and yards. Judging from all the children going to school this morning I would say this is a neighborhood where families with young children are the norm.

When I arrive both Mrs. and Mr. P are home. Mr. P is sitting on the sofa holding C in his lap. Mr. P is working the evening shift for awhile. Mr. P is getting ready to leave to run some errands. Mrs. P is short, 5'1", stocky and outgoing person. She is dressed in a pair of beige pants and a baggy blue shirt. She also has her long hair stuffed under a floppy purple and yellow baseball style cap.

The living room and dining area are very neat and I suspect Mrs. P. cleaned up last evening or perhaps this morning. This is a three bedroom house, 1-1/2 bath, with a large kitchen and dining area. The baby's room (also serves as the study) is next to the parents room. His room is decorated with pictures of children playing and a pair of lamps--one a dog and the other a cat. His crib is burdened with stuffed animals, but no other types of toys. A Winnie-the-Pooh mobile hangs over the crib.

C has light brown hair with just a hint of red in it and blue eyes. He is probably just below the third percentile in height and weight, and his color is excellent for a baby with Tetralogy of Fallot.

After I have hung up my coat M leads me toward her husband. "Bonnie, I'd like you to meet my husband D." "Nice to meet you". D looks up at me briefly and nods "Hi". It is an awkward greeting because we are all nervous. F (D from now on will be called F for father) is holding B on his lap and is bouncing him up and down playfully and gently. F supports B by holding him gently around the chest. B is smiling and enjoying the game. M just watches the two of them. She doesn't seem to know what to do next. F solves the problem. F gives B a light kiss on the forehead. "Well tiger I gotta go". F has turned B so he is facing him. Before giving him to M he pulls B up to a standing
position. B smiles in delight and so does F. F brings B in close to his body and stands up and presents B to M. M takes B and rests him prudently on her left hip. B gazes around the room, but his attention isn't drawn to any particular object. M holds B securely with her left hand only, but her attention is directed towards her husband. The three of them walk slowly to the kitchen and I remain seated in the living room. It sounds like M is reminding F of all the things he needs to pick up. They come back to the living room and M walks F to the front door. F gives his wife a brisk kiss on the cheek and says goodbye. B is content to look at his father. M comes back into the living room and sits down on the sofa. She embraces B gently but is still providing adequate support for him. She has B drawn up on her chest so his head can rest on her shoulder. B turns his head slowly to the side and looks at me. M is watching him and is earnestly interested in his actions. M- "Is that someone new? I think he is interested in you. He is a very alert baby and he really likes people. He is interested in everything." M looks at B and tells him "I think I'll put you down for awhile and get something done." "There is one thing about B you never know what his schedule is going to be like. Sometimes he stays up for 12 hours and sometimes he takes a lot of naps. He seems to know when he needs to rest". M is still holding B. M talks to me about the errands F has to run this morning. As she talks to me she alternates between lightly stroking B's head and rubbing his back. B responds to this by resting his head quietly on M's shoulder. He is still. M stands up and as she does so uses both her hands to support B, one hand holds his head and the other his back. She walks in an unhurried manner across the room. She lays B down softly on his stomach and then covers him up with a blanket. B does not respond in any noticeable fashion to the put-down. M winds up the crank on the cradle and it begins to swing back and forth. "This is the greatest thing. B just loves it." B has pushed his head and shoulders and the upper portion of his abdomen off the cushion. He has good head control. He holds his head and shoulders at a 90° angle as he strains to look over the side of the crib. "Are you doing your push-ups again?" M teases. "I don't think you want any short rest yet." M teases
again. B looks up at M as she speaks to him. B slowly lowers his head, but still holds it off the cushion. M sits down in the rocking chair which is right next to the cradle. She pats B playfully on his bottom. "Come on put your head down", M almost seems to beg him. With her free hand M searches around in the cradle and finds B's pacifier. She finds it and places it in his mouth. This action succeeds in getting B to put his head down. He sucks vigorously on the pacifier. His eyes are open, but he is content. With this M gets up and goes over and turns on the TV. "You know he likes alot of noise. I guess he got use to that in the hospital. I still leave a light and a radio on in his room at night. In a way its good because during his naps nothing bothers him. I don't know if he'll quiet down now or not." M sits down in the rocker and watches TV. B continues to suck noisily on his pacifier. M looks at B very rarely and concentrates on "Good Morning America".

This pattern continues for the next 5 minutes. B sucks on his pacifier. Only once did M turn and look at him for an extended period of time. During this time she also reached down and gently rubbed B's head. B stopped sucking when she first touched him, but then returned to his former activity.

The first 15 minutes are always the hardest. For a time there I thought I had forgotten how to do this. M seems somewhat unsure as to how and what she should be doing. I am sure we can't sit here and watch TV for 4 hours. Things should loosen up in an hour or so. It was nice to see F was openly affectionate with B. He too seemed a bit nervous and I don't think he would have left so soon if I hadn't been here. B has been quiet and relatively inactive thus far. I have decided to do a DDST on each baby to check developmental level. Test will be done by observation only.

We are still watching "Good Morning America". M says she really enjoys this show. During this period B looses his pacifier and begins to fuss. M looks down immediately, but says nothing. She picks up his pacifier, gives it to him and B takes it eagerly. B remains quiet and sucks his pacifier. M watches the show until it ends without further interruption.
B's rocker has stopped and M rewinds it. Then she looks B over to make sure he is comfortable. Then she stands and walks to the kitchen. As she leaves she states "I have some work to do", I don't know if the remark was for me or B. I sit in a chair near B's rocker and M goes into the kitchen to work. B cannot see her and at this age I doubt if the noise in the kitchen means anything to him. It sounds like M is putting away dishes. B continues to suck on his pacifier. Occasionally he grabs and pulls on his blanket. He is quiet and M is able to get her work done in the kitchen.

This pattern continues for the next five minutes. Towards the end of the period B becomes more active and begins to squirm in his cradle. His active kicking is unknown to M who continues to work in the kitchen. B has kicked his blanket partially off his back. He is no longer sucking on his pacifier. B continues to wiggle, he almost succeeds in turning to his back. B begins to fuss briefly, but stops very quickly. There is no response from M. B remains quiet the rest of the period.

It seems we are getting to the usual daily routine. M is comfortable working without having B in her sight and does not come out to check on him unless his fuss seems to signal some distress. B is having a good day or he is not a very fussy baby.

B's rocker has stopped and it is not long before he begins to fuss loudly. M responds by walking swiftly out of the kitchen and directly over to B. She looks down at him sympathetically and says "Look at you." M leans over and gives him the pacifier. B quiets promptly. M looks at him for a few seconds and then returns to the kitchen. For some reason M walks back into the living room 40 seconds later. She comes over to B who is satisfied to suck on his pacifier for the time being. M picks B up quickly but attentively. She strolls over to the sofa and the other side of the room and sits down. M holds B on her lap with his back resting next to her chest. B looks at me. M watches his activity. "She's going to watch you all morning. She's going to see what a fuss you make about your bath," M declares in an amused tone. "He is a typical little boy—he hates water already." M teases. As she speaks she leans over to the side and looks into B's face. Teasingly she states
"Water isn't good for little boys". B smiles and coos at her. M returns the smile and is pleased by B's response to her. M shifts B's position so he is sitting across her lap with his head resting in her left arm. The right side of B's face rests next to M's chest. The TV is still on (AM San Francisco) and M glances at it, but B does not. He seems to be staring at the door. B squirms some and then stuffs the fingers of his right hand into his mouth. M glances down at him and his activity holds her interest. "Go ahead put the whole thing in" M scolds. Looking up at me M tells me. He did this to me the other day and gagged. It really scared me to death." M returns her attention to B, but makes no attempt to stop him from sucking on his hand. B takes his hand out of his mouth but continues to hold both of his hands up near his face. Typical of this age group symmetrical body postures predominate. B is also drooling quite abit and M wipes this away with the bottom of his night shirt. M changes B's position again. She slides him around on her lap so he is facing her and his feet are resting on her stomach. They both look at each other. M grasps B firmly under his armpits and pulls him to a stand. B sustains part of his own weight while M holds him. He smiles and enjoys the fun. "Show Bonnie how well you stand up." M smiles at B and seems proud of his accomplishment. M lowers him swiftly and then instantly raises him again. B continues to smile and drool. M repeats this procedure two more times. Both enjoy the activity and interchange.

While M is holding B in a standing position she pulls him in next to her. B draws his legs up and allows M to support his weight with her arms. B rests the left side of his head on M's shoulder. He watches M's face intently. Then he yawns. M is observing him. She smiles at his yawn. He yawns again. "Goodness, look at you" M says fondly. B nestles his face in M's chest. "Are you going to be shy" she teases tenderly. M continues to gaze at him. B does look timid. M looks up at me, "Do you know he threw a temper tantrum when I left him with my mother yesterday. She said he just screamed." (Really) M looks back at B and then at me. "You just didn't want to be left alone" M states as she playfully touches his chin. B does not respond to this gesture. M pulls B back down so he is sitting on her lap and facing her. As M draws B towards her
face she says "boo" in a very excited voice. B smiles and draws his hands up in front of his chest as he is drawn towards M. M continues the game to B's pleasure. After the fourth time M decides it is time to stop although it appears B is still enjoying himself. M holds B on her knees away from her body. B just looks around listlessly. He begins to fuss softly. M bounces him up and down lightly on her knees and stops fussing immediately. "I suppose it's time for you to eat" M states matter of factly. M scoots over on her left hip and stands up. M moves easily and confidently with B on her hip. B looks around the room as M goes into the kitchen. With B still propped on her hip M stoops down to get a pan out of the cupboard. M rumbles around in the cupboard banging pots and pans together. The noise attracts B's attention and he turns towards all the noise, but doesn't look down in the cupboard. M finds the pan and stands up slowly, "ugh" she groans. She stands still for a moment. She hitches B up a little higher on her hip, and B can now see over M's shoulder. B gazes slowly around the room, but it is difficult to determine what he is looking at. M continues to prepare the cereal. She walks over to the sink and puts some water in the pan. "He really likes cereal", I nod. Once the water is heating on the stove M turns and looks at B. "Well what kind of fruit today," M inquires. "How about bananas? You like those." M gets these and sets them down and then checks the water temperature. "Well that's done."
Appendix B

Interview Questions

Case No._________

Father's occupation_____________ Age___ Educ.__________

Mother's occupation_____________ Age___ Educ.__________


2. When did you first find out your baby had a problem?
   a. How did you find out?
   b. What were you told? Did you understand what was said? How would you describe what is wrong with your child now?
   c. How did you feel? Your husband?

3. How long after the birth of the baby did you get to see your child?

4. How would you say you and your husband adapted to the situation?

5. Since the baby was born have there been significant changes in your activities? During the first 3 months? How about the past 3 months?

6. Has the baby's problem been discussed with other members of the family? How have they reacted?

7. Do you have the opportunity to be away from home to do something you would like for yourself?

8. What suggestions would you have for other families in the same situation?

9. What could the doctors and nurses have done that would have been more helpful after B's birth? Later hospital or clinic visits?
CHILD CARING PRACTICES

1. First of all I'd like to get a picture of the family. How many children do you have? How old are they?
   
a. Do they have any chronic medical problems? If so describe.

2. Has B been with you all of his/her life, or have you been separated from him/her at any time? If separated for how long? How old was B?

3. Would you look back to B's first 3 months. Who took care of B mostly then? How about the past 3 months?
   
a. How much did your husband do in connection with taking care of B during the first 3 months? The past 3 months? Did he ever change the baby's diapers? Feed B? Give B a bath?

4. Would you describe B as an easy, difficult or average baby to care for? What are some examples of this type of behavior.

5. All babies cry, of course. Some mothers feel that if you pick up a baby every time it cries, you will spoil it. Others think you should never let a baby cry for very long. How do you feel about this? What do you do about this with B?

6. Do you have time to spend with the baby besides the time necessary for feeding him, changing him/her, and just regular care? Tell me about what you do during this time.

7. Now would you tell me something about how the feeding went during the first 3 months. The past 3 months.

8. How did you happen to decide on which method to use?

9. (If breast fed) And now how about weaning B. When did you or have you started to wean B? How did you decide it was time to begin this? How did you go about it? How did B react to being taken off the breast?

10. There has been a lot of talk about whether it is better to have a regular feeding schedule for a baby, or to feed him whenever he/she is hungry. How do you feel about this? How did you handle this with B? If a schedule was followed how closely did you stick to that schedule?

11. At what age did you begin to introduce solid foods? How did it go?

12. Have you had any problems about B eating enough, or eating the kinds of foods he/she needs. What did you do about it.
13. How much attention does B need from you?

14. How does your baby let you know what he/she wants? How does he show likes and dislikes?

15. How does B get on your nerves? For example crying may be one way.

16. What kinds of toys do you think your sixth month old baby should have?

17. When and how do you plan to toilet train your child?

18. Does B go out with you, for example when you go shopping? If not who watches him/her?

19. Some mothers feel that their main job is to stay home and take care of the baby. At the same time they sometimes feel that they owe it to themselves to do some outside work or at least have some outside interests. What is your point of view about this?

20. Now I'd like to talk for awhile about B and his/her father. How much does your husband do in connection with taking care of B now? (Skip if answered earlier.)

   a. Does he ever stay with the baby when you are out?
   b. Does he show affection towards B quite often (hugging and kissing) or is he fairly reserved?

21. What are your worries about the future of your child?

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These questions were taken from an interview developed by R. Sears, E. Maccoby and H. Levin; Patterns of child Rearing, Evanston: Row, Peterson and Company, 1957.
Appendix C
Dr. Ainsworth Coding Guide

Infant Crying and Maternal Response to It

A. Coding Information

The coding and subsequent measures of infant crying and maternal response to crying are based on naturalistic observations in the home. The critical event to be coded for the narrative reports of observations is each instance of infant crying.

A crying episode refers to any instance of a vocal distress signal, whether protest, fuss, or full-blown cry. A new episode is considered to have started when there is more than a momentary pause separating two instances of crying. The information to be coded from the narrative reports is recorded in the relevant columns listed below:

<table>
<thead>
<tr>
<th>Column 1</th>
<th>Serial number of episode.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Column 2</td>
<td>Time from last feeding. Estimate, in minutes, the length of time from the end of the previous feeding to the onset of the crying episode.</td>
</tr>
<tr>
<td>Column 3</td>
<td>Placement of the baby prior to the onset of the cry. Specify the location of the baby with reference to his mother of main caregiver. Three conditions of proximity to the mother are possible: no proximity, in which the baby can neither see nor hear his mother; proximity, in which he can see and/or hear her, and perhaps also touch or be touched by her; close proximity, in which a baby is in close physical contact with his mother, usually being held by her.</td>
</tr>
<tr>
<td>Column 4</td>
<td>Ongoing routine. State if the cry occurred during the course of a routine, such as feeding, bathing, or changing.</td>
</tr>
</tbody>
</table>
Column 5  Events or stimuli immediately preceding the cry. Note the occurrence of any events, or the presence of any stimuli, immediately prior to the onset of crying, which may have a causal relation to the crying episode.

Column 6  Type and duration of cry. State whether the distress signal was an unhappy noise a fuss, or a full-blown cry. In addition, estimate the duration of the episode from its inception until the baby is quiet for more than a momentary pause.

Column 7  Related cues from baby. Note any other behaviors or conditions in the baby that are coincident with the cry. These often serve as additional evidence of the cause of crying.

Column 8  Mother's delay before responding to the cry. Time the delay between the onset of the episode until the mother produced her initial response to the baby, whether it was effective in soothing the baby or not. If the baby stops crying before mother responds, time the delay to the cessation of the cry.

Column 9  Unsuccessful maternal interventions. Describe those behaviors which the mother produced in response to the cry which were not effective in soothing the baby for a period of two minutes or longer.

Column 10  Successful maternal interventions. Describe the behavior produced by the mother which finally succeeded in quieting the baby for a period of at least two minutes.

Note: If someone other than the mother responds to the cry, his behaviors will be recorded in Columns 9 and 10, clearly labelled to indicate the identity of that person. If a substitute figure is present in lieu of the mother, her behavior will be coded in Columns 8, 9, and 10.

B. Measures

The following measures have been derived from this coding to date:
1. **Infant Behavior**

   a. **Frequency of crying episodes**
      The number of crying episodes per infant's waking hour. Cries taking place in close succession to one another are considered to represent separate episodes if the pause between them is more than momentary.

   b. **Frequency of crying clusters**
      The number of clusters occurring per infant's waking hour. A crying cluster is a group of crying episodes taking place less than two minutes apart.

   c. **Duration of total crying**
      The combined length of all crying episodes taking place within the span of time under consideration (whether one observation session, or quarter-year, or total period of time encompassed by the research project) expressed in minutes per waking hour.

2. **Maternal Behavior**

   a. **Episodes of crying ignored by the mother**
      The number of episodes (per infant's waking hour) to which the mother did not respond with any intervention.

   b. **Duration of maternal unresponsiveness**
      The mean length of time (per infant's waking hour) that elapsed between the onset of the various crying episodes and the initiation of a response by the mother or, if the mother did not respond, the duration of the cry before it terminated. This measure reflects the promptness with which the mother characteristically intervenes.

   c. **Maternal effectiveness**
      The mean number of interventions a mother undertook before producing the response which soothed the baby for longer than two minutes. If a baby remained quiet for more than two minutes following a maternal intervention, that episode was considered to have been terminated successfully.