Investigation of the Effects of a Home-Based Nursing Intervention on Mother-Premature Infant Interaction Behavior and Maternal Feelings of Competence

by

M. Loretta Secco, B.Sc.N.

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A thesis submitted to the Faculty of Graduate Studies of the University of Manitoba in partial fulfillment of the requirements of the degree of

MASTER OF NURSING

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DEDICATION

This thesis is dedicated to Dr. Ria Rovers who was killed in a tragic car accident January, 1988. Dr. Rovers was involved in my undergraduate maternal and child education and strongly influenced the directions of both clinical practice and graduate research.

ABSTRACT

Investigation of the Effects of a Home-Based Intervention on Mother-Premature Infant Interaction Behsvior and Maternal Feelings of Competence

The investigator examined the effects of a nursing intervention on mother-premature infant interaction and maternal feelings of competence. Research indicates that families which experience premature birth require special care and attention.

Separation, high levels of technology, and experiences associated with premature birth affect both the mother and infant. The mother may simultaneously feel guilt, disappointment, and grief over the birth of an infant who may not resemble the infant of her dreams. Although the nurses encourage mothers to progressively provide infant care, the mother may be too frightened to do so in the unfamiliar, busy, and noisy neonatal intensive care unit. Premature infants have been labelled unresponsive, fussy, difficult feeders, and prone to health problems. All of these factors impinge on the developing parent-infant competence process.

The theoretical framework for the thesis investigation is a parent-infant competence process model which describes assessment of the infant's needs, intervention and evaluation of physical and interaction care. Qualities of both the mother and infant may affect the competence process. The mother's knowledge level and skill in infant care, available resources, and the quality of the premature infant's behavior can affect the process. The knowledgeable and skillful mother provides appropriate physical and interaction care for the infant. The infant with readable, responsive, and predictable behavior provides rewarding cues for the mother. The mother of a premature infant requires extra knowledge, skills, and resources which are not necessarily available to the mother after discharge.

After discharge the mother must assess and meet the premature infant's care needs on her own. The process is especially difficult if the premature infant's response to the mother's care is not predictable and readable. Stress and anxiety may decrease the quality of the mother's and infant's interaction and attachment. The mother may need to learn about the effects of a premature nervous system on infant behavior and interaction.

The thesis investigation examined the effects of a home-based teaching intervention on 18 mother-premature infant pairs. The mothers were visited in their homes during the first, third (experimental group only), and fifth week after the premature infants' discharge. The experimental group mothers received instruction about premature infant behavioral development, effects on mother-infant interaction, and strategies to enhance mother-infant interaction. Effects of the intervention on mother-infant interaction behavior during feeding and maternal feelings of competence were examined.

The data were analyzed using parametric and nonparametric statistical tests. Results indicated that mothers who received the teaching intervention had significantly higher scores on the Maternal Competence Questionnaire, fewer feelings of helplessness, and the infants had significantly higher predictability scores. The videotaped specific interaction behaviors revealed both development and intervention effects. A developmental effect was indicated in that both the experimental and control groups revealed a higher proportion of gross movement and mother smiling at the posttest. An intervention effect was shown in the significant increase in infant vocalizations for the experimental group. A more general qualitative impression of the interaction behavior was represented by the dialogic states data which showed the activity during a five second segment of the feeding session. The possible dialogic state activities include: mother acted alone, infant acted alone, the mother and infant both acted, or neither the mother nor infant acted. The experimental group mothers and premature infants revealed a significant increase in acting together (coaction; C), infant acting alone (I), and a decrease in quiet(Q) segments with time. Transitional state analyses revealed the proportion of time that a specific dialogic state followed another. The transitional states of the experimental mothers and infants included more coaction followed by coaction and mothers tended to break the quiet segments rather than the infants.

The Assessment of Premature Infant Behavior (APIB) described the premature infant's behavioral and developmental characteristics. Variation was detected in the infant's clarity and ability to maintain alert state, as well as the investigator's success in eliciting alert states. Motor strength was variable and may have been a key factor in the infant's contribution to interaction. The ABIP also revealed the premature infant's stimuli preferences and the mother's interest in observing the infant's behavioral repertoire.

The discussion evaluates the parent-infant competence process as a framework for nursing research. Factors which affect the comparison of various intervention study findings

are presented. Recommendations for future research and questions for future attention are outlined. Implications for action are described within the perspective of growing theoretical foundations and a changing health care system. Nursing care recommendations aimed at fostering maternal competence and promoting quality mother-infant interaction are offered.

The findings of this investigation indicate the importance of enhancing the parenting process through instruction, providing role models, and considering the inherent importance of the mother's and infant's socioemotional needs.

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INTRODUCTION

The need for comprehensive and appropriate health care for families of premature infants is more apparent today than ever. With health care advances over the past several decades greater numbers of premature infants are surviving. Premature infant care has been affected by both technology and a growing awareness of the importance of the mother-infant relationship. The greater numbers of premature infants who are being discharged home at progressively earlier developmental levels have unique needs and characteristics which place a great responsibility on the parents who provide physical and psychosocial care.

The premature infant's optimal development often depends on the quality of the environment that the parents create. Additional instruction and support in the parenting role would benefit both parents and premature infants. Although there are many questions about premature infant care and development that require intervention and research, this investigation focuses on the development of a healthy mother-premature infant interactive system. The investigation examines whether a home-based teaching intervention for mothers will affect mother-premature infant

behavior during interaction and maternal feelings of competence.

Statement of the Problem Area

Health care of the ever increasing population of high-risk premature infants is a significant and growing concern today. Of the approximately 378,260 babies born yearly in Canada (Stats Canada, 1986), 21,738 or 5.7% (Stats Canada, 1985) are premature. While the incidence of premature birth has remained stable since the turn of the century (Chapman, 1984), the survival rate has steadily increased. Major contributing factors to this increase are the medical and technological means to sustain the premature infant's life.

An overview of survival and handicap rates of the past several decades mirrors the progress of physiological health care for the premature infant. During the time period of 1965-1969, the survival rate of premature infants weighing less than 1500 grams was approximately 45%; the rate is now 85% (Hunt, Tooley & Harvin, 1982). A 95% survival rate is reported among premature infants weighing between 1501 and 2000 grams (Hack, Fanaroff, & Merkatz, 1979; Casiro, 1986). Currently the rate of severe handicaps (mental retardation, blindness, and cerebral palsy) among premature infants weighing less than 1500 grams at birth is reported as ranging between 5-20% (Hunt, Tooley & Harvin, 1982; Casiro, 1986). With survival almost guaranteed concern should now shift to quality of life for the premature infant.

Today's optimism due to increased survival and decreased handicap rates is justified. However, more parents are taking home premature infants who may have spent as many as four to sixteen weeks in the hospital. The greater number of survivors and the effects of the intensive care nursery environment on the premature infant have created a need for new and more appropriate health care and support services. Such health care services for the parents and premature infants must extend far beyond the discharge of the premature infant.

Health care must address both the physical and psychosocial needs of families of premature infants. Promotion of maximum development requires that parents provide for the physical, social, and sensory needs of the premature infant (Hack et al., 1979; Rice & Feeg, 1985). Creation of the optimum social and sensory environment in the home requires parental knowledge and intervention. Many of the social and sensory needs of the premature infant are met within the context of the parent-infant interactive relationship. Investigators have classified the premature infant as more difficult to care for and interact with than the full-term infant. Clearly, a need exists to enhance the parent's knowledge and skills in caring for and interacting with their premature infant (Eilers, Desai, Wilson & Cunningham, 1986).

An overview of the literature revealed numerous theories which support the need for early and comprehensive intervention with families and premature infants. Reasons for interventions include prevention of unnecessary separation and physical handicaps, promotion of attachment and the premature infant's behavioral competence. Bonding, attachment, and separation theories state that the strength and quality of the mother-infant relationship is dependent on physical and affectional contact. On the other hand, developmental theories emphasize the importance of the premature infant's behavioral maturity level in determining the nature and quality of interaction. Crisis theory helped describe the parent's perspective; the demands of premature delivery and the special needs of a premature infant create physical and emotional stress for the mother. The stress must somehow be alleviated in order to promote optimal parenting.

Since the 1950's there has been a growing realization about the importance of infant social development and the infant's role in mother-infant interaction. Research findings have consistently indicated that the infant's emotional and affectional needs are largely met through the parent-infant relationship and interaction. The negative experiences of the families and premature infants may affect this developing mother-infant relationship. A more elaborate discussion of each rationale for early intervention follows.

Research consistently points to the fact that the high-risk premature infant and mother often develop interaction difficulties (Bakeman & Brown, 1980; Brazelton, 1979; Field, 1980; Magyary, 1984; Thoman, 1980) which some researchers have attributed to faulty bonding. Bonding theorists believe that mother-infant contact during the first few hours after birth is necessary to promote a close mother-infant relationship (Bowlby, 1969; Klaus & Kennel, 1976). Close physical contact includes skin-to-skin touching, suckling, eye contact, and fondling. Due to the unstable condition of the premature infant after birth, the mother and infant are often separated and subsequently deprived of this recommended early contact. The mother-premature infant relationship, viewed within this bonding framework, would be considered imperfectly formed.

Attachment theory (Bowlby, 1969) describes the gradual development of a mother-infant affectional tie over the infant's first year of life. The crisis of premature labor and delivery, the premature infant's scrawny appearance and critical condition, and separation of the mother and infant may adversely affect attachment. The high-risk premature infant often spends one to four months in the hospital where the nurse is the primary caregiver. The longstanding assumption that an infant develops strong attachments with their caregiver because of satisfaction of physical needs (Hoffman, Paris, Hall & Schell, 1988) may affect the mother.

The mother needs reassurance that attachment will grow even though she does not initially perform the mothering tasks for her high-risk premature infant.

Separation of mothers and hospitalized or premature infants has been implicated in poor parenting outcomes. Child abuse, neglect, and failure-to-thrive are reported more frequently among premature infants (Jeffcoate, Humphrey, & Lloyd, 1979; Klein & Stern, 1971; Schmidt & Kempe, 1975). The infant with nonorganic failure to thrive does not eat or gain weight although there is no physiological basis for the condition. The 'vulnerable child syndrome', a persistent disguised mourning which occurs as a result of an earlier life-threatening illness of the child, is more common among mothers of premature infants (Green & Solnit, 1964; Ross, 1980). The 'vulnerable child' is overprotected and viewed as dependent; and the parents may find it difficult even to leave the child with a babysitter.

During premature labor and delivery, parents experience physical and emotional upheavals which are classified as crisis events (Bibring, 1959; Caplan, 1968; Kaplan & Mason, 1960). The initial threat of infant death may cause grief and anxiety which affect the developing mother-infant relationship. The mother-infant attachment process may be affected by the small amount of time the mother interacts

with the premature infant. Parents of premature infants may unconsciously use protective psychological mechanisms which have the potential to detract from the strength and quality of attachment. A detachment phenomenon may occur whereby the mother fails to begin the attachment process due to grief and fear of infant death. In the event that the infant survives the mother finds it difficult to begin the attachment process and attachment may be deficient or inadequate.

The infant's need for intensive and highly technical care may be interpreted by the parents as failure since, not only have they failed to produce a normal infant but, they lack the skills to care for the infant (Caplan, Mason & Kaplan, 1965; Kaplan & Mason, 1960). The self-centered nature of parental depression and grief may interfere with attachment and the amount of quality emotional time available for the infant (Emde, 1980). Intervention may be necessary to facilitate and strengthen the attachment process. (Bibring, 1959; Caplan, 1968; Kaplan & Mason, 1960).

Although social learning theorists' state that attachment is the interaction between the infant and mother (Kaluger & Kaluger, 1984), evidence suggests that mother-infant interactional behavior is merely a reflection of the quality of maternal-infant attachment (Magyary, 1984). The behavior of both the mother and the infant contributes to the quality

of the mother-infant relationship. Difficult infant behavior, more common among premature infants, has been noted as a possible precursor to child abuse and failure to thrive (Campbell, 1979; Sameroff & Chandler, 1975). Behavioral development theorists stress the important role of infant behavior in social interaction (Brazelton, 1979). The premature infant's immature body organs and systems often result in behavior which the mother finds aversive (Blumberg, 1980; Broussard & Hartner, 1971). Even after survival is assured, the premature infant may continue to display behavioral and interaction difficulties.

The infant's temperament and personality characteristics affect the parents' response to the infant. The quality of attachment bond may depend equally on the infant's and parents' style (Hoffman et al., 1988). Research has labelled the premature infant as fussy, difficult to soothe, and as having a difficult temperament (Emde, 1980; Field, 1980). Temperamental difficulties reported include irregular body functions, very intense reactions, withdrawal, and slow adaptation to change (Chess & Thomas, 1973). Thomas, Chess and Birch (1968) suggest that parents of fussy infants develop feelings of guilt, anxiety, helplessness, and cope less effectively. The mother may become frustrated because the premature infant's behavior is difficult to interpret (Brazelton, 1979). The relative unresponsiveness of the premature infant, the less developed repertoire of

interactive abilities such as coos and smiles, frequent gaze aversion, and fussiness may affect the mother-infant relationship.

Parents have to work hard at generating responses such as attention, smiles, and contented vocalizations because the premature infant is less responsive (Field, 1982). The premature infant is less frequently available for interaction due to infrequent and short periods of alertness (Cohen & Beckwith, 1979; DeVitto & Goldberg, 1979; Field, 1977), decreased responsiveness to sights and sounds, an aversive cry (Goldberg, 1979), and fewer opportunities for eye contact. Exaggerated behavioral responses of the premature infant include startles, jerky movements, and tremors which can be disconcerting for the parents (Johnson & Grubbs, 1975). Frequent displays of negative affect (Crnic, Ragozin, Greenberg, Robinson & Basham, 1983) have caused the premature infant to be labeled as a difficult social partner (Censullo, Lester & Hoffman, 1985). If the negative cycle of interaction is not treated, the mother may either grow to avoid the unresponsive and aversive infant or overload the infant with inappropriate stimulation in the hope of eliciting a positive response.

During hospitalization, the parents and premature infant have limited opportunities to interact and get acquainted (Goldberg, 1979). Many premature infant care practices in

the hospital, while necessary in promoting physical growth and maturation of the body organs and systems, prevent mother-infant contact. The premature infant may not be held by the mother until a certain body weight is reached or may not be fed orally until the suck reflex and physiological condition stabilize. Consequently, the mother and infant do not experience the recommended quality contact necessary to develop a strong and interactively healthy relationship. Due to the decreased amount and quality of interaction time, the parents and the premature infant are less likely to be skilled social partners at the time of discharge.

After discharge the mother is expected to care for and interact with a fragile infant who has spent one to four months in the hospital. Caring for the discharged premature infant, along with fulfilling other responsibilities to the family, can be a physically draining and frustrating task. Premature infants often have feeding problems, difficulty in establishing a day/night schedule, and special health care needs may require frequent doctors visits and rehospitalization. Once at home, because the mother and infant are finally getting to know each other, stress and frustration should be kept to a minimal. A lack of support systems, either in the hospital or the community, can make the transition home difficult (Affleck, Tennen, Allen, & Gershman, 1986; Raff, 1986).

The premature infant does not always facilitate the transition home. It may be difficult for the parents to interact with and provide a nuturant level of stimulation due to the premature infant's sensitive sensory thresholds (Als, Lester, and Brazelton, 1979). The optimal level of interactive stimulation may be difficult for parents of premature infants to achieve. Low levels of stimulation do not elicit responses while high levels result in overstepping the bounds of the stimulation threshold. Once the threshold is exceeded, the premature infant may cry, fuss, and become difficult to console. The infant's negative responses may cause frustration and anxiety for the mother. As a result, the parents may not interact or offer stimulation due to the possibility of triggering a negative response or a fussy period.

Despite the great number of potential health and psychosocial problems, professional support in the community is scant for families of premature infants. While the premature infants receive attention during hospitalization, comparatively little help is available after discharge (Affleck et al., 1986; Anderson, 1981; Crnic et al., 1986; Ross, 1980). The mother and premature infant may receive routine monthly visits from the Public Health Nurse and attend regular pediatric examinations. Very little assistance in the form of child care, housekeeping, instruction in infant health and developmental care topics,

and interactional guidance exists. Some mothers are not aware of the special needs of the premature infant or the few resources available to them in the community. The physical and emotional energy and the responsibility required to care for a premature infant may cause great stress for parents.

Meeting the developmental and social needs of the premature infant requires knowledge, resources, and provision of challenging and interesting experiences. Therefore, discharging a physiologically healthy baby from the hospital is only half the job (Schraeder, 1986)--parents must be helped to promote the infant's optimal development. To truly care for the premature infant requires a change in focus, a rechannelling of energy and money, and creation of community-based health care programs.

This thesis investigation determined the effect of a home-based nursing intervention on mother-premature infant interactional behavior and maternal feelings of competence. The teaching intervention stressed the developmental nature of premature infant behavior and its effects on the evolving mother-infant relationship. The premature infant's unique cues, sensory thresholds, and means to promote interaction were discussed with the mother. The overall guiding hypothesis of the investigation was that an improved understanding and ability to interpret the premature

infant's behavior would enhance the mother's sense of confidence in interacting with her premature infant.

Theoretical Framework

Th investigator chose a theoretical framework which focuses on mother-infant interaction within the parenting context. Rationale for the interactive approach has recently gained support. Gorski, Davidson, and Brazelton (1979) noted that cognitive development correlated better with measures of social interaction (such as holding, touching, talking, and eye contact) than with the neurophysiological measures. Past research may have reported lower intervention effects than actually achieved due to sole reliance on measures related to cognitive and physical development. Greenspan and White (1985) offer evidence that many different types of preventive interventions result in a positive immediate effect across a range of outcome variables. Therefore, measurement of outcomes which encompass social competence, family functioning, and adaptability are more aligned with the goals of most programs (Greenspan & White, 1985; Provence, 1985). In addition, other researchers have recommended measuring parental outcomes such as self-confidence, self-esteem, or stress (Barrera, Rosenbaum & Cunningham, 1986).

The theoretical framework for the investigation draws on the work of four main sources to explain parent-premature

infant interaction. The overall organizing structure is the parent-infant competence process (Figure 1) which was adapted from the work of Goldberg (1977;1979).

The parent-infant competence process involves the steps of assessment, intervention, and evaluation which occur within the context of the parent-infant relationship. Although the father may play an important role in the process, the need for focus and definition confined the investigation to mother-infant interaction.

Step	Influential Factors
a) Assessment	
MOTHER:	knowledge level frustration resources skill confidence previous success
INFANT:	readability predictability responsiveness
b) Decision	easy and quick difficult
c) Intervention	either physical and/or interactional care
d) Evaluation	based on the infant's response
e) Affective Outcome	an increase or decrease in the following: - frustration, stress, anxiety - attachment, - quality interaction, - overall feelings of satisfaction with mothering (i.e., COMPETENCE)

Figure 1: The Parent-Infant Competence Process

Within the mother-infant competence process the mother assesses the infants needs, makes a decision, and intervenes to provide either physical and/or interactional care. Assessment is bidirectional and influenced by qualities of both the mother and infant. The mother's knowledge level, success with past judgements, skill confidence, and the quality of the infant's behavior affect the assessment. The infant who displays readable behavior makes the mother's decision easier and less frustrating. The predictable infant provides the mother with expections based on past responses to interventions. The mother of a responsive infant is likely to feel confident because she can see the effects of her care.

The quality of available resources also affects the type and quality of maternal decisions. For the inexperienced mother, the quality of infant care decisions often depends on the information received from others. Based on the assessment, the mother makes a decision whether or not, and how to intervene. The effect of the mother's intervention is based largely on the infant's behavioral response. The overall process outcome can either positively or negatively influence the mother and premature infant. There may be either an increase or decrease in frustration, an enhanced or decreased quality of interaction, or overall feelings of satisfaction or competence for the mother and infant. The quality of mother-infant attachment is reflected in the

ongoing, cyclical, and dynamic process. The process outcome is like a feedback loop which effects all stages of the process.

The infant's response to the intervention is the means by which the mother evaluates her care; the positive, readable, and predictable response will decrease frustration, enhance satisfaction, and promote overall feelings of competence for both the mother and infant. The quality of the mother-infant relationship is thus established and strengthened through the context of the parent-infant competence process.

The bidirectional and dynamic nature of the process underscores the fact that characteristics of both the mother and infant can determine the affective outcome. The contributions of the full-term and premature infant and their mothers to the process are compared in the second aspect of the theoretical framework. Thoman (1980) describes the active and vibrant contribution of the full-term infant while Als, Lester, Tronick, and Brazelton, (1982) portray the premature infant's less active role in the mother-infant competence process.

The Infant's Contribution

The full-term newborn is a "born communicater", designed for survival in a social environment with a strong capacity for cue-giving behavior and a well developed sensory system (Thoman, 1980). The mother and infant give simultaneous

multimodal sensory stimuli during interaction. The mutual cue-exchange reveals a rhythmic interaction in which each can lead or follow or anticipate actions of the other. The major task of the mother and infant is to synchronize their separate rhythms of on-going behaviors. Nonverbal interaction and rhythmic patterning of cues are means by which the mother and infant develop expectations for the behavior of the other member of the dyad.

The smooth functioning of the fine dynamic process, or the full-term infant and mother communication model, depends on both members of the dyad fulfilling their role in the exchange. Both the mother and the infant play crucial roles in determining the success of the interactive relationship. After birth the full-term infant quickly develops the perceptual ability to orient, maintain attention to social stimuli, and to sustain an alert and responsive state. Thoman (1975) describes "state" as a prelude, a mediator, and an eliciter, as well as the context for interaction between the infant and mother. Infant state provides an ongoing developmental characteristic for assessing the relationship between mother-infant interaction and the infant's development (Thoman, 1980). Within the mother-infant competence model, the full-term infant is readable, responsive, and predictable. The mother's role in the parenting process is facilitated by these infant characteristics.

The premature infant is a deficient cue-giver due to immature behavioral mechanisms which are detailed in the following section (Als et al., 1982). A three-stage sequential agenda of premature infant behavioral development describes the premature infant's contribution to the interaction process. The behavioral development occurs while the premature infant continuously interacts with the environment. Throughout the three stage process, the preterm infant develops sufficient physical strength and stability to use caregiver support and input needed to make continuing developmental gains (Gorski et al., 1980).

Stage one, seen in premature infants of 32 weeks or less gestational age, has been labelled the 'turning-in' phase. It is a period of physiological reorganization where the immature body organs necessary to support life develop and mature. The bodily functions of respiration, heart beat, temperature control, digestion, and elimination become stabilized. Therefore, in the early weeks or days after birth, the infant can not participate in, or tolerate, reciprocal interactions. The mother must watch and wait until the body organs mature and the infant is not overwhelmed by environmental stimuli. The mother may be too frightened to touch or make contact with the premature infant during this process.

Stage two, the 'coming-out' stage, involves a further refinement the infant's behavioral responses. The infant is no longer acutely ill, can breathe effectively, and can absorb calories from the gastrointestinal tract. By thirty-four to thirty-six weeks conceptual age, the infant has achieved a minimal capacity to maintain physiological homeostasis. The premature infant begins to respond readily to, and occasionally seeks out, social interaction. Changes in the caregiver environment critically affect the physical well-being and growth of the high-risk infant (Gorski et al., 1980). Diffuseness of states begins to slowly disappear, the full range of states from 'asleep' to 'awake' to 'aroused' emerges. States become clearer, more flexible, and require less energy from the infant. Stage two usually ends around the time that discharge from the hospital to home is possible. Therefore, up to the time of discharge, the mother and premature infant may not have many opportunities to interact and become acquainted.

According to Als et al., (1982) stage three is a period of active reciprocity with the social environment which occurs between thirty-six and forty weeks of conceptual age. This phase often begins after discharge home and continues throughout infancy. The infant is now strong enough to breathe, feed, and respond to caregiver behaviors in specific and predictable ways (Gorski et al., 1980). The alert state becomes more flexible, robust, accessible, and

differentiated from the other states. Finally, the mother and premature infant are at the point that the mother and full-term infant started their relationship.

Consequences for Interaction

The conceptual framework depicts the full-term newborn as a social character who is ready to interact from the time of birth. Although the full-term infant is often behaviorally organized hours after birth, the preterm infant may take weeks to several months for the process to take place. The full-term infant helps the mother by displaying readable, predictable, and responsive behavior. The premature infant does not have this interactive capacity since the care-soliciting and social behaviors are unavailable. Difficulties in the developing mother-infant relationship may be displayed as modifications and violations of interaction.

Modifications and Violations

The third section of the theoretical framework includes the modifications and violations of interaction described by Field (1980). Many of the rules of mother-infant interaction are commonly violated by the mother-premature infant dyad. The violations are the result of an undeveloped interactive system which may affect maternal feelings of competence.

Initiation

The unclear behavioral cues of the premature infant make it difficult for the mother to assess readiness for interaction. As a result, initiations are more frequently made by the mother rather than the infant. Although the mother may persist with initiations, the infant often fails to respond.

Speaking the Same Language

Mothers of full-term infants often use "infantized" behavior consisting of exaggerated facial expressions, prolonged vowel sounds, and higher pitched vocalizations. The premature infant's mother often drops these behaviors due to preoccupation with initiating an infant response, few infant behaviors to imitate, and little satisfaction for her interactive efforts.

Playing the Same Game

The premature infant has a limited behavioral and game repertoire which varies with developmental age. The responsibility for making age-appropriate adjustments is on the mother. The mother of a premature infant often introduces age-appropriate games in terms of chronological age rather than developmental age.

Turn-taking

Turn-taking, an important rule of interaction is complicated by the relatively infrequent infant initiations and latent responses of the infant. Because the infant does not clearly signal an intent to take a turn, the mother is often observed taking her baby's turn as well as her own. Long silences, failures to illicit responses, and abortive conversations have frequently been reported as frustrations felt by mothers.

Monitoring Signals

One of the most important aspects of the mother's role in the interaction process is observing the infant's interaction rhythms and signals. The mother modulates the pace, form, and intensity of stimulation. The onus of monitoring signals is on the mother. Since the signal repertoire of the infant is most developed visually, eye contact and gaze aversion provide the principal cues rather than verbal and gestural cues which prevail in the adult signalling system.

Contingent Responsivity

Contingent responses are those which occur within a given time and are similar to an initial behavior. The timing suggests that the behaviors of one partner are in direct response to the behavior of the other. An appropriate

maternal response which occurs within a few seconds of the infant's behavior is likely to be perceived by the infant as a direct response to his/her own behavior. Some contingent responses may include cooing, smiling, ceasing activity, highlighting or imitating behavior. Although many mothers of premature infants are reported to show the necessary prerequisite for contingent responsivity, (i.e. close visual monitoring of the infant's behavior), many fail to contingently respond.

Termination of Interaction

Termination is subtly controlled by the premature infant and include signals such as yawning, gaze and head aversion, squirming, fussing, or crying. The mother develops a sensitivity to the premature infant's need for time out from stimulation. It is possible that the mother will feel rejected by the infant's turning away.

Theoretical Framework Summary

The full-term infant is capable of communicating and responding to the mother from the time of birth. The behavior of the mother and infant become patterned, synchronized, and coordinated to the point of being a rhythmical dance or harmonious interchange. A mutual exchange of behavioral cues and social responses form a predictable unit. The mother and infant come to mutually predict, read, and understand the other's behavior. The

synchronized and rhythmical interaction results in feelings of competence and satisfaction for both the mother and infant.

Unfortunately, the premature infant's initial neurophysiological immaturity affects both behavior and social competence. The behavioral responses of the premature infant may not be expected by the mother. As a result, the accepted rules of interaction are violated and the interactive unit is adversely affected.

Consequently, both the mother and premature infant have a complicated role to play during interaction. Greater demands placed on the mother include assessment of the premature infant's readiness to interact, initiation of interaction, and determination of the appropriate amount and type of stimulation. The premature infant is often unable to fully respond to the mother's interactive attempts. The premature infant's narrow sensory thresholds and difficult temperament place an additional stress on the mother. Rejection, disappointment, and anxiety may result due to the unexpected and unpredictable responses of the infant.

Prematurity adds an additional dimension to interaction and has great impact on all of the components of the parent-infant competence model. The parents must learn the meaning of infant behavior through interacting with the infant. Although the full-term infant assists the learning process

for the mother by displaying readable and predictable behavior, the premature infant may not. Therefore an intervention designed to facilitate the mother's role in the parent-infant competence process may foster optimal parenting.

Significance of the Study

The significance of the proposed investigation lies in its potential to influence the quality of care for parents and premature infants. Health care providers and decision-makers may be alerted by sound scientifically-based research findings. Understanding the problem and testing appropriate interventions are the first steps toward provision of appropriate supportive care. All those directly and indirectly responsible for the care of premature infants may be affected by the study results.

Parents are the most important determinant of the developmental outcome for premature infants. Assisting parents to cope effectively enables them to fulfill their role in promoting the premature infant's development. Parents will benefit if health care professionals are aware and committed to new ways of helping families of premature infants.

The present investigation endeavored to discover the effect of one planned nursing intervention on mother-premature infant behavior during interaction and maternal

feelings of competence. Positive interaction reflects a healthy mother-infant relationship and promotes attachment, development of the premature infant, and maternal and infant feelings of competence. The incidence of child abuse, failure-to-thrive, handicaps, and rehospitalizations could be decreased among premature infants.

Researchers have indicated that intervention directed toward the mother is an effective means of enhancing interaction for parents and full-term infants. The time has arrived to determine appropriate means to assist parents and premature infants. If quality survival is more important than mere survival, support and assistance must be provided for parents and premature infants beyond discharge.

Summary

When an infant is born prematurely there is a potential for many stresses and adversities to take their toll on both the parents and the infant. Parents require support in learning to understand, care for, and interact with the premature infant. Currently, few community support programs exist despite the increasing population of surviving premature infants.

Optimal infant development depends on positive parenting which is accomplished, partially, via mother-infant interaction. The premature infant's behavior often results in a disrupted interactive system. Satisfying mother-infant

interaction is more difficult to achieve for the mother and premature infant.

An intervention designed to enhance interaction may result in more positive attachment. The mother who can read and predict her infant's behavior may feel more satisfied and competent in relating with and caring for her infant. The mother may realize that the premature infant's negative interaction behaviors are not a reflection of her own inadequacies.

Chapter II

LITERATURE REVIEW

Introduction

The mother-infant relationship is a key determinant of the infant's future development and quality of life. The infant's physical and psychosocial development depends on the parent's investment in care and attention. This was the conclusion reached after several decades of research in attachment, interaction, and infant development. Observational research of infants and mothers informed professionals that the infant is active, competent, and plays a major role in mother-infant interaction. The understanding of the dynamic and important nature of the mother-infant relationship has influenced infant care practices.

The study of animal and human mother-infant interaction behavior revealed new knowledge about the mother-infant relationship. Early animal and human ethologists challenged the assumption that attachment developed simply because the mother provided the infant's food. Eventually, it was realized that human infants have a need for social interaction which becomes focused on the mother (Lamb, Thompson, Gardner & Charnov, 1985).

Active investigation in the area of mother-infant attachment expanded existing theoretical foundations (Bowlby, 1969; Klaus & Kennell, 1983). Bowlby (1969) stressed the important role of attachment in the development of the infant's emotional well-being. Infant behaviors were found to play a role in enhancing mother-infant interaction. Ainsworth (1973) conducted research in mother-infant separation and identified characteristic behaviors of the infant and toddler which promoted attachment. Klaus and Kennel (1983) incorporated the mother's experiences during pregnancy, labor and delivery, and the post-partum period into the process of attachment. Eventually attachment was viewed as a complicated and intricate process that began even before birth.

Although attachment of the mother and full-term infant has been studied since the 1950's, concern over mother-premature infant attachment and interaction is a more recent phenomenon. The history of premature infant care reveals that before the 1960's premature infants died receiving very little special care and/or attention. Due to the expansion of knowledge and technology over the past 20 to 30 years, the quality of care and survival rate of premature infants have dramatically improved. However, follow-up studies have reported an increased incidence of negative parenting outcomes such as failure to thrive, child abuse, and the vulnerable child syndrome among premature infants.

The higher infant survival rates during the 1960's and 1970's were paralleled with an increase in handicaps. Interventions and means to improve premature infant care and prevent handicaps became a priority in the research field. Some of the tested interventions included infant stimulation, encouragement of mother-premature infant contact, and methods to enhance mother-premature infant interaction. Presently, with survival almost guaranteed for premature infants weighing 1500 grams or more at birth, concern is shifting to quality of life for the premature infant.

Beginnings of Attachment Theory

Attachment theory began with research linking the developmental outcomes of children to various care practices. Institutional child care which was popular from the 1940's to 60's was associated with psychological, social, and physical problems. The detrimental effects were correlated with the quality and quantity of maternal care. Research in maternal deprivation and secondary drive theories heightened awareness of the importance of the mother-infant relationship and helped crystallize our understanding of the process of attachment.

Maternal Deprivation

Maternal deprivation theory grew out of observations of children cared for in foundling homes and/or orphanages. Many children in Europe were orphaned, accidentally lost, or intentionally removed from their parents to spare them the horrors of the two world wars (1914-18;1939-1945). Orphanages provided at least adequate physical care to large numbers of children.

Orphanages were also established in North America for abandoned, illegitimate, maltreated children, and/or the offspring of teenage, single mothers. Although the orphanages had the best of intentions, the results were unexpectedly tragic. The children showed signs of serious psychological dysfunction despite the fact that the institutions met their nutritional, medical, and physical needs. The specific effects varied depending on the ages of the children concerned, but children of all ages appeared to suffer.

A consistent pattern of reactions was observed in infants and children separated from their parents.

> Infants older than six to nine months initially displayed protest, in which they wept piteously, and behaved angrily toward their caretakers trying to comfort them. Thereafter, their distress was replaced with despair, a phase in which they appeared depressed and disinterested in social interaction. Finally, their demeanor brightened, signaling a phase labeled detachment, because their prior attachment bond had been severed, and they were now able to form new attachments (Lamb et al., 1985).

After the three stages were complete, the infant or child accepted care from a nurse or someone other than the mother. However, when the mother returned, the child appeared to have forgotten her and refused contact (Cram, 1985).

Studies from 1910-1960 consistently reported the harm caused by institutional care of infants. Therefore, the World Health Organization commissioned Bowlby to perform a literature review (Bowlby, 1951) which confirmed psychiatrists' and developmentalists' worst fears about the harmfulness of institutional care, and indeed any type of extended mother-child separation. Countries rapidly moved to terminate reliance on long-term care for children. As a result, children were to be placed in more home-like settings whenever possible; both their emotional and psychosocial needs were to be met.

The concept of maternal deprivation stressed the fragile nature of early infant socioemotional development. Maternal deprivation research had two beneficial effects on developing theories: (a) the abandonment of secondary drive theory in the mother-child relationship, and (b) development of ethological attachment theory.

Secondary Drive Theory

Secondary drive theory viewed the infant's need for nourishment as a primary drive, and food as a reward.

Through classical conditioning, or repeated association of food with the mother's presence, the mother becomes the focus of a secondary drive. Secondary drive helped early investigators explain the infant's desire or drive for interaction even in the absence of food. Abandonment of secondary drive theory was a great stride forward since the theory depreciated the mother's role and the infant's socioemotional needs.

Harlow and Zimmerman (1959) and Harlow (1958, 1961) influenced the demise of secondary drive theory when they examined the effects of separation on lab monkeys. Infant monkeys, raised in isolation, displayed aberrant social and emotional development. Harlow and Zimmerman outlined the effects of deprivation of maternal-infant contact on monkeys raised by two 'surrogate mothers'. One surrogate mother, a wire manikin with a bottle in the middle of the chest, fed the infant monkey. The other terrycloth-covered surrogate played no role in the infant's feeding. The infants preferred clinging to and associating with the terrycloth mother even though fed exclusively by a bottle in a 'wire mother'. Harlow's work emphasized that 'contact comfort' plays a crucial role in the formation of social relationships; involvement in feeding is relatively unimportant.

The maternal deprivation studies stressed the importance of contact comfort. The infants and children in the orphanages and hospitals had their physical and nutritional needs met yet, like the monkeys raised in isolation, they suffered from emotional deprivation. The explanation was thought to rest in the needs not met by institutional care: adequate social stimulation and continuity of the same caregiver over an extended period of time. Both the maternal deprivation and secondary drive theories influenced the growth of attachment theory which now dominates our understanding of early social and emotional development.

Attachment Theory

Bowlby described an innate (i.e. biologically-based) 'need' for social interaction in human infants that eventually becomes focused on a specific figure. Darwin's theory of natural selection influenced Bowlby's hypothesis that the behavioral repertoire of any species is adaptive. Behavioral patterns that fail to promote species survival are eliminated while behaviors which enhanced the species success are spread throughout the population. In order to survive, infants are equipped with a repertoire of behaviors needed to attain proximity of an adult.

Whereas, the infants of the animal species use locomotion to attain proximity, the human infant is dependent on signals. The human infant's cry and smile are strong

proximity-promoting signals. Infants become attached to individuals who consistently and appropriately respond to the infant's proximity-promoting signals and behaviors. Furthermore, Bowlby suggested that adults are equipped with a repertoire of caregiving responses which complement the care-eliciting repertoire of the infant. The efficacy of the signals depends on the promptness and appropriateness of the adult's response. Consequently, mutual responsiveness and interaction become critical in human infants. Therefore, the mother must be sensitive to her infant's communication signals and respond in an effective manner (Turley, 1985). As a result of attachment theory, the infant is now viewed as having a strong influence on the mother's sensitivity and responsiveness to the infant's cues (Thoman, 1975).

Attachment and Bonding: Distinctions

Although the terms attachment and bonding are frequently used interchangeably, some distinctions are essential. The term attachment was introduced by Bowlby (1969) and refers to a hypothetical construct reflecting the quality of the affectional tie between an infant and his/her parents, especially the mother. The attachment tie develops gradually over the first year of life. In contrast, the term bonding is more often used to indicate a rapid process which occurs immediately after birth and reflects mother-infant

attachment (Campbell & Taylor, 1980). Bonding is enhanced by physical contact between a mother and her newborn (i.e., through skin-to-skin contact, suckling, mutual visual regard, and fondling).

Both bonding and attachment refer to aspects of the mother-infant affectional relationship; bonding has traditionally been viewed as as unidirectional and rapid. Attachment develops gradually over the first year of the infant's life and is influenced by psychological variables such as quality, timing, and pacing of adult-child encounters (Campbell & Taylor, 1980).

Attachment Behavior and Attachment Bond

Convinced that there is more to a relationship than behavior or even interaction, Bowlby attempted to distinguish between attachment and the attachment behaviors. Attachment was defined as an enduring affectional tie or bond, specific in focus and essential for healthy development. The attachment behaviors played a role in the formation and maintenance of the bond between the mother and infant. The infant behaviors such as crying, smiling, sucking, following, and clinging function to promote mother-infant contact.

On the other hand, Ainsworth was interested in measurement of the strength and quality of the attachment formed rather than in the behavior patterns that mediated

the attachment (Lamb et al., 1985). The strength of attachment is reflected in the quality of the infant's or child's protest behaviors displayed when separated from the parent (i.e. strange situation). Because it is ethically unsound to separate mother and infant for extended periods of time, studies used short-term separations to view the attachment behavioral reactions of the child. Ainsworth, Blehar, Water, and Wall (1978) reported that insecurely attached infants were delayed in social development. Ainsworth established that the mother's sensitivity to the infant's needs are very important to the development of secure attachment.

From observations Ainsworth (1964) described 13 patterns of interaction or attachment behaviors. These behaviors were: (a) crying, (b) smiling, (c) vocalizing, (d) visual-motor orientation, (e) crying when attached figure leaves, (f) following, (g) scrambling, (h) burying, (i) face in lap, (j) clinging, (k) lifting arms in greeting, (l) clapping hands in greeting, and (m) approach through locomotion. The attachment behaviors occurred discriminately in response to the attachment figure. The growth of knowledge about infant needs and the realization of the importance of the mother-infant relationship had implications for the quality of newborn care.

Factors Affecting Quality of Newborn Care

Two key events during the 1960's and 70's profoundly influenced the quality of health care for newborns and their families. The first event was the a model which described attachment as a process and a renewed awareness of the importance of mother-infant contact for the long-term bond between the parents and infant (Klaus & Kennell, 1983). Additions and revisions to the attachment theory had lasting effects on infant care.

The Process of Attachment

The first factor which had an impact on newborn and family care was the work of Klaus and Kennell (1983) which suggested that the mother-infant bond develops as a function of close contact and interaction with the infant from the earliest moments after birth (Lefrancois, 1984). According to Klaus and Kennell, the attachment process begins even before the birth of an infant and is influenced by many factors (Figure 2). Past experiences in the lives of both the mother and father may influence the attachment process (Moore, 1981).

1. Planning the pregnancy
2. Confirming the pregnancy
3. Accepting the pregnancy
4. Feeling fetal movement
5. Accepting the fetus as an individual
6. Labor
7. Hearing and seeing the baby
8. Touching and holding the baby
9. Caring for the baby

Figure 2: Steps in Attachment

According to the attachment process (Klaus and Kennel, 1976), a planned pregnancy increases the likelihood that the woman adjusts and accepts the pregnancy. Confirmation of pregnancy starts after the first and often subtle signs of pregnancy occur. The physical and emotional changes prepare the woman for motherhood; the pregnancy becomes real and acceptance is started. When quickening or sensation of fetal movement occurs (at 16 to 32 weeks gestation), the woman is prepared for birth and eventual separation from the fetus who is now viewed as an individual. The woman fantasizes about the appearance of the infant, attributes human characteristics to the fetus, and produces early feelings of attachment (Klaus & Kennell, 1983). Most of the conscious fantasies are of the expected, hoped-for infant (Taylor &

Hall, 1980). However, coexisting fantasies about the feared sick or malformed infant may be at the conscious level or restricted to symbolic dreams.

A positive labor, delivery, and postpartum experience enhances the attachment process. The mother-infant relationship is positively influenced by a labor experience which meets the mother's expectations. Seeing, touching, and eye contact during the immediate postpartum period encourages the acquaintance and attachment process. The healthy newborn visually follows the parents' face and voice; signals the parents with facial expressions, movement, and vocalizations.

> After birth it is extremely valuable for the father, mother, and infant to be together for about thirty to sixty minutes. Obviously this is only possible if the infant is healthy and the mother is well. ...We recommend skin-to-skin contact. ...The father stands or sits at the side of the bed by the infant. This allows parents and infants to become acquainted (Klaus and Kennel, 1976).

The final step in Klaus and Kennels attachment process is caring for the infant which contributes to forming an interactive relationship. The mother, reacting to infant cues and behavior, feels satisfaction in meeting the infants needs.

The attachment theory of Klaus and Kennel quickly influenced the care of the newborn infant. Hospitals established policies which increased the amount of mother-

infant contact after birth. Infant research unfolded the second influence: the vast competencies and behavioral capabilities of the newborn. The parents' crucial role in eliciting the infant's behavioral repertoire was elaborated.

Newborn Capabilities

Newborn and early infant care was influenced by an expanding knowledge about infant capabilities and behavior. Infants were no longer considered to have empty minds--incapable of either thought or learning. Infant research revealed that newborn infants, not only saw and heard but, showed preferences for certain visual and auditory stimuli. The newborn and very young infant were discovered to be much more capable of organized responses than ever assumed before (Korner, 1973).

> Our current view considers the newborn infant to be active, capable of organizing complex information, selectively attentive, and capable of rapid learning (Goldberg, 1977).

Differences among infants indicated that care and attention should be individual. Infant responses differed in such areas as visual pursuit, amount of alert time, behaviors in response to mother's care, readiness to respond to auditory stimuli, and frequency and amount of activity. Researchers reported differing temperamental styles which impacted on the early developing mother-infant relationship. Infant responsiveness qualities such as alertness, activity level, personality, fussiness, consolability, and cuddliness

may affect the quality of mother-infant attachment (Hoffman et al., 1988).

Infant Studies

Bennett (1971) observed ten full-term infants during the first ten weeks of life and suggested that infant characteristics and state influence social responsiveness. Cues and signals were given by the infant during mother-infant interaction. These signals included: eye contact and subtle eye movements, mouth and tongue movements, and affect-like expression during vis-a-vis. Infant temperament was noted to evolve out of the complex mother-child interchange during the first weeks of life. Extremes in irritability and soothability were thought to have devastating effects on the mother-infant relationship and to predict atypical development in some cases. Investigators reported individual differences in the early capabilities of infants and in the manifestation of temperament.

Early experience is influenced by the way the infant perceives the mother-infant relationship, separations, and other events in their lives (Korner, 1973). Infants were most responsive to stimulation which a sensitive mother provided in the course of infant care. Mother and infant behavior were frequently logically related (Osofsky & Danzger, 1973); the attentive sensitive mother elicited attentive, sensitive behavior from the infant. The mother-

infant relationship and maternal care were discovered to be very important in the physical and psychosocial development of the infant.

Development and frequent use of the Brazelton Neonatal Behavioral Assessment Scale (BNBAS; 1973) revealed that the full-term infant has a vast behavioral repertoire. The BNBAS became an effective instrument for teaching new parents about infant behavior and sensory capabilities. The infant's capabilities led researchers to realize that both infants and mothers play significant roles in interaction. The mother's personality and her tendency to be attuned to her infant's needs at any particular age may be more influential than any opportunity she had to touch her infant while in the hospital (Powell, 1974).

Chess and Thomas (1973) defined infant temperament as the behavioral style of the individual, irrespective of the content, level of ability, or motivation of the particular activity. The relationship between temperament and child environment interaction was investigated. Through their research, Thomas and Chess defined nine sub-categories of temperament: activity, rhythmicity, approach, withdrawal, adaptability, intensity, mood, persistence, distractability, and threshold. The infants were scored on these subcategories and then placed in one of three categories: a) difficult, b) easy, c) slow to warm up. Carey expanded on

the work of Thomas and Chess to produce a parent-reported tool which assesses temperament (Carey, 1970). The questionnaire was developed as a screening tool for difficult temperament. The Infant Temperament Questionnaire, further revised and standardized in 1977 (Carey & McDevitt, 1978), provided a means to discover infant individuality.

Kronstadt, Oberklaid, Ferb, and Schwartz (1979) explored the relationship among full-term infant temperament, maternal concern, and adjustment during early infancy. The mothers with difficult infants reported more concerns. At each age there was a considerable proportion of mothers who, although they reported having difficult infants, did not have major concerns nor have to make major adjustments. The mother's perception of their infant is influenced by many other factors in addition to infant behavior. Kronstadt et al (1979) speculated that the mother's own temperament, confidence, previous experiences, and social support affect her perception of the infant.

Campbell (1979) investigated maternal ratings of full-term infant temperament and made independent observations of maternal and infant behavior. Infants rated by their mothers as extremely irregular, nonadaptable, and negative in mood received less responsive mothering at three and eight months. Thus, negative maternal perceptions of infant behavior may have negative consequences for the mother-infant relationship.

Anderson (1981) investigated an early intervention designed to familiarize mothers with the capabilities and individual characteristics of their infants. The newborn was discovered to profoundly influence the caregiver. Through predictable, clear-cut emissions of cues, behaviorally organized neonates influenced interaction with their caregivers (Anderson, 1981). Mothers observed administration of the BNBAS to the full-term infant. Each item on the scale and infant responses were explained. Informing and demonstrating the behavioral characteristics of their infants increased reciprocity between the mother and the infant. Once again the characteristics of both the parents and infant affected the interactive quality of the relationship.

Perry (1982) explored the contribution of infant behavior and other factors on parents' perceptions of their term firstborn infant. A negative cycle of interaction occurred when the infant gave ambiguous cues, was 'difficult' or irritable, and/or had parents who were insensitive to infant cues. Opportunity to interpret the infant's behavior may ease concerns and enhance confidence in the parenting role. The parents assessed their infant's behavior using an adapted version of the BNBAS. No relationship was found between the behavior of the infant and parents' perception of their infants. The non-significant findings underscored the complicated nature and the difficulty of measuring and correlating the two concepts of perception and behavior.

Ventura (1982) examined the relationship between parental coping behaviors, parent functioning, and infant temperament. Parents who perceived their infant as smiling and laughing more frequently reported less distress with limitations. These parents also reported using coping strategies to maintain family integrity. Depressed or anxious parents viewed their infant as less soothable and expressed more distress with limitations.

Golas and Parks (1986) examined the effects of using the BNBAS to teach new mothers about infant behavior. Increasing the mother's knowledge about infant behavior and promoting confidence in interpreting the behavioral responses was hoped to contribute to a more satisfying mother-infant relationship. An experimental group of mothers received the teaching intervention which included viewing a film about the newborn The Amazing Newborn (Hack, Kennell & Klaus, 1975), presentation of infant states and maternal responses, and demonstration of part of the BNBAS by a pediatric nurse practitioner. At a four week postnatal office visit, experimental mothers had more knowledge about infant behavior although there was no difference in maternal confidence in interpreting behavioral cues of their own infant. A contrast group of mothers was asked to report, by checklist, interest in learning about topics presented in the teaching intervention. The most frequently identified topic was 'figuring out what your baby's behavior means'.

Watt (1986) examined the temperament of small-for-gestational-age, premature, and fullterm infants. Very few premature infants were categorized as difficult at either measurement time with the Revised Infant Temperament Questionnaire. No group differences in overall categories were found at either six months or 20 months although all infants were rated as more difficult at 20 months than six months and small-for-gestational-age infants were less approaching and more intense than premature infants at six months. Few relationships were found among infant temperament dimensions and mother and infant interaction behavior. Overall, the study suggested that definition and measurement of the concept temperament be approached cautiously.

The vital nature of infant temperament was underscored by Kemp (1987) who investigated the relationship between a mother's perception of her child's temperament and the strength of mother-child attachment. The child appears to make an important contribution to the quality of reciprocal mother-child relationship. Kemp (1987) reported that temperament scores were able to significantly predict the quality of mother-infant attachment.

The growth in knowledge about infant capabilities, attachment, and infant temperament affected health care and parenting practices. The increasing number of surviving

premature infants would eventually benefit from the clearer knowledge and understanding of the infant's psychosocial needs. However, history reveals that the advancements took a longer time to affect the care of prematurely born infants than full-term infants.

Historical Background of the Premature Nursery Care

The scanty documentation of premature infant care began with Dr. Martin Couney who demonstrated the use of incubators in 'child hatchery' displays at numerous exhibitions and world fairs. During the late 1800's doctors gave the premature infants to Couney because they were expected to die. At the exhibitions nurses cared for the premature infants; the mothers received passes to visit at any time. The public who came to observe were very interested and touched by the tiny premature infants. Although displaying premature infants for profit may demonstrate poor taste, the premature infant finally received attention. The high survival rate of Couney's premature infants caused hospitals to slowly establish premature nurseries; the first premature nursery opened in 1923 at Chicago's Sarah Morris Hospital.

Unfortunately, care policies and practices of the hospital nurseries were influenced by Couney; family and mothers were excluded from the nurseries (Klaus & Kennell, 1983). From 1945 to 1960 visitors and parents were

restricted from the nurseries due to fear of infection. Silverman (1984) described how,back in this time period, parents were allowed in the nursery corridors during visiting hours for a glimpse of their baby through the window. A mother reflects back to 1964 when she delivered a premature infant at 26 weeks gestation.:

> Parents were not allowed in the nurseries in those days...I stood in the hallway gazing at her tiny, purplish body through the nursery window and the incubator wall. Sometimes I hated the nurses because they could touch her and care for her while my own instincts were in a holding pattern. I felt as if I had been robbed (Holbrook, 1984).

The premature nursery also remained isolated and protected from innovations, investigation, and parents. However, the quality of care gradually improved as an understanding of the parent's and premature infant's medical and psychosocial needs increased.

Survival and Handicap Trends

Premature infant survival and handicap rates reflected the quality of medical interventions. From the 1940's to the early 1960's medical treatment of the premature infant was marked by numerous setbacks. The overuse of oxygen was associated with a form of blindness, retrolental fibroplasia. When the concentration of administered oxygen was restricted, neonatal deaths and neurological damage among surviving infants increased (Harrison, 1984). Inappropriate delays in initiating feeding led to starvation hypoglycemia, dehydration, and jaundice.

With new treatment methods during the 1960's mortality rates finally declined, but sometimes at the expense of an increased handicap rate among survivors (Stewart, Reynolds & Lipscomb, 1981). Sophistication of both instruments and knowledge of the physiological needs resulted in more accurate monitoring of both the fetus and neonate. Early optimal thermal environments, prevention of asphyxia, and fluid and nutritional supplementation was provided. Premature infants of increasingly lower gestational ages survived despite aggresively invasive treatments.

An even more sophisticated and physiological approach to premature infant care occurred during the 1970's and continues to present. The skills and knowledge of the two fields of obstetrics and pediatrics combined forces in the specialty of clinical perinatology. This specialty, along with more successful resuscitative and maintenance procedures, had a positive effect on both survival and handicap rates. Perinatal mortality decreased appreciably and a measurable improvement in quality of life for the survivor resulted (Hack et al., 1979; Rawlings, Reynolds, Stewart et al., 1971). Reductions in severe handicaps such as diplegia, blindness, and severe hearing loss took place.

> At selected centres, by the beginning of the 1970's, 80 to 90 per cent of surviving very-low-birth-weight infants (less than 1500 grams) were free from serious mental or physical handicap (Hack et al., 1979).

Due to the positive outcomes, perinatal care is now in a phase of confidence. Mortality and morbidity rates are lower than ever and more premature infants are occupying the intensive care nurseries and pediatric hospital beds. Consequently, there is now a growing tendency to discharge the premature infants at progressively younger ages.

Coincident with the improvements in physiological care of the premature infant was an enhanced appreciation for the psychosocial needs of the mother and infant. Research on attachment and bonding had a profound influence on postpartal care of the mother and newborn. During the 1970's and 80's these developments influenced the nursing and health care of the premature newborns. Attachment and interaction of the mother and premature infant became an area of great concern.

Premature Birth
Affects the Mother-Infant Relationship

Even psychologically normal women experience emotional upheavals during pregnancy and attachment to the infant. Bibring (1959) described pregnancy as a developmental crisis which all expectant mothers experience. Premature labor and delivery are crises situations (Bibring, 1959; Caplan, 1957) which are additional stresses above the maturational crisis of pregnancy. Kaplan and Mason (1960) depicted the birth of a premature infant as an acute crisis. Premature labor and

delivery are often emergency situations where the woman feels depersonalized and loses self-esteem.

> There is usually more activity around the mother in premature labor and general apprehensiveness prevails over the condition of the baby. These experiences confirm the woman's feeling that the situation is dangerous. ...After delivery the mother of a premature infant, as opposed to a full-term infant, has a heightened concern about whether the infant will live...(Kaplan and Mason, 1960).

The stresses associated with premature labor and delivery may affect the attachment process of the mother and premature infant. However, today we are armed with a greater awareness and concern about the psychological impact of premature birth. As a result, health professionals have developed interventions to facilitate a positive mother-premature infant relationship.

Premature birth can cause feelings of great loss for the parents. Rather than the expected healthy bouncing full-term newborn; the parents are presented with a scrawny, underweight, and "high-risk" infant. At birth the premature infant is either under-reactive or unreactive rather than responsive and active. Mother and infant separation is the rule because the premature infant is cared for in the intensive care nursery rather than in the mother's room. The mother feels like an outsider in the intensive care nursery because the nurses and doctors care for the infant. Failure and loss, rather than the success associated with the birth of a healthy, are felt by the parents.

Kaplan and Mason (1960) realized that these feelings of the parents of a premature infant were symptomatic of grief. The first days, and sometimes months, after the birth of a premature infant are fraught with many life and death battles. The grief was attributed to both the loss of the expected infant and the realistic anticipation of the loss of the premature infant (Taylor & Hall, 1980).

Nursery policies of the 1960's exacerbated the grief and separation problems of the parents and premature infant. Some of the policies included: (a) preventing the mother from seeing the infant especially if the infant was likely to die; (b) separating the mother and baby at birth; (c) not allowing visitors in the nursery; and (d) allowing the infant to die if it was 10 weeks or more premature (Chapman, 1978). Policies reflected the basic assumption that the mother should not attach with the premature infant who was expected to die.

The survivors of premature birth experienced more frequent health and parenting problems than infants born at term. Early separation of the mother and premature infant was implicated as the basis for the poor parenting outcomes. Even Couney described behaviors of parents of premature infants that were cared for in the 'hatchery display' which reflected parenting and attachment problems.

> In all these shows Couney was proud of the fact that he never took a cent from the parents. But he was puzzled (and hurt) by what he felt was an

> unappreciative attitude of the parents. They visited their babies relatively infrequently; when it came time to take the infants home, Couney had difficulty persuading them to assume their parental responsibilities (Silverman, 1979).

Finally, health care professionals realized that the seemingly unappreciative attitudes of the mothers were rooted in attachment problems. The enlightenment catalyzed investigations to determine the basis for the disrupted bonding. Studies with full-term infants and comparison studies of premature and full-term infant-mother dyads were illuminating. The behavior and psychological variables of both the mother and infant, as well as the environment, were found to affect the quality of parent-infant interaction and the mother-infant relationship.

Mother-Infant Interaction Studies

Brown, Bakeman, Snyder, Fredrickson, Morgan, and Hepler (1975) developed a methodology which allowed the study of mother-infant interaction. The technique involved recording ongoing interaction behaviors of mothers and their full-term infant dyads. A catalog of 100 mother and infant behaviors was used to objectively describe interactive patterns during a feeding session. The method indicated that mothers who fed their infants for longer periods also held and looked at them longer. The same mothers stimulated their infants less. The infants with higher activity levels opened their eyes more often and their mothers spent more time performing caretaking activities.

Premature infant-mother interaction was behaviorally evaluated by Beckwith, Cohen, Kopp, Parmelee, and Marcy (1976) who focused on the dimensions of parent-infant interaction and the premature infant's skills. The developmental level of the premature infant was discovered to be an important determinant of the patterns of social interactions with the primary caregiver. The significance of environmental encounters was supported since social transactions as early as one month of age were found to influence infant performance at nine months (Beckwith et al., 1976).

Osofsky (1976) reported that interaction in two situations revealed a consistency of full-term infant and maternal styles. Osofsky concluded that (a) more research examining newborn behavior was needed to gain a clear understanding of the effects on the developing interactive relationship, (b) consistent patterns of mother-infant interaction may develop from as early as the first few days of life, and (c) infants and parents affect each other from very early in life. Hence, it is necessary to study the relationship as an interactive one with the individual contributions of each partner affecting the other's behavior.

Bakeman and Brown (1977) investigated mother and full-term infant interaction using their microscopic behavioral

approach. Specific interaction behaviors were recorded and analyzed in terms of frequencies and durations. A more general approach to behavioral study was also introduced by Bakeman and Brown. The more general behavioral analysis defined whether the infant was acting alone, the mother was acting alone, both the mother and infant were acting, or neither the infant nor the mother acted was documented for each five second segment during a feed. The more general approach viewed interaction as a behavioral dialogue and represented a means to capture the behavioral components of both mother and infant during interaction.

Bakeman and Brown (1978) used the same behavioral approach to compare term and preterm mother-infant pairs. Premature infants were more difficult to care for and less responsive than the full-term infant. Mothers of premature infants were more active than mothers of full-term infants during interaction. Overall, the premature infants were somewhat less active than full-term infants. The behavioral approach successfully detected differences between full-term and premature infants during interaction with the mother.

Minde, Marton, Manning, and Hines (1980) examined the relative contribution of the psychosocial history of the mother, perinatal events, and infant behavior on early maternal behavior. Past maternal life experiences were associated with the activity level of the mother toward her

infant in both the hospital and home setting. The infant appeared to play a crucial role in steering the course of mother-infant interaction. Contingencies were reported between the infant's eye opening and the mother's touching and between gross motor stretches and mother's smiling.

Bakeman and Brown (1980) observed and compared premature and full-term infant-mother interaction behavior in an effort to discover the etiology of child abuse. Mothers of preterms were more likely to initiate, persist, and continue behavioral episodes than mothers of full-term infants. All older infants were more likely to initiate and continue behavioral episodes than younger infants. The balance between mother and infant dialogic states eventually became more evenly proportioned. Preterm infant interaction behaviors were less variable than those of full-term infants.

Crawford (1982) indicated that interaction pattern changes occurred as the infant grew. When observed at six months chronological age, premature infants behaved differently than full-term infants of the same chronological age. Premature infants were more fretful, played with objects less, and used vision more often to experience the world. Also mothers spent less time and smiled less often with their premature infants. Findings suggested that the mother's response to the premature infant influenced interaction.

Crnic, Ragozin, Greenberg, Robinson, & Basham (1983) observed differences between premature and full-term mother-infant pairs. The premature infants were less active, less responsive, vocalized and smiled less frequently, averted their gaze and bodies more frequently, and displayed less positive general affect. Mothers of premature infants were more active and stimulated their infants more frequently during interaction. Often many of these behavioral characteristics persisted across the premature infant's first year of life.

Premature infants reacted differently to social stimuli than the full-term infants. Masi and Scott (1983) examined and compared full-term and preterm infants' early responses to social stimuli. As compared with the preterm infant, the full-term infant regarded the mother's face longer than a stranger's face. Preterm infants looked at their mothers' faces for shorter periods and were slower to orient to stimuli. The hypothesis that preterm infants are less responsive to social stimuli than full-term infants during the early months of life was confirmed.

Lester, Hoffman, and Brazelton (1985) videotaped premature and full-term infant-mother dyads during face-to-face interaction. The purpose was to quantify behavioral cycles and compare temporal organization among term and premature infants. The infant-caregiver system was thought

to differ in term and premature infants due to variance in temporal organization of mother-infant interaction. Spectral analysis which measures the degree to which time series shared the same underlying processes was used to determine cyclicity. Premature infant-mother dyads were less able to coordinate their behavioral cycles of affect and attention during social interaction. Synchrony in social interaction, the biological basis of interactive rhythms, may have diagnostic value in the detection of early disturbances in the mother-infant relationship (Lester et al., 1985).

Censullo, Lester, and Hoffman (1985) studied interaction of term and premature mother-infant pairs for evidence of a rhythmic pattern. Spectral analysis determined cyclicity or rhythmic patterning of recurring behaviors in units of time. Nonrandom, reliable rhythms occur in dyadic mother-infant interaction from birth for term and 40 weeks gestation for preterm pairs. However, no significant difference was detected between rhythmic patterns for premature and term dyads.

The growth of the knowledge about the importance of the mother-infant relationship in the infant's socioemotional development caused health care providers to realize changes were necessary. Interventions designed to promote attachment and a positive parent-infant relationship were

evaluated. Some of these interventions included encouragement of mother-infant contact, infant stimulation, and enhancement of interaction. Eventually total physical and psychosocial care of the the premature infant and family became the priority.

Interventions

In the quest to improve the developmental and attachment outcome for the premature infant and its parents several interventions were tested and later implemented. Rooming-in was assessed and eventually deemed essential in the postpartum care of the fullterm newborn and mother. Infant stimulation was extensively researched as a means to enhance the cognitive, physical, and social development of the premature infant. A more recent trend focuses attention on the parents; teaching parents the physical needs, behavioral cues, and developmental characteristics of the premature infant.

Rooming-In and Early Contact

Rooming-in was one of the first interventions designed to enhance the mother-infant relationship. The mother provided 24-hour infant care in her hospital room with the goal of promoting contact, enhancing mother-infant interaction, and improving the mother's skills in infant care. An opportunity is provided, not only to enjoy contact with her infant but, to read and exchange cues with the infant.

Provision of infant care by the mother is important in the development of mother-infant synchrony (de Chateau, 1980); early mother-infant contact enhances the mother-infant relationship.

The bonding and attachment research with parents and premature infants eventually prompted hospital policy changes. The premature nurseries began to implement more flexible policies of care; mothers were permitted to visit, touch, and hold their premature infants. Early contact was promoted and rooming-in became more common in maternal-infant care. Hospitals began to encourage the mother to stay in hospital for several days before the premature infant's discharge.

Promotion of Contact Studies

Promotion of contact was stimulated largely by the research which indicated the essential nature of contact in bonding and attachment. A secondary influence which turned attention to the mother-infant relationship were reports that showed over-representation of premature infants among cases of child abuse and failure to thrive (Jeffcoate et al., 1979; Klein & Stern, 1971; Ross, 1980). Increased survival rates of the 1960's and 70's indicated that the premature infants do not necessarily die. All of these factors turned attentions toward the enhancement of the premature infant's developmental outcome.

The first barrier dropped after a landmark study of Barnett, Leiderman, Grobstein, and Klaus (1970) which indicated that pathogens in the nursery actually decreased with liberal parental visiting patterns. Barring of parents from the nursery was no longer accepted; parents visited and even touched their premature infant. The effects of varied amounts of mother and premature infant contact on parenting, child development, and attachment were then studied.

Klaus and Kennel (1976) investigated the degree which visiting frequency predicted later parenting skills. Also, the consequences of early and later maternal contact on maternal behavior and child development were observed. The mother's attitude toward her infant and visiting frequency was seen as an early index of maternal involvement.

Harper, Conception, Sokal, and Sokal (1976) reported that the parents felt contact with their premature infant was a good idea. However, the increased contact elicited high anxiety levels among the parents. The interrelationship between anxiety and increased contact was a new phenomenon. Of great concern were the possible effects of the anxiety on the process of attachment.

An observational study (Minde, Trehub, Corter, Boukydis, Celhoffer, and Marton, 1978) of the mother-child relationship in the premature nursery reported varying maternal visiting patterns. Mothers who interacted more

also visited more often and for longer periods and mothers may also have telephoned the nursery more often to ask about the infant's condition. It was speculated at that time that interaction between the mother and her infant is related to the strength of the bond.

Jeffcoate et al. (1979) reported disturbed parent-premature infant relationships. The parents saw, touched, and held their premature infants significantly later than parents of full-term infants. Also the parents of premature infants reported delayed affection as long as two months, difficulty in feeling the infant was theirs, and fear of infant death. Parents of premature infants rated their own infant more negatively than the average infant on the Neonatal Perception Inventory. Jeffcoate et al (1979) stated that prevention of unnecessary separation of the mother and premature infant is essential; parents must also be shown how the attributes and needs of the premature infant differ from those of the full-term infant.

Infant Stimulation

In the 1960's, in an attempt to decrease the handicaps associated with the premature infant, researchers began to assess the effects of supplemental stimulation. Infant stimulation is defined as

> any input from the environment that produces a response - - either quiescence or arousal (Luddington, 1983).

The rationale for infant stimulation is commonly based on: (a) environment, (b) development, and/or (c) attachment. The environment of the fetus differs greatly from that of the premature infant. The intrauterine environment, filled with sensations and stimulations, provides a continuous and aggressive bombardment of activity from the moment of conception to birth. At three to four months conceptual age the fetus is auditorily stimulated by the mother's strong cardiovascular system. Tactile, vestibular, and kinesthetic stimulation occur as the mother walks, sits, bends, and moves. Amniotic fluid provides a whirlpool-like milieu. As the fetus grows amniotic fluid decreases and the multiple opportunities for touch and contact with the placenta, uterine surfaces, and the fetus' own body increase during the last half of the pregnancy.

> There in the womb, weightless, the unborn moves through space, is toweled by the amnionic sac in which he/she is enfolded, has a rhythmic, yet changing patterned heart beat to listen to, and is gently rocked while the mother walks/moves (Chapman, 1980).

This lively scenario is vastly different than that of the static neonatal isolette where the premature infant is surrounded by electronic monitors and equipment. Keeping life systems functioning consumes most of the total care time of the hospital personnel. Little time, attention, or motivation is available to focus on psychosocial and developmental needs. Housed in an isolette, the premature

infant is almost completely isolated from quality sensory and social stimuli (Kramer, Chamorro, Green, Knudtson, 1975). Most of the stimulation the infant does receive is of an obtrusive or noxious nature (such as injections, gavage feedings, blood tests, physical exams). Faced with the demands of keeping the biological systems functioning and often influenced by the assumption that handling increases energy consumption, nursing personnel do not provide the cuddling, caressing, and holding that the term or healthier infant would receive (Rice, 1979). Parents take cues from the nurses and also handle their premature infants less frequently.

The environment of the premature infant is described as lacking quality as compared to that of the full-term infant. Mother-infant contact and the opportunity for early bonding are almost absent or deficient. The premature infant is cared for by nurses; many stressful interventions are carried out rather than the satisfying mother-infant interaction.

Developmental reasons for infant stimulation are evidenced by the high rate of handicaps. The animal deprivation studies have demonstrated that detrimental changes in the chemical composition and structure of the brain can occur (Schapiro & Vukovich, 1970). The brains of animals who suffered a deprivation of handling and

stimulation weighed less, lacked dendritic connections between the nerve cells, and had a decreased axion diameter.

The third common rationale for the infant stimulation programs is related to attachment. It is more difficult for the premature infant and parents to form a positive, rewarding relationship. Reasons for the poor attachment include separation, a negative birth experience, and poor parent-infant interaction. The stimulation programs were designed to help the premature infant become behaviorally more attractive and capable of positive interaction. Involvement of the mother in the stimulation program usually improved the home environment by increasing the mother's knowledge about the premature infant's developmental needs.

Stimulation Studies

The infant stimulation studies influenced the trend toward promotion of premature infant growth and development. Rather than mere survival, the quality of life for the premature infant became the goal. The premature infant benefited from the knowledge and insights derived from the numerous premature infant stimulation studies.

Hospital stimulation programs

1960-1970: In 1964 Eileen Hasselmeyer completed the first planned supplemental stimulation program as part of the requirements for her Ph.D. in nursing (Chapman, 1980). A

group of premature infants, provided with various types of stimulation, were quieter and cried less than the infants who were left untouched. Other stimulation programs were performed in the 1960's (Freedman, Boverman, & Freedmen, 1966; Solkoff, Yaffe, Weintraub, & Blaze, 1969) and the results were positive. Tactile and/or vestibular stimulation promoted short-term increments in weight, reduced crying, and had long-term effects on motor development.

1970-1980: Neal (1970) reported that premature infants who were rocked in their isolettes gained weight faster and had superior motor, visual, and hearing development predischarge. Powell (1974) examined the effects of extra handling of premature infants weighing 1000 to 2000 grams. Although the handled infants were more responsive than control infants, many of the smallest infants reacted negatively to the stroking. Powell raised the possibility that the ideal type of stimulation may vary depending on the premature infant's birth weight.

Oscillating water beds (Korner, Kraemer, Haffner, & Cosper, 1975) provided vestibular-tactile stimulation without human handling. Another innovative approach was the combination of tactile and kinesthetic stimulation (White & Labara, 1976). Few studies reported statistical significance; generally investigators reported improved

weight gain, infant development, and respiratory and digestive functioning. A few of the studies with combined tactile with other forms of stimulation demonstrated statistical significance in weight gain despite small sample sizes.

Auditory stimulation (Katz, 1971; Segall, 1971; Chapman, 1978) involved playing tape recordings of the mother's voice, music, or heart beat via speaker for short periods of time during the day. Chapman (1978) found that limb activity frequently formed a predictable pattern among premature infants exposed to auditory stimulation. Improved development in the cognitive, motor, and sensory domains, and facilation of weight gain among the experimental groups was revealed in the auditory studies.

Multimodal stimulation studies included the work of Barnard (1973) who exposed premature infants to recorded heart beat while being rocked within the isolette. Kramer and Pierpont (1976) combined oscillating water beds and tape recording of a female voice and heart beat. Wright (1971) combined four sensory modalities: vestibular, auditory, visual, and tactile. Multimodal stimulation assisted weight gain, increased head circumference, facilitated neurological development, and helped the infant cope in a stressful situation. Measel and Anderson (1979) reported that use of a pacifier during and five minutes after nasogastric feedings

resulted in infants taking oral feeds earlier, gaining weight faster, and being discharged earlier than a control group.

1980-present: Leib, Benfield, and Guidubaldi (1980) performed a multimodal stimulation study involving visual (mobile), tactile (rubbing), auditory (talking and a music box), and vestibular (rocking before and after feeds) modalities. The experimental group revealed no difference in weight gain although they consumed fewer calories than the control group. Another multimodal study (Naqvi & Hyatt, 1980) reported the experimental infants had stronger sucks, greater weight gains, and shorter hospital stays. A unique characteristic of these two studies was the delay in stimulation until the infants were in the Intermediate Care Nursery.

Rausch (1981) combined tactile (gentle rubbing) and kinesthetic (limb exercises) stimulation and reported increased fluid intake and decreased abnormal stooling. Korner (1981), in a letter to the editor, described the response of very sick infants to oscillating waterbeds as unpredictable. Increased incidence of apnea and bradycardia were reported for some of the infants. Jones (1981) exposed 14 premature infants with apnea to four hour periods on oscillating and non-oscillating waterbeds and found that treatment on the non-oscillating waterbed was associated

with decreased apnea. It was noteworthy that these experimental infants were 27 to 33 weeks gestational age and 930 to 1470 grams.

Jay (1982) experimented with 'gentle human touch' of 12 minutes duration at a frequency of four times a day. Transcutaneous oxygen levels, monitored for two days, decreased by 10% when touch was initiated. However, after the third to tenth minutes of continuous touching the transcutaneous oxygen level increased 10 to 30% above the baseline. Intermittent, brief touching episodes may be more aversive for premature infants than prolonged and continuous touching episodes. Jay (1982) reported no difference in weight gain or loss, however, the experimental infants had higher hematocrits and required fewer blood transfusions than the control group infants.

An experiment with oscillating waterbeds reported better orientation and motor maturity among the stimulated infants (Korner& Sneider, 1983). It was unclear whether waterbeds reduced apnea in premature infants other than those with a diagnosis of uncomplicated apnea of prematurity (Korner, 1983). Barnard and Bee (1983) combined vestibular (rocking) and auditory (heartbeat) stimulation which was produced after each 90 seconds of inactivity. For the first eight days all the experimental infants had decreased rates of activity; this was followed by increased rates of activity.

The experimental infants revealed fewer abnormal reflexes, better orienting responses, and higher Baley scores at 24 months. The growing idea that the premature infant suffered from inappropriate rather than insufficient stimulation was supported by the study of Barnard and Bee (1983). It was suggested that the

> temporally unpredictable quality of the stimulation received in the Intensive Care Nursery contributes to the premature's inability to organize physiological/behavioral reactions to external events (Barnard & Bee, 1983).

Post Hospital Programs

Stimulation after hospital discharge was studied in two investigations by Rice (1977, 1979) which involved teaching the mothers to massage and stroke the infants four times daily. Outcomes were measured at four months chronological age or three months after the program ended. Experimental infants demonstrated greater weight gain, higher scores on the mental scales of the Baley, and better neurological maturation than the control infants. Bromwich and Parmelee (1979) examined an educational program designed to enhance parents' awareness of infant behavior in the social-affective, cognitive-motivational, and language domains. Although no difference was noted in the infants at two years of age, the homes of the experimental infants scored higher in terms of being a favorable environment for future development. Williams and Scarr (1971) examined whether toys and tutoring of the parents would create a favorable

effect. Improved verbal performance and increased social maturity was noted in neurologically impaired infants.

Follow-up studies of the hospital stimulation programs reported (Malloy, 1979; Porter, 1973) no statistical significance, however, confounding variables and small sample sizes were indicated as negative influences. Research turned to the question of whether combined home and hospital programs would have more lasting effects. Two studies (Chapman, 1978; Scarr-Scalapatek & Williams, 1973) reported favorable short-term effects but no long-term outcomes. Chapman (1978) addressed the question of long-term effects in a series of follow-up investigations. The premature infants were exposed to recorded music during the first half of hospitalization and to parental voice once the infant had gained enough weight. A second experimental group was exposured alternately to music and voice throughout their hospitalization. Parental voice was selected hoping the infant related positively to the real voice due to familiarity with the taped voice of the parents. After discharge the infants were assigned at random to the condition of presence or absence of a home stimulation program involving professional tutoring and toys. The program was evaluated at nine and eighteen months of age and indicated that mental and motor development were within normal range. At three years of age the experimental children revealed an average IQ score of 100 while the home

control group was six IQ points lower. Chapman's (1984) follow-up to four years of age reported no evidence that stimulation programs at different times during the first three years affected overall outcome.

Conclusions

Stimulated infants tended to score higher than counterpart infants on sensorimotor and behavioral assessment scales. An improvement in physiological functioning such as weight gain was commonly reported, although not always demonstrated. The studies varied in the use of single or multiple sensory modalities; in the intensity, length, and duration of a single intervention (Blackburn, 1983; Cornell & Gottfried, 1976).

The stimulation studies had major limitations such as: small sample sizes, wide variations in gestational ages and weights of infants at birth, and the timing and duration of the stimulation programs. Few investigations attempted to explain the mechanism by which the beneficial effects were achieved. Short-term outcomes were more often measured rather than long-term follow-up.

The stimulation programs were seldom individualized according to infant cues, temperament, behavioral organization, or infant state. Optimal types and amounts of stimulation are unknown and some intervention programs may

have inadvertently overstimulated the infant (Field, 1980). Research must identify behavioral cues which caregivers can use to provide optimal stimulation for each individual premature infant.

The early studies increased knowledge of the premature infant's needs, behavior, and development. A key discovery was that the premature infant under thirty-two weeks gestation is prone to intraventricular hemorrhage and should be treated with no additional tactile or vestibular stimulation in the first ten days of life (Harrison, 1985).Such restricted contact has grave effects on the developing mother-infant relationship and infant development.

Observations resulted in much greater understanding of the characteristics and unique needs of the premature infant. A theory of behavioral organization was developed which is closely related to gestational age (Gorski et al., 1979; Als et al., 1982). Infant state was discovered to be a powerful determinant of how the infant perceives and reacts to a stimulus, as well as how the infant reacts with the environment at any given time (Blackburn, 1983). For example, infants responded to visual and auditory stimuli only when in the alert state (Gorski et al., 1979). In each case the infant responded uniquely and in a predictable manner. Behavioral states determined level of arousal and

alertness and were indicators of optimal times for stimulation.

Individual assessment indicated that stimulation is not appropriate for every premature infant. Each mother can be helped to determine the infant's unique stimulation needs and move at the infant's pace (Klaus & Kennel, 1982). Care of an infant requires maternal adaptability and the challenge is far greater in the case of an infant with unusual sensitivities (Korner, 1973). The maternal care must be delicately tuned to the infant's state at any given time. Maternal actions may be guided by factors external to the infant's needs such as maternal convictions regarding 'good' child care practices or psychological needs within the mother (Korner, 1973). These maternal factors may cause a mismatch between mother and infant. For example, if a mother believes that stimulation is good for babies, she may severely hamper an excitable baby's process in achieving homeostasis.

Interaction Intervention

Whitt and Casey (1982) noted that, despite the growing emphasis on the infant's role in social interaction with caregivers, studies that evaluated the effectiveness of fostering the mother-infant relationship were rare. Whitt and Casey (1982) explored the effect of a pediatric-based intervention on cognitive development, maternal-infant

behavior, and the interactional qualities at six months of age. Physical examinations of infants and discussions with the mother at six different occasions from two to 27 weeks of age constituted the intervention. The discussions with the pediatrician included counselling the mother to respond to infant cues by vocal, visual, and supportive physical contact. The infant and mother were observed at play prior to the last visit and behaviors of the mother and infant were coded and recorded. Results indicated that pediatric well-child visits are a potentially effective modality for enhancing the parent-infant relationship.

Field (1982) studied specific strategies designed to modify the interaction behaviors of the mother and premature infant. Imitation, repetition of phrases, silencing during pauses, and gameplaying increased the amount of time that the infants looked at their mothers. Also when the mothers imitated the premature infant's behavior, the amount of infant gaze at the mother increased significantly. Repetition of phrases and silencing during pauses also increased the main proportion of interaction time which the infant spent gazing at the mother. When asked to try and maintain the premature infant's attention the mothers provided excessive amounts of auditory, tactile, kinesthetic, and facial expression stimulation. Often the mothers played games such as 'Itsy-bitsy spider' or 'I'm gonna get you' which induced smiling and laughter. When the

stimulation was too intense or rigorous the infant would appear to become too aroused as manifested by rigorous laughter followed by gaze aversion. The study indicated that mothers of premature infants can be taught more appropriate ways to interact with their premature infants.

Nurcombe, Howell, Rauh, Teti, Ruoff, and Brennan (1984) evaluated an intervention program for mothers of low-birthweight infants. A pediatric nurse taught the mother specific information about the premature infant with the aim of enhancing the quality of interaction. Mothers were taught to be more sensitive and responsive to their infants' physiological and social cues. The resulting improvement in interaction was hoped to facilitate infant development and maternal adjustment. A beneficial effect on general adaptation to mothering was reflected in enhanced satisfaction and confidence in mothering. The program did not report a significant improvement in infant cognitive development.

Magyary (1984) reported implications of premature infant-mother interaction problems for clinical practice. Research must identify infant and parent characteristics that place the dyad at risk for developing an overtaxed interactive system. Additional research must document the success of nursing interventions (Magyary, 1984). Stage setting involves encouraging the parents to interact with the infant

during situations or parts of the day when the infant is usually most alert. Interactive coaching involves helping parents learn strategies to interact with their premature infant. Evidence suggests that parents require education about the premature infant's needs to modulate sensory input by periodically withdrawing from parental stimulation.

> Currently what needs to be studied are the various coaching techniques that may help parents of preterm infants to be more discriminating in their intensity and timing of stimulation (Magyary, 1984).

Province (1985) suggested that the effects of early interventive programs must be evaluated. Long-term benefits of interventive programs appear linked to the inclusion of parents as active participants in efforts to bring about change and facilitate development. This points to the importance of educating mothers about the premature infant's physical and psychosocial needs.

Turley (1985) performed a meta-analysis of research between 1970 and 1981 which provided mothers with information about the sensory and perceptual abilities of their full-term newborns. The effect of the intervention on interaction was also noted. Information presented in the home setting and four weeks after discharge revealed the largest mean effect size in terms of mother-infant interaction. The time lapse of two weeks from presentation of the information to the measurement of outcomes tended to

produce the largest mean effect size. Information provided to the mothers about their infant's social capabilities significantly increased overall effect size in terms of mother-infant interaction. Therefore, the optimal time to instruct mothers appeared to be after discharge.

Barrera, Rosenbaum, and Cunningham (1986) investigated the effects of a year-long intervention program on the premature infant's cognitive development. The study was based on the transaction model which identifies both the mother and the infant as targets for intervention. Mothers were taught problem-solving strategies to help them cope with the challenges of parenthood. The home intervention, and particularly those dealing with parent-infant interaction, produced marked changes in the home environment. Some behavioral changes during mother-infant interaction and modest changes in the infants' cognitive development were reported. Treatment effects in the verbal/independent play and in mothers' responsiveness were reported. The study underscored that intervention, focused mainly on parent-infant interaction within a problem-solving model, is an effective home treatment for premature infants and their parents. Barrera et al. (1985) recommended selection of high-risk populations in future studies due to the high cost of intervention and the greater potential for improvement.

Harrison and Twardosz (1986) examined the effects of a teaching intervention on mother's perceptions of, and interaction with, their premature infants. The mothers in the experimental group received instruction about the unique physical and behavioral characteristics of premature infants. Maternal perception of, and behaviors toward, the infants were not significantly improved. Harrison and Twardosz (1986) suggested that outcome measures which were more related to the intervention, such as a test of knowledge about premature infant behavior, may have reflected more significant differences.

Summary

Care of the premature infant has improved due to many advances in knowledge about the premature infant's physiological and psychosocial needs. Awareness that the premature infant interacts with the environment has created great strides in understanding the premature infant's needs. From the 1960's to the 1970's most stimulation studies involved the nurse as the provider of stimulation in the hospital setting. When parents were permitted into the nurseries, they became the principal providers of stimulation care for their premature infant. Programs which included the mother as the provider of stimulation were more successful. The home stimulation programs revealed significant results more often than those in the hospital setting. The quality of the home environment, as well as

the mother's ability to interact with her infant, improved during these programs.

The parents are now considered the most influential factor in determining the premature infant's developmental outcome. The extent and quality of stimulation care in the home appears very important in the social, physical and emotional development of the infant. The quality of life for the premature infant may depend largely on the knowledge and investment of the parents in the infant's developmental care.

It is very important that the parents interact appropriately with the premature infant. Appropriate interaction requires that the parents monitor and assess the infant's response to stimulation. Characteristics of the premature infant such as their narrow sensory thresholds increase the requirements for parental knowledge and skill.

Chapter III

METHODOLOGY

Development of an interactive relationship may be a difficult process for parents and premature infants. During the premature infant's extended hospitalization and after discharge the parents and infants may experience many stresses which hinder the establishment of quality interaction. The investigator is convinced that part of the problem is the parent's knowledge deficit in relation to the premature infant's behavior, interactive abilities, and the important role of interaction in infant development. Therefore, the investigation assessed the effect of a nursing intervention designed to increase the parent's knowledge and skill in interacting with the premature infant.

The need for home intervention is evidenced by the manner which parents are prepared for the care of their newborn. During the prenatal and postnatal periods both hospital and community nurses provide general instruction in the physical care of the newborn. 'Newborn' care instruction includes general topics such as bottle/breast feeding, infant nutrition, a bath demonstration, and the importance of immunizations. Unfortunately, many communities and

hospitals do not offer specialized instruction about the premature infant's special social, emotional, and developmental needs. The situation has become acute due to the ever increasing population of surviving premature infants who require appropriate services.

Some hospitals and communities are devising new and more appropriate programs and resources. One such program allows parents to remain in hospital to care for their premature infant for 48 hours before discharge. Providing the physical care of the premature infant helps the parents realize their learning and support needs before discharge. Another popular intervention to meet the needs of the premature infant is stimulation. Researchers indicate that premature infant stimulation, implemented at the appropriate developmental time, prevents handicaps and promotes optimum development. Despite these findings some hospitals still fail to provide infant stimulation as an early means of preventing handicapping conditions.

In summary, there is a paucity of intervention programs available both in the hospital and community which meet the special needs of families and premature infants. Some researchers fail to agree on the effectiveness of the newer and more innovative interventions and therefore expenditure of money cannot be justified. At present the investigator is unaware of any planned intervention which specifically

instructs parents of premature infants in means to enhance interaction. Therefore, the investigation assessed one teaching intervention designed to enhance mother-premature infant interaction.

Design

The thesis investigation was a quasi-experimental design (Appendix A) and explored the effects of a nursing intervention on mother-premature infant behavioral interaction and maternal feelings of competence. The mother and premature infant pairs were randomly assigned (Appendix B) to an experimental and a control group. The mothers and premature infants were visited by the investigator during the first, third, and fifth weeks after the premature infant's discharge. The experimental group experienced a two-part home-based teaching intervention (independent variable) which focused on mother and premature infant interaction. The intervention was administered during the first and third week after the premature infant's discharge.

Population

The target population of infants included all those premature infants born at 37 weeks gestational age or less and also weighing 2000 grams or less. All possible mother-premature infant dyads that met the inclusion criteria were approached and asked to participate in the investigation.

The target population included all mothers who delivered prematurely, were between 18 and and 40 years of age, and lived within a fifteen minute driving radius of the Winnipeg city Perimeter Highway. They delivered at one large Winnipeg teaching hospital and could have been classified as high-risk before delivery. Both Cesarian section and vaginal deliveries were included in the sample. Preexisting medical conditions such as toxemia, hypertension, placenta previa, diabetes gravidarum (excluding depressions or psychiatric conditions) did not exclude any mother. Multiparous women with no previous prematurely born infants were included in the study. All possible mother and infant pairs who met the inclusion criteria were approached until the sample size was 18 (9 in each group).

The rationale for including multiparous women who did not previously experience a premature birth was based on several points.

1. Although a term birth and delivery has its maturational stresses, literature reveals that premature `delivery has the stress proportions of a crisis. Whereas, birth of a full-term infant is generally a joyous occasion, premature birth is often the opposite. The hospital experience is more stressful and lengthy for the mother and premature infant. The high-risk premature infant differs from the full-term infant in terms of health status,

development level, behavior, interactive ability, and care requirements. Therefore, the experience of having a premature infant is different than having a full-term infant.

2. Studies of high-risk premature infants have traditionally reported difficulty attaining an appreciable sample size. Therefore, to enhance sample size, multiparous women with no previous premature infant were included.

Setting

The investigation took place in the home setting, rather than in the hospital or a lab setting, because experts recommend that interaction be studied in it's natural setting (Ziajka, 1981). In this way, the distractions and anxieties of the hospital environment were avoided and interaction was recorded as naturally as possible. One major focus of the investigation was the feeding situation, a naturally occurring interactive event.

Mother-infant interaction during feeding was selected for several methodological reasons. The problem of when to begin recording behavior, or 'point of entry', was overcome by observing interactive processes in the context of a feeding situation. The flow of interaction was captured due to the natural beginning and end. The feeding situation provided the opportunity to observe the reciprocal

relationship between infant and parent. Another practical reason was that feeding is often one of the few times when the young infant is alert, awake, and open to interactive approaches from the parents.

> Ultimately, observing the feeding provides the information necessary to identify patterns of interaction in the first year of life that can be of predictive or suggestive value in the early identification of healthy or deleterious mother-child interactional processes (Spietz, 1978).

Instruments

Three instruments were used in the investigation: the behavioral code catalogue (Appendix C), the Assessment of Premature Infant Behavior (APIB; Appendix D), and the Maternal Competence Questionnaire (MCQ; Appendix E). The following section describes each instrument and addresses validity and reliability.

Behavioral Code Catalogue

The behavior code catalogue was developed by Bakeman and Brown (1977) to investigate mother and full-term infant interaction. The same code was used to compare full-term and premature infant behavior during feeding (1978). The code catalogue is comprised of specificly defined and coded infant and mother interaction behaviors. While observing the feeding session, the researcher records the code number for each behavioral occurrence. The data are later analyzed for frequencies, durations, and probabilities of behaviors.

Although this approach is judged lengthy and complicated (Bakeman & Brown, 1978), it successfully detected differences between preterm and full-term interaction behavior. Flick and McSweeney (1987) suggested that rating scales are most appropriate when an inexpensive means which is sensitive to general behavior and not to fine discrimination between types of behavior is required. Rating scales are adequate in the study of overall quality of interaction (Bakeman and Brown, 1978). However, the stipulation of having both an accurate rating scale and a knowledgeable and trained research observer has been emphasized. The investigator is convinced that such a detailed and sensitive tool as the behavior code catalogue is necessary to pick up subtle interaction differences among premature infants.

Specific Behavior Codes

As advised by Bakeman (1986, June) the investigator used a modified behavior code system and incorporated only the interaction behaviors which specifically related to the research question. These behaviors include 50 different mother behaviors and 33 different infant behaviors which are classified as appropriate to the both the feeding situation and interaction (Bakeman and Brown, 1977, 1980; Brown et al., 1975). Additional behaviors, based on the work of Field (1980), were added to the catalogue. Whereas,

Bakeman's and Brown's (1978) methodology involved researchers encoding the interaction behaviors live while the mother is feeding the infant, the present methodology differed in that the feeding sessions were first videotaped and later encoded.

Time sampling methodology. Time sampling allows the investigator to concentrate on recording selected aspects of behavior as they occur within specified time intervals (Irwin & Bushnell, 1980). The videotape recordings were sampled for a specific time intervals; all the behaviors which occurred during the specific time interval were recorded. Hutt and Hutt (1970) suggest that the frequencies and durations are approximate and relative.

Following these guidelines, the investigator encoded the first five minutes and every third subsequent minute. The videotape recorder was viewed for five seconds, stopped, and the behaviors and their durations were recorded. The introduction of investigator bias was avoided by choosing arbitrary time sampling methods which were followed for each videotape. A range of 45% to 55% of each feeding session was represented in the encoded data.

Validity and reliability. Content validity was supported because experts in premature infant social and emotional development created and used the code system in previous investigations. Videotape records allowed multiple

observations to check encoding accuracy until a level of consistency was reached (intrarater reliability of at least 80%). Reliability was enhanced by the objective nature of the behavioral code catalogue.

Interrater reliability was assessed on a five minute sample segment of a randomly selected mother-infant feeding pair. Both a casual and a strict interrater reliability measure were calculated. The strict approach (interrater reliability of 64.9%) used both the behavior occurrences and frequencies in the calculation. The more casual approach (interrater reliability of 85.4%) used only the behavioral occurrences in the calculation. These reliability measures are comparable with those of Bakeman and Brown (1980) who reported strict and casual agreements of 70 and 90 percent. Due to methodological reasons, the casual approach is deemed more appropriate. When the videotapes were encoded, the VCR machine was stopped every five seconds and the behaviors were recorded before observing the next five second segment. It was virtually impossible for the investigator and the reliability checker to stop the VCR player at the exact times. As a result behaviors which lasted greater than a second were not necessarily divided into the same five second period. Consequently, the frequencies could differ. For this reason, the casual interrater reliability measure was more appropriate.

Assessment of Premature Infant Behavior

As the survival rate of premature infants increased it became more important to measure infant development and behavior which are major factors that determine the quality of mother-infant interaction. Therefore instruments were developed to examine the effects of early intervention on the developmental course of premature infants (Als et al., 1982). One measurement tool which focuses on infant behavioral development is the APIB which developed from the BNBAS (1973). While the BNBAS is a means to document patterns of developing behavioral organization in full term infants, the APIB focuses on the premature infant. The APIB is appropriate from the time that the infant is no longer dependent on ventilatory or mechanical devices until the infant can attend to the environment (Als, Lester, Tronick, & Brazelton, 1982).

The investigator used the APIB in the thesis investigation to document the behavioral development level of the premature infants. The behavioral development is one key factor which determines the infant's interaction abilities. Because the APIB is interaction and behavior-based, the investigator could detect any potential infant characteristics which may affect the quality of mother-infant interaction. An additional reason for performing the APIB was to help the investigator become more familiar with

the premature infant's behavioral capabilities and also to demonstrate them for the mother. The APIB helped the investigator develop assessment skills and to determine the value of the tool in the nursing care of mothers and premature infants. There are few instruments designed specifically for premature infant and their validity and reliability are not yet fully established.

The APIB consists of maneuvers which are a graded sequence of environmental inputs which normally occur during daily infant care. While administering each package the infant is assessed along the five systems: physiological, motor, state, attention/interactive, and self-regulatory. The system parameters, grade scaled from 9 (disorganized performance) to 1 (well-organized performance), allow a focus on subsystems. Thresholds of integration and stable organization, areas of poor functioning and regulation, and the areas of beginning modulation and differentiation are identified. Thus the APIB allows one to document the behavioral dimensions of the premature infant.

The APIB was designed to assess the interactional competence and behavioral repertoire of the premature infant. Signs of vulnerability to stimuli and environmental manipulations which may promote alert states can be identified. Observation of behavioral strengths, weaknesses, and developmental changes over time is possible.

The individualized, interactive approach to infant assessment decreases the chance of providing inappropriate stimulation. Cole and Frappier (1985) described the role of the APIB in documenting the behavioral functioning of the premature infant during hospitalization. Such valuable information can be used to design and implement an individualized program of nursing care which is developmentally-focused.

Validity and Reliability The APIB, specifically designed to allow measurement of the premature infant behavior and development, is relatively new and studies are on-going to establish its validity (Cole & Frappier, 1985). The calibration is sensitive enough to detect subtle behavioral characteristics of the premature infant. To enhance reliability and clinical expertize, the investigator practiced the APIB on premature infants in the hospital nursery before beginning the investigation. The investigator's past experience with infants and a consistent approach added reliability to the APIB.

Maternal Competence Questionnaire

The Maternal Competence Questionnaire (MCQ) is a 40 item, 5 point likert-scaled questionnaire which assesses mother's feelings of competence in caring for and interacting with an infant. The MCQ subscales are: infant readability,

predictability, responsiveness, mother's knowledge level, skill confidence, and feelings of helplessness. Readability depends on the dual function of infant behavior and parent recognition of that behavior. Predictability is the regular occurrence of given behaviors (feeding, waking). Responsiveness is the infant's ability to react to animate and inanimate stimuli. The questionnaire draws heavily on the competence motivation model of Goldberg (1979) which suggests that competence is determined by the parent's experience with the infant. Experience with a particular infant may decrease, maintain, or enhance the competence feelings of the parents. The parents interpret the infant behavior, make decisions about care or social interaction, and evaluate their own effectiveness in terms of the infants subsequent behavior. Goldberg (1979) emphasizes the relationship between behavior and competence feelings.

Parents feel successful when they can read the infant's behavior, make decisions quickly, and the subsequent infant behavior is more enjoyable. The competence feelings of parents are related to and dependent upon the competence of the infant. The readable, predictable, and responsive infant provides the parents with clear signals of needs.

Validity & reliability. Research has indicated that behavior changes and environmental modification result if

parents' awareness of their role in infant care is enhanced (Barrera, Rosenbaum, & Cunningham, 1986). Therefore, measuring an intervention change in the parent's behavior is currently stressed. Maternal competence was selected as the indicator of the parental intervention effect.

A pilot project was performed to establish validity and reliability measures for the MCQ. Twenty-two mothers of full-term infants completed the MCQ in their homes within the first week after birth. The standardized item alpha for the MCQ was .8639 and the subscales ranged between .3742 and .7858. External validity of the MCQ was established with the Neonatal Perception Inventory (NPI, Broussard & Hartner, 1971) which was completed at the same time as the MCQ. Two measures of the same construct should correlate highly with each other (Waltz & Bausell, 1981). The NPI measures the mother's perception of her infant as compared to the 'average' infant. The mother rates her own baby on a five-point Likert scale that consists of six items: crying, spitting up, feeding, elimination, sleeping, and predictability. Because the manner in which a mother relates to an infant is related to her perception of the infant's appearance and behavior (Broussard & Hartner, 1971), the NPI and the MCQ were expected to correlate. The measures were also expected to correlate because the NPI and the MCQ address several of the same concepts. The Kendall tau correlation between the MCQ and the NPI total score was

.49585 (p-level=.002) indicating a positive association. Reliability of the MCQ was also assessed for the 18 mothers and premature infants; the standardized item alpha was .7478 for the pretest and .8278 for the posttest measurement. The MCQ pretest and posttest scores revealed a correlation of .54 (p-level=.002). The MCQ appeared to be a valid and reliable instrument to measure change in maternal competence.

Ethical Considerations

The investigator received approval from the University of Manitoba School of Nursing, Ethics Committee. The investigator always respected the rights of the infants and mothers. Consent was obtained from the mothers only after written and verbal descriptions of the study were given to the mothers. The mothers were informed that they could withdraw at any time and that no subsequent harm would come to the infant or mother. The mothers were informed verbally and in writing that confidentiality would be maintained and that no names would appear on the data sheets. Only the investigator, the thesis committee, and the statistician had access to the coded data. All the data would be destroyed after completion of the analysis.

The APIB involves noninvasive stimulation of the type that infants experience daily during maternal care. However, if at any time the premature infant became distressed, the

investigator allowed the infant to rest before completing the assessment. If the infant indicated continued distress the assessment was not completed.

If a mother or infant problem was discovered during the home visit, the problem was not ignored. For example, if the mother propped the bottle or the infant displayed a weakness on one side of the body, the investigator provided teaching and/or referral to a health care professional after permission was received from the mother.

Mothers' questions about the APIB were answered honestly. A list of anticipated questions (Appendix F) was prepared so that the mothers each received consistent feedback. The investigator carried out the assessment with sensitivity to the infant's needs and did not verbally evaluate or rate the infant's behavior.

Procedure for Data Collection

Prior to data collection, approval was received from the Ethics Committee at the University of Manitoba School of Nursing. Access to subjects was received from a large Winnipeg teaching hospital's Department of Maternal/Child Nursing and the Head of Neonatology.

Recruitment of Subjects

Subjects were recruited from two units of the teaching hospital: the Intermediate Care Nursery and the Pediatric

Nursery. Recruitment procedures were arranged in conference with the appropriate Head Nurses and an Assistant Head Nurse. In the Intermediate Care Nursery, the investigator received potential participants' names and telephone numbers from the Assistant Head Nurse. In the Pediatric Nursery, the investigator reviewed the patient Kardex every two to three days. When the investigator identified a potential subject, she sought permission to approach the mother from the Head Nurse. If the Head Nurse approved, the name and telephone number of the mother was obtained from the chart by a nurse in the nursery. The investigator then telephoned the mother and gave her a general description of the study (Appendix G). If the woman expressed an interest in the study a more detailed explanation (Appendix H) was provided. Consent (Appendix I) of the subject was obtained only after written and verbal explanations were provided.

Data Collection in the Home Setting

Data collection took place over nine months and included a five week follow-up with two visits for the control group and three visits for the experimental group. The first home visit was during the first week after the premature infant's discharge home. Once in the home, and before the study was started, the mother was asked if she had any questions and further explanations were provided as necessary. The demographic forms (Appendix J) and the MCQ were completed.

The mother-infant feeding session was then videotape recorded and the first half of the teaching intervention was delivered (for the experimental group). The feeding session lasted from ten to forty minutes--depending on the length of the feed. The MCQ took approximatly 10 minutes to complete. The first part of the teaching intervention lasted approximately one hour depending on the number of questions the individual mother asked.

The intervention (Appendix K) involved a description of premature infant behavioral development and its effects on interaction. Discussion between the investigator and mother was encouraged to help individualize the intervention and included examples and demonstrations of means to enhance interaction. The intervention was presented at this particular time for several reasons. The mother had just resumed 24-hour infant care and awareness of her responsibility in providing for the premature infant's physical and social care was heightened. Readiness to learn was high since mothers were eager to promote the infant's development and establish a positive mother-infant relationship. Learning was facilitated because the mothers' anxiety levels were lower at this time than during the infant's hospitalization.

The second home visit (experimental group only), during the third week after the premature infant's discharge,

involved additional discussion with questions, clarifications, and comments as necessary. Maternal observations of progress and changes in the premature infant's behavior and development were stressed. The learning process was enhanced by allowing the intervention to take place over two visits and by reinforcing material covered in the previous visit. The home visits usually lasted one and one-half to three hours; very long home visits were avoided as tiring might interfere with the mother's learning process.

The third home visit was scheduled during the fifth week after the premature infant's discharge home. The mother and premature infant feeding session was again videotaped; the MCQ was redone for the posttest measure. By the fifth week the mothers had time to absorb, assimilate, and practice the instructed material. The mothers had the opportunity to become better acquainted and interact with her infant. During this visit the APIB was performed to assess infant behavioral development and interactive abilities (approximately 20 minutes). At this time the control group mothers were offered the teaching intervention.

Hypotheses

HYPOTHESIS I

As a group, the mothers' feelings of competence will be higher at five weeks, compared with the first week, after the premature infant's discharge home.

HYPOTHESIS II

The experimental group mothers who received a teaching intervention will have a significantly greater increase in feelings of competence at five weeks after discharge as compared with the control group.

HYPOTHESIS III

Mothers who received a teaching intervention will have significantly increased maternal competence subscale scores compared with the control group.

HYPOTHESIS IV

Mothers and premature infants who received the teaching intervention, compared with those who did not, will reveal a significant increase in the following behaviors at five weeks after the premature infant's discharge: mother smiles, infant vocalization, gross movement, fine movement, tactile stimulation, and socially expressive vocalizations.

HYPOTHESIS V

The mothers and premature infants who received a teaching intervention will show lower proportions of the following behaviors at five weeks after the discharge of the premature infant: null action, suck noises, and stimulating the infant to suck.

HYPOTHESIS VI

The mothers and premature infants who receive a teaching intervention will have a greater proportion of coaction (C) at the posttest.

HYPOTHESIS VII

The mothers and premature infants who receive a teaching intervention will have lower proportions of mother and infant acting alone (M, and I) dialogic states.

HYPOTHESIS VIII

A greater number of mother-premature infant pairs who received the teaching intervention will reveal changed dialogic state proportions.

HYPOTHESIS IX

The transitional probabilities which represent positive interaction will occur more frequently among the mothers and premature infants who received a teaching intervention. These transitions include CI, MQ, and CC.

HYPTHESIS X

The mothers and premature infants who receive a teaching intervention wil have lower proportions of the transitions which represent negative interaction: II, IQ, MI, QI, QQ, and MM.

Assumptions

1. The basic assumption of the investigation is that the mother and infant form an interactive unit from the time of birth.
2. The mother and premature infant are deficient interactionists and education directed toward the mother will help alleviate the problem.
3. The mother did not receive such interactive counselling (explanation of infant behavior, cues, and the developmental nature of behavior) while the infant was hospitalized or during the early post discharge period.
4. Interactional difficulties were revealed during a videotaped feeding session which is representative of the total interactive domain.
5. The sample of mothers experiences a common level of stress and support in caring for the premature infant at home.
6. The home-based intervention occured at a time when the mother was eager and willing to learn about the premature infant and means to enhance mother-infant interaction.

7. Home-based intervention facilitated learning because the home setting was less anxiety-producing than the hospital.
8. The mother who is able to read the infant's cues and to predict outcomes of her ministrations will report greater feelings of competence in interacting with her infant.

Limitations

1. Videotapes of two feeding sessions may not have been sufficient follow-up measurement. Also a single measurement of the infant development may be inadequate due to the nonlinear characteristics of infant development. However, these are common limitations of many studies and at the master's level, research time and money were constraints which had to be considered.
2. It is possible that a two part, home-based teaching intervention was not extensive enough to meet the requirements of the infants and mothers. Incremental, planned teaching and assistance on a longitudinal basis would be more suited to the needs of the parents and premature infants. However, the investigation aimed to discover the effects of one specific intervention and consequently the restrictions were realistic.

3. Many varied factors affect the experiences of individual mothers and infants. Family support, financial concerns, availability of assistance, past life experiences of the mothers vary-- these may have affected the findings. Imposition of complete control over these variables was virtually impossible.
4. The intervention, as well as the pre- and posttest interaction videotapes, were performed by one investigator. The investigator's presence during the outcome measure may have caused the mothers to perform in a socially expected way. However, the mothers were advised to act as if the investigator was not present during the feeding session; the investigator interacted as little as possible with the mother and infant.

Chapter IV

ANALYSIS AND RESULTS

This section describes the sample of mothers and premature infants and the two major data sets. The data sets include the maternal competence questionnaire and the behavioral interaction data encoded from the interaction videotapes. The premature infants' results on the APIB are presented to help describe their contribution to the behavioral interaction. Hypotheses are developed and either accepted or rejected based on the statistical evidence.

Sample Characteristics

The research sample comprised eighteen mother-premature infant pairs; four of the premature infants were twins of different sex and one of the premature infants was an identical twin. Demographic characteristics including mother's age, marital status, education, income, and mode of delivery varied. Attachment indicators examined included time until the mother first saw, touched, held, diapered, and bathed her premature infant(s). Although the premature infants and mothers represented a heterogeneous group, the ANOVA tests revealed no significant differences between the experimental and control groups in terms of the biomedical, demographic, and attachment variables.

The mothers were 18 to 37 years of age with a mean of 24.7 years. Twelve of the women were married, three were in a common-law arrangement, and one was a single teenager (Table 1). Nine of the mothers had a Grade 12 education or less, three had 12 to 14 years of education, and four had 14 to 16 years of education. The most common family income reported was $10,000.00 to $20,000.00 (n=8). Seven of the mothers were first time mothers; nine of the mothers were multiparous with one or two other children. None of the mothers experienced a previous premature birth. Nine of the premature deliveries were by vaginal mode and seven were by cesarian section.

The mother's general knowledge level about premature infants was determined by asking if the mothers received any special instruction, read any books, or attended any support group meetings. Six of the mothers reported receiving special instruction about the premature infant during hospitalization. Seven of the mothers reported reading a book about premature infants, two saw a videotape, and two attended an in-hospital support group meeting.

Gestational ages and other biomedical variables are varied for the premature infants (Table 2). The assessed gestational age at birth ranged from 27 to 35 weeks with a mean of 31.8 weeks. Six of the premature infants were 31 or less, seven were 32 weeks, and five were between 32 and 35

TABLE 1

Socioeconomic Demographics

VARIABLE	CLASS	N
MARITAL STATUS	SINGLE	1
	MARRIED	12
	COMMON LAW	3
EDUCATIONAL	LESS THAN 12 YEARS	3
	12 YEARS	6
	12 TO 14 YEARS	3
	14 TO 16 YEARS	4
FAMILY INCOME*	$10 - $20,000	6
	$20 - $30,000	4
	$30 - $40,000	4
	GREATER THAN $40	1
DELIVERY MODE	CESARIAN	9
	VAGINAL	7

*One mother chose not to report income.

weeks gestational age at birth. The premature infants' birthweights ranged between 1100 to 1860 grams with a mean of 1623 grams. Eight of the premature infants weighed less than 1500 grams and ten weighed between 1500 and 1860 grams at birth. Eight of the premature infants were male and ten were female. Body length, head circumference, and Apgar scores at birth varied. The Apgar scores at one minute after birth ranged between 1 and 9 with a mode of 7; Apgar scores at five minutes ranged between 4 and 9 with a mode of 8.

The number of days which the premature infants required respiratory support ranged from 0 (n=7) to 39 (n=1) days with a mean of 7.16 days. While eight of the infants required from one to ten days of respiratory support, three of the infants received from 30 to 39 days of respiratory support. The premature infants spent 0 (n=3) to 69 (n=1) days in the Intensive Care Nursery (mean = 17 days); 5 (n=4) to 53 (n=1) days in the Intermediate Care Nursery (mean = 17.8 days); 7 (n=2) to 28 (n=1) days in the Pediatric Nursery (mean = 15.9 days).

TABLE 2

Premature Infants Biomedical Variables

VARIABLE	MEAN	MINIMUM	MAXIMUM
GESTATIONAL AGE	31.8	27	35
BIRTH WEIGHT	1623.3	1100	1850
HEAD CIRCUMFERENCE	29.2	26	31
ONE MINUTE APGAR	6.4	1	9
FIVE MINUTE APGAR	7.9	4	9
RESPIRATOR DAYS	7.2	0	39
NICU DAYS	17.1	0	69
IMCN DAYS	17.8	5	53
PEDIATRIC DAYS	15.9	7	28
NASOGASTRIC FEED	8.2	0	42
ORAL FEED	20.2	0	58

The premature infants were first fed by nasogastric tube from 0 to 42 days after birth (mean = 8.2 days); first fed by the oral route from 0 to 58 days after birth (mode = 17

days). Fifteen of the premature infants were first fed by nasogastric tube within ten days after birth while three of the premature infants were first fed by nasogastric tube from 27 to 42 days after birth. The first oral feed often corresponded with the first time held by the mother.

Factors affecting attachment which were examined included time to first see, touch, hold, diaper, and bath the premature infant (Table 3). The mothers first saw their premature infants from one minute (n=2) to 15 hours (n=1) after birth with a mean of 1.37 hours. Twelve of the mothers first saw their premature infant within fifteen minutes after birth and six from two to 15 hours after birth. The mothers first touched their premature infants from less than one hour (n=6) to 24 (n=4) hours after birth with a mean of 9.0 hours. Thirteen of the mothers touched the premature infant within the first 12 hours after birth. The premature infants were held for the first time from 2 (n=2) to 60 (n=2) days after birth with a mean of 18.7 days. The mothers first changed their infant's diaper from 3 (n=1) to 45 (n=2) days after birth with a mean of 14.7 days. The mothers first bathed their premature infant from 16 (n=1) to 90 (n=1) days after birth with a mean of 41.4 days.

TABLE 3

Attachment Variables

VARIABLE	MEAN	MINIMUM	MAXIMUM
FIRST SAW	113.0	1	900 (min)
FIRST TOUCHED	9.0	1	24 (hr)
FIRST HELD	18.7	2	60 (days)
FIRST DIAPERED	14.7	3	45 "
FIRST BATHED	41.4	16	90 "

The premature infants' feeding method at the time of videotaping varied (Table 4). One third of the mothers breast fed (n=6) and two thirds bottle fed (n=12) their premature infant.

TABLE 4

Feeding Method

FEED	FREQUENCY	PERCENT
BREAST	6	33.3
BOTTLE	12	66.7
TOTAL	17	100.0

Data Analyses

Descriptive and inferential data analyses were performed using both the SAS and SPSSX Computer Packages. Univariate analyses of the MCQ and the videotaped behavioral data produced distributions, means, standard deviations, and ranges. Analysis of variance for significant group differences included the ANCOVA and T-Tests (for normally distributed data), the Wilcoxin Rank Sum and the Wilcoxin Sign Rank Tests (for data which were not normally distributed). The alpha level of significance was set at .025 for a two-sided significance test. The statistical tests for significant group differences in the behavioral interaction data included analysis of variance tests such as the T test and the Chi Squared Test as well as the Z test for equality of proportions.

Descriptive and Inferential Analysis of the MCQ Data

The MCQ data analyses were performed at the total score, subscale score, and the item response levels. General trends in the data were highlighted by comparing the pretest and the posttest MCQ score distributions. The MCQ data were subjected to both nonparametric and parametric tests, for the total sample and by experimental and control groups separately, to ascertain whether the intervention significantly influenced maternal feelings of competence. Three hypotheses related to maternal competence were

addressed. The mean and raw subscale scores were evaluated, both descriptively and statistically, to assess whether the increase in maternal competence feelings could be linked to any or some of the subscales. Pretest and posttest item mean responses at the total and subscale levels were compared with their respective grand mean. The pre- and posttest subscale item means and their changes with time were compared.

The MCQ scores for the whole group were normally distributed for the pretest measure (p-level=.34) and the posttest measure (p-level=.17). The pretest MCQ scores ranged from 144 to 185 with a mean of 164.4 out of a highest possible score of 200. Seventy-two percent (n=13) of the mothers and premature infants scored between 152 and 176 or one standard deviation on either side of the mean. Eleven percent (n=2) of the mothers scored less than 152 or within two deviations below the mean (i.e., greater than 140 and less than 152). Seventeen percent (n=3) of the mothers scored greater than 174 and less than 188 or within the second deviation above the mean.

The posttest MCQ scores for the total group ranged from 140-188 with a mean of 170.8. Seventy-two percent of the mothers of premature infants scored between 157 and 184 or one standard deviation on either side of the mean. Only one mother scored within each of the second and third deviations

below the mean or less than 158. Three of the mothers' scores fell within the second deviation above the mean or greater than 184.

The histogram diagram (Figure 3) shows the distribution of the pretest and posttest MCQ scores. The majority of the MCQ pre- and posttest scores fall in the 160 and 168 histogram bars (n=10). Most of the posttest MCQ scores fall in the 176 score bar (n=11). The increase in maternal competence is thus illustrated.

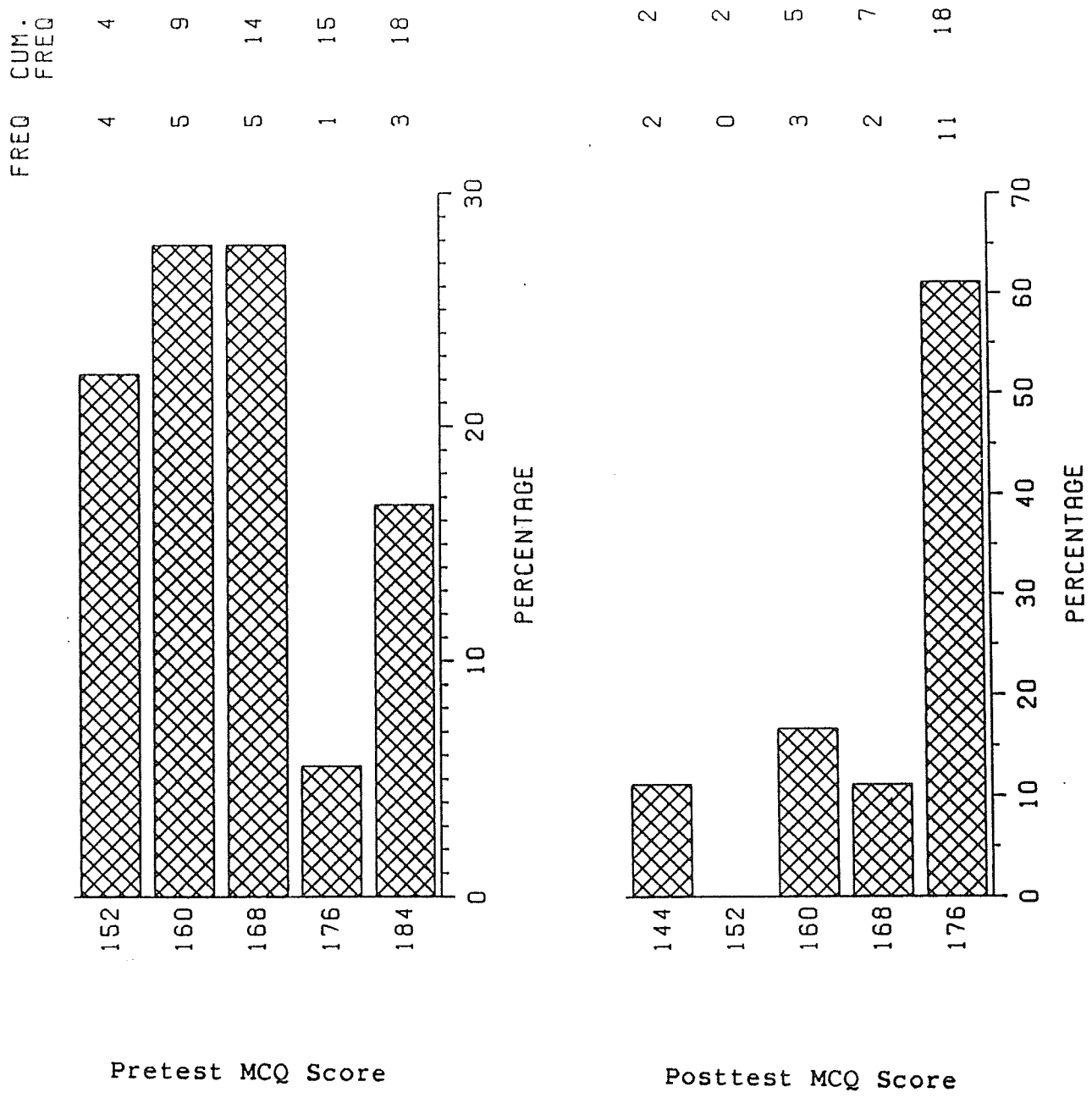

Figure 3: Histogram Distribution of Pretest and Posttest MCQ Scores for the Total Group

The total scale MCQ posttest mean was 6.4 points higher than the pretest mean. The first hypothesis addressed whether there was a significant increase in the mothers' feelings competence as one group and established the relevance of examining additional hypotheses. If maternal competence variable was static there would be few reasons to examine the issue further.

HYPOTHESIS I

As a group, the mothers' feelings of competence are higher at five weeks, compared with the first week, after discharge of the premature infant home.

Examination of the pre- and posttest total scale maternal competence scores revealed an increase with time (Table 5), although several of the mothers' scores were lower at the posttest measurement. Several statistical tests were run to determine whether the increase was significant. A significant increase in maternal competence scores with time was detected by the nonparametric Sign test (p-level=.008), the Wilcoxin Sign Rank Test (p-level=.022), and the parametric ANCOVA Test (p-level=.0038).

Statistical evidence supported hypothesis I which was therefore accepted. While hypothesis I established a significant increase in maternal competence feelings at the posttest measurement, the second hypothesis addressed the effect of the experimental intervention.

HYPOTHESIS II

The experimental group mothers who received a teaching intervention will have a significantly greater increase in feelings of competence at five weeks after discharge as compared with the control group.

The maternal competence scores were subjected to additional nonparametric analyses to discern whether the significance was due to the intervention. If the experimental group significantly increased maternal competence while the control group did not, then it could be suggested that the intervention had an effect on competence. The dependent group Wilcoxin Sign Rank test was significant for the experimental group (p-level=.004) and nonsignificant for the control group. A dependent group Paired Comparison T Test detected a significant mean difference increase in the competence scores between the pre- and posttest for the experimental group (p-level=.0034) and not for the control group (p-level=.5733). However, when an ANCOVA Test was performed, using the pretest score as a covariate, the experimental intervention was no longer significant.

The subscale level descriptive data analyses, for the total group, revealed an increase in all but one of the subscale posttest mean scores (Table 5). The helpless subscale mean decreased slightly indicating an increase in feelings of frustration and/or helplessness.

At the posttest measurement, the mothers perceived their premature infants as more readable, responsive, and

TABLE 5

Comparison of Total Group MCQ and Subscale

Pretest and Posttest Mean Scores

	Mean		
	Pretest	Posttest	Difference
total scale:			
Competence	164.5	170.8*	6.8
subscale:			
Readability	31.4	32.9*	1.5
Responsiveness	37.8	39.6	1.8
Predictability	25.3	27.4*	2.1
Knowledge	28.4	31.1	2.7
Helplessness	32.4	31.8	-0.6
Skill Confidence	9.0	10.0	1.0

*significant p-level of .025 or less

predictable. The mothers' mean scores in the knowledge level subscale also increased. The mothers' skill confidence was tested by only two questions and was high at the posttest (9 out of 10).

HYPOTHESIS III

The mothers who received a teaching intervention will have significantly increased maternal competence subscale scores compared with the control group.

The subscale scores were all subjected to ANOVA T Tests and Wilcoxin Rank Sum tests, none of which indicated a significant increase. On the other hand, the nonparametric dependent group Wilcoxin Sign Rank test detected significant differences for some of the subscales. The Readability subscale scores significantly increased (p-level=.024), however, because the difference was not specific to either the control or experimental level, the increase in Readability could not be attributed to the intervention. For the total sample, the Responsiveness subscale scores approached a significant increase (p-level=.029). When examined at the group level, the control group did not significantly increase, whereas, the experimental group approached statistical significance (p-level=.039). The Predictability subscale Wilcoxin Sign Rank test indicated a significant increase (p-level=.004). When examined at the group level, the Predictability subscale significance was attributed only to the experimental group (p-level=.008). Although the Helplessness subscale did not show significant improvement for the total group, the experimental group approached approached a significant improvement (p-level=.039). Two of the MCQ subscales, readability and predictability, revealed significant increases among the experimental group mothers. Therefore, hypothesis III was neither accepted nor rejetcted.

At the item level, the grand item means and the item mean responses were compared (Table 6). The MCQ total scale grand item mean was 4.11 for the pretest and 4.25 for the posttest. The item mean responses increased slightly for all of the subscales except the helplessness subscale. The greatest item mean response (i.e., .35) increase appeared in the predictability subscale. All of the item means for the pre- and posttest were compared with the respective grand item mean. At the pretest measurement two of the eight item means in the readability subscale, six of the ten item means in the Responsiveness subscale, and three of the six Predictability item means were lower than the grand item mean.

At the posttest measurement two of the eight Readability subscale item means, six of the Responsiveness subscale item means, one of the six predictability subscale item means, and two of the seven knowledge level item means were lower than the grand mean. The Knowledge Level and Predictability subscales both had item response means which either increased or remained constant. Four of the Helplessness subscale item means decreased and indicated an increase in maternal feelings of frustration.

In summary, the maternal competence scores increased as evidenced by the higher posttest total score mean and the distribution comparisons. At the subscale level, all the

TABLE 6

Comparison of Pretest and Posttest Grand Item and Subscale Item Means for the Whole Group

N=18

Subscale	Mean Pretest	Mean Posttest	Difference
Grand Item	4.11	4.25	.14
Readability	3.92	3.98	.06
Responsiveness	3.78	3.56	-.22
Predictability	4.21	4.56	.35
Knowledge	4.06	4.11	.05
Helplessness	4.63	4.45	-.18

means increased at the posttest, except the helplessness subscale mean, indicating a slight increase in some of the mothers' frustration levels. However, the premature infants' were perceived as more readable, responsive, and predictable at the posttest measurement. The mothers' mean scores on the knowledge level subscale also increased although they did not significantly change. The mothers in the intervention group perceived their infants as significantly more predictable and approached a significantly lower level of helplessness feelings.

Analysis of the Interaction

The mother-infant interaction data during feeding consisted of three main categories: the specific interaction behaviors, the dialogic states, and the transitional state probabilities. Proportions of specific interaction behaviors for the whole sample and for the treatment groups are described and analyzed. The behavioral data are then reduced to a more general level of dialogic state which specifies whether the mother acted alone, the infant acted alone, the mother and infant coacted, or that both the mother and infant were quiet during a five second interval. Transitional probabilities describe the proportion of time that a given dialogic state followed another during the feeding session.

Specific Interaction Behaviors

The premature infants were relatively inactive during feeding and many of the behaviors either did not occur or were very infrequent. Because some of the coded behaviors could not be assessed equally for all of the mothers, they were dropped from the analyses. For example, the behaviors 'opens eyes' or 'looks at mother' were difficult to assess due the small size of the infants' eyes and environmental factors such as infant positioning. Also, many of the feeding behaviors (e.g. rooting, refuses nipple, and milk dribbles) and expressive behaviors (e.g. smiles, whimpers,

grimaces, and cries) were infrequent and therefore not included in the analyses. Although a large number of behaviors were encoded, the investigator selected some of the more salient and interesting behaviors for analyses. The proportions of the selected behaviors (expressed as a percentage) at the pre- and posttest feeding sessions for all the mothers and infants are presented in descending order of proportion (Table 7).

The most commonly occurring interaction behavior was tactile stimulation or softly touching the premature infants' face or body (11.55%). The mothers also frequently talked with their premature infant in a socially expressive manner (7.76%). Null activity, or no behavior, during a five-second interval occupied 6.8% of the feeding time and mothers smiled 5.67% of the total time. Feeding behaviors such as jiggles bottle (1.28%) and stimulates to suck (.99%) occurred commonly among some of the mothers. At times these behaviors were used simultaneously or in an alternating pattern to encourage the infant to suck. Commands (.76%) such as 'come on, drink' and 'stay awake' or 'wake up' were strategies used by the mothers to encourage the infants to suck. Kisses (.55%) and praises (.36%) occurred a small proportion of the time; exaggerated facial expression (.26%) and mother imitates the infant (.05%) were the two lowest selected proportions.

TABLE 7

Specific Behaviors: Proportions* of Feed Time

N=18

FEEDING BEHAVIOR	PRETEST	POSTTEST	OVERALL
MOTHER			
tactile	11.17	11.93	11.55
socially express	7.25	8.26	7.76
null action	7.67	6.08	6.88
smiles	4.44	6.94	5.67
jiggles bottle	1.74	.80	1.28
stimulates suck	1.26	.72	.99
commands	.89	.62	.76
kisses	.54	.56	.55
praises	.50	.22	.36
exaggerated facial	.38	.14	.26
imitates	.07	.04	.05
INFANT			
gross movement	6.29	9.92	8.08
fine movement	5.66	4.85	5.26
vocalization	4.42	4.32	4.37
suck noise	3.19	3.20	3.19
turns head away	.37	.36	.36
turns head toward	.09	.31	.20

* Proportion of feeding time is expressed as a percentage

The infant behaviors which occurred most frequently were gross (8.08%) and fine movement (5.26%). Infant vocalization (4.37%) were also frequent and excluded grunts, hiccoughs, and sucking noises. The premature infants turned their heads away from (.36%) and toward (.20%) their mother a very small number of times.

One consistent characteristic of feeding interaction behaviors was the variable behavior among the mothers and premature infants. This variability is highlighted in the means and ranges of the interaction behaviors (Table 8). Eight of the behaviors did not occur for some of the mothers. Whereas, the proportion of a specific behavior was zero for some mothers, it was as high as 50% for another mother. While some of the mothers appeared to prefer expressive verbal communication, others preferred tactile stimulation during feeding. For example, one mother who softly touched her infant's cheek throughout the entire feed did not talk with her infant. Due to the observed variability, the control and experimental groups were compared at the pretest for significant differences.

TABLE 8

Means and Ranges of Specific Behavior Proportions

BEHAVIOR	MEAN	RANGE
null action	6.85	.00 - 30.5
suck noise	3.34	.12 - 15.46
vocalization	4.21	1.00 - 14.91
gross movement	8.16	.17 - 19.81
fine movement	5.17	.00 - 15.39
stimulate to suck	.86	.00 - 6.26
tactile	12.49	.00 - 50.84
kiss	.49	.00 - 2.72
smile	5.59	.00 - 17.72
socially express.	8.11	.00 - 22.45

*Proportion of time is expressed as a percentage.

The nonparametric analysis of variance revealed no significant differences between the treatment groups in terms of the behaviors. However, the Z tests showed many significant mean proportion differences. These differences were found in the following behaviors: null activity, smiles, suck noises, infant vocalization, gross and fine movement. Due to these differences the investigator focused on assessing changes between the pre- and posttest for specific behaviors.

Some of the mother and premature infant behaviors significantly differed for the whole group at the posttest as compared with the pretest. Behaviors which significantly decreased included null action (Z=11.0;p-level=.0000), fine movement (Z=-3.0; p-level=.0013), stimulating to suck (Z=6.75;p-level=.0000) and jiggles bottle (Z=7.2;p-level=.0000). Behaviors which significantly increased included gross infant movements (Z=11.0;p-level=.0000), socially expressive vocalizations (z=3.22;p-level=.0006), and turning head toward mother (Z=4.89; p-level=.0000).

The changes with time were examined at the treatment group level to determine whether there was an intervention effect. Two hypotheses were developed which address the expected change in behavior related to the treatment group.

HYPOTHESIS IV

Mothers and premature infants who received the teaching intervention, compared with those who did not, will reveal a significant increase in the following behaviors at five weeks after the premature infant's discharge: mother smiles, infant vocalization, gross movement, fine movement, tactile stimulation, and socially expressive vocalizations.

The proportion of mother smiles increased for both the experimental (Z=-6.98;p-level=.0000) and the control groups (Z=-5.43;p-level=.0000) and indicated an increase in the mothers' expression of positive affect. The premature infants' gross movements increased significantly for both the experimental (Z=-4.77;p-level=.000) and the control groups (Z=-10.98;p-level=.0000) indicating a development in physical strength. The control group decreased the proportion of fine movements significantly (Z=5.9;p-level=.0000) while the experimental group remained approximately the same. The infant vocalizations significantly increased for the experimental group (Z=3.71;p-level=.0000) while it decreased significantly for the control group (Z=-4.0;p-level=0000). Tactile stimulation increased significantly among the control group mothers (Z=-7.72;p-level=.0000) and decreased significantly for the experimental group (Z=5.4;p-level=.0000). The control group significantly increased the proportion of socially expressive vocalizations (Z=-4.26;p-level=.0000).

In summary, the behaviors specified in hypothesis IV did not all increase significantly and one behavior actually

decreased significantly. Two of the behaviors significantly increased for both the experimental and control groups possibly indicating a development rather than an intervention effect. The proportion of infant vocalizations was the behavior that increased significantly for only the experimental group. Therefore, hypothesis IV was rejected due to a lack of statistical support.

HYPOTHESIS V

The mothers and premature infants who received a teaching intervention will show lower proportions of the following behaviors at five weeks after the discharge of the premature infant: null action, suck noises, and stimulating the infant to suck.

The null action decreased significantly for the control group (Z=7.0;p-level=.0000) while it did not significantly decrease for the experimental group. However, the control group began with a significantly higher proportion of null action at the pretest measurement. The proportion of infant suck noises decreased significantly for the experimental group (Z=2.26;p-level=.0119). Stimulating the infant to suck significantly decreased for the experimental group (Z=2.4;p-level=.0082) and significantly increased for the control group (Z=-3.8;p-level=.0000).

The hypothesis is rejected because the null action behavior did not decrease significantly. The decrease in stimulating the infant to suck and suck noises indicate that either the infant developed a stronger suck or that the

mother feels more confident and relaxed about the infant's intake.

Behavioral Dialogues:Dialogic States

The interaction behaviors during feeding were translated into general, behaviorally nonspecific dialogues or dyadic states. At this level each of the five second intervals is represented by one of the four dialogic states. The dialogic states are 'M' (mother acts alone), 'I' (infant acts alone), 'C' (mother and infant coact), and 'Q' (both quiet). The proportions of dialogic states for the mothers and infants are a means to describe the interaction behavior in a more general manner (Table 9). The proportions of dialogic states are described first for the whole sample, and then for the experimental group, and in terms of differences with time.

Mothers acted alone the greatest proportion of the feeding session (46.19%) while the infant acted alone the smallest proportion of time (5.74%). The mother and infant coacted 31.34% of the time and were quiet 16.71% of the feeding time.

The overall variance in mother-premature infant interaction is also revealed in the dialogic state proportions. At both the pre- and posttest measurement, the dialogic state proportions were significantly different (X^2 =10.08; p-level=.018). Coaction was approximately equal at

TABLE 9

Proportions of Dialogic States for the Total Sample

DIALOGIC STATE	PRETEST	POSTTEST	N=18 OVERALL
C	29.75	32.93*	31.34
I	5.34	6.13	5.74
M	46.97	45.41	46.19
Q	17.90	15.52*	16.71

*significant change;p-level<.025

both times, whereas, infant action increased and both mother and quiet states decreased. The Z test of proportions was used to detect significant mean proportion changes. The quiet state was the only one which changed significantly and was lower at the posttest.

Dialogic States: Changes from the Pretest to Posttest

The dialogic states for the whole sample were also examined for patterns and trends with time. There was a significant increase in coaction with time (Z=-3.66; p-level=.0000). The infant acting alone approached a significant increase and there was a significant decrease in quiet state (Z=3.4; p-level=.0006).

TABLE 10

Dialogic State Proportions* By Groups

	PRETEST	POSTTEST
STATE		EXPERIMENTAL N=9
C	27.93	35.68**
I	6.15	5.55
M	52.30	43.07**
Q	13.61	15.70
STATE		CONTROL N=9
C	31.36	30.31
I	4.68	6.69**
M	42.28	47.64**
Q	21.68	15.36

* Proportions are expressed in percentage of feeding time.
**Significant changes; p-level,.025

The experimental and control groups overall dialogic state proportions (Table 10) were significantly different (X^2 =12.75; p-level=.005). The variance in the mother-infant interaction appeared to emanate mainly from the mother and

quiet states. The control group had a significantly higher proportion of quiet state (Z=2.99; p-level=.0028) at the pretest and the infant action state (Z=2.33; p-level=.0198) at the posttest. The control group's greater amount of quiet state was largely due to the high pretest level which decreased at the posttest.

The experimental and control groups were significantly different (X^2 =98.76; p-level=.000) at both the pre- and posttest. The control group had a significantly higher proportion of coaction (Z=2.54; p-level=.011) and the quiet state (Z=8.09; p-level=.000) at the pretest. In contrast, the experimental group displayed a higher proportion of infant action (Z=-2.578; p-level=.0098) and mother action (Z=-7.8; p-level=.000) at the pretest.

At time two the experimental and control groups had significantly different dialogic state proportions (X^2 =20.78; p-level=.000).

HYPOTHESIS VI

The mothers and premature infants who receive a teaching intervention will have a greater proportion of coaction (C) at the posttest.

The experimental group had a significantly higher proportion of coaction at the posttest (Z=-4.2; p-level=.0000). The mothers and premature who received the teaching intervention acted together a greater proportion of the time. Therefore, hypothesis VI was accepted.

HYPOTHESIS VII

The mothers and premature infants who receive a teaching intervention will have lower proportions of mother and infant acting alone (M, and I) dialogic states.

The control group had a significantly higher proportion of mother acting alone at the posttest ($Z=-4.6$;p-level=.0000) whereas, the mother acting alone significantly decreased ($Z=6.786$;p-level=.0000) for the experimental group. The proportion of infant acting alone significantly increased for the control group ($Z=3.3$;p-level=.0005). The mothers and infants in the experimental group were less likely to act alone.

Individual Mother's and Infant's Dialogic States

Eleven of the eighteen mother-infant pairs revealed significant differences in dialogic state proportions at the posttest. Seven of the 18 mother-infant pairs revealed no significant differences in dialogic state proportions. The investigator developed an hypothesis related to the changes in dialogic state proportions for the individual mother and infant pairs.

HYPOTHESIS VIII

A greater number of individual mother-premature infant pairs who received the teaching intervention will reveal changed dialogic state proportions.

The investigator looked for trends and patterns in the dialogic states of the individual mother-premature infant

pairs. The significant changes in dialogic states did not appear to be associated with treatment group, or parity of the mother. The Wilcoxin Sign Rank test reported no significant differences by treatment group. Seven of the mother-infant pairs did not significantly change. Of the seven who did not change only one infant was a male--the possibility of this happening due to chance is quite small (p-level=.0078). It is possible that the mothers of male infants tend to change their interaction behavior.

Transitional Probabilities

A transitional probability, or the chance that one dialogic state follows another, describes the flow of interaction or change with time (Bakeman & Brown, 1981). The transitional state probabilities of the two treatment groups (Table 11) reveal the changes with time. Only the more salient transitional probabilities were analyzed using the Z test of proportions. Two hypotheses address whether the experimental groups increase or decrease the proportions of specific transitions.

The transitions selected for analyses included CI, II, IQ, MI, MQ, QI, QQ, MM, and CC. The CI transitional probability, or the probability of coaction given that infant action occurred in the previous five-second interval, indicates contingent interaction. The infants action resulted in the mother and infant coacting in the subsequent

TABLE 11

Proportions* of Mean Transitional Probabilities by Group

transition	PRE-TEST		POSTTEST	
	CONTROL	EXPERIMENTAL	CONTROL	EXPERIMENTAL
CI	.016	.024	.019	.028
II	.014	.018	.029	.015
IQ	.033	.034	.029	.023**
MI	.009	.013	.009	.006**
MQ	.058	.037	.057	.056**
QI	.063	.068	.009	.007
QQ	.094	.043	.033**	.044
MM	.249	.368	.308	.262**
CC	.212	.179	.203	.229**

* Proportions are expressed in percentage of time.
**Significant improvements; p-level < .025.

five-second interval. The II transition indicates that the infant acted alone in two consecutive segments. The IQ indicates that the infant broke the quiet state and may reflect the infant's maturity level as an initiator of interaction. The MI indicates that although the mother acts following the infant, the infant does not continue action. The MQ transition represents the proportion of time that the mother initiates interaction to break the quiet state. The QI transition indicates that the mother did not respond to the infant's behavior and both the infant and mother were quiet. The QQ transition consecutive quiet action or an overall lack of interaction between the mother and premature

infant. The CC transition represents the continuation of coaction between the mother and infant on two consecutive segments.

Hypothesis IX addresses the transitions which are expected to significantly increase in the experimental group.

HYPOTHESIS IX

The transitional probabilities which represent positive interaction occur more frequently among the mothers and premature infants who received a teaching intervention. These transitions include CI, MQ, and CC.

The proportion of CI transitions did not increase significantly at the posttest for either the experimental or the control group. On the other hand, the MQ ($Z=-2.59$;p-level=.0048) and the CC ($Z=4.59$;p-level=.0000) transitions were both significantly higher for the experimental group. The experimental group mothers appeared to break the quiet state and try to initiate infant action more often. The experimental group also had a significantly higher proportion of CC or persistent coaction. Hypothesis IX was neither accepted nor rejected because two of the three transitional probabilities revealed a significant change.

The second transition-related hypothesis addresses those transitions which are expected to decrease among the mothers and premature infants who received the teaching intervention.

HYPTHOSIS X

The mothers and premature infants who receive a teaching intervention have lower proportions of the transitions which represent negative interaction: II, IQ, MI, QI, QQ, and MM.

The experimental group proportions of II, QI, and QQ did not decrease significantly. The proportion of II transition increased (Z=-3.9;p-level=.0000) for the control group which meant that the infants were acting alone. The QQ transition decreased significantly for the control group (Z=9.2;p-level=.0000); the control group had a significantly higher proportion of quiet states at the pretest (.094) than did the control group (.0428). The MI (Z=2.73;p-level=.0032) and the MM (Z=2.73;p-level=.0032) significantly decreased for the experimental group indicating that mothers acted alone less frequently. The IQ transition was significantly lower at the posttest for the experimental group (Z=2.4;p-level=.0082).

In both of the transition-related hypotheses it is interesting to note that the transitions which involved the mother followed hypothetical predictions. The mothers who received a teaching intervention increased the proportions of MQ and CC and decreased the MI and MM as the hypotheses predicted.

Overall Impressions of the APIB

The APIB helped the investigator document the behavioral and developmental differences among the premature infants

which potentially affect mother-infant interaction. The APIB was used to describe the premature infants in a qualitative, rather then a statistical sense. Because all of the premature infants were assessed at approximately five weeks after discharge, the premature infant's postconceptual ages often varied. Premature infants of lower gestational ages and birth weights may have experienced complications and longer hospital stays.

APIB helped to document the premature infant's response to animate and inanimate stimuli while assessing motor, physiological, state, and regulatory systems. Many characteristics which potentially affect interaction style such as temperament, irritability, and cuddliness were evaluated. The APIB helped to pinpoint the degree of variation and the full range of the premature infants' behavioral differences. The most basic and important finding was that the premature infants were each unique; no two were alike.

The premature infants revealed variation in their abilities to regulate and maintain states. While some of the premature infants spent the majority of the time in a clearly alert state, other infants had more diffuse and poorly defined states or remained in lower drowsy or sleeping states. The specific state quality of any infant affected all the other aspects of the APIB. For example, the

infant in lower states generally had lower performance scores. If it was difficult for the premature infant to achieve an alert state it was usually also difficult to maintain that state once achieved. The infants in the lower states were less responsive and the examiner had to facilitate interaction more often.

Another aspect of the APIB which tended to affect all the performance scores was the muscle tone and motor ability of the infant. Better muscle tone and motor ability was associated with improved overall interactive ability. Some of the infant's motor abilities affected the maternal responsiveness. For example, the mother was more socially responsive and displayed positive affect if the infant turned his/her head toward the mother or stretched. The 'pull to sit' maneuver helped to display the range and variation in motor strength among the premature infants. Although several of the infants performed this maneuver perfectly, many of the infants showed some sign of muscle weakness such as head lag (falling forward or backward). The pull-to-sit maneuver was commonly the only time that the premature infant cried during the entire APIB. If there were any abnormal abductor or adductor muscle tone (hyperflexion, hypoflexion) it was seen during this maneuver. During the pull to sit maneuver one of the premature infants tended to stand rather than sit due to abnormal muscle tone. The same infant also had some involuntary movements of the right arm.

The attentional/interactive package produced the most details about the premature infant's interactive abilities. The criteria of performing this package with the infant in an alert state was both challenging and difficult for the investigator. Some of the infants preferred the lower states of alertness. Variation and preferences to stimuli were noted.

The mother's response to the APIB was also interesting to observe. All the mothers watched at least part of the APIB: many asked questions and/or made comments. Mothers expressed surprise over the infant's capabilities and were happy to see their infant follow an object or smile in response to the various stimuli. Some mothers stated they didn't realize it was O.K. to play with the infant and that they thought that the infant should only eat and sleep. Overall, the mothers enjoyed seeing their premature infant's varied and unique responses and characteristics. Mothers often picked up the tools used in the APIB (rattle or bell) and tried to elicit alert and responsive behaviors from the infant.

Description of the APIB Data

The APIB consists of six packages described below that include maneuvers that challenged the infant and tested the functioning of subsystems. Sleep/distal package assessed the infant's ability to maintain sleep and decrease responses to repeated stimuli (flashlight, rattle, and

bell). The system responses, along with other reactions to the stimuli were noted. Of the eighteen infants assessed, ten premature infants were asleep and could be assessed with the sleep/distal package. These infants showed minimal to moderate delay of reaction to the flashlight, rattle, and bell which usually involved brief eye openings, blinks, smiles, gross or fine movement, or an increase in respiratory rate. Some of the premature infants maintained sleep; others developed higher states as a result of distal stimulation during sleep. Eight of the premature infants were awake and the sleep/distal package could not be performed.

The Capacity to deal with uncovering package assessed the premature infant's ability to deal with uncovering and being placed prone. The premature infants generally required little assistance or special precautions when being placed prone. Many of the premature infants were already prone and did not have covers on them.

The Low tactile package included maneuvers to assess the infant's reflexes and limb movements. The assessed reflexes included plantar grasp, babinski, palmar grasp, glabella, rooting, and sucking. The premature infant's reflexive responses generally produced either a weak to strong and unsustained to sustained response. Passive arm and leg movements helped determine the infant's muscle strength and

range of motion. The premature infants usually had little to moderate resistance to extension of the arms and legs.

The medium tactile package included the pull to sit, standing, walking, incurvation, crawl, and cuddling maneuvers. The pull to sit was unique in that it caused most of the infants to cry. The scores on the pull to sit maneuver varied between poor to good performance. Only four of the premature infants could lift there heads and maintain the position for one minute; only two of these infants revealed head lag during the maneuver. Five of the premature infants showed some shoulder muscle tone increase and made futile attempts to right their head. The other nine infants showed slight increase in shoulder muscle tone and maintained the head for 10 seconds. Eight of the premature infants revealed umbrella stance during the standing maneuver; 13 briefly supported their weight while 6 supported their weight. Cuddling was assessed and none of the premature infants resisted being held. Scores varied depending on whether the infants usually or always molded and relaxed when first held. Six of the premature infants achieved the highest possible scores on the cuddling.

The High tactile/vestibular package was not performed because the premature infants were generally fed just before the assessment. The rotation maneuver involved holding the infant above the investigator's head at a 30 degree tilt and

rotating the infant 90 degrees. This maneuver commonly causes infants to regurgitate, therefore the package was not assessed.

The Attentional/interactive package, performed while the infant was in an alert state, assessed specific attentional and interactive capacities. The examiner used various animate and inanimate visual and auditory stimuli. Ease of eliciting an alert state, quality and of the response and cost to the infant were observed. The investigator noted a wide range of responses in the premature infants. Only three of the premature infants could be brought to alert states reliably and maintained for considerable periods. Although the majority of premature infants could be brought to alert states using the stimuli, the duration of the alert periods varied from brief to moderate. Three of the premature infants could be brought to alert states with moderate difficulty and maintained for only brief to fleeting periods. For these infants there was mild cost in terms of brief state fluctuations which appeared as though the infant would ignore the stimuli or become drowsy. The premature infants often showed preferences for certain stimuli forms. One premature infant might enjoy the face and voice while another might enjoy the voice alone. Many of the premature infants smiled in response to the sound of the bell or soft rattle. All but one of the premature infants responded better to the face and voice together than to any

other stimuli. One premature infant prefered the voice alone, perhaps indicating that eye contact with auditory stimulation together was too much for the infant to process.

Signs of compensated physiological parameters of the premature infants included startles. Although seven of the premature infants did not startle during the APIB, the rest of the infants showed 2 to 4 startles. Two of the premature infants showed no smiles while the rest smiled at some time. Some of the infants showed undifferentiated smiles in sleep and drowsy states only. Other infants smiled occasionally in response to internal triggers. Others smiled when their attention was focused on a social or inanimate stimulus.

Motor parameters included muscle tone and limb movement arcs. Muscle tone ranged between average when handled to hypertonic 75% of the time. Most of the infants showed limb movements of at least 60 degree arcs 50% of the time. The premature infants moved a moderate to a large amount of time.

Self regularity maneuvers included withdrawal and avoidance behaviors. The most frequently observed avoidance behavior was yawning which was observed for 12 of the infants. The behaviors of hiccoughing, finger splay, averting, and grimacing were observed among three or four of the infants.

Approach or groping behaviors were displayed by some of the premature infants. Fourteen of the infants made the 'ooh face' typical of the premature infant. Almost all of the infants made some movements or sounds. Some of the infants were very active while other infants moved very little. Some of the premature infants vocalized frequently while others vocalized infrequently. Most of the premature infants did not display irritable crying except in response to one or two stimuli. In general the premature infants cried very little.

Other Interesting Results

The investigator examined the relationships among the MCQ data, the specific interaction behaviors, and the biomedical variables. Nonparametric analysis tests determined that variance could not be attributed to the independent variables of delivery mode, infant sex, and feeding method. Bottle-feeding mothers used tactile stimulation more frequently at the posttest ($F=12.95$; p-level=.0024) than the breast feeding mothers which may indicate that the bottle-fed infants required more encouragement to suck. Fine movements were more frequent at the posttest for the females ($F=5.71$; p-level=.0295) indicating a sex or development-related finding. While the proportion of fine movements increased for the females, they decreased for the males.

There were also some interesting correlations noted among the interaction behaviors, the MCQ data, and the biomedical and attachment variables. The posttest MCQ total scores were both significantly correlated with the proportion of gross movement at the pretest (r=.3908; p-level=.0250). Mother's smiling at the pretest was positively correlated with the MCQ posttest scores (r=.5050; p-level=.0039), the readability posttest scores (r=.3881; p-level=.0311), and knowledge level subscales (r=.3630; p-level=.0444). Pretest infant responsiveness subscale of the MCQ scores were positively correlated with infant vocalizations (r=.4446; p-level= .0118). Gross movements, mother smiling, and infant vocalizations may be important indicators of quality interaction and maternal competence.

The biomedical variables of assessed gestational age at birth, length of hospital stay, birth weight, and days until first held the infant were not correlated with the MCQ or subscale scores. This finding was unexpected as the investigator thought that the higher risk premature infant and mother would have lower competence scores.

Summary of Analysis

The mothers and premature infants revealed a large amount of variation in the biomedical, attachment, and behaviors which relate to mother-infant interaction. The MCQ data analysis revealed that the mothers' perceptions of

competence in caring for and interacting with their premature infant increased between the first and fifth weeks after discharge. The mothers who received the teaching intervention had significantly higher maternal competence total scores. Infant predictability subscale scores increased significantly while the readability, responsiveness, and helplessness subscales approached significant increase. The mothers appeared to perceive their premature infant's behavior more positively and feelings of frustration or helplessness decreased. The knowledge level subscale showed no significant change between the pre- and posttest for either the control and experimental groups. While some of the significant MCQ changes were shared by both the experimental and control groups indicating development and growth, other significant changes were attributed only to the treatment group. For example, the predictability subscale scores significantly increased for the experimental group while the responsiveness and helplessness subscales approached a significant increase. The mothers in the experimental group reported lower feelings of helplessness and frustration. The greatest item level change occurred in the predictability subscale items. The experimental group premature infants were more predictable at five weeks after discharge.

The videotaped interaction data were examined at the level of specific behaviors, dialogic states, and

transitional probabilities. At each level, the mothers and premature infants displayed individual differences. Nonparametric analysis of variance tests showed no significant group differences for specific behaviors at either measurement times. However, Z-tests of proportions indicated significant difference for the group and individual mothers. At the group level there was a significantly lower proportion of null action, stimulate to suck, and jiggling the bottle at the posttest. The premature infants showed significantly higher proportions of both gross movement and turning head toward the mother at the posttest. The control group mothers showed a significantly higher proportion of socially expressive vocalizations at the posttest. There were some noteworthy significant behavioral proportion differences between the experimental and control groups. Both the groups showed significantly increased proportions of mother smiling and infant's gross movements. The proportion of suck noises decreased significantly only for the experimental group, whereas the proportion of fine movements increased only for the control group. The proportion of socially expressive vocalizations increased significantly only for the control group. Some of the directional changes varied for the two groups. Infant vocalizations increased for the experimental group and decreased for the control group. The proportion of tactile stimulation increased among the control group mothers yet

decreased for the experimental group. The experimental group mothers may have been influenced by the intervention to use other modes of interaction. Although null action was expected to decrease for the experimental group, it remained the same. Stimulating the infant to suck decreased for the experimental group and increased for the control group.

The dialogic state data gave a more general impression of the general duration and quality of mother and infant action during feeding. The mothers acted alone (46.19%) more often than the infant (5.74%) or coaction (31.34%). The mothers and premature infants showed a significant increase in coaction, infant acting alone, and a decrease in quiet segments with time. The experimental group coacted a significantly higher proportion and acted alone a significantly lower proportion of the feeding time. Infant acting alone significantly increased for the control group yet remained approximately the same for the experimental group. Dialogic state proportions for the individual mother and premature infant pairs were examined for patterns, trends, and associations. No relationships could be found except that of the dialogic state proportions that did not change, only one was male.

The transitional data represented the proportion of time that one specific dialogic state followed another. The dialogic states (MQ, CC, and CI) were predicted to increase

for the mothers who received the teaching intervention. The MQ and CC transitional probabilities were significantly higher for the experimental group mothers and infants. Whereas, the CI did not significantly increase for the experimental group. The transitional probabilities (II, MI, QI, QQ, MM, and IQ) were expected to be significantly lower at the posttest for the intervention group mothers. The proportion of II, QI, and QQ transitions were not significantly lower for the experimental group. The MI, MM, and IQ transitions were significantly lower for the experimental group. The mothers who received the teaching intervention acted alone less often and the lower IQ transition showed that the experimental group infants less frequently broke a quiet segment. The experimental group mothers broke the quiet state more often than the infants as indicated by the significantly higher proportion of MQ.

The APIB data helped to describe the premature infant sample in terms of the specific behavioral and developmental characteristics. Interesting findings related to infant state, motor development, stimuli preferences, and mother's reaction to the assessment. The clarity of the premature infant's state, as well as the ability to maintain and regulate states, showed considerable variation. The premature infant with clear and easily elicited alert states were generally more responsive infants overall. The premature infant's motor ability varied and played a role in

the interaction quality. The stronger, more active infant was more likely to give the mother cues and signals. For example, the premature infant who could move his/her head toward the mother frequently received smiles and socially responsive vocalizations from the mother. The maneuvers which evaluated motor ability also helped to detect abnormal adductor and abductor muscle tone. The premature infant's early preferences for certain stimuli were found to vary. Whereas, one infant might orient, follow, and smile in response to the bell, another infant might react best to the sound of a rattle. One premature infant might react best to the human voice and face whereas, another might react best to the voice alone. The mothers responded positively to the APIB - - some were surprised when they realized that their infant could follow an object or smile. Mother enjoyed seeing their infant's responses and often tried the maneuvers themselves to see the responses again. Some of the mothers stated they will be using more bright toys with their infants; others asked advice on what were the best toys for her infant.

Chapter V

DISCUSSION

Summary

Many factors contribute to the special needs of the families of premature infants. Infants of progressively lower gestational ages and birthweights are surviving, there is a trend toward early discharge, and reseach indicates that the parent-infant relationship relationship is vital to the final developmental outcome of the infant. Therefore, community-based resources are needed which meet the needs of a growing population of premature infants.

One specific area where attention is required is mother-infant interaction and maternal feelings of competence. Mothers are uncertain of the interactive and physical care needs of their newly discharged premature infant. One means to enhance the mother-infant competence is by increasing the mother's knowledge level about infant care and problem solving. A mother with greater understanding of her infant's behavior will find the infant's behavior more readable, responsive, and predictable. Decisions about infant care and interaction will be less frustrating; satisfaction and decreased anxiety in the maternal role will promote both attachment and interaction quality.

The present investigation examined the effect of a small-scale nursing intervention performed in the homes of the premature infants after discharge. The mothers in the treatment group were taught about the premature infant's organizational and behavioral development and its effects on the mother-infant relationship and interaction quality. The intervention effects were analyzed in terms of two main dependent variables: mother-infant interaction behavior and maternal feelings of competence.

The mothers in the experimental group revealed a significant increase in feelings of competence between the first and fifth week after discharge. Mothers who received the teaching intervention had significantly higher MCQ total scores and predictability subscale scores; the responsiveness and helplessness subscale scores approached significant increase.

The behavioral interaction data, obtained from a videotape of the mother feeding her infant, suggested several intervention effects. Infant vocalization significantly increased for the experimental group while it decreased significantly for the control group. Dialogic state proportions revealed that the experimental group mothers and infants coacted a significantly greater proportion of the feeding time and mothers acted alone significantly less often. Some of the transitional state

probabilities were found to follow predicted changes. The MQ and CC transitional probabilities were significantly more frequent among the experimental mothers and infants. The mothers in the experimental group tended to break the quiet states and coaction tended to follow coaction. Some of the transitional probabilities which represented less positive interaction (MI, MM, IQ) occurred significantly less often among the experimental group. The APIB data helped to pinpoint and describe the variable nature of the individual premature infant's physical, motor, state, and interactional capacities.

Evaluation of a Theoretical Construct

The parent-infant competence process appears to be a sound theoretical construct for research involving mothers and premature infants. Over the years there has been a progression toward a model which considers both the mother and infant within the parenting context. During the 1970's theoretical constructs emphasized the bidirectional nature of the mother-infant relationship and characteristics of the mother and infant (Magyary, 1984). The overall parenting outcome depends on the characteristics of the mother and infant and their interplay with the environment. The transactional model of Sameroff and Chandler (1975) identified the mother and infant as targets for intervention and focussed on the interaction as a vehicle for intervention (Barrera et al., 1986). Research progressed

from blaming the mother and infant for the developmental and parenting outcome. A multicausal approach now considers past and present experience, characteristics of the mother, infant, and the environment.

The mother-infant competence process helps the researcher consider a host of factors that affect the parenting process including the resources in the community. In this way, rather than focusing on seeking one cause for the poor outcome, present research can be intervention and parenting-oriented. The health care system and its services can be viewed as playing a large and crucial role in determining parenting process outcome. The parent-infant competence process is progressive and can be applied despite trends and societal changes.

Description of the premature infant's interactive contribution to the parenting process is facilitated by the work of Als et. al., (1981). The consequences of mother and premature infant interaction (Field, 1980) are better understood in light of the characteristics of both the mother and infant. Development level of the infant is seen as a factor that affects the quality of behavior and interaction. Although a mother may continually violate an established rule of interaction, it may be understood when the whole picture is examined. For example, the mother who constantly takes the infants turn may reflect an infant who

is either unresponsive or in lower states. You cannot assume the problem belongs solely to the mother without taking the premature infant's characteristics into account.

Numerous studies have pointed to the concerns and anxieties, emotional upheavals, and negative experiences as variables which may affect the parenting process. The parent-infant competence process looks at these variables as affective outcomes of the parenting process. The outcomes of the parenting process include attachment, helplessness or anxiety, satisfaction, or competence in the parenting process.

The findings of the present study underscore the relevance of the mother-infant competence process as a framework for guiding research. The mothers feelings of competence increased with time as expected; the mothers who received the teaching intervention had significantly higher total scores and one subscale score than the control group mothers. The intervention had an overall goal of enhancing the mother's competence feelings by increasing their knowledge level about premature infant behavior and interaction. The mothers in the experimental group reported significantly higher predictability scores while the responsiveness and readability subscales approached statistical significance. The direction and trends of the present investigation indicate the strength of the theoretical construct.

The parent-infant competence process incorporates the important theoretical concepts and conclusions of researchers to date. The construct draws on the work of many professionals in premature infant research including psychologists, behaviorists, developmental specialists, and nurses. The bidirectional nature of mother-infant interaction processes, the importance of the characteristics of the mother and infant, and the quality of the environment and its resources are all considered in the parent-infant competence process.

Factors Affecting Comparison

Comparison of intervention studies to date was difficult due to methodological and theoretical variation. Inherent differences in the factors and characteristics of the studies rendered interpretation, comparisons, and associations next to impossible. Therefore, the relationships and parallels of the present study to other studies were not easily drawn.

The studies of the 1960's and 1970's may be obsolete due to advances in health care and a more positive outlook which includes lower handicap and higher survival rates. Not all the earlier studies considered factors in the premature infant's environment such as the mother or the NICU environment. Eventually research lead to clearer theoretical foundations explaining the premature birth

experience. The premature infant, the parents, and the overall experience of premature birth are better understood today due to the research of the 1960's and 1970's.

Research has progressively told us more about the characteristics of the premature infant and their effect on the mother-infant relationship. Personality qualities of the mother and premature infant were discovered to affect the mother-infant relationship. Infant temperament, predictability in establishing a daily pattern, responsiveness levels, and preferences for stimuli were noted. Health status, complications, gestational age at birth, developmental level and many other factors were found to affect interaction. The mother's labor and delivery, expectations and fantasies about the hoped-for perfect baby, and grief following the birth of a premature infant were discovered to affect the mother and infant relationship. As research unfolded new knowledge about the premature infant, more and more questions were asked. Some of the unanswered questions related to the research methodology, design, and the inability to make definitive conclusions.

Intervention studies varied considerably in sample inclusion criteria which made comparison difficult. Some of the samples included premature infants less than 2500 grams (Barnard et al., 1987), less than 2200 grams (Nurcombe et al., 1984), less than 2000 grams (Barrera et al., 1986), and

less than 1800 grams (Field, 1982). Other studies had inclusion criteria based on gestational age only (Harrison & Twardosz, 1986). The variation among the samples of mothers was great and was often not fully described. For example, Harrison and Twardosz (1986) described their sample of mothers only in terms of marital status and gestational age at delivery. Another study described the sample of mothers as 'middle income' (Field, 1982). Other studies such as Barrera et al., (1986) described the mother, infant, and demographic variables in greater detail. A complete description of samples is recommended as research models indicate that characteristics of both the mother and infant are important in determining the quality of interaction. Parent-oriented intervention studies should encourage description of the infant, the parents, and the environmental characteristics (which includes the resources). The inconsistent nature of research findings to date may be due to the sample variability. The samples are different in scope, based on parental characteristics (i.e., education level and socioeconomic status) and infant characteristics (i.e., gestational age, birth weight, and medical complications) (Magyary, 1984).

Although most recent intervention studies used some form of a transactional model, the extent to which the framework influenced the planning, evaluation, and discussion of results varied. Many studies do not carry through on this

task. Harrison and Twardosz (1986) performed an interesting study which used the same framework as the present investigation, the competence motivation model of Goldberg (1977;1979). Unfortunately, the study results and findings were not discussed in light of the competence framework. Although Nurcombe et al., (1984) used the stages of infant organization of Als et al., (1982), the findings were not discussed in light of the framework. Barnard et al., (1987) stated that the goal of their study was optimal parenting, however no framework was specified. Therefore, the present investigator found it difficult to compare the various theoretical frameworks of the intervention studies.

The intervention studies rarely describe the resources available to the mothers and premature infants after discharge. Studies were based in different countries, states, and provinces; it would be helpful to know about the various health care services. The parent-infant process model draws attention to the resources as a factor in the infant's outcome. The interventions vary in focus, time and duration of administration, and the background of the interveners. One of the studies examined the effects of suggestions to modify the mother's interaction behaviors just before videotaping (Field, 1982). Another study involved instruction on infant behavior, development, and health care topics with follow-up as long as one year (Barrera, 1987).

Methodological variation was found in the theoretical and operational definitions of interaction, the methods and instruments used to measure interaction, and interpretation of results. There are numerous ways of defining, measuring, and interpreting 'quality' interaction. Some of the studies measured mother-infant interaction by encoding videotaped behavior during feeding, play, or teaching sessions. The focus of the behaviors at the videotaping, the age of the infant, the length of time after delivery, and the setting of the videotaping frequently differed. Each of these factors may have contributed to the inconsistent results and findings of the various studies. The developmental level may be a key determinant of the infant's contribution to interaction. If the indicator of quality interaction is 'eye contact' or 'turns head toward mother', the infant who does not have the motor strength to turn the head will be evaluated poorly. Health status, length of time on a respirator, and health complications may affect the findings.

The lack of a 'norm' or 'standard' reference of premature infant development or interaction behavior affects comparison. There is no one instrument to measure mother-infant interaction and the instruments change as new knowledge is gained about the premature infant. While one study may concentrate on the temporal aspects of interaction or the recurrence of cycles in units of time (Censullo,

Lester & Hoffman, 1985), another may focus on synchrony or co-occurrence of behaviors with dyads moving to higher levels of affect (Censullo, Bowler, Lester, & Brazelton, 1987). One simpler and newer instrument focuses on rating the quality of interaction rather than the specific behaviors of interaction. Censullo et al., (1987) developed a rating scale which consists of only six items which evaluate infant-adult synchrony. As the knowledge of the important factors in mother-premature infant interaction grows, the instruments become more specific and accurate. An easier and more general method of measuring mother-infant interaction may encourage replication studies on all types of mother and premature infant populations. Interpretation of studies and comparison of results would then be facilitated.

In summary, there are many factors in premature infant research which interfere with the cross comparison of studies. Some of the factors outlined included the advances and changes in technology, care, and knowledge about premature infants and their parents; mother and infant sample variation; theoretical orientation of studies; intervention focus and duration; and research instruments. The implications and suggestions for future research were derived with these limitations in mind.

Comparison With Other Intervention Studies

Comparison of the results and methods of various intervention studies with those of the current thesis investigation was difficult due to the variation described earlier. The comparison studies were all similar in one respect -- they shared a common goal to facilitate the parenting process and promote premature infant development. All of the studies were performed within the context of interaction and the mother-infant relationship.

Field (1982) examined the effects of specific strategies to modify mother-infant interaction. Mothers were encouraged to imitate the infant, repeat phrases, silence during pauses, and gameplay with their premature infants. The mother-infant interaction during gameplaying was videotaped and analyzed in terms of the infant's gaze toward or away from the mother. Modifying the mother's behavior had an effect on infant gaze away and toward the mother. Field'ssuggestions for modifying interaction style of the mother were included in the thisis intervention. Some of the mothers in this study agreed that their infants looked away occasionally during interaction. The small proportion of mother imitation in the present study may be explained by the infrequent infant behaviors for the mother to imitate. Although there was a significant increase with time, the premature infants turned their heads toward the mother only

.36% of the feeding time. The motor and state development level of the infant may be factors affecting the low proportion of head turning. Whereas, Field (1982) examined the infants at three and one-half to four months corrected age, the infants in the thesis investigation were approximately 38 to 54 weeks gestational age (or less than term to three and one-half months) when videotaped.

The transactional model of (Sameroff & Chandler, 1975) states that biomedical risk interacts with environmental inadequacy to depress infant development. Nurcombe et al., (1984) visited mothers and premature infants eleven times during the seven weeks before and three months after discharge. A pediatric nurse delivered the intervention which emphasized maternal sensitivity and responsiveness to infant social signals. Nurcombe et al., (1984) reported a beneficial effect on general adaptation to mothering shown in enhanced satisfaction and competence. The intervention mothers perceived their infants as more adaptable, approachable, happier and less less easily distressed. These findings parallel those of the thesis investigation which included significant increases in the MCQ and infant predictability subscale scores for the experimental group.

Harrison and Twardosz (1986) used the competence motivation model (Goldberg, 1977;1979) which also formed an integral part of the present thesis investigation framework.

While the premature infants were still in the NICU, the mothers received instruction about the unique behavioral and physical characteristics of the premature infant. At one month after discharge there was no significant difference in mother's perceptions of, and behaviors toward, the premature infant. There were no significant differences in the mother's behaviors toward the infant in terms of certain specific behaviors (kiss, smile, gaze, enface, touch, cradle, proximal hold). It is possible that the mother's anxiety level while the infant was in the NICU affected the learning process and the teaching intervention had little effect on the mother's behavior and/or perception. In contrast, the present investigation discovered some significant changes in both perceptions of competence and specific interaction behaviors.

Barrera et al., (1986) studied the effects of a year long intervention program on premature infant cognitive development. Mothers were taught problem-solving strategies related to infant development to help them cope with the challenges of parenthood. The intervention was behavior and interaction-focused and involved weekly visits the first four months and bimonthly visits for the remaining 20 months of the year. The home intervention, and particularly those dealing with parent-infant interaction, produced marked changes in the home environment. Treatment effects in the verbal independent play and mother's responsiveness were

reported and may be related to significant increase in the maternal socially expressive vocalizations in the thesis findings.

Barnard et al., (1987) performed an extensive follow-up study of both full-term and premature infants. The parent-oriented intervention was administered by 23 public health nurses during eight home visits. The public health nurses first received instruction on new findings about the premature infant and then taught the parents with the final aim of helping the parents understand the premature infant's less responsive behavior and to deal with their anxiety. The concepts described to the mothers included state regulation and behavioral responsiveness which are similar to the present investigation. Barnard et al., (1987) performed an extensive intervention which included discussion of health-related concerns, the physical environment and safety, signs and symptoms of illness, community and family resources, problem solving and anticipatory guidance. Rather than having a control group, Barnard's investigation compared the results for the premature infant with the full-term infant. Although premature infant responsiveness was lower than the full-term infants of the same age, infant responsiveness increased significantly between successive visits. The thesis investigation also showed a significant increase in infant responsiveness with time for all the premature infants and

mothers. Barnard found none of the birth characteristics were related to the later feeding interaction scores; this finding was shared with the thesis investigation.

Recommendations for Future Research

Future research should apply the most recent knowledge about the premature infant when planning research design. The importance of infant state and developmental level as variables affecting mother-infant interaction must be addressed. Colombo and Horowitz (1987) suggest that state is a lead variable in the early behavioral repertoire of the infant which may reflect infant development. Characteristics of the mothers and infant, as factors that affect interaction, should be described in detail to allow future comparison. Investigators must agree on the salient inclusion factors for the sample of mothers and premature infants. The questions of what birth weight and gestational age define 'high risk' must be answered. Once these questions are answered, the studies of premature infants with samples should be replicated.

Interaction must be theoretically and operationally defined for each development level of the premature infant. Indices of quality interaction vary with the premature infant's development level, state of alertness, and many other characteristics. Since research is costly in terms of time and money, it is important to define these parameters

in order to enhance knowledge gain. Since parent-infant interaction occurs within the parenting context, the investigator suggests that theoretical frameworks of intervention studies be parent-process oriented. Characteristics of the infant, parents, home, hospital, and community environment should be described. The health care resources available to the parents in the community should be described.

Many questions about the experience of premature birth and its effects on the mother-infant relationship remain unanswered. Knowledge about the role of infant state in interaction quality and strategies for mothers to enhance alertness are required. The question of whether it is advisable, and at what stage of development, to elicit the premature infant's alert states has not yet been addressed. It is possible that the premature infant of less than 40 weeks gestaltional age cannot tolerate alert states for excessive periods. The 'gaze aversion' referred to in a number of studies may be a reflection of the infant not liking the forced alert states caused by stimulation. To date the interpretation is that the premature infant cannot tolerate certain forms and strengths of stimulation; perhaps the premature infant does not tolerate the alert state. Some additional unanswered questions include: Is the quality of interaction at various stages after birth an indicator of the mother-infant relationship and developmental outcome for

the infant? What are the indices of quality interaction, how can they be measured, and are they the same for each mother-infant dyad?

The individuality and variability of interactive range of the mothers and premature infants in the present investigation has implications for future research. The experience of premature birth, mother-infant interaction, and their effects on the developmental outcome of the premature infant may be understood more clearly with different research methods. The investigator suggests that research methods that focus on the individual, rather than the group, are more appropriate for nursing. Experimental designs which group mothers and premature infants according to specified inclusion criteria may not be appropriate. Meier and Pugh (1986) suggest that the individual case design is an effective strategy for client-centered clinical phenomena. The method would allow more detailed observation of the individual mother and premature infant from the moment of premature labor and long after discharge. The research can then focus on the process of establishing mother-infant interaction patterns from the first moments of life. Both nursing and the parent-infant competence framework are process-oriented and permit a longitudinal perspective. The case study design may be appropriate since the process becomes the focus (Holm, 1983) rather than any one event.

One recommendation for future research is to begin intervening early. Studies to date may have intervened too long after birth to make an impression on the mother and infant; the patterns and styles of interaction may have already formed and cemented. The experiences of mother-premature infant interaction before one or two months of age is poorly documented. A qualitative approach to research at the 'factor-isolating' level may be necessary due to the advances in premature infant care which have produced a new breed of survivors. These survivors, especially less than 1000 grams, have survived due to the intrusions of life saving technology. The higher incidence of painful procedures may affect the infant's social, physical, and cognitive development as well as the parenting process. Does the parents observation of the premature infant suffering affect the parenting process? Does this lead to a higher incidence of the vulnerable child syndrome?

The investigation has stimulated many questions for future research. Two recommended future studies include a retrospective examination of premature infant nursing care and a case study evaluation of the psychosocial needs of families that experience premature birth. The retrospective study would isolate parents' and nurses' perceptions of valued nursing care interventions during the first year of the prematurely born child's life. Parents could discuss the helpful interventions, comment on the quality of nursing

care which they received, and make suggestions for improving the nursing care. Nurses in both the acute care and community settings would be asked similar questions. The nurses would be asked such questions as:

1. What are the key nursing care interventions for the premature infant and its family?
2. Are their critical times for these interventions?
3. What are your recommendations for the improvement of nursing care of families and premature infants?

The second future study would help describe the process of parenting the prematurely born infant and identify the psychosocial needs of parents. The case-study and longitudinal design would test the theory and document the process of parent-infant competence. The specific psychosocial nursing needs, both emotional and informational, could be identified. The behavioral development of the premature infant and its effects on the parent-infant relationship could be identified. Parent-infant interaction could be evaluated at various times during the first year.

Conclusions

The findings of the present investigation, along with other intervention studies, support the hypothesis that an intervention related to enhancing the mother's knowledge level about premature infant behavior affects maternal

competence and interaction. Intervention studies have consistently indicated some improvement in parenting variables. The present investigation underscored the benefits derived from the use of a parenting process oriented theoretical framework as well as the dynamic and variable nature of mother-infant interaction. The variability and broad range of interaction behaviors and patterns have implications for future investigations. A perusal of factors affecting the comparison of intervention studies to date highlighted the need for revisions and modifications in future research endeavors. The case study design is suggested in order to document the parent-infant competence process and interaction. Case study design allows the investigator to be process-oriented, client-centered, and longitudinal. Implications for action stem from the findings of the thesis investigation and indicate the need for innovative health care policies and practices at all levels.

Implications for Action

The consistent research findings of the present investigation, and those to date, have implications which should compel action at all levels of health care planning and provision. Knowledge about the premature infant should be translated into health care programs and nursing interventions in the hospital and community settings. The existing gap between health care practice and research

findings must be narrowed; the social imperative is too great to allow the situation to remain unchanged. One of the major means to enhance the parenting process is through support which is appropriate to the needs of families of premature infants.

The present investigation attempted to strengthen the parent-infant competence by increasing the mother's knowledge about premature infant behavior, development, and its effects on the mother-infant relationship. Care of the premature infant must go far beyond the biomedical model and the hospital environment. Knowing the technology to support a 750 gram premature infant is not enough; truly caring means changing the focus and investing talent and resources in programs of family support (Schraeder, 1987).

> The explosion of knowledge in the well-being of premature infants should not stop at the doors of the nursery (Schraeder, 1986).

Nurses in the Neonatal Intensive Care units have the difficult task of meeting both the high technological and socioemotional needs of the families and premature infants. At times it may appear that satisfying the physical needs of the premature infant is more important than meeting the socioemotional and attachment requirements. For example, although bonding and attachment theories state that the infant and mother require physical contact, the mother may not hold the premature infant for days or months after

birth. The premature infant is not able to give the mother interactive cues which are deemed necessary in order for attachment to take place. The characteristics of the parents and premature infant create special needs which affect the parent-infant competence process.

Nurses are cognizant of the special physical and socioemotional needs of parents and premature infants. This knowledge is reflected in the numerous interventions designed specifically to enhance the mother-infant relationship. Some of the interventions include encouraging physical contact and interaction, allowing the mother to care for the premature infant, providing guidance and support for the mother. Nurses teach the mothers to bath and feed the infant before discharge. Hospitals have rooming-in programs where the mother provides 24 hour care of the premature infant before discharge. Nurses are experienced in assessing the mother's attitudes and feelings toward the infant. Many problems in the mother-infant interaction quality can be detected by the nurse. Early discharge programs with extensive medical follow-up is becoming commonplace. The premature infants are being discharged earlier and at younger developmental ages. Therefore, mothers have informational and support needs related to parenting after discharge.

After discharge the mother, no longer able to rely on the nurses, is responsible for meeting the physical and socioemotional needs of her infant. The responsibility may seem ominous since the premature infant has spent the first few weeks to several months in the hospital. Just having to care for the premature infant may cause anxiety for the parents. The task is more difficult if the premature infant has a sleeping, feeding, or heath problem. An added factor is that the mothers have been geared to think mainly in terms of the infant's physical needs; she may not be fully aware of the social needs for interaction and stimulation. Discharge may occur before the premature infant has reached a social responsiveness stage of development. The mother may not know how to interact with the premature infant. Even if the mother was taught about the interactive needs of the premature infant, she may need support and encouragement in performing the interaction strategies. The premature infant may be less responsive, have sensitive sensory thresholds, or respond adversely once stimulated. The infant may maintain lower states or sleep most of the day. This may cause maternal concern if the mother expects certain her infant behaviors. Therefore, mothers require support and guidance in establishing the mother-infant relationship and interaction.

The recommendations for fostering the mother-infant competence process were developed with the following words in mind.

> The state of the art is relatively undeveloped since we know very little about harmonious interactions, less about disturbed interaction, an even less about facilitative techniques (Field, 1982).

The investigator is convinced that the innovative interventions are applicable in either the home or follow-up clinic setting. Due to the relatively undeveloped nature of both the interventions and knowledge about the premature infant's interaction needs, the investigator suggests that a research evaluative component be an integral part of the care plan for families of premature infants. In this manner, the intervention can be evaluated while gaining theoretical support; existing gaps between theory, research, and practice can be narrowed. The precautions related to stimulation of the premature infant and the unanswered questions can both be addressed.

1. Research has consistently indicated that increasing the mother's knowledge about the premature infant's behavior will enhance interaction and maternal satisfaction. Therefore, interventions in the hospital and community should apply this new knowledge in the provision of continuing instruction, support, and advice about the behavioral development of the premature infant. The effects of the premature infant's developmental level on the mother-infant interaction should be discussed with the mother. The infant behavioral development would include

description of infant state as a variable in determining interaction quality. Mothers can be taught the importance of alert state, how to detect, and elicit alert states. The responsiveness, predictability, and readability of the infant's behavior can be highlighted. Understanding the premature infant's typical behavior, signals, and cues can help the mothers in forming the mother-infant relationship. Mothers awareness about the infant's behavioral cues and signals can help her to determine the infant's stimulation preferences and thresholds. The mother will not be afraid to talk with and provide stimulation for her infant.

2. The mothers should be aware of the infant's characteristics and capabilities at all stages of development. The APIB could be demonstrated for the mothers at different times both before and after the premature infant's discharge. In this way the mother is aware of the infant's capabilities (e.g., can see and hear) which can be fostered.
3. The nurse in the hospital and community can be an interactive role model and coach for the mother. The mother can be guided to determine the time of the day that the infant is usually most alert. After watching mother-infant interaction, the nurse can comment on strengths and weaknesses of the

interaction quality. The nurse can help modify the mother's behavior during interaction and suggest interaction activities which will promote infant development and maternal satisfaction. This recommendation may be crucial for the mother who reveals very few socially responsive interaction behaviors.

4. The nurse in the home and community can provide the mother with appropriate resources about the development of the infant. Pamphlets, books, pictures, slide shows, and videotapes can be developed which describe the special interaction needs of the prematurely born infant. Common concerns after discharge such as tips on feeding would be very helpful for the mother of a premature infant. With these resources, the mothers would not be forced to rely on out-dated and perhaps inaccurate literary and personal resources.
5. The mother of a premature infant would benefit from help with housework, laundry, meals, travel back and forth to doctor visits, and feeding the infant. The mothers of twins or with other siblings at home spend a great amount of time and energy performing child care tasks. If the mother spends 12 hours a day feeding twins, there is little time or energy left to foster the mother-infant relationship. Some of the

mothers are low-income and would benefit from monetary assistance with child care expenses, especially with the purchasing of infant formula.

Nurses should continue to enhance the parenting process by providing instruction, being role models, and stressing the importance of the infant's and mother's socioemotional needs. The mother-infant competence is facilitated by the provision of appropriate informational, emotional, and therapeutic support in the hospital and community. As a result a healthy mother-infant relationship is encouraged and the competence of both the mother and infant is fostered.

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Appendix A

EXPERIMENTAL PROCEDURE

Time	Group	
	Experimental	Control
within first week after discharge	Video MCQ* Intervention (part one)	Video MCQ*
within third week after discharge	Intervention (part two)	
within 5th week after discharge	Video MCQ* APIB**	Video MCQ* APIB** offer intervention

* Maternal Competence Questionnaire
** Assessment of Premature Infant Behavior

Appendix B

RANDON ASSIGNMENT

To accomplish random assignment of mothers and their premature infants to the designed groups, 18 pieces of paper with the numbers one to eighteen were pulled from an envelope. The results of the random assignment are outlined below.

Subject	Group	Subject	Group
1	Control	11	Control
2	Control	12	Experimental
3	Control	13	Experimental
4	Control	14	Experimental
5	Experimental	15	Control
6	Experimental	16	Experimental
7	Experimental	17	Experimental
8	Control	18	Experimental
9	Experimental		
10	Control		

Appendix C

BEHAVIORAL CODE CATALOGUE OF INTERACTIVE BEHAVIORS

Infant Behaviors

01 roots, opens mouth
02 refuses nipple
03 rejects nipple
04 milk dribbles
05 reguritates/coughs/chokes/spits out
06 burps
07 turns head toward mother
08 opens eyes
09 looks at mother
10 grimaces

11 yawns
13 smiles
14 whimpers
15 cries
16 hiccoughs
17 sneezes
18 makes sucking noises
19 other vocalizations
20 babbles, coos

21 laughs
22 hand, finger in mouth
23 touches mouth
24 rejects pacifier
25 accepts pacifier
26 startles
27 begins gross movements
28 trembles
29 stretches
30 turns head away

31 begins fine movements
32 grasps, touches
33 comes off breast/nipple
92 grunts

Mother Behaviors

35 picks up bottle

36 stimulates I to suck
37 pulls nipple out slightly
38 inserts nipple
39 removes nipple
40 jiggles, rotates bottle

41 sits infant on knee
42 checks amount consumed
43 shifts position
44 restrains I's hands
45 pushes I's hand from mouth
47 pats back
48 rubs back, nuzzles
49 inspects, grooms with hand
50 tactually stimulates body parts

51 grooms with object
52 tactile play
53 kisses
54 elicits grasp reflex
55 rocks, close contact
56 rocks, no close contact
57 bounces, jiggles
58 presents face
59 presents object
60 visual play (eg. peek-a-boo)

61 makes noise
62 places I hand on object
63 places object in I's hand
64 removes I's hand from object
65 changes diaper
66 changes/arranges clothes
67 checks diaper
68 arranges blanket, bib
69 wipes I's mouth
70 offers pacifier

71 removes pacifier
72 looks at infant
73 makes faces
74 smiles
75 directive command (do, don't)
76 social expressive vocalization (sings, whistles,
77 imitates I's vocalizations (vocal/nonvocal)
78 praises
79 reprimands
80 referential speech (refers to the environment-labels,
talks about people, objects.

Additional Mother Behaviors*

81 exaggerated facial expression

82 prolonged vowel sounds
83 higher pitched vocalizations
84 frown
85 cooing
86 cease activity
88 close visual inspection (less than 6 inches from infant)
89 holds infant up in front of mother's eyes playfully
90 auditory stimulation with a music box

91 examines nipple of bottle
93 expresses breast

*(based on Field, 1980, 1982)

Appendix D

THE ASSESSMENT OF PREMATURE INFANT BEHAVIOR

The APIB concentrates on the infant's behavioral response to the environment. Part one of the APIB assess various body systems (physiologic, motor, state, attentional/interactive, and regulatory) are their reactions during the various maneuvers and challenges of the six packages. Three scores are arrived at for each of the systems: a baseline, reactive, and post-package measure. The physiologic system involves assessing behavioral indices such as respiratory pattern, heart rate, skin color, autonomically mediated movements (tremors, eye movements), sounds (sighs, whimpers), and behavioral indices of visceral control (hiccoughing, gagging).

The motor system is assessed following the behavioral indices of posture, movement, tonus, and amount and degree of differentiation of activity.

The state system is assessed with the various behaviors including eye movements, eye opening and facial expressions, gross body movements, respirations and body tone. Behaviors indicate the level of consciousness of the infant at specific points in time.

The attentional/interactive system is assessed using the quality of the infant's alert state: its availability, duration of responsivity to stimuli, and the modulation and differentiation the infant uses to attend to and interact with the environment. The assessment of the infant's ability to regulate state in response to animate and inanimate objects is the major goal of the assessment.

The regulatory system is assessed by observing the infant's use of physiological, postural, and/or state strategies to maintain or return to the baseline state after assessment.

Examiner facilitation is the degree and amount of energy required from the examiner to set the stage for a package or a maneuver and to bring out the infant's optimal performance.

Part two includes various maneuvers to assess the premature infant's ability to react and adapt to stimuli of

various types and intensities. Package one assesses the infant's capacity to maintain a sleep state while exposed to repeated distal stimuli (flashlight beam and soft rattle). The infant responses are recorded according to a detailed list of characteristics which are graded on a scale of 1 to 9.

Package two assesses the infant's ability to deal with and adjust to being uncovered and then placed in the supine position.

Package three observes the infant's capacity to deal with tactile stimulation of the face and extremities. Assessment of systematically elicited movements and reflexes is also included in this package.

Package four assesses the infant's ability to posturally adjust the body. Scoring is recorded on the capacity to deal with undressing, pull to sit, and additional systematically elicited maneuvers.

Package five assesses the infant's ability to handle massive tactile combined with vestibular input by moving the infant horizontally and vertically while being held. Head and eye movement are noted after both the rotation and the moro maneuvers.

In package six the examiner observes the infant's attentional and interaction capacities while the infant is optimally alert. Several parameters are recorded for each item:

1. The degree to which a particular stimulus elicits and maintains an alert state and responsivity.

2. The infant's orienting capacity.

3. Efforts to shut out and efforts to attend.

4. Cost of attention.

5. Quality of responsivity.

Attention and interaction are assessed with visual, auditory, animate, and inanimate stimuli.

Part three of the APIB includes the behavioral summary scales of specific parameters. The physiological parameters are tremulousness, startles, skin color, and smiles. Specific motor organization parameters include tonus, motor activity, and hand to mouth facility. State organization parameters include alertness, state regulation, irritability, robustness and endurance, control over input,

and need for facilitation and use of stimulation. Overall summary parameter scores reveal the infant's general social attractiveness.

Appendix E

MATERNAL COMPETENCE QUESTIONNAIRE

Code No._____

Please complete each of the following questions by marking a vertical line between never and always to indicate your answer to the question. There are no right or wrong answers, only what you feel.

The example below may help you understand the marking of the questions.

It is very important that a mother has a sense of humor.

never|_____|_____|always

1. At the time of my baby's discharge I felt able to meet his/her needs.

never|_____|always

2. At the time of my baby's discharge I knew about my baby's needs.

never|_____|always

3. At the time of my baby's discharge I felt frustrated whenever he/she cried.

never|_____|always

4. When my baby was discharged I felt confident in my ability to bath him/her.

never|_____|always

5. When my baby was discharged he/she was sleepy.

never|_____|always

6. When my baby was discharged I felt confident in my ability to feed him/her.

never|_____|always

7. When my baby was discharged he/she was frequently unresponsiveness.

never|_____|always

8. At this time I feel frustrated because I don't know how satisfy my baby.

never|_____|always

9. It is not easy for me to decide what my baby needs when he/she cries.

never|_____|always

10. At this time I feel frustrated when my baby cries.

never|_____|always

11. When my baby is tired or fussy I know what he/she needs.

never|_____|always

12. My baby lets me know when he/she is hungry.

never|_____|always

13. My baby sends me a clear signal when his/her diaper is wet.

never|_____|always

14. After changing my baby's diaper he/she will stop crying and/or fussing almost immediately.

never|_____|always

15. After feeding my baby he/she will stop crying and/or fussing almost immediately.

never|_____|always

16. My baby responds to my care just as I had imagined he/she would.

never|_____|always

17. I am confident that I can meet my baby's needs.

never|_____|always

18. My baby will let me know when he/she is tired by sending me clear signal/s.

never|_____|always

19. I feel good when my baby stops crying after I feed him/her.

never|_____|always

20. I feel good because of the number of times my baby smiles at me.

never|_____|always

21. I know some activities which will help my baby's ability to interact with others.

never|_____|always

22. When my baby cries I can tell what he/she needs.

never|_____|always

23. My baby relaxes when I talk soothingly to him/her.

never|_____|always

24. My baby relaxes when I gently touch him/her.

never|_____|always

25. My baby smiles when I talk to him/her.

never|_____|always

26. My baby watches me and follows me with his/her eyes.

never|_____|always

27. My baby stops sucking while feeding if I talk to him/her.

never|_____|always

28. I can tell when my baby is finished feeding.

never|_____|always

29. My baby takes the amount of milk/formula that I would like him/her to take.

never|_____|always

30. My baby turns away when I talk to him/her.

never|_____|always

31. My baby squirms and/or fusses when I give him/her too much attention.

never|_____|always

32. I feel confident that I understand my baby's physical needs.

never|_____|always

33. I feel confident that I understand my baby's social needs.

never|_____|always

34. I can tell when my baby is too sleepy for activity or play.

never|_____|always

35. My baby's color and expression show me when I offer too much stimulation or attention.

never|_____|always

36. I have concerns about my baby's health status.

never|_____|always

37. I have concerns about my baby's social development.

never|_____|always

38. I have concerns about my baby's physical development.

never|_____|always

39. At this time my baby is wide awake and responsive.

never|_____|always

40. I feel that my baby and I both are relaxed and soothed by each other.

never|_____|always

The space below is provided so that you may add any comments or general impressions if you would like.

Appendix F

QUESTIONS: ANSWERS

1. Why are you testing my infant?

   Your infant was born prematurely and I am interested in the behavior of the premature infant. The APIB, however, is not a test which has a pass or fail- - it is used to determine and record the behaviors of premature infants.

2. Will the assessment hurt/harm my infant in any way?

   No, the assessment will record the responses to stimuli such as a flashlight, the sound of my voice, or a rattle. The assessment is safe; it involves activity that the infant is exposed to daily when you care for him/her.

Appendix G

INFORMATION PROVIDED BY THE HOSPITAL NURSE

INFORMATION PROVIDED BY THE HOSPITAL NURSE

"Hi, my name is _____, I am a nurse on the postpartum unit. A student in the Master of Nursing Program at the University of Manitoba will be performing a study involving mothers and their premature infant. May I have your permission to give her your telephone number so she can telephone you and describe the study? You can wait until you talk with her before decide to participate. [If the woman agrees and gives the nurse the telephone number...] Her name is Loretta Secco, she will telephone you in the next two days. Thank you."

TELEPHONE CONTACT WITH A POTENTIAL SUBJECT

" Hello, my name is Loretta Secco. I am a student in the Master Nursing Program at the University of Manitoba. I received your telephone number from a nurse on the pediatric unit [or Intermediate Care Nursery]. I am doing an investigation involving mothers and their infants. [At this point I will explain the study (Appendix H) based on the group to which the woman would be assigned.] Do you have any questions? Are you interested in participating? [If yes] What is the most convenient time for me to visit you in your home? What is your address? Thank you."

Appendix H

EXPLANATION OF THE STUDY FOR PARTICIPANTS

There is a separate study explanation for each group since the activities vary. The written explanations are provided below.

Control Group Explanation of Study

A University of Manitoba student in the masters nursing program will be performing a study to learn more about the needs of mothers and their premature infants. Your voluntary involvement in this study is requested. There is no obligation, you can say no if you will be inconvenienced.

If you consent to participate you are free to withdraw at any time with no consequences. There will be an initial time commitment of approximately ten minutes when you fill out a consent form and a questionnaire which asks you for general information about you and your infant. You do not have to answer all the questions if you desire.

The second time commitment (approximately 45 minutes) will take place within the first week after your infant's discharge home. At that time the masters nursing student will videotape you feeding your infant. This will take the usual time that you take to feed your infant. The investigator will also give you a questionnaire to fill out which asks you how you feel about caring for your premature infant (approximately 15 minutes).

The third time commitment will occur during the fifth week after your premature infant's discharge home. At this time the videotaping of feeding will be done again. The same questionnaire that was filled out by you in the first home visit will be done again (15 minutes). An assessment of you baby's responses, reflexes, and behavior will be done (approximately 20 minutes).

The videotape recordings and all information will be coded so that no names appear and confidentiality will be protected. The videos and questionnaire information will be disposed of after the study is completed.

If you have any questions about the study you can contact the masters nursing student at any time (Loretta Secco R.N., B.Sc.N. 253-5089 at home or 474-5089 at school).

Experimental Group Explanation of Study

A University of Manitoba student in the masters nursing program will be performing a study to learn more about the needs of mothers and their premature infants. You are asked to be involved in this study. There is no obligation, you can say no if you will be inconvenienced.

If you consent to participate you are free to withdraw at any time with no consequences. There will be an initial time commitment of approximately ten minutes when you fill out a questionnaire which asks general questions about you and your infant.

The second time commitment (approximately one hour and 45 minutes) will occur within one week after your infant's discharge home. At that time the masters nursing student will videotape you feeding your infant. This will take the usual time that you take to feed your infant. The investigator will then provide instruction (approximately one hour) covering such topics as premature infant behavior, interaction, and means to enhance mother-infant communication. The time required for teaching will vary depending on the number of questions you ask. A questionnaire will also be completed by you (approximately 15 minutes) which asks how you feel about your infant's care.

The third time commitment (approximately 1 hours) will be another home visit. At this time the nurse researcher will provide part two of the teaching intervention (approximately one-half an hour).

The forth time commitment (approximately 45 minutes) will occur within the fifth week after your infant's discharge and will again occur in your home. At this time the videotaping of feeding will be done again. The questionnaire which asks you how you feel about your infant's care will be filled out by you again. The investigator will also perform an assessment of your infant which will examine general behavioral characteristics (approximately 20 minutes). This assessment will not cause any harm to the infant, the investigator will be continuously sensitive to the infant's responses and needs.

The videotape recordings and all information will be coded so that no names appear and confidentiality will be protected. The videos and questionnaire information will be disposed of after the study is completed.

If you have any questions about the study you can contact the masters nursing student at any time (Loretta Secco R.N., B.Sc.N. 253-5089 at home or 474-8266 at work).

Appendix I

CONSENT FORMS

This consent form indicates that I _____ (please print name in full) agree to participate in a study involving mothers and their infants. I have been provided with the investigators name, credentials, and a verbal and written explanation of the study. The study fully described the commitments required of me as a voluntary participant in the study.

This consent also gives the investigator access to the medical records of me and my infant. I have had opportunity to ask questions and feel I can ask further questions at any time. I realize that the study involvement is voluntary and that I can withdraw at any time with no consequences to either myself or my infant. I have been told that the study is investigatory in nature and there may be no benefit for either me or my infant. However, the study may help us gain more understanding of mothers and infants.

My signature on the next page indicates that I consent for my and my infant's participation in the investigation. I realize that I may request study results if I desire.

Date:_____ _____
(signature of participant)

Date:_____ _____
(signature of investigator)

Please send me a copy of the study results, my name and address are below.

Name:_____
Address:_____
_____
_____
_____
Telephone:_____

Appendix J

DEMOGRAPHIC DATA

INFANT DATA
SOURCE: Medical Record

sex_____ Birthweight_____ Headcirc_____
Body length_____

Apgar_____(1 min) _____(5 min) Days on Respirator_____

Resusitated at birth_____

Assessed _____; Estimated gestational age_____

days in NICU_____ days in Intermediate Nursery_____

days on Pediatric unit_____

Intracranial hemorrhage_____ Ultrasound_____

Necrotizing Enterocolitis_____ Surgery_____

Respiratory Distress_____ Apneas_____

Bradycardias_____ Noninfectious illness_____

Infectious Illness_____ Congenital anomaly_____

Other medical condition_____

No. of days after birth N/G feeds started_____

No. of days after birth oral feeds started_____

No. of days held by mother(chart)_____

MOTHER DATA

SOURCE: MOTHER and MEDICAL RECORD

Age at last birthday_____ Married_____ Single_____

Culture_____

Number of years of education
_____12
_____greater than 12 but less than 14
_____greater than 14 but less than 16
_____greater than 16 but less than 18

Total Family Income_____less than $10,000.00
_____between $10,001.00 and $20,000.00
_____between $20,001.00 and $30,000.00
_____Between $30,001.00 and $40,000.00
_____greater than $40,000.00

Your occupation_____ Spouse's occupation_____

How many minutes/hours/days
after birth were you permitted to see your infant?_____

How many minutes/hours/days
after birth were you permitted to touch your infant?_____

How many minutes/hours/days
after birth were you permitted to hold your infant?_____

How many hours/days after birth
were you permitted to bath your infant?_____

How many hours/days after
birth did you get to change your infant's diaper?_____

Have you read any books, seen any videos, or received
any special instruction about the premature infant? _____
If yes, please specify book_____,
video_____, or special instruction_____.

Did you attend any parents-of-premature infants support
group meetings?_____ If yes, how many?_____

DEMOGRAPHIC DATA
SOURCE: Mother's Medical Record

Gravida_____ Para_____

Medical/health condition_____
_____diabetes _____hypertension
_____toxemia _____other

hospitalized before the premature delivery_____ times.
hospitalized before the premature delivery_____ days.

_____prednisone given before delivery(while in hospital)
_____other medications(while in hospital)

Delivery mode _____vaginal _____c/s

Total length of recorded labor_____

Appendix K

TEACHING INTERVENTION

Intervention Contents *

1. Introduction
2. Behavioral Development of the Premature Infant
   a) Physiological Stability
   b) Neuromotor development
   c) State Control
   d) Social Responsiveness
3. Forming A Relationship
4. Learning a New Language
   a) Exploring
   b) Eliciting
5. Hints to Help Interaction
   a) Imitation
   b) Repetition of phrases
   c) Silencing during pauses
   d) Attention-getting manipulation
   e) Gameplaying

*Intervention contents derived largely from Sammons & Lewis (1985) and Field (1980, 1982).
*The intervention was discussed at the mother's level of understanding with demonstrations and explanations as required.