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# An investigation of the relationship between maternal-infant patterns of synchrony during feeding, preterm infant state and a parent-administered state modulation treatment

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University of Washington, 1992



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**An Investigation of the Relationship Between Maternal-Infant Patterns of Synchrony during Feeding, Preterm Infant State and a Parent Administered State Modulation Treatment**

by

Phyllis Ann Page

A dissertation submitted in partial fulfillment
of the requirements for the degree of

Doctor of Philosophy

University of Washington

1992

Approved by Kathryn E Barnard
(Chairperson of Supervisory Committee)

Program Authorized
to Offer Degree Nursing

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Abstract

# An Investigation of the Relationship Between Maternal-Infant Patterns of Synchrony during Feeding, Preterm Infant State, and a Parent Administered State Modulation Treatment

By Phyllis Ann Page

Chairperson of the Supervisory Committee: Professor Kathryn E. Barnard
School of Nursing

The specific purpose of the study was to consider maternal-preterm infant interaction patterns in the early post hospital discharge weeks given a parent administered prefeeding infant state modulation treatment (PASMT). Twenty mother-preterm infant dyads were enrolled in the study post hospital discharge. The study utilized each dyad as their own control in a pretest/post-test design. Therefore, all mothers received instruction in the PASMT intervention. Demographic data and baseline knowledge of infant behavior was obtained by interview, followed by a baseline observation of a feeding interaction by a maternal and an infant coder in the home setting. The maternal observer coded maternal interventions of arouse, soothe, neutral, or other; infant position; and scored the Nursing Child Assessment Feeding Scales (NCAFS). The infant observer, in time synchrony (15-second epochs) with the maternal coder, coded infant state and quality of sucking. In a subsequent home visit the investigator provided the mother with instruction and written materials on preterm infant state related behaviors and a simple state modulation treatment which included strategies for arousing and soothing their infants prior to and

during the feeding episode. After a home visit follow-up on the PASMT instruction, a second feeding observation was made in the home setting by the coding team. Analysis of the data focused on analyses of frequencies of infant and maternal variables coded during baseline and post PASMT instruction observations of feeding interactions. NCAFS total scores at baseline and post PASMT instruction observations were compiled for hypotheses testing. Significant differences demonstrated post instruction included: increased frequency of maternal arousal techniques utilized, increased Maternal Indices of Synchrony, decreased Infant Indices of Need for State Modulation, increased infant alert time, decreased infant drowsy and low state arousal time, increased frequency of sucking bursts, increased length of sustained sucking, decrease in length of feeding time, and increase in total NCAFS scores. Since each dyad served as their own control, the influence of infant maturation on the natural known treatment improvement in mothers' skills could not be evaluated in this study. However, the results are similar to other control/experimental study samples on the NCAFS scores.

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## ACKNOWLEDGEMENTS

The author gratefully acknowledges the members of the supervisory committee, Dr. Kathryn Barnard, Dr. Susan Blackburn, Dr. Diane Magyary, Dr. Cathryn Booth, and Dr. Nancy Robinson, for their assistance in the preparation of this manuscript. Special gratitude is extended to Dr. Kathryn Barnard for her long term mentorship and support throughout all phases of study conceptualization, data collection, data analyses, and manuscript preparation. Appreciation is also expressed to research assistants, Amy Orr, Lisa Engman, Lori Hilliker, and Lee Norton, for their consistently cheerful, conscientious work as infant observational coders. In addition, warm thanks is extended to Lauren Toquino, Michelle Thorton, Sandy Harwood, Karen Ludwig, Elinda Anderson, and Jeanne Zepp for their assistance in subject recruitment. A special acknowledgement and thanks is extended to all the mothers and their preterm infants who so generously shared their time as study participants.

# DEDICATION

To my daughter, Jennifer, who has taught me anew the fantastic joys of the magical developing child.

# CHAPTER 1

# INTRODUCTION

Preterm infants, as a group, demonstrate less adequate development than full term infants in many domains of psychological and physiological functioning (Crnic, Ragozin, Greenberg, Robinson, & Basham, 1983; Cohen & Beckwith, 1979; Howard, Parmelee, Kopp, & Littman, 1976; Siegel, 1982). Research during the last two decades points to factors in the postnatal social environment, and in particular to qualities of interaction between infant and caregivers as pivotal in determining developmental outcome (Bee, Barnard, Eyres, Gray, Hammond, Spietz, Snyder, & Clark, 1982; Beckwith, 1980; Beckwith & Cohen, 1978, 1984, 1990; Cohen & Beckwith, 1979; Cohen & Parmelee, 1983; Goldberg & DiVitto, 1983; Gottfried, 1984a; Ramey, MacPhee, & Yeates, 1982; Sameroff, 1980; Stern, 1982; White-Traut & Nelson, 1988). Work by Escalona (1982) suggests that socioemotional environmental deficits and stresses impair early cognitive and psychosocial development for both fullterm and preterm infants; however, the preterm group is more vulnerable to such environmental insufficiencies than are fullterm infants.

## Discussion of Problem Area

Findings regarding preterm interactive behaviors are consistent across a number of longitudinal investigations. Preterm infants have been found to be less alert, less active, and less responsive than fullterm infants during the first few months of infancy (Bakeman & Brown, 1980; Crnic, et

al, 1983; DiVitto & Goldberg, 1979; Goldberg, 1978; Gottfried, 1984b; Field, 1977, 1980a, 1980b). In response to their infants' behaviors, mothers of preterm infants stimulate them more than mothers of fullterm infants in an effort to elicit responses. Once aroused, the preterm infant tends to become easily overstimulated as demonstrated by irritability, gaze aversion, and inattention (Field, 1977). In view of the critical nature of factors in the social environment as indicators of developmental outcome, and the heightened vulnerability of the preterm infant to socioemotional environmental deficits, research in the area of interventions aimed at facilitating positive early interactions between preterm infants and their caregivers is compelling.

## Purpose of the Study

Early interaction between infants and their caregivers provide a foundation for the development of infant communication patterns. These early interactions are implicated as a focal point in the animate environment of the infant, around which the infant may organize his state. The behaviors of the caregiver in early interactions with infants have been demonstrated as important influences, especially on the preterm infant's ability to interact responsively and provide clear cues to the caregiver. This study builds on earlier work testing a state modulation intervention by Fuhrmann (1984) and the field test of protocols from Nursing Systems

Toward Effective Parenting-Premature by Barnard and colleagues (1990). The tested intervention provided the study infants with a parent administered state modulation treatment (PASMT) at each feeding episode, thus facilitating the infants to modulate levels of arousal or alertness prior to and during each feeding. Providing PASMT on a regular basis at each feeding has the potential of providing the infants a focal point for organization of behavioral states. Sharing information about infant state behaviors and state modulation strategies with parents has several potential effects. Parents may be better prepared to understand their infant's unique behaviors and various states. Parents may be able to enhance and support the infant's emerging organization and behavioral integration, which in turn would assist the infant in being more responsive to the parent's caregiving.

The general aim of this study was to gain increased understanding of the socioemotional environment of the preterm infant and the patterns of maternal-preterm infant interaction during feedings in the early weeks post hospital discharge. The specific aim of the study was to consider maternal-preterm infant feeding interaction patterns given a parent administered infant state modulation treatment. The following research questions were addressed:

1. Given instruction in techniques to modulate preterm infant state, with what frequency do mothers attempt state modulation intervention appropriate to infant state during a feeding episode as

compared to feeding episodes prior to receiving instruction?

2. What is the infant state response pattern to appropriate maternal state stimulation versus inappropriate state stimulation during the feeding episode in preterm infants before and after PASMT instruction?

3. What is the pattern of sucking during a feeding episode in preterm infants relative to patterns of alertness during the feeding episode?

4. What is the relationship between the quality of mother-infant interaction and preterm infant patterns of alertness during the feeding episode?

5. What patterns of synchronous contingent mother-infant interaction are exhibited in mother-preterm infant dyads when the infant maintains alertness during the feeding episode?

# CHAPTER 2

# REVIEW OF THE LITERATURE

## Adaptation to the Extrauterine Environment

The uterine environment is, with occasional exception, the ideal environment to foster the fetus's normal progressive development. In utero, the fetus is dependent on the mother's physiologic systems to automatically regulate its own. At birth the neonate's basic physiologic needs are met in radically different ways. Newborns express the impact of their birth experience and initial encounter with their extrauterine environment through imbalance in their circadian rhythms, patterns of sleep/wake cycling, respiratory and heart rates, blood chemistry levels, metabolic processes, body tension/relaxation, and feeding patterns (Blackburn & Loper,1992; Deters,1980; Fanaroff & Martin, 1988;Klaus & Kennell, 1982). The primary task of the neonate is to reestablish a biorhythmic balance by stabilizing the function of these systems. Typically, the healthy infant born at term easily achieves physiological homeostasis and is ready to interact with the environment.

Adaptive abilities are challenged when the neonate is compromised by preterm birth (Blackburn & Loper, 1992; Touwen, 1980). Behavioral state organization is quite immature in the infant born prior to 37 weeks conceptual age (Berg & Berg, 1987). The adaptation difficulties of the infant born prior to 37 weeks conceptual age is often accounted for by the immature central nervous system. The sleep-wake periods and activity cycles of the mother provide feedback which may facilitate the infant's

organization in utero (Blackburn, 1982). However, the preterm infant is deprived of the influence of the maternal sleep cycle, periods of activity and quiescence, and other aspects of maternal rhythms such as the patterned sensory input of the maternal heartbeat. For the preterm infant in the Neonatal Intensive Care Unit (NICU), very few events occur at regular intervals. In a study of caregiving in the NICU, Blackburn, Barnard, and Kang (1983) found that the preterm infants were subjected to irregular patterns of being handled due to irregular timing of many NICU procedures and an absence of handling in response to the infant's emerging behavioral organization. The work of Blackburn, et al, (1983) suggests that early caregiver-infant interactions influence the infant's behavioral organization, development of diurnal rhythms, and can nurture or hinder early adaptations and interactions of the infant. Caregivers who are attentive to the preterm infant's need for diurnal cycles and responses from the environment which are contingent to their behavioral states are likely to facilitate adaptation to the extrauterine environment, and potentially, the central nervous system organization of the preterm infant.

## State Organization in Preterm Infants

Neonatal behavioral organization is most consistently described in terms of sleep-wake states. Postnatal development of sleep-wake pattern reflects the underlying maturation of the reticular activating system, brain stem, and related circadian rhythms (Blackburn & Loper, 1992). Responses to environmental stimuli must be interpreted within the context

of the presenting state of consciousness, which, in turn, is dependent on physiological variables such as hunger, nutrition, degree of hydration, and the time within the sleep-wake cycle of the infant. Brazelton (1973) suggests that the pattern of states, as well as the movement from one state to another, are important neonatal characteristics and may be good predictors of the infant's receptivity and ability to respond to stimuli in a cognitive sense. The smoothness of the transition from state to state reflects the infant's ability to modulate and organize behavior in order to interact with the environment (Als,1986).

Sleep-wake patterns change with CNS maturation in the infant. In the preterm infant the sleep states and sleep-related behaviors change rapidly between birth and 40 weeks conceptual age (Berg & Berg, 1987; Booth, 1980). With continuing development, the amount of active sleep decreases and quiet sleep increases, respiratory patterns become increasingly regular, rapid eye movements (REM's) decrease, and body movements decrease (Berg & Berg, 1987; Dreyfus-Brisac, 1968,1970, 1974, 1975; Parmelee & Stern, 1967, 1972; Petre-Quadens, Delee, & Remy, 1971; Prechtl,1974, 1980). Active sleep of REM sleep appears at 28 to 30 weeks gestation, with evidence of cycling of states beginning at 32 weeks (Dreyfus-Brisac, 1968; Hack, 1983). Quiet sleep appears at approximately 36 weeks gestational age (Parmelee & Stern, 1972). As the infant matures there is increasing integration among state behaviors, resulting in smoother muscle movements, reduced global responses,

improved habituation and adaptation, and general improvement of attentional abilities (Berg & Berg, 1987; Blackburn & Loper, 1992).

While changes in sleep-wake state characteristics reflect the preterm infant's neurological maturation, sleep, wakefulness, and behavioral state organization in preterms continue to differ markedly for some time from that of fullterm newborns (Gorski, Davison, & Brazelton, 1979). Dreyfus-Brisac (1970) who studied the ontogenesis of sleep in the preterm infant demonstrated that the preterm infant does not, even at 40 weeks postconceptual age, obtain the level of organization in sleep-wake states that infants born at term display. The preterm infant demonstrates a lack of sleep cycling such that active sleep and quiet sleep are poorly organized, and the respective periods of each state (quiet sleep, active sleep, and wakefullness) are of short duration (Dreyfus-Brisac, 1974). These patterns of sleep and wakefulness are of particular interest as they represent different levels of central nervous system control and feedback, as well as a synchrony deficit in the preterm infant. This synchrony deficit is critical not only because it represents disruption to the neurological maturation process, but also because it has implications for the quality of interaction the preterm infant may have with caregivers. The poor organization of the preterm's sleep-wake states can present an unrewarding set of responses to caregivers.

## Socioemotional Environment: Parent-Preterm Infant Interactions

The socioemotional environment relative to the parent-infant interactive system is established through reciprocal behaviors on the part of both infant and parent (Brazelton, Koslowski, & Main, 1974). During interaction both parent and infant reciprocally influence the behavior of the other in a way that is potentially rewarding for both partners. Through a process of social interaction and bidirectional influences, the parent and infant learn to adapt, modify and change their behaviors in response to the other. Since the infant has a limited capacity to accomodate to the parent partner, the quality of the socioemotional environment in the early infancy period is highly dependent on the social competence of the parent. The ability of the parent to interpret infant behavior and respond contingently, as well as the infant's ability to give clear behavioral cues influences the influences parent-infant interactions.

Parent-fullterm infant interactions are unique and typically represent rich sophisticated interpersonal exchanges. In contrast, parent-preterm infant interactions have been described as making extreme demands on parent caregiving abilities. The less well-adapted preterm infant demonstrating poor state organization and lower responsiveness is a challenging partner. Field (1980b) reported that at hospital discharge the behavior of the preterm infant was not as well adapted to caregiving as that of the fullterm infant, in that they were unable to provide clear distress

signals by crying when attention was needed. Up to at least four months of age preterm infants were uniformly described as unresponsive and more difficult than fullterm infants. Mothers of preterm infants appear to react to this pattern by increasing their own efforts (Field, 1977). This heightened level of maternal stimulation seems not to be particularly well tuned to the infant's cues, nor is it especially affectionate and loving (Barnard, Bee, & Hammond, 1984). Field (1980b) reported that in play and feeding interactions mothers of 4-month-old preterms showed less eye contact, less optimal patterns of holding, more verbal stimulation , but less contingent responsiveness than mothers of term infants. Barnard and Bee (1981) reported that at four months, when the preterm infant was less responsive than his fullterm counterpart, the mothers compensated by providing more stimulation. However, by eight months when the preterm infants' behaviors were more active like fullterm infants, the mothers' behaviors had changed so that they were less attentive, less positive, and less involved. A similar pattern of inattentive , more negative, uninvolved maternal behavior persisted at two years. Barnard hypothesized that continued lack of responsiveness on the part of the preterm infants in the early months of interaction had caused the mothers to 'give up' being sensitive to them.

## Sensory Stimulation Interventions

Over the last two decades much of the preterm intervention research has involved investigations of the effect of increments of sensory

stimulation on growth and development outcomes. Rationale for these interventions stem mainly from the view that birth before term deprives the infant of the regulatory influence of maternal biorhythms and of the tactual, vestibular, kinesthetic, and auditory stimulation that characterizes the intrauterine environment. An early review of the literature on the effects of these types of interventions by Cornell and Gottfried (1976) revealed that stimulated infants tended to perform at higher levels than control group infants on measures of sensorimotor and motor development. These intervention studies varied in sensory modalities stimulated; use of unimodal or multimodal stimulation; and the intensity, frequency, and length of stimulation. More recently, several researchers have demonstrated that achievement of the alert state through various forms of stimulation (nonnutritive sucking, stroking, and rocking) is optimum for preterm infants at the time of feeding, due to enhanced mother-infant interactions and feeding success (Gill, Behnke, Conlon, McNeely, & Anderson, 1988; McCain, 1992; White-Traut & Nelson, 1988). Few studies have examined specific state modulation interventions for effects on preterm infants. Several studies will be reviewed which demonstrate various dimensions of sensory stimulation intervention and state modulation effects on the preterm infant.

Barnard (1973) studied the influence of kinesthetic and auditory stimulation on the preterm's sleep-wake behavior. A rocker bed provided kinesthetic stimulation and a recording of a heartbeat offered auditory

stimulation for the experimental group. Results indicated there were more and longer periods of quiet sleep accompanied by larger weight gains and more rapid neurological development in infants in the experimental group as compared to the control group infants. Korner, et al (1972, 1978, 1983) have investigated the effects of kinesthetic stimulation in a similar manner in several studies of the oscillating waterbed for preterm infants. The most significant reported findings in repeated trials was the significant reduction of apnea while infants were on the oscillating waterbed. In addition, infants while on the intermittently oscillating waterbed showed a significant increase in sustained quiet sleep and a significant decrease in irritability. Change was also observed in quality of motor movements with the mean number of jerky and unsmooth movements less than half of those observed under the control condition. Studies by both of these researchers suggest that compensatory vestibular proprioceptive stimulation may enhance both the state organization and the neuro-behavioral development of preterm infants.

Rose, Schmidt, Riese, and Bridger (1980) investigated cardiac and motor activity responses to a tactile stimulus during the first sleep cycle for three groups of infants: 30 fullterms, 30 nonintervened preterms, and 30 intervened preterms. Prior to testing of stimulus responses, the intervention group had received a regimen of multimodal sensory stimulation which emphasized the tactile (massage) and vestibular (rocking) modalities. The study results demonstrated that the intervention altered the

preterm infants' sensory functioning mainly during active sleep. In this state the fullterms and intervened preterms exhibited a significant cardiac acceleration to the stimulus while the nonintervened preterms failed to do so. Similarly, motor responses of the intervened preterms were more like the fullterm. Another major finding indicated that the effects of such early intervention may last a long time. Visual recognition memory was found to be enhanced when the infants were tested at six months of age. In spite of marked differences between preterms and fullterms, the intervention seemed to narrow the gap to an extent.

## State Modulation Interventions

Fuhrmann (1984) studied twenty mothers and their preterm infants at hospital discharge in a control-intervention group design to examine the effects of instructing mothers on infant state related behaviors and state modulation strategies to be used prior to feedings. The state modulation treatment included strategies for arousing or alerting infants prior to feedings, as well as strategies for soothing or quieting the fussy or crying infant. Mothers were asked to provide the state modulation treatment at every feeding for 4 weeks post discharge. The mothers also recorded the state of their infant prior to feedings and the total feeding times. At 4 weeks a feeding observation was made and the NCAFS scored by an observer blind to the study conditions. Results demonstrated that the intervention group using the state modulation treatment prior to feedings had alert infants prior to feedings more often ($p<.01$), shorter feeding

times ($p<.05$), and higher NCAFS scores ($p<.05$) than the control group.

Barnard and colleagues (1990) completed a field trial with 76 mothers and their preterm infants using the Nursing Systems Towards Effective Parenting-Preterm (NSTEP-P) protocol. Community health nurses were trained in the use of the protocol by the research team and followed families in six sites across the country. Eight contacts at 37, 38, 40, 44, 48, 52, 56, and 60 weeks conceptual age focused on issues of state regulation, behavioral responsiveness, health concerns, and family and community resources. The same state modulation instruction utilized by Fuhrmann (1984) was taught in the first contact. Nursing Child Assessment Feeding Scale scores (44, 48, and 60 weeks conceptual age) were found to be equivalent to both living age and adjusted age norms and at some time points significantly higher than living age and adjusted age norms. In the feeding interaction, significant increases in the infants responsiveness and clarity of cues were accompanied by significant increases in the mothers social-emotional and cognitive growth fostering during the 16-week period between the first and last feeding observations. This sample of mothers and infants were performing as well as, and in some cases better than, a normative sample of term infants at the same conceptual age.

In a modified replication of the NSTEP-P protocols at three sites (San Jose, San Bernadino, California; and seattle, Washington) an experimental design was used to test treatment efficacy assigned by

maternal education (Kang, Barnard, Oshio, Hammond, 1991). High education was defined as greater than or equal to 13 years, and low education was less than or equal to 12 years. High education study mothers in the intervention group received a hospital based program of state modulation instruction in which they learned about infant states of consciousness, interaction cues, and ways to arouse and soothe infants during feedings. The hospital comparison group received instruction about car seat positioning of the preterm infant to prevent hypoxia. Only mothers in the low education group received the NSTEP-P intervention program of home visiting. The NSTEP-P program is composed of four topics which are discussed during each of nine home visits beginning after the infants discharge through 6 months: state modulation, infant behavioral responsiveness and infant stimulation, preterm infant health concerns, family and community resources. The comparison group for the home visiting intervention received standard public health nurse follow-up with primary foci on physical health and community resources. All groups with state modulation instruction in the hospital only and those with state modulation and public health nurse home follow-up had significantly better infant NCAFS scores. These study results provided support for state modulation instruction and NSTEP-P as effective interventions to promote positive parent-preterm interaction.

## Summary

Adaptive abilities are challenged when an infant is born prematurely.

The preterm is initially challenged with achieving physiologic stability for survival, and then meeting the challenge of organizing state behaviors in order to interact with the environment. The preterm infant has been characterized as demonstrating poor state organization and low responsiveness in parent-infant interactions. Various studies of sensory stimulation with preterm infants over the last two decades have generally demonstrated a trend in improved physiologic variables such as heart rate , weight gain, and state organization. Considering the poor state organization and CNS immaturity of the preterm infant and their subsequent relationship to asynchronous patterns of social interaction, intervention studies designed to promote state organization through state modulation are compelling.

# CHAPTER 3

# METHODOLOGY

## Sample Population

A pretest-post test design in which subjects served as their own controls was used for this study. Twenty preterm infants and their mothers were enrolled in the study between June 1991 and January 1992. The following criteria were utilized to determine infant and maternal eligibility for study participation:

1. Gestational age at birth $\leq$ 34 weeks
2. Singleton birth
3. Infants were considered in normal health at discharge. Those excluded from the sample were those with:
   a. central nervous system dysfunction
   b. grade 3 and 4 intraventricular hemorrhage
   c. home use of assisted ventilation
   d. known chromosomal disorders
   e. life-threatening congenital anomolies
   f. positive drug screen
   g. infants with mothers who had history or physiologic evidence of drug addiction
4. Mothers who spoke English
5. Mothers who were $\geq$ 18 years old
6. Mothers who were the primary caregiver during the study period
7. Consent of mother to participate in the study.

## Sample Selection

The neonatal unit nurse managers and the perinatal clinical nurse specialists of the selected hospitals served as intermediaries. Mothers of the preterm infants who met the study criteria were approached by an intermediary and briefly introduced to the study. Mothers who indicated an interest in hearing more about study participation and agreed to being

contacted by the investigator were contacted by phone or in person for a full explanation of study participation. Written consent was obtained from those who agreed to participate (Appendix A).

## Procedures

Participation in the study included the following:

1. The infant's hospital record was reviewed by the investigator to record for descriptive and analytic purposes the following information: sex, length, head circumference, APGAR score, birth weight, discharge weight. gestational age at birth, gestational age at discharge, maternal age, maternal gravida and parity, type delivery, and neonatal course in the NICU (Appendix B).

2. Mothers were interviewed by the investigator in the hospital just prior to discharge or in the home setting within a few days of discharge to determine demographic data (Appendix C) and baseline knowledge of infant state (Appendix D).

3. Mothers were given the usual discharge instructions for infant care currently given all mothers in the unit.

4. Baseline Feeding Observation: Observation and live coding of mother and infant behaviors 2-3 minutes prefeeding (as possible) and throughout a feeding episode were accomplished by the investigator and one research assistant in a home visit 2-12 days post-discharge. The maternal and infant coders were able to maintain time synchrony by utilizing a battery operated timing device, which was set to sound a simultaneous beep every 15 seconds through the ear pieces attached by a length of wire and worn by each of the coders. Behavior codes were recorded at the sound of the beep.

    a. Maternal coder -the investigator coded the following variables using 15 second epochs for variables 1 and 2 (Mother Code Sheet, Appendix E):
        1.) Maternal interventions: arouse, soothe, neutral, other

2.) Positioning of Infant
3.) NCAFS-Maternal and Infant Subscales(Appendix F)

b. Infant coder -the research assistant in time synchrony with the investigator using 15 second epochs coded the following infant variables (Infant Code Sheet, Appendix G):
1.) State(Anderson Behavioral State Scale,Appendix H)
2.) Sucking: Sucking burst, intermittent, no suck, or nipple out of mouth

5. In a home visit within 1 to 5 days of the first feeding observation the investigator provided the mothers with instruction and demonstration of infant state related behaviors and state modulation. The instructions and demonstration included the following:

a. A verbal summary by the investigator and printed material on :
1.) Infant state related behaviors and implications for caregiving around feedings (Appendix I)
2.) Strategies for arousing or alerting infants prior to feedings and strategies for soothing or quieting infants (Appendix J)
3.) Infant engagement and disengagement cues (Appendix K)

The teaching interchange alerted the mother to state-related behaviors of her newborn and provided her the opportunity to talk about what she had already observed in her infant.

b. A demonstration by the investigator using the mother's own infant which encouraged the mother's active involvement in eliciting her own infant's behaviors and responses. The demonstration allowed the investigator to alert the mother to state-related behaviors of her newborn, based on the infant's behavioral display. It also provided the mother with an opportunity to talk about what she saw. During the demonstration the investigator talked the mother

through the arousal and soothing strategies to be used as needed depending on the infants's state prior to and during the feeding. It was emphasized that the mother needed to provide the state modulation treatment prior to every feeding and throughout the feeding with the goal of facilitating alertness through arousal strategies for infants in low state or soothing strategies for infants in high state arousal. Mothers were instructed to incorporate the state modulation treatment into their infant's current feeding schedule. A Nursing Child Assessment Sleep Activity Record (NCASA) form (Appendix L) was provided for the mothers to record feeding times and application of the Parent Administered State Modulation Treatment (PASMT).

6. Within 2 to 4 days after PASMT instruction the investigator visited the mother and infant again for the purposes of: answering questions regarding PASMT; checking the record of feeding times and PASMT; observing a return demonstration of the mother's application of PASMT during a feeding episode; and clarification of appropriate provision of state modulation techniques, as needed.

7. Mothers received a follow-up home visit by the investigator and research assistant within 5 to 10 days of the instruction session for the purposes of observing a prefeeding application of PASMT and a feeding episode. The data collection procedure was identical to the first feeding observation described in item 4 above.

8. At the conclusion of the second feeding observation subjects were paid $25 for their participation in the study. Subjects were also given a certificate for free well child exams and immunizations for one year at a university affiliated nurse practitioner-managed clinic.

A summary of variables, data sources, and times of assessment is presented in Table 3.1

## Table 3.1

## Summary of Variables, Data Sources, and Times of Assessments

| Variable & Instrument/Data Source | | Times of Assessment: Post Discharge Day 0-4 | 2-12 | 12-21 |
|---|---|---|---|---|
| Perinatal Factors & Infant Status | | | | |
| Sex | Hospital Records | X | | |
| APGAR (5 minutes) | Hospital Records | X | | |
| Gestational age: | | | | |
| Birth | Hospital Records | X | | |
| Discharge | Hospital Records | X | | |
| Weight: | | | | |
| Birth | Hospital Records | X | | |
| Discharge | Hospital Records | X | | |
| Length | Hospital Records | X | | |
| Head circumference | Hospital Records | X | | |
| Type delivery | Hospital Records | X | | |
| Maternal age | Hospital Records | X | | |
| Maternal gravida/parity | Hospital Records | X | | |
| Neonatal course | Hospital Records | X | | |
| Family Ecology: | | | | |
| Economic status | Interview | X | | |
| Parent employment | Interview | X | | |
| Marital status | Interview | X | | |
| Maternal education | Interview | X | | |
| Paternal education | Interview | X | | |
| Paternal age | Interview | X | | |
| Mother: | | | | |
| Baseline knowledge of infant state | Interview | X | | |
| Feeding interventions | Observation | | X | X |
| Feeding position | Observation | | X | X |
| Feeding interaction | NCAFS | | X | X |
| Infant: | | | | |
| State | ABSS | | X | X |
| Suck | Observation | | X | X |
| Feeding interaction | NCAFS | | X | X |
| Mother-infant interaction: | | | | |
| Total feeding score | NCAFS | | X | X |

## Measures

### Demographic Measures

Demographic measures utilized to compile descriptive data on the study subjects included the Referral Information form, Demographic Interview, and the Baseline Knowledge of Infant State Interview. These measures were adapted from measures developed by the Nursing Systems Toward Effective Parenting-Premature staff at the University of Washington. The Referral Information form (Appendix B) was used to review the infant chart for data regarding infant characteristics at birth and discharge, as well as any complications experienced during the hospital course. The chart review was completed after the consent form had been signed. Measures on the Referral Information form included gestational age at birth and discharge, weight at birth and discharge, five minute APGAR score, type delivery, and complications at delivery. The Demographic Interview (Appendix C) and the Baseline Knowledge of Infant State Interview(Appendix D) were conducted by the investigator with the mother on the first contact in the home or in some cases in the hospital setting prior to the discharge of the infant. The demographic measures obtained through the Demographic Interview included data on mothers and fathers regarding age, race, marital status, education, family income, and source of income. The Baseline Knowledge of Infant State Interview data included measures of how the feedings were going, number of feedings per day, length of feedings, infant cues used to determine infant

readiness to feed and satiety, techniques used for arousing and soothing, and ease in determining infant needs.

## Maternal-Infant Interaction

### Nursing Child Assessment Feeding Scale

The Nursing Child Assessment Feeding Scale (NCAFS) (Appendix F) is designed to assess the contributions and characteristics, unique to the feeding interaction, of both the parent and the infant during the first year of life (Barnard, 1978b). The NCAFS has previously been used on preterm samples and has been shown to differentiate between the interactions of mothers of preterm infants and mothers of term infants (Barnard & Bee, 1982). The NCAFS is a 76-item binary scaled (yes or no response) tool which assesses characteristics in six key areas that have been found to be important to the interaction-adaptation process between parent and infant. The parent dimensions are: Sensitivity to child cues, response to child's distress, and provision of social-emotional and cognitive growth fostering situations. The infant is assessed on dimensions of clarity of cues and responsiveness to the parent. The parent and child subscales (I-VI) are summed to yield a single score representing the adaptiveness of the parent-infant interaction. The individual sums of the maternal(I-IV) and child(V-VI) subscales may also be analyzed separately to view the individual contributions to the interaction. Individuals observing and scoring the feeding interaction must be trained to a minimum of 85% inter-observer reliability according to the Nursing Child Assessment Satellite Training

(NCAST) standards (Barnard, 1978a). The investigator who scored all subjects at baseline and post PASMT instruction maintained an NCAFS inter-observer reliability of .98 to .99 during the study period.

The internal consistency (Cronbach's alpha) of the NCAFS have been reported as .86 and .88 at 4 and 8 months respectively for the total maternal score and .70 and .52 for the child scores (Barnard, Bee, & Hammond, 1984). Scores from the feeding observations have also been reported to display modest predictive validity. In a fullterm infant sample, the mothers' feeding score at 4 months was significantly correlated with the 4 year IQ ($r=.18$, $p<.05$), motor development ($r=.21$, $p<.05$), and receptive language ($r=.17$, $p<.05$) (Barnard, Bee, & Hammond, 1984).

## Infant Behaviors during Feeding

### Anderson Behavioral State Scale

The Anderson Behavioral State Scale (ABSS) is a 12-category scale designed to assess preterm infant state (Anderson, 1987; Anderson, Behnke, Gill, Condon, Measel, & McDonie, 1990). The scale measures behavioral states on a scale of 1 to 12 with 1=regular quiet sleep, 2=irregular quiet sleep, 3=active sleep, 4=very active sleep, 5=drowsy, 6=alert inactivity, 7=awake quiet, 8=active, 9=very active, 10=fussing, 11=crying, 12=hard crying (Appendix H). Categories 1 through are designated as sleep states; categories 6 and 7 as inactive awake states; and categories 8 through 12 as active/restless states. Content validity has been established by a panel of neonatal nurse clinicians/researchers and a

developmental pediatrician (G. Cranston-Anderson, personal communication, 1991).

For the purposes of this study 15 second time epochs were used, with the predominant observed state during the 15 second epoch recorded. Four infant coder research assistants who were registered nurses with experience in maternal child nursing participated in data collection during the course of the study. All had achieved and maintained throughout the study a reliability of .96 or greater on the ABSS. Interrater reliability was .90 or greater for all infant coders. The infant coders were blind to the treatment conditions of the subjects (baseline versus post instruction) in 35 out of 40 feeding observations.

**Quality of Infant Suck**

Quality of infant suck was coded simultaneously with infant state each 15 second epoch by the infant coder. Three distinct categories of sucking activity were distinguished by code, as well as a fourth code (X) for nipple out of the infant's mouth. The three codes for sucking activity were: 'S' for sustained sucking which was vigorous in quality, or characterized by vigorous sucking bursts throughout the majority of the 15 second epoch; 'I' for intermittent, slow, occasional sucks; and 'N' for no suck.

## Maternal Behaviors during Feeding

**Maternal Interventions**

Maternal interventions during the feeding were coded as arousing

(A), soothing (S), neutral (N), burp (B), or other (X) for each 15 second epoch throughout the feeding. An arousing intervention was one which utilized sensory stimulation (tactile, auditory, visual, kinesthetic) in a singular fashion or in combination characterized by variety. Examples of variety in stimulation included fingertip touch which moved rapidly then slowly across an infant's body part, high then low voice talking quickly and slowly, presenting the mother's face to the infant and talking, or putting the infant up to the shoulder. Soothing interventions were characterized by repetitive sensory stimuli including gentle repetitive stroking in the same area, talking in a soft steady voice, wrapping the infant snugly, and rocking the infant. The neutral intervention was defined as no demonstration of either arousing or soothing behaviors. Mothers in the neutral mode did nothing beyond holding the infant in the feeding position and offering the bottle or breast. The burp intervention was demonstrated by an interruption in the feeding and position change, typically to the shoulder or sitting upright in mothers's lap, and patting or rubbing the infant on the back in an attempt to elicit gas from the stomach. All other caregiving interventions not related to feeding or burping were coded as other.

**Maternal Positioning of Infant**

The position of the infant was coded every 15 seconds concurrently with maternal interventions by the maternal coder. The codes developed were en face, trunk to trunk (ET); en face, lap (EL); en face, infant seat/carrier (EC); arm cradle (A); lap (L); infantseat/carrier (C); shoulder

(S); other (X). The en face position was defined as the condition where the mother's face is in such a position that her eyes and those of the infant are able to meet fully in the same vertical plane of rotation (Barnard, 1978b).

## Hypotheses

Relationships were hypothesized relative to the variables of: frequency and appropriateness of maternal state modulation maneuvers, state response to contingent stimulation, sucking patterns, quality of mother-infant interaction and infant alertness, mother-infant contingency responsiveness and infant alertness. The specific study hypotheses tested were:

**Hypothesis 1**:

Mothers given instruction in techniques to modulate preterm infant state will more frequently provide state modulation interventions during the feeding than prior to PASMT instruction.

**Hypothesis 2**:

Mothers of preterm infants provided PASMT instruction will provide more appropriate state contingent arousing and soothing techniques in the two minute prefeeding and during the feeding episode than prior to PASMT instruction.

**Hypothesis 3:**

Preterm infants provided PASMT will more frequently respond to soothing stimulation by quieting and arousing stimulation by alerting through the mid-feeding portion of the feeding episode than preterm infants not provided PASMT.

**Hypothesis 4:**

Frequency of sucking bursts will be positively correlated with frequency of alert state during the feeding episode.

**Hypothesis 5:**

Preterm infants provided PASMT will demonstrate longer durations of sustained sucking than preterm infants not provided PASMT.

**Hypothesis 6:**

The total NCAFS score will have a positive correlation with the frequency of the alert state during the feeding episode.

**Hypothesis 7:**

Synchronous contingent mother-infant interactions will be demonstrated more frequently when the infant maintains alertness during the feeding than when the infant does not maintain alertness.

# CHAPTER 4

# RESULTS

## Sample Demographics

The sample population was recruited from two birth centers in Tacoma, Washington; one which provided levels I through III neonatal care, and the second which provided levels I and II neonatal care. The two birth centers admit primarily from the counties in the South Puget Sound Region of the state and share Level II neonatal census overflow as needed. Tacoma is the southern urban center of the Seattle-Tacoma corridor with a population of 177,500 (1990 Census). The study enrolled 20 mother-preterm infant dyads meeting all subject selection criteria between June 1991 and January 1992.

The sample consisted of 14 male and 6 female infants born at 34 weeks gestation or less. Gestational age was determined by assessments utilizing the Ballard scoring system (Ballard, Kazmaier, & Driver, 1977). Gestational ages at birth ranged from 26 to 34 weeks with a mean of 32 weeks. Eleven of the infants were 34 weeks gestational age at birth. Postconceptual ages (combined gestational and postnatal ages) at discharge ranged from 34.3 to 38.6 weeks with a mean of 36 weeks. Birth weights ranged from 780 to 2750 grams with a mean of 1829.7 grams. Discharge weights ranged from 1750 to 2820 grams with a mean of 2267.4 grams. The infants had a wide range of hospital days from 7 to 89 days with a mean of 29 days. Nine of the infants were hospitalized less than 14 days, 6 infants were hospitalized 16 to 29 days, and the remaining 5 infants were

hospitalized 42 to 89 days. All infants were considered healthy at discharge without evidence of chronic physiologic conditions. Infant demographic data is summarized in Tables 4.1, 4.2, and 4.3.

The 20 sample mothers ranged in age from 18 to 38 years with a mean of 26.7 years. The predominant racial group represented in the sample mothers was Caucasian (N=13), 4 were Afro-American, 2 Hispanic, and 1 was Asian. Sixteen mothers were married living with their partner. One mother was married and separated from her husband. Three mothers were unmarried; two living with the fathers of their infants, and one living with her mother. Eleven of the mothers experienced vaginal births, while nine gave birth by Caesarean Section. Gravida ranged from 1 to 7 with a mean of 2.6 pregnancies. Parity ranged 1 to 4 with a mean of 1.7 live births. Nine of the mothers experienced their first live birth with the infant in the study. Education of the mothers ranged from 11 to 18 years with a mean of 13.3 years. Fourteen of the mothers were not working at the time of enrollment in the study; however, eight of these mothers had worked during their pregnancy. Six mothers were working part time or fulltime when enrolled in the study. All of the working mothers were using maternity leave or special leave to be at home to care for their infants during the early post hospital discharge weeks.

Fathers ranged in age from 20 to 43 years with a mean of 29.1 years. The predominant racial group represented among the fathers was Caucasian (N=14), 4 were Afro-American, 2 Hispanic, and 1 was Asian.

**Table 4.1**

**Infant Demographic Data**

| Variable | Range Low | Range High | Mean | Standard Deviation |
|---|---|---|---|---|
| Gestational Age (weeks) | 26 | 34 | 32 | 2.9 |
| Birth Weight (grams) | 780 | 2750 | 1829.7 | 579.9 |
| OFC (cm) | 23 | 37 | 29.4 | 3.3 |
| Length (cm) | 33 | 48 | 42.2 | 4.7 |
| APGAR (5 minutes) | 7 | 9 | 8 | .8 |
| Discharge Postconceptual Age (weeks) | 34.3 | 38.6 | 36 | 1.4 |
| Discharge Weight (grams) | 1750 | 2820 | 2267.4 | 313.1 |
| Number of Hospital Days | 7 | 89 | 28.8 | 28.3 |

OFC = Occipital Frontal Circumference

**Table 4.2**

**Infant Gestational Age at Birth Frequencies**

| Gestational Age (weeks) | Frequency |
|---|---|
| 26.0 | 1 |
| 26.2 | 1 |
| 27.0 | 1 |
| 29.0 | 2 |
| 31.0 | 1 |
| 31.5 | 1 |
| 33.0 | 1 |
| 33.2 | 1 |
| 34.0 | 11 |

Total = 20 Infant Subjects

**Mean Gestational Age=32 weeks**
**Standard Deviation=2.9 weeks**

## Table 4.3

### Infant Postconceptual Age at Hospital Discharge Frequencies

| Postconceptual Age (weeks) | Frequency |
|---|---|
| 34.3 | 1 |
| 34.6 | 1 |
| 35.0 | 3 |
| 35.1 | 3 |
| 35.2 | 1 |
| 35.3 | 1 |
| 35.4 | 1 |
| 35.6 | 1 |
| 36.0 | 1 |
| 36.2 | 1 |
| 36.4 | 1 |
| 37.2 | 1 |
| 38.2 | 1 |
| 38.4 | 1 |
| 38.5 | 1 |
| 38.6 | 1 |

Total = 20 Infant Subjects

**Mean Postconceptual Age=36 weeks**
**Standard Deviation=1.4 weeks**

The educational range of the fathers was 12 to 16 years with a mean of 12.7 years. Eighteen of the fathers were employed fulltime, one worked part time, and one was recently unemployed. Family income ranged from $10,000 to 50,000 or more per year with the mean family income in the $25-29,999 per year range. Maternal and paternal demographic data is summarized in Table 4.4.

## Data Analysis

Analysis of the data focused on analyses of frequencies of infant and maternal variables coded during baseline and post PASMT instruction observations of feeding interactions. NCAFS total scores and subscale total scores at baseline and post PASMT instruction observations were compiled for hypotheses testing. Descriptive statistics, student t-tests for correlated samples, and Pearson product-moment correlational techniques utilizing the Statistica/Mac program (StatSoft, 1991) were employed for hypotheses testing. Descriptive statistics and narrative description were used to review the data from the Baseline Knowledge of Infant State Interview (Appendix C) in the text.

### Maternal Baseline Knowledge of Infant State

Mothers were interviewed in the hospital on day of discharge or in the home within a few days of discharge after signed consent to participate in the study was obtained. The interview (Appendix C) consisted of 17 items designed to gather data to describe the sample in terms of type of feedings, general feelings about how the feedings were

**Table 4.4**

**Maternal and Paternal Demographic Data**

| Variable | Range | | Mean | Standard Deviation |
|---|---|---|---|---|
| | Low | High | | |
| Maternal Age (years) | 18 | 38 | 26.7 | 4.6 |
| Maternal Education (years) | 11 | 18 | 13.3 | 1.9 |
| Gravida | 1 | 7 | 2.6 | 1.6 |
| Parity | 1 | 4 | 1.7 | .8 |
| Abortions | 0 | 5 | .9 | 1.3 |
| Paternal Age (years) | 20 | 43 | 29.1 | 4.9 |
| Paternal Education (years) | 12 | 16 | 12.7 | 1.1 |
| Family Income ($per year) | $10-14,999 | $50,000+ | $25-29,999 | $5,000 |

going, infant state behaviors mothers had observed around feeding times, and state modulation strategies they had utilized to arouse or soothe their infant. Mothers were initially asked how things in general were going for them on a scale of 1 to 4 with 1 being poor and 4 being great. The majority of the mothers (N=12) reported they were feeling good (scale value 3); while 7 reported they were feeling fair (scale value 2), and 1 felt poor. Similarly, 14 of the mothers reported the feedings were good, 2 reported the feedings were going great, and 4 reported the feedings as fair. Twelve mothers were using a combination of breast and bottle feeding, 7 were bottle feeding, and 1 was breast feeding exclusively. Number of feedings per day ranged from 5 to 12 with a mean of 7.7 (SD=1.8). Time for each feeding ranged from 15 to 60 minutes with a mean of 39.3 minutes (SD=16.1). Four of the twenty subjects took 20 minutes or less to feed at baseline, while 80% required greater than 20 minutes. General descriptive variables relative to the feedings are summarized in Table 4.5.

**Maternal Observations of Infant State Behaviors**

The majority of infants awakened on their own for feedings most of the time (N=12), 5 infants consistently awakened on their own to feed, 1 infant sometimes awakened, and 2 infants never awakened on their own for feedings. Twelve of the infants sometimes needed to be awakened for feedings, 5 never, 2 always, and 1 needed to be awakened for feedings most of the time. Eight mothers reported that their infants fell

**Table 4.5**

**Baseline Knowledge of Infant State Interview: Frequencies of General Descriptive Variables**

| Variable | Frequency |
|---|---|
| General Feeling | |
| 1-poor | 1 |
| 2-fair | 7 |
| 3-good | 12 |
| 4-great | 0 |
| How the feedings are going | |
| 1-poor | 0 |
| 2-fair | 4 |
| 3-good | 14 |
| 4-great | 2 |
| Feeding Method | |
| Breast | 1 |
| Bottle | 7 |
| Breast/bottle combination | 12 |
| Feedings per Day | |
| 5-7 | 11 |
| 8-10 | 8 |
| >10 | 1 |
| Length of Feeding (minutes) | |
| 15-20 | 4 |
| 25-30 | 5 |
| 35-40 | 3 |
| 45-50 | 2 |
| 55-60 | 6 |

N=20 subject responses on each variable

asleep during feedings most of the time, 7 mothers reported always, and 5 mothers reported that sometimes their infants fell asleep during feedings. The majority of mothers observed very little cry or fuss behaviors in their infants (N=16), 3 observed a moderate amount, and 1 mother had observed no cry or fuss behavior in her infant. Eleven mothers reported that when their infants cried they did nothing on their own to calm down. Nine mothers reported their infant hand sucking as a self-calming technique. Twelve mothers reported that it was usually easy for them to calm their infants, while the remaining eight mothers reported their infants very easy to calm. Baseline maternal observations of infant state behaviors are summarized in Table 4.6.

**Maternal Responses to Infant State Behaviors**

Cues that mothers used most frequently to determine when to feed were time since the last feeding, infant crying, and infant sucking on hands. Strategies mothers applied most frequently when they had to arouse their infant for feeding were: changing infant position by picking up; talking to the infant; touching the infant's face, arms, legs, body; and taking blankets off. The most frequent strategies used when the infant fell asleep during the feeding were: changing infant position; touching the infant's face, arms, legs, body; and talking to the infant. Mothers reported most frequently that they determined their infant had had enough to eat by: decreased strength of suck, spitting out nipple, number of ounces of formula taken or time nursing, and infant falling

## Table 4.6

### Baseline Knowledge of Infant State Interview: Frequencies of Maternal Observation of Infant State Behavior Variables

| Variable | Frequency |
|---|---|
| Awakens for feedings | |
| 1-never | 2 |
| 2-sometimes | 1 |
| 3-most of the time | 12 |
| 4-always | 5 |
| Mother needs to awaken for feeding | |
| 1-never | 5 |
| 2-sometimes | 12 |
| 3-most of the time | 1 |
| 4-always | 2 |
| Falls asleep during feeding | |
| 1-never | 0 |
| 2-sometimes | 5 |
| 3-most of the time | 8 |
| 4-always | 7 |
| Cry/fuss | |
| 1-none | 1 |
| 2-very little | 16 |
| 3-moderate amount | 3 |
| 4-quite a bit | 0 |
| 5-a lot | 0 |
| Self-calming Strategies | |
| doesn't do anything, just cries | 11 |
| looks at things in the house | 1 |
| listens to sounds | 0 |
| sucks on hands | 9 |
| Ease in calming with maternal intervention | |
| 1-not easy at all | 0 |
| 2-sometimes it's easy | 0 |
| 3-usually easy | 12 |
| 4-very easy, no problem | 8 |

N= 20 subject responses on each variable

asleep. Soothing strategies mothers reported most frequently were: picking up to hold, rocking or walking the infant, giving a pacifier, and stroking the back. Thirteen of the mothers reported using trial and error to determine what their infant needed and usually found it easy to meet infant needs. The remaining 7 mothers reported they found it consistently easy to determine infant needs. Baseline maternal responses to infant state behaviors are summarized in Table 4.7.

## Hypotheses

The pretest-post test study design using each subject as their own control allowed the investigator to compare data collected at baseline to data collected post PASMT instruction along several variable dimensions.

### Frequency and Appropriateness of Maternal State Modulation Maneuvers

**Hypothesis 1:**
Mothers given instruction in techniques to modulate preterm infant state will more frequently provide state modulation interventions during the feeding than prior to PASMT instruction.

**Hypothesis 2:**
Mothers of preterm infants provided PASMT instruction will provide more appropriate state contingent arousing and soothing techniques during the feeding episode than prior to PASMT instruction.

Baseline and post PASMT instruction feeding observations were initially analyzed for frequencies of arouse, soothe, and neutral maternal

**Table 4.7**
**Baseline Knowledge of Infant State Interview: Frequencies of Maternal Responses to Infant State Behavior Variables**

| Variable | Frequency |
|---|---|
| Determining Feeding Time: | |
| time since last feeding | 10 |
| baby cries | 11 |
| baby sucks on hands | 9 |
| baby's arms and legs flexed toward body | 0 |
| don't know, hard to tell | 0 |
| Strategies to Awaken prior to Feeding : | |
| do nothing, go ahead and feed | 1 |
| take blankets off | 6 |
| talk to the baby | 7 |
| change position | 9 |
| touch baby | 7 |
| bathe the baby | 1 |
| show baby something to look at | 2 |
| jiggle baby | 3 |
| Strategies to Awaken during Feeding : | |
| do nothing, go ahead and feed | 1 |
| take blankets off | 3 |
| talk to the baby | 6 |
| change position | 9 |
| touch baby | 7 |
| bathe the baby | 0 |
| show baby something to look at | 2 |
| jiggle baby | 4 |
| stop feeding | 2 |
| Determining Satiety: | |
| baby falls asleep | 6 |
| number of ounces of formula or time nursing | 8 |
| baby no longer has strong suck | 10 |
| baby spits out nipple | 7 |
| baby's arms and legs relaxed | 1 |
| don't know, hard to tell for sure | 2 |
| Strategies for Soothing: | |
| show baby caregiver's face | 0 |
| restrain baby's arms | 1 |
| wrap baby in blanket | 1 |
| pick up and hold | 17 |
| rock or walk baby | 10 |
| give pacifier | 7 |
| stroke feet or back | 6 |
| put baby in swing or front pack | 0 |
| give to someone to console | 0 |
| feed | 5 |

interventions throughout the entire feeding episode (Table 4.8). The following criteria were utilized for designation of all maternal interventions coded (arouse, soothe, or neutral) each 15 second epoch as appropriate or inappropriate,based on the infant's state and quality of suck.

**Criteria for Designation of Appropriate Maternal Interventions:**

**Arouse:**

*1. Within first 30 seconds of initiating feeding
2. Within 30 seconds of state 5 or less
3. Within 30 seconds of intermittent suck (I), no suck (N), or nipple out of mouth (X) when not associated with burp time.
4. Intermittent suck (I) or no suck (N) persisting 30 seconds or more when not associated with burp time

**Soothe:**

1. Within 15 seconds of state 8 or 9, soothe until state 7 or less, may continue up to 30 seconds of reaching state 6 or 7
2. Concurrent with states 10-12, soothe until state 7 or less, may continue up to 30 seconds of reaching state 6 or 7
3. State 8 or greater requires soothing, taking precedence over quality of suck (I, N, or X)

**Neutral:**

1. Within 30 seconds of state 6 or 7
2. Within 30 seconds of vigorous sucking bursts (S)
3. Within 30 seconds of end of burp (B)
4. Within 30 seconds of arouse intervention (A)

*5. Within first 30 seconds of feeding if infant is in state 6 or 7

* In the first 30 seconds of feeding it is appropriate for the mother to continue or discontinue arousal if the infant is in state 6 or 7. Arousal must be applied if the infant is in state 5 or less.

Frequency of maternal arousal as a state modulation technique demonstrated a significant increase from baseline to post PASMT

**Table 4.8**

**Frequencies of Maternal Interventions**
**Beginning of Feeding through Entire Feeding**

| Subject # | Arouse | | Soothe | | Neutral | |
|---|---|---|---|---|---|---|
| | BL | PI | BL | PI | BL | PI |
| 1 | .14 | .46 | .50 | .00 | .15 | .28 |
| 2 | .24 | .00 | .12 | .13 | .45 | .65 |
| 3 | .10 | .17 | .00 | .07 | .90 | .41 |
| 4 | .13 | .43 | .69 | .00 | .19 | .57 |
| 5 | .07 | .35 | .27 | .03 | .58 | .61 |
| 6 | .32 | .19 | .14 | .02 | .49 | .75 |
| 7 | .33 | .15 | .05 | .04 | .44 | .44 |
| 8 | .06 | .13 | .34 | .00 | .31 | .54 |
| 9 | .12 | .07 | .00 | .00 | .51 | .61 |
| 10 | .26 | .75 | .01 | .00 | .56 | .18 |
| 11 | .18 | .48 | .00 | .02 | .82 | .48 |
| 12 | .19 | .48 | .00 | .00 | .53 | .33 |
| 13 | .40 | .43 | .00 | .00 | .54 | .37 |
| 14 | .00 | .13 | .00 | .13 | .84 | .83 |
| 15 | .16 | .28 | .01 | .04 | .07 | .54 |
| 16 | .10 | .33 | .00 | .05 | .90 | .63 |
| 17 | .37 | .44 | .00 | .00 | .56 | .36 |
| 18 | .48 | .36 | .00 | .04 | .44 | .37 |
| 19 | .50 | .25 | .02 | .00 | .34 | .75 |
| 20 | .10 | .80 | .01 | .01 | .82 | .09 |

BL=baseline
PI=post PASMT instruction

**Means and SD:**

Baseline- Arouse .21 (SD .14)
Soothe .11 (SD .19)
Neutral .52 (SD .24)

Post Instruction- Arouse .33 (SD .21)*
Soothe .03 (SD.04)
Neutral .49 (SD .19

*p=.044

instruction t (19)= 2.23, p=.04. The frequencies of both maternal soothing and neutral interventions did not demonstrate a significant increase from baseline to post PASMT instruction. Hypothesis 1 is supported for arousal, as a state modulation intervention, which demonstrated a significant increase post PASMT instruction.

Frequencies of appropriate maternal interventions were analyzed to the midfeed point and throughout the entire feeding for baseline and post PASMT instruction feeding observations (Tables 4.9 and 4.10). Separate analyses were conducted for arouse, soothe, and neutral interventions. A composite score of frequencies of appropriate arouse, soothe, and neutral was calculated to yield a Maternal Index of Synchrony (Table 4.11). The indices were calculated by totaling the frequencies of all appropriate epochs of arouse, soothe, and neutral (see criteria on previous page); and then obtaining the proportional representation of appropriate epochs out of the total epochs in the feeding (excluding burp time).This index reflected the mother's ability to interpret her infant's behavior and respond by offering contingent stimuli which had the potential for modulating infant state and sucking quality throughout a feeding interaction.

Analyses of appropriate arouse and appropriate soothe interventions yielded no significant differences from baseline to post instruction at the midfeed time point or throughout the entire feeding. The appropriate use of neutral intervention from baseline to post instruction yielded significant increases at both midfeed, t(18)=5.80, p<.001, and throughout the entire

## Table 4.9

**Frequencies of Appropriate Maternal Interventions Beginning of Feeding through Entire Feeding**

| Subject # | Arouse | | Soothe | | Neutral | |
|---|---|---|---|---|---|---|
| | BL | PI | BL | PI | BL | PI |
| 1 | .88 | 1.00 | .04 | - | .82 | .56 |
| 2 | .94 | - | .00 | .44 | .74 | .93 |
| 3 | .50 | 1.00 | - | .00 | .33 | .83 |
| 4 | 1.00 | .93 | .00 | - | .67 | .55 |
| 5 | .83 | 1.00 | .04 | 1.00 | .40 | .71 |
| 6 | .96 | 1.00 | .00 | .00 | .75 | .67 |
| 7 | .81 | .87 | .20 | .00 | .55 | .91 |
| 8 | .86 | 1.00 | .00 | - | .17 | .50 |
| 9 | .91 | .67 | - | - | .30 | .96 |
| 10 | 1.00 | .97 | .00 | - | .31 | 1.00 |
| 11 | 1.00 | 1.00 | - | .00 | .13 | .73 |
| 12 | 1.00 | .80 | - | - | .29 | .71 |
| 13 | .93 | .97 | - | - | .18 | .61 |
| 14 | - | 1.00 | - | .00 | .96 | 1.00 |
| 15 | .87 | .68 | 1.00 | 1.00 | .54 | .73 |
| 16 | 1.00 | .85 | - | 1.00 | .25 | .88 |
| 17 | 1.00 | 1.00 | - | - | .34 | .75 |
| 18 | 1.00 | .97 | - | 1.00 | .75 | .86 |
| 19 | 1.00 | 1.00 | .33 | - | .63 | .50 |
| 20 | .73 | .97 | 1.00 | 1.00 | .33 | 1.00 |

BL=baseline
PI=post PASMT instruction

**Means and SD:**

Baseline- Arouse .91 (SD .13)
Soothe .24 (SD .39)
Neutral .47 (SD .25)

Post Instruction- Arouse .93 (SD .11)
Soothe .49 (SD .50)
Neutral .77 (SD .17)*
*p<.001

**Table 4.10**

**Frequencies of Appropriate Maternal Interventions Beginning of Feeding through Midfeed**

| Subject # | Arouse | | Soothe | | Neutral | |
|---|---|---|---|---|---|---|
| | BL | PI | BL | PI | BL | PI |
| 1 | 1.00 | 1.00 | .08 | - | .25 | .43 |
| 2 | .89 | - | .00 | 1.00 | .75 | 1.00 |
| 3 | .50 | 1.00 | - | .00 | .38 | .88 |
| 4 | - | .75 | .00 | - | .50 | .46 |
| 5 | 1.00 | 1.00 | .00 | 1.00 | .48 | .74 |
| 6 | 1.00 | 1.00 | .00 | - | .56 | .92 |
| 7 | 1.00 | .80 | .00 | .00 | .70 | 1.00 |
| 8 | .75 | 1.00 | .00 | - | .71 | .82 |
| 9 | 1.00 | 1.00 | - | - | .32 | .94 |
| 10 | 1.00 | .95 | - | - | .24 | - |
| 11 | 1.00 | 1.00 | - | - | .00 | .86 |
| 12 | 1.00 | .71 | - | - | .24 | 1.00 |
| 13 | .92 | .93 | - | - | .50 | .92 |
| 14 | - | 1.00 | - | .00 | 1.00 | 1.00 |
| 15 | .80 | .54 | - | - | .73 | .82 |
| 16 | - | .75 | - | 1.00 | .21 | 1.00 |
| 17 | 1.00 | 1.00 | - | - | .60 | .90 |
| 18 | 1.00 | .95 | - | - | .67 | .94 |
| 19 | 1.00 | 1.00 | .33 | - | .59 | .72 |
| 20 | .60 | 1.00 | 1.00 | 1.00 | .55 | 1.00 |

BL=baseline
PI=post PASMT instruction

**Means and SD:**

Baseline- Arouse .91 (SD .16)
Soothe .16 (SD .33)
Neutral .50 (SD .23)

Post Instruction- Arouse .92 (SD .14)
Soothe .57 (SD .53)
Neutral .86 (SD .17)*
*p<.001

## Table 4.11

**Maternal Indices of Synchrony for Beginning to Midfeed and through Entire Feeding at Baseline and Post PASMT Instruction**

| Subject # | Midfeed | | Entire Feed | |
|---|---|---|---|---|
| | BL | PI | BL | PI |
| 1 | .39 | .81 | .33 | .83 |
| 2 | .68 | 1.00 | .69 | .85 |
| 3 | .40 | .75 | .35 | .79 |
| 4 | .13 | .53 | .25 | .71 |
| 5 | .40 | .81 | .33 | .82 |
| 6 | .61 | .93 | .71 | .73 |
| 7 | .76 | .92 | .63 | .84 |
| 8 | .28 | .88 | .15 | .60 |
| 9 | .39 | .95 | .41 | .93 |
| 10 | .33 | .95 | .52 | .97 |
| 11 | .17 | .96 | .29 | .84 |
| 12 | .38 | .73 | .48 | .77 |
| 13 | .80 | .92 | .50 | .81 |
| 14 | 1.00 | .97 | .96 | .99 |
| 15 | .75 | .70 | .60 | .73 |
| 16 | .21 | .95 | .32 | .88 |
| 17 | .82 | .96 | .60 | .83 |
| 18 | .85 | .95 | .88 | .92 |
| 19 | .81 | .75 | .84 | .63 |
| 20 | .56 | 1.00 | .38 | .98 |

BL=baseline
PI=post PASMT instruction

**Means and SD:**

Baseline-
Midfeed .53 (SD .26)
Entire Feed .51 (SD .22)

Post Instruction-
Midfeed .87 (SD.12)*
Entire Feed .82 (SD.11)*
*p<.001

feeding, t(19)=4.54, p<.001. The Maternal Indices of Synchrony also yielded significant increases from baseline to post instruction at midfeed, t(19)=5.98, p,<.001, and throughout the entire feeding,t(19)=6.13, p<.001. Based on the tested composite scores, Maternal Indices of Synchrony, Hypothesis 2 is supported. Mothers provided more appropriate state modulation during the feeding post PASMT instruction.

## State Response to Contingent Stimulation

**Hypothesis 3:**

Preterm infants provided PASMT will more frequently respond to soothing stimulation by quieting and arousing stimulation by alerting through the mid-feeding portion of the feeding episode than preterm infants not provided PASMT.

Data from all 20 subjects were examined in relation to Hypothesis 3 for beginning of feed through midfeed and beginning of feed through the entire feeding. Each 15-second epoch of feeding observation record codes were examined at baseline and post PASMT instruction to determine both maternal application of appropriate strategies to modulate state, and infant state and sucking behaviors indicating need for state modulation interventions. Maternal Indices of Synchrony (MIS) based on appropriate application of state modulation strategies and neutral behaviors were correlated to Infant Indices of Need for State Modulation (IINSM). The IINSM reflected a composite score for the total amount of low state arousal and high state arousal (non-alert state 6 or 7) the infant exhibited over the entire feeding (Table 4.12). MIS and IINSM were also calculated

## Table 4.12

**Infant Indices of Need for State Modulation for Beginning to Midfeed and through Entire Feeding at Baseline and Post PASMT Instruction**

| Subject # | Midfeed | | Entire Feed | |
|---|---|---|---|---|
| | BL | PI | BL | PI |
| 1 | 1.00 | .77 | 1.00 | .76 |
| 2 | .09 | .08 | .33 | .38 |
| 3 | .30 | .25 | .55 | .37 |
| 4 | .75 | .77 | .83 | .66 |
| 5 | .72 | .65 | .80 | .70 |
| 6 | .86 | .29 | .75 | .60 |
| 7 | .66 | .08 | .82 | .21 |
| 8 | .96 | .75 | .98 | .87 |
| 9 | .96 | .10 | 1.00 | .11 |
| 10 | .95 | .70 | .97 | .65 |
| 11 | 1.00 | .70 | 1.00 | .69 |
| 12 | 1.00 | .40 | 1.00 | .59 |
| 13 | 1.00 | .46 | 1.00 | .76 |
| 14 | .00 | .03 | .00 | .10 |
| 15 | .53 | .50 | .70 | .61 |
| 16 | .87 | .05 | .94 | .31 |
| 17 | .59 | .41 | .81 | .59 |
| 18 | .85 | .67 | .92 | .80 |
| 19 | 1.00 | .55 | 1.00 | .78 |
| 20 | .85 | .74 | .92 | .76 |

BL=baseline
PI=post PASMT instruction

**Means and SD:**

Baseline-
Midfeed .74 (SD .31)
Entire Feed .82 (SD .26)

Post Instruction-
Midfeed .45 (SD .27)*
Entire Feed .56 (SD .24)*
*p<.001

for beginning of feeding through the midfeed time portion of each feeding.

Low negative correlations were found for beginning through midfeed and entire feed time periods at both baseline and post PASMT instruction. Midfeed Pearson product-moment correlations were: MIS/IINSM, baseline, r=-.43 (p<.06); MIS/IINSM, post instruction, r=-.33 (p<.15, NS) Pearson product-moment correlations determined across the entire feed time period were: MIS/IINSM, baseline, r=-.48 (p<.03); MIS/IINSM, post instruction, r=-.42 (p<.06). These findings are oriented in the appropriate direction to support Hypothesis 8; however, higher overall correlations and levels of significance are necessary to generalize to a wider population.

## Sucking Patterns

**Hypothesis 4:**

> Frequency of sucking bursts will be positively correlated with frequency of alert state during the feeding episode.

Sucking burst frequency was analyzed through midfeed and the entire feed for both baseline and post instruction time points. Weak positive correlations of sustained sucking frequency with alert state frequency were demonstrated across all time points. Pearson product-moment correlations were: (baseline midfeed) alert state with sucking bursts, r=.15; (post instruction midfeed) alert state with sucking bursts, r=.14; (baseline whole feeding) alert state with sucking bursts, r=.25; (post

instruction whole feeding) alert state with sucking bursts, r=.32. None of the correlations were significant; therefore, Hypothesis 4 was not supported.

**Hypothesis 5:**

Preterm infants provided PASMT will demonstrate longer durations of sucking bursts than preterm infants not provided PASMT.

The trend in the data for the twenty study subjects was an increase in the number of epochs of sustained sucking from baseline to post PASMT instruction. At baseline the duration of sustained sucking were clustered at 30 seconds or less. Two subjects demonstrated sustained sucking for 45 seconds or greater. Post PASMT instruction eight subjects demonstrated patterns of sustained sucking for 45 seconds or greater. Sustained sucking frequencies through the midfeed and throughout the entire feed were tested for significant differences from baseline to post PASMT instruction using student's t test for correlated samples. Midfeed baseline to post PASMT instruction demonstrated a significant difference $t(19)= 3.40$, $p=.003$. Similar significant difference was demonstrated for sustained sucking frequencies over the entire feeding, $t(19)=2.90$, $p=.009$. To test Hypothesis 5 the durations of the longest sustained sucking episodes for subjects were tested for significant differences from baseline to post PASMT instruction using student's t test for correlated samples. The mean time at baseline for the longest sustained sucking was 89 seconds (SD 56) and at post PASMT

instruction the mean time was 139 seconds (SD 74). The length of sustained sucking was found to increase significantly post PASMT instruction, t (19)= 2.87, p=.01. Hypothesis 5 was supported.

## Quality of Mother-Infant Interaction and Infant Alertness

**Hypothesis 6:**

The total NCAFS score will have a positive correlation with the frequency of alertness during the feeding episode.

Highly significant differences were demonstrated in the total NCAFS scores from baseline (mean=54.9, SD=6.1)to the post instruction (mean=69.3, SD=4.2) time points, t(19)=9.88, p<.001. Baseline and post PASMT instruction NCAFS scores were correlated with frequencies of alertness through midfeed and throughout the entire feeding interaction. Pearson product-moment correlations yielded no significant correlations at any time point. Correlations were: NCAFS score baseline with alertness, midfeed, r=.24; NCAFS score post instruction with alertness, midfeed, r=.18; NCAFS score baseline with alertness, whole feeding, r=.19; NCAFS score post instruction with alertness, whole feeding, r=-.15. Hypothesis 6 was not supported.

## Mother-Infant Contingency Responsiveness and Infant Alertness

**Hypothesis 7:**

Synchronous contingent mother-infant interactions

> will be demonstrated more frequently when the infant maintains alertness during the feeding than when the infant does not maintain alertness.

To test this hypothesis Pearson product-moment correlations were applied to Maternal Indices of Synchrony and infant alertness frequencies at both baseline and post instruction for midfeed and entire feed time points. Low positive correlations were demonstrated at all time points. Correlations were: MIS/infant alertness midfeed, baseline, $r=.41$ ($p<.07$); MIS/infant alertness midfeed, post instruction, $r=.33$ ($p<.15$); MIS/infant alertness whole feeding, baseline, $r=.48$ ($p<.03$); MIS/infant alertness whole feeding, post instruction, $r=.43$ ($p<.06$). These correlations are in the direction hypothesized and indicate support for Hypothesis 7.

# CHAPTER 5

# DISCUSSION

Research efforts in the last two decades have given increased attention to investigations of the relationship between preterm infant state behaviors and aspects of development. The purpose of this study was to consider the effects of a parent administered state modulation treatment on preterm infant state, sucking behaviors, and maternal interventions during feeding. Study results contribute to knowledge regarding maternal adaptation to preterm infant behaviors during feedings in the first weeks at home post hospital discharge. Furthermore, the results provide strong support for state modulation as an effective clinical therapeutic for those infants demonstrating difficulty in modulating state arousal. Discussion will focus on sample characteristics, data trends, model of optimal mother-preterm infant interaction, limitations of the study, and future study recommendations.

## Sample Characteristics

The sample preterm infants were predominantly male (14 males out of 20 subjects). The recruitment sites reported a relatively equal gender distribution during the study period; therefore, the male predominance is assumed to be relative to sample size. While the gestational age ranged from 26 to 34 weeks, 11 out of 20 infants were 34 weeks gestational age. The prevalence of infants at the upper end of the gestational age criteria was anticipated by virtue of other selection criteria which screened out the morbidity factors associated with younger preterm infants. Infant

postconceptual age at discharge was more uniform than gestational age distribution with less variance, 1.4 weeks versus 2.9 weeks for gestational age.

The sample mothers were predominantly Caucasian and relatively well educated. Study criteria screened out teenage mothers (maternal age 18 years or older recruited); therefore, the mean maternal age of 26.7 years was older than the mean age typically found in a population of mothers of preterm infants. The older maternal age may have contributed to the high education (mean 13.3 years) of the sample mothers. Two mothers had 11 years of education, while 18 mothers had 12 years or more education, including 4 mothers with bachelors degrees. Ten of the sample mothers had a history of one or more spontaneous abortions which reflects pregnancy difficulties frequently encountered by mothers of preterms. During the baseline interview one of the themes regularly initiated by the study mothers was a search for rationale for their preterm delivery or their history of pregnancy difficulty. The mothers concerns were acknowledged as a normal response to the event of preterm birth, however, were not focused on as a study variable.

Fathers of preterm infants in the study were predominantly Caucasian and on the average 3 years older than the mothers with a mean age of 29.1 years. Fathers were similarly well educated at a slightly lower level (12.7 years) than the sample mothers. Families were predominantly in the middle income range with 8 of the 20 subjects reporting an income

of $40,000 or greater. Few fathers were present at home visit data collection points; however, of those who were present, a genuine interest was expressed in their infant as they also related how things were going since the infant had come home and particular infant behaviors they had noticed. Fathers who were present for the state modulation instruction were very interested in the information shared, although all of the study mothers were the primary infant caregivers. While fathers were not a focus of any study hypotheses, it is speculated that the responses of fathers and their support of the mothers of their preterm infants are major variables in qualities of maternal-infant interaction dynamics.

## Data Trends

### Maternal Baseline Knowledge Interview Items

The majority of sample mothers reported they were feeling good (60%) and the feedings were going good (70%) at the time of initial interview during the first week post hospital discharge. Anecdotal information contributed by subjects revealed that often the good feelings were attributed to the joy they experienced knowing their infant had progressed to the point of being stable enough to come home from the hospital. They felt that the major hurdles threatening survival had been passed. Feedings were perceived as going well, in part, due to the progression from gavage feedings to breast, bottle, or combination breast and bottle feedings. This progression from gavage feedings to breast or bottle feedings was described by some mothers as the last hurdle before

hospital discharge. They expressed eagerness to do all they could to help their infant succeed at feedings and continue to gain weight.

Most mothers reported spending a good deal of time feeding their infants at baseline with a mean of 39.3 minutes per feeding. Eleven of the infants required 35 minutes or more to feed with 6 of those infants requiring 55 to 60 minutes. While the mothers did not express distress related to the amount of time they spent on each feeding, the time intensity certainly had potential for taking a toll on maternal energy and tolerance levels. Breastfeeding mothers, in particular, committed additional time to feeding, since most of them continued to express breast milk by pump to maintain their milk supply and to feed the milk to their infants in a bottle. The breastfeeding mothers frequently expressed concerns about the adequacy of their milk supply and observations of the ease in feeding which their infants experienced with bottle feedings.

The sample infants nearly uniformly (N=17) demonstrated clear hunger cues by awakening for feedings most of the time or consistently, as reported by the mothers. Most mothers (55%) reported waiting for infant high state arousal as a cue for determining feeding time. Others also noted hand sucking and time since last feeding to determine feeding time. Of particular concern were those infants whose mothers did not observe arousal at feeding times (2-never, 1-sometimes). These 3 infants demonstrated high IINSM at baseline (midfeed-1.0, .75, 1.0; entire feed-1.0, .83, 1.0). The IINSM decreased post PASMT instruction; however,

remained greater than .50 at all except one time point (midfeed-.77, .77, .40; entire feed-.76, .66, .59). These infants were all 34 weeks gestational age at birth and 35 to 36 weeks postconceptual age at discharge. While there may have been some treatment benefits, there may have been other variables interacting with infant ability to respond to maternal interventions designed to facilitate state modulation.

Infants falling asleep during the feeding was a universal problem reported by the sample mothers. A majority of the mothers reported that their infants fell asleep during their feedings always or most of the time (N=15). The remaining mothers reported their infants sometimes fell asleep during the feed. This question response indicates that all of the sample infants had some difficulty modulating their state during feeding at least some of time and could potentially benefit from state modulation treatment. Reported maternal responses to infant low state arousal during feeding were most often kinesthetic, auditory, and tactile stimulations. Anecdotal observations of baseline maternal efforts at arousal noted interventions that often tended to be soothing in quality. Movement, speech, and touch tended to be hesitant, very delicate, and gentle without the kind of variety that had potential for effective arousal. Mothers tended to use only one kind of stimulation at a time and paused frequently, rather than using multimodal stimulation and continuing until the infant demonstrated some signs of arousing to a higher state.

High state arousal was not reported as a frequent problem at

baseline. Very little fussing behavior was reported by 80% of the sample mothers. The rest of the sample reported moderate or no fussiness in their infants. Mothers reported anecdotally that most of the fussiness experienced was in relation to arousal for feedings or in response to caregiving which involved exposure, such as diaper changes or bathing. The majority of the infants (55%) demonstrated no self calming techniques and required maternal intervention to modulate to a lower state. The only self calming technique observed by mothers in the remaining sample infants (45%) was hand sucking. This technique was most likely a demonstration of the cluster of hunger behaviors, since high state arousal occurred primarily around feeding times. Once their infants were in a high arousal state the mothers universally reported ease in soothing. The most common maternal responses to infant distress were tactile and kinesthetic responses; they picked up and held and rocked their infants. At baseline the mothers had already determined effective infant soothing strategies for those infrequent occasions of infant high state arousal.

## Maternal State Modulation

It was interesting to find that frequencies of appropriate maternal arouse and soothe interventions did not increase significantly from baseline to post PASMT instruction; however, the appropriate maternal neutral intervention did significantly increase from baseline to post PASMT instruction. Although not significant, the data trend was a post PASMT instruction increase in appropriate maternal arouse and soothe

interventions. As a group, the infants had significantly more alertness and significantly less low state arousal during feeding post PASMT instruction, which may partially account for the nonsignificant change in appropriate maternal arouse intervention post PASMT instruction. Correspondingly, the Infant Indices of Need for State Modulation were significantly lower post PASMT instruction. The significant increase of maternal neutral intervention from baseline to post PASMT instruction reveals the critical balance between knowing when to apply strategies to modulate infant state, and when to do nothing in response to optimal alert state and effective suck during the feeding.

## State Response to Contingent Stimulation

Low negative nonsignificant correlations were found for Maternal Indices of Synchrony (MIS)/Infant Index of Need for State Modulation (IINSM) at all time points. These correlations were an indicator of the infant's response to appropriate state contingent maternal interventions during the feeding. Correlations were in the direction hypothesized; however, sample size may have limited the size of the correlations. Differences in both MIS and IINSM from baseline to post PASMT instruction were found to be significant ($p<.001$). It is speculated that with a larger sample higher correlations may be found.

## Sucking Patterns

Frequency of sustained sucking during the feeding was not strongly correlated with the frequency of alert state. Sample size must be

considered as one possibility accounting for the weak positive correlations. Another consideration is the perception of infant alertness as measured in the study. Perhaps there are some other central nervous system factors operating which facilitate sustained sucking while the infant is not perceived as being alert by externally observed criteria.

Sustained sucking frequency increased significantly from baseline to post PASMT instruction. The trend for duration of sustained sucking was an increase in duration from baseline to post PASMT instruction. At baseline the majority of sustained sucking episodes were of a duration of 30 seconds or less. Post PASMT instruction the majority of sustained sucking episodes continued for 45 seconds or longer. The length of the longest sustained suck increased significantly from baseline to post PASMT instruction. Correspondingly, with increased sustained sucking the length of the feeding time decreased significantly ($p=.03$) from baseline (mean=20.5, SD=8.1) to post PASMT (mean=16.5, SD=7.2). These trends for increased sustained sucking frequency and duration of suck, while not correlated with a[illegible]ss in this sample, may be viewed as having some relationship to both internal infant organization of state and the overall maternal-infant interactional dynamics.

## Quality of Mother-Infant Interaction and Infant Alertness

NCAFS scores were utilized as measures of qualities of maternal-

infant interaction and yielded significant differences from baseline to post PASMT instruction. In spite of these significant differences there were no significant positive correlations of NCAFS total scores to alertness at any time point. Similarly, no significant correlations to alertness were demonstrated for the infant subscales, Clarity of Cues and Response to Parent. This finding may be due to small sample size or other variables which were undefined in this study which play into the complex dynamics of dyadic interaction. It is speculated that increased positive maternal perception of the infant post PASMT instruction may be one of the variables operating which resulted in maternal behavior changes and significant differences in NCAFS scores from baseline to post PASMT instruction.

Given that the study infants as a group demonstrated significant increases in alertness from baseline to post PASMT instruction, NCAFS Subscale scores were tested for differences from baseline to post PASMT instruction. The trend was for significant differences on all subscales except Subscale II. Response to Distress. The finding of no significance on this subscale may be somewhat confounded by virtue of the way the subscale is scored. When there is no evidence of infant distress all items are scored yes for an automatic score of 11. At baseline when the infants tended to be in low arousal states 8 infants exhibited no distress during the feeding, thus automatically scored 11. Post PASMT instruction when the infants tended to have higher arousal states only 5 infants exhibited no

distress during the feeding. There was very little variance in this subscale at either time point (baseline mean-10.10, SD-1.2, post PASMT instruction mean-10.15, SD-.93).

## Mother-Infant Contingency Responsiveness and Infant Alertness

Low positive correlations were found between MIS and infant alertness at all time points. Small sample size may account for the low correlations; however, the positive direction of the correlations encourages the speculation that increased maternal contingency responsiveness to infant state may be relative to facilitating the alert state during the feeding. Specific maternal and infant contingency response items from the NCAFS yielded significant differences from baseline to post PASMT instruction; however, no significant correlations with infant alertness were found.

## Model of Optimal Maternal-Preterm Infant Interaction

The results of this study suggest that maternal interventions do have an impact on the level of infant state arousal. It was demonstrated that mothers with infants who had poorly organized state behaviors and relatively low state arousal, were able to facilitate state organization and arousal to the alert state during feedings. Mothers who most effectively facilitated state organization and state modulation to the alert state in their infants during feedings were sensitive reciprocal partners. They attended

closely to the most subtle cues of their infant, perceiving early signs of imminent state changes such as decreasing suck, fluttering eyelids, and increasing or decreasing body tension. The mothers in a sensitive reciprocal partnership with their infants encouraged their infants as needed with either arousing or soothing interventions to maintain alertness. They provided encouraging feedback along the way as progress was made toward completing the feeding. At the same time, they recognized the intensity of focused moments in the feeding when the infant was maintaining alertness and intently concentrating on sucking. The mothers in a sensitive reciprocal partnership with their infant did not intervene at these critical moments; however, they maintained a subtle vigilance focusing on infant cues. The sense conveyed to observers of the sensitive reciprocal partnership mothers was one of enthusiasm, a sense that they were confident during the feeding interaction, and were familiar with the particular behaviors of their infant . They had confidence in the infant abilities to successfully feed to satiety. On the other hand, the infant responded to the encouragement from the maternal partner with alertness and sustained suck. The picture was one of winning synchronous interaction between the sensitive mothers and their infants; a subtle balance of ongoing maternal encouragement, infant responsiveness, and maternal vigilance for infant cues.

## Limitations of the Study

A number of factors limit the generalization of the findings of this study to other populations of preterm infants and their mothers. Areas of limitations are:

1. Sample size
2. Sample characteristics:
   predominance of male infants
   narrow range of predominant gestational age
   narrow range of predominant postconceptual age at hospital discharge
   low infant morbidity factors
   predominantly Caucasian
   high maternal and paternal education
   predominantly intact families
   high mean maternal age
   predominantly middle income
3. Observation Techniques:
   Infant observers were not blind to study conditions (baseline versus post instruction) in 5 out of the 40 observations. All maternal observations and NCAFS scores were completed by the investigator.
4. Confound of maturation with treatment

Observational research carries with it the burden of achieving the naturalistic environment for realistic observation, and balancing the degree of intrusiveness with obtaining the most accurate data possible. Live observation was chosen for this study, due to previous difficulty experienced with videotapes in adequately viewing the infant for accurate scoring of state and sucking. It was also felt that some of the more subtle maternal behaviors would be missed. While live observations did have

advantages; disadvantages included timing logistics for the family in projecting the precise time of the feeding, the availability of the maternal and infant observers, and ongoing monitoring of interrater reliability throughout the study. The potential for observer bias existed in this study; however, the possibility was decreased somewhat due to the nature of the coding tasks for the infant and maternal observers. Tremendous attention and focus on the details of behaviors were necessary to accurately record every 15 seconds. There was no time to reflect on the observation time point and how behaviors would be influenced. Findings on the NCAFS measures are parallel to the findings in Fuhrmann's study (1984) which was a case-control design with blind observers scoring the NCAFS on preterm infants at similar time points in the home. This provides a measure of support for the validity of NCAFS scores in this study.

In study replication consideration should be given to synchronized split screen videotaping with one very adept recorder focusing closely on the infant's face, and a second recorder focusing on the mother. Perhaps, future technologies will be developed which will allow noninvasive measures of infant state and quality of suck throughout a feeding which would further facilitate a study replication.

The confound of maturation with treatment limits the study in that the effects of PASMT cannot be attributed solely to treatment due to the lag in follow-up time. One week of development in the early life of a preterm infant can influence observed behavior and the level of state organization.

However, it was noted that in the follow-up phone call on the day following the teaching and implementation of PASMT most mothers reported they noticed increased alertness and increased vigorous sucking during feedings.

Several mothers expressed amazement that their infants could be so responsive during a feeding. There were some apparent immediate effects within one day of the treatment implementation. However, the design of this study did not allow for control of developmental effects. Replication should include design features utilizing a case-control method or factoring of variance due to development.

**Recommendations**

Due to the limitations of this study the findings must be interpreted with care; however, they do stimulate further questions and provide direction for additional potentially productive areas of preterm infant research. It is emphasized that study results cannot be attributed directly to the PASMT intervention. Study replication with a larger diverse sample would be worthwhile. The sample should include diverse social-economic levels; multiple ethnic-racial groups; varying maternal age, including teenage mothers; diverse family forms; varying education levels; and varying gestational ages and postconceptual ages at hospital discharge to examine maturational influences. Furthermore, it would be useful to compare the effectiveness of PASMT with infants having various morbidity factors; particularly infants who face increased challenges to their state

organization, such as infants of substance abusing mothers.

Another area of exploration is the question of establishing early identification criteria for neonates, preterm or fullterm, who potentially will have difficulty with the development of their state organization and who may benefit from PASMT. In the study there were some preterm infants who were observed maintaining the alert state fairly effectively at the baseline feeding time point. There were other infant subjects who had difficulty achieving the alert state at baseline, and also failed to respond to state appropriate maternal alerting interventions at the post PASMT instruction time point. What are the factors which influence well organized infant state behavior, poorly organized infant state behavior, and infant state behavior which is not responsive to contingent stimulation from the caregiver?

It would also be useful to look at the effectiveness of PASMT with infants as they transition from gavage to breast or bottle feedings prior to hospital discharge. Learning to suck, swallow, and breathe in a coordinated energy efficient fashion is a particular challenge to the preterm infant. Findings from this study suggest that state modulation intervention administered by nursing staff or parent to facilitate the alert state would benefit the preterm infant facing the new task of learning to coordinate nutritive suck, swallow, and breathe functions. Such an intervention could potentially shorten the hospital stay.

The study also stimulated questions regarding breastfeeding success

with preterm infants. The breastfeeding mothers as a group expressed more concerns about how their infants were doing with the feedings. They were less confident than bottle feeding mothers in judging infant satiety. Those who were combination breast and bottle feeding often remarked that they felt their infants were more satisfied with formula feedings than breast feedings. Many of these mothers had spent several weeks expressing their milk, making daily or more frequent trips to the hospital, prior to the infant ever latching on to nurse. In the face of increasing doubts regarding infant satiety and the challenge of feeding an infant in low state arousal, it would be expected that many of even the most committed breastfeeding mothers would not persist. A study exploring the effects of PASMT instruction on maternal confidence and success in breastfeeding would be worthwhile.

The finding of very low correlations of infant alertness and NCAFS scores was unexpected. This stimulates the compelling question of how maternal perceptions of the infant and maternal confidence in caregiving changes post PASMT instruction. Could the variables of maternal perception of infant and maternal confidence be operative in the observed NCAFS behaviors scored more so than infant alertness? One sample mother, who had experienced several early pregnancy losses and now had her second preterm infant, asked after her PASMT instruction, "Why don't all mothers get this kind of information before they take their premature babies home?". She expressed that she found the information gave her

added confidence in interpreting her infant's behaviors, confidence that she did not have in caring for her first preterm infant. Several other study mothers related feelings of increased confidence in their caregiving abilities. In study replication inclusion of the variables, maternal perception of infant and confidence in caregiving, would add to our knowledge of how PASMT instruction influences the mother's view of her infant and herself.

The interest of the few fathers who were present prompted the question of how paternal support of the mother may influence the success of PASMT, and how behaviors in father-infant feeding interactions may differ from those observed in mother-infant feeding interactions. A comparison of PASMT administered by fathers and mothers of preterm infants may yield some interesting findings. In the course of home visits as parents related stories of the preterm birth, the hospital experience, and their transition from hospital to home, it was apparent that many family variables seemed to influence these transitions and family adaptations. Further exploration of family variables related to the experiences of preterm birth, parenting the preterm during the hospital course, and making the transition from hospital to home would provide valuable direction for practice. How do families adapt to these experiences and what are the implications for perinatal care?

Observational research carries with it the burden of achieving the naturalistic environment for realistic observation, and balancing the degree

of intrusiveness with obtaining the most accurate data possible. Live observation was chosen for this study, due to previous difficulty experienced with videotapes in adequately viewing the infant for accurate scoring of state and sucking. It was also felt that some of the more subtle maternal behaviors would be missed. While live observations did have advantages; disadvantages included timing logistics for the family in projecting the precise time of the feeding, the availability of the maternal and infant observers, and ongoing monitoring of interrater reliability throughout the study. In study replication consideration should be given to synchronized split screen videotaping with one very adept recorder focusing closely on the infant's face, and a second recorder focusing on the mother. Perhaps, future technologies will be developed which will allow noninvasive measures of infant state and quality of suck throughout a feeding which would further facilitate a study replication.

## Implications for Nursing

Transition from hospital to home with a preterm infant is potentially stressful for parents and the family system. The health care system does not provide for automatic follow-up of potentially vulnerable preterm infants once they are discharged from Neonatal Intensive Care. Nursing is in an optimal position to provide morbidity reduction in this population through community health nursing services and clinical nurse specialists in home or clinic settings. Information about state, infant behaviors, and state modulation has impact on early parent-infant interactions which may

persist through at least 7 months of life (Barnard,et al, 1990). Nurses in the Neonatal Intensive Care Unit could begin sharing this information, as well as modeling state and behavior sensitive interactions in their caregiving while the preterm infant is hospitalized. Specific state modulation techniques could be demonstrated and encouraged as parents begin feedings prior to discharge. Discharge protocol should assure that this instruction has been accomplished prior to the infant going home. Follow-up and reinforcement of this teaching by a community health nurse or clinical nurse specialist post discharge would be ideal. The health care system needs to recognize the value of family support in optimizing the developing parent-infant relationship after the preterm infant is discharged. Nursing needs to be involved at the policy making and health care funding decision levels to insure that families have access to the kinds of support they need for success in parenting.

The PASMT intervention seemed to have the effect of increasing maternal confidence and competence. While further exploration of this area is needed, what is clear from studies that have been done to date is that there is improved maternal-interaction when mothers have information about recognizing state, infant behavior, and how to apply state modulation with a drowsy infant who is sucking poorly. Nurses in the hospital, home, or clinic setting could incorporate this into their teaching repertoire to facilitate maternal confidence and maternal-interaction.

## Summary

This study investigated aspects of the feeding interaction in 20 mother-preterm infant dyads following infant hospital discharge at a baseline time point and post PASMT instruction. Baseline maternal knowledge was examined with an initial interview. Live observational techniques were utilized to collect data on dimensions of maternal interventions and infant state and suck in 15 second epochs throughout a baseline feeding and a post PASMT instruction feeding. NCAFS was used as a measure of qualities of the interaction at both time points. Analysis of the data focused on analyses of frequencies of infant and maternal variables coded during baseline and post PASMT instruction observations of feedings interactions. NCAFS subscale total scores and NCAFS total scores at baseline and post PASMT instruction observations were compiled for hypotheses testing. Significant differences demonstrated post instruction included: increased frequency of maternal arousal techniques utilized, increased Maternal Indices of Synchrony, decreased Infant Indices of Need for State Modulation, increased infant alert time, decreased infant drowsy and low state arousal time, increased frequency of sucking bursts, increased length of sustained sucking, decrease in length of feeding time, increase in total NCAFS scores, and increased subscale scores: Sensitivity to Cues, Social-Emotional Growth Fostering, Cognitive Growth Fostering, Clarity of Cues, Responsiveness to Parent. Hypotheses relative to correlations between NCAFS measures and infant alertness were not supported. It was

speculated that possible changes in maternal perception of the infant based on knowledge gained post PASMT instruction may have had a greater influence on the dynamic interaction of maternal and infant behaviors reflected by NCAFS scores than infant alert state.

Nursing science has increasingly focused research attentions onaspects of the environment and the respective influence on individual health responses. Findings in this study support PASMT, considered a modification of the preterm infant's social environment, as an effective clinical therapeutic. While the findings cannot be attributed solely to the teaching intervention, it may be noted that the findings appear to be a logical consequence of the specific instruction provided to the mothers. PASMT was demonstrated to promote positive maternal-preterm infant interaction and facilitate infant feeding, thus potentially decreasing morbidity associated with poor feeding. Similar effects were found by Fuhrmann (1984) in a control-intervention group study where mothers of preterm infant were given instruction on state related behaviors and state modulation prior to hospital discharge. Results demonstrated that mothers who used the state modulation treatment prior to feedings had infants in an alert state prior to feedings more often and had higher NCAFS scores. Barnard and colleagues (1990) field tested a protocol, Nursing Systems Toward Effective Parenting-Premature (NSTEP-P),which involved state behavior and state modulation instruction to 76 mothers of preterm infants less than 37 weeks gestational age. They reported NCAFS scores

equivalent to and in some cases significantly higher than adjusted age norms at 3, 4, and 7 months of living age. The data from the present study and previous work by Fuhrmann (1984), Barnard, et al (1990), and Kang, et al (1991) suggest that the mothers and preterm infants demonstrated a different developmental course in their interactions from those in non-intervention studies of mother-preterm interaction (Magyary, 1984). Additional research is implicated to determine if state modulation techniques could be generalized to other populations, as well as further examination of evolving maternal and infant responses over time.

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# Appendix A

**UNIVERSITY OF WASHINGTON**
**CONSENT FORM**

**An Investigation of the Relationship Between Maternal-Infant Patterns of Synchrony during Feeding, Preterm Infant State, and a Parent Administered Prefeeding State Modulation Treatment**

**Investigator:**
**Phyllis Page, M.N., R.N.**
**School of Nursing**
**Phone: (206) 941-0902**

The purpose of this study is to learn more about how premature infants and their mothers interact with each other during feedings. The information gained will guide nurses in helping parents with their premature babies in the first weeks after discharge from the hospital. Particpation in this study will contribute to what health professionals understand about this early infant feeding behavior. Additionally, you may enjoy discussing what you have noticed about your own baby's behaviors. Mothers will also learn how to recognize particular infant communication behaviors and ways to help alert and soothe their baby. Participation in the study is voluntary.

Your participation in this study would involve a review of the infant medical record, a parent interview, and a total of four home visits. More specifically, your participation will include:

1. Review of the infant's hospital record by the investigator to record the following information: sex, length, head circumference, APGAR score, birth weight, discharge weight, gestational age at birth, maternal age, number of maternal pregnancies and births, type of birth for this infant, hospital course.

2. Interview of mother: the first part of the initial interview will involve questions about your background (for example, age, years of education, occupation, family income). The second part of the interview will involve questions about how the feedings are going and what you have noticed about your baby's behavior (for example, what do you do if your baby falls asleep during a feeding). The subject is free to refuse to answer any questions in either part of the interview. (Time: about 1/2 hour)

3. Mothers will be given the usual discharge instructions for infant care currently given all mothers in this NICU.

4. Within the first week after discharge the investigator along with a team of three observers will make a home visit, at a time scheduled with you, to observe the infant and mother's behaviors as the mother gets ready to feed and through the total feeding time. (Time: about 1 hour)

5. Within a few days following the observation home visit the investigator will visit again to provide instruction and demonstration of various infant behaviors and ways of alerting and soothing the baby. (Time: about 1 hour)

6. A follow-up home visit will be made by the investigator in one to four days following the instruction to answer questions, clarify techniques, and observe a return demonstration by the mother. (Time: about 1 hour)

7. Within one week of the instruction session the team of three observers will return a second time with the investigator in a home visit to observe the infant and mother's behaviors as the mother gets ready to feed and through the total feeding time. (Time: about 1 hour)

The total time commitment for each subject participating in the study, including the initial interview, will be approximately four and one half hours over a two to three week period. Home visits will be scheduled at a time convenient to the family.

The risks to mothers or their infants from the procedures to be used in this study are minimal. Subjects may experience some stress or discomfort in having three observers present during the two feeding observation sessions. The observers will remain as unobtrusive as possible in the home visit; however, the presence of the observers constitutes an invasion of the subject's privacy to some extent. If at any time during the observation session the mother feels too uncomfortable, we will end the observation session when requested by the mother.

The identity of all subjects and their infants will be confidential. Each subject will be given a code number and all data collected will be identified by the code number only. The list matching the code number with the names will be kept in a locked place separate from the data. The only individuals having access to the data, other than the investigator and

research assistants, will be School of Nursing faculty advisors to the investigator. The group data for all subjects will be compiled and may be used for presentations at professional meetings, publication, or teaching purposes. Data on individual subjects may be used for case presentations to professional or student groups, however, subject identity would not be revealed. A copy of the report of this study will be placed in the Health Sciences Library at the University of Washington.

While child abuse is not the focus of this study, participating families should be aware that the investigator is obligated to report to Child Protective Services any incidents of child abuse observed during the study.

Participation in this study is voluntary and is not related to the provision of healthcare by the primary healthcare provider or any other program of services. Subjects may refuse to participate or may withdraw from the study at any time without penalty or loss of benefits to which they are otherwise entitled. When subjects have completed all aspects of the study they will receive $25 and access to free well child care for one year at Pacific Lutheran University School of Nursing Wellness Clinic. There are no costs to subjects.

_____ _____

Signature of Investigator Date

Subject's Statement:

The study described above has been explained to me. I voluntarily grant permission for my infant and myself to participate in this activity. I have had an opportunity to ask questions. I understand that future questions I have about this research or about my rights as a subject will be answered by the investigator listed above.

_____ _____

Signature of Mother Date

Copies to: Subject
Investigator's file
Infant Chart

# Appendix B

University of Washington
School of Nursing
Preterm Infant Study
Phyllis Page, M.N., R.N.

REFERRAL INFORMATION

Subject #____
Sex M F
(circle)
Infant Name _____ _____ __
Last First MI

Hospital_____
Date Recruited __ __ __
mo da yr

Mother's Name _____ _____ __
Last First MI

Address: _____ Phone: _____
Number Street Apt. #

_____
City County Zip

BIRTH DATA:
Birth Date__ __ __
mo da yr
APGAR __ 5 min
Gestational age at birth__ __ weeks
Birthweight _____ grams
Length _____ cm
OFC _____ cm
Type delivery _____ Complications _____

DISCHARGE DATA:
Discharge Date __ __ __
mo da yr
Discharge weight _____ grams
Gestational age at discharge _____ weeks
(birth gestational age + weeks living age)

MATERNAL DATA: (if available in infant record)
Maternal age ____ yr
Maternal gravida __ para __

NEONATAL COURSE:

Neonatal Complications: (check if evidence of in hospital record)

__Positive drug screen
__ Respiratory distress
__ Ventilatory assistance
__ Positive or suspected infection
__ Temperature disturbance
__ Metabolic disturbance
__ Congenital anomaly
__ Necrotizing enterocolitis
__ CNS hemorrhage
__ Hyperbilirubinemia
__ Surgery _____ (procedure)
__ Other (describe) _____

# Appendix C

University of Washington
School of Nursing
Preterm Infant Study
Phyllis Page, M.N., R.N.

DEMOGRAPHIC INTERVIEW

While it is important for the purposes of this study to be as accurate as possible, if you feel uncomfortable answering any of these questions you may feel free to tell me so and refrain from answering those questions.

MATERNAL DEMOGRAPHICS:

1. How old are you? ____ years

2. How many pregnancies have you had? ____

3. Including this baby, how many children have you had? ____

4. What racial group do you belong to? ___
   1 = White
   2 = Black
   3 = Hispanic (Puerto Rican, Mexican, South American, etc.)
   4 = American Indian or Alaskan Native
   5 = Asian (Chinese, Filipino, Korean, Japanese, etc.)
   6 = Southeast Asian (Vietnamese, Cambodian, Thai, etc.)
   7 = Pacific Islander (Hawaiian, Samoan, etc.)
   8 = Other _____

5. What is your marital status? ___
   1 = Unmarried, living with partner
   2 = Unmarried, not living with partner
   3 = Married, living with partner
   4 = Married, not living with partner
   5 = Separated, living with partner
   6 = Separated, not living with partner
   7 = Divorced, living with partner
   8 = Divorced, not living with partner
   9 = Widowed, living with partner
  10 = Widowed, not living with partner
  11 = Other _____

6. Are you working right now at some job for which you get paid? ____
   If no, did you have a job in the past 9 months?
   1 = Not working now nor during the past 9 months
   2 = Not working now, but yes within past 9 months
   3 = Working part time (up to 35 hours per week)
   4 = Working full time (more than 35 hours per week)

7. How many years of regular schooling have you completed? ____
   (Circle years completed for each educational level, then total)

| | | |
|---|---|---|
| Grade School/ Junior High | 1 2 3 4 5 6 7 8 | |
| High School | 1 2 3 4 | |
| College | 1 2 3 4 | Degree ___ |
| Graduate/ Professional School | 1 2 3 4 5 6 | Degree ___ |

8. Mother's scale score for education:
   1 = Less than 7 years of regular schooling
   2 = 7-9 years of regular schooling
   3 = 10-11 years of regular schooling
   4 = 12 years of regular schooling or GED
   5 = At least 1 year of vocational training beyond high school diploma
   6 = At least one year of college
   7 = College or university graduation
   8 = Graduate or professional degree

9. What is the main source of income for your household? ____
   1 = Self employed
   2 = Husband or partner employed
   3 = Both mother and partner employed
   4 = Parents or other family financial support
   5 = Savings or loans
   6 = Public assistance
   7 = Unemployment insurance
   8 = GI bill, scholarship or grant
   9 = Other _____

10. What was the TOTAL family income, before taxes, last year _____

| | |
|---|---|
| 1 = Less than $3,000 | 7 = $20,000 to 24,999 |
| 2 = $3,000 to 4,999 | 8 = $25,000 to 29,999 |
| 3 = $5,000 to 7,499 | 9 = $30,000 to 39,999 |
| 4 = $7,500 to 9,999 | 10 = $40,000 to 49,999 |
| 5 = $10,000 to 14,999 | 11 = $50,000 or more |
| 6 = $15,000 to 19,999 | 12 = Don't know |

PARTNER DEMOGRAPHICS

11. How old is your partner? ____ years

12. What racial group does he belong to? __
    1 = White
    2 = Black
    3 = Hispanic (Puerto Rican, Mexican, South American, etc.)
    4 = American Indian or Alaskan Native
    5 = Asian (Chinese, Filopino, Korean, Japanese, etc.)
    6 = Southeast Asian (Vietnamese, Cambodian, Thai, etc.)
    7 = Pacific Islander (Hawaiian, Somoan, etc.)
    8 = Other _____

13. Is your partner working right now at some job for which he gets paid? If no, has he had a job in the past 9 months? ____
    1 = Not working now nor during the past 9 months
    2 = Not working now, but yes within past 9 months
    3 = Working part time (up to 35 hours per week)
    4 = Working full time (more than 35 hours per week)

14. How many years of regular schooling has your partner completed? ___
    (Circle years completed for each educational level, then total)

| | | |
|---|---|---|
| Grade School/ Junior High | 1 2 3 4 5 6 7 8 | |
| High School | 1 2 3 4 | |
| College | 1 2 3 4 | Degree ___ |
| Graduate/ Professional School | 1 2 3 4 5 6 | Degree ___ |

15. Partner's scale score for education: ____
    1 = Less than 7 years of regular schooling
    2 = 7-9 years of regular schooling
    3 = 10-11 years of regular schooling
    4 = 12 years of regular schooling or GED
    5 = At least 1 year of vocational training beyond high school diploma
    6 = At least one year of college
    7 = College or university graduation
    8 = Graduate or professional degree

# Appendix D

University of Washington
School of Nursing
Preterm Infant Study
Phyllis Page, M.N., R.N.

BASELINE KNOWLEDGE OF INFANT STATE INTERVIEW
Subject Number ____ Date _____

1. How are things going? Would you say you were feeling ____? ___
   1 = poor 2 = fair 3 = good 4 = great

2. How are the feedings going? Would you say they were ____? ___
   1 = poor 2 = fair 3 = good 4 = great

3. How are you feeding _____ (baby's name)? ____
   1 = breast 2 = bottle 3 = breast/bottle combination

4. How many times a day do you feed your baby? ___

5. How long does it usually take to feed him/her? ___ minutes

6. How do you know that it is time to feed _____ (baby's name)?
   (check all items that apply, do not read list)
   ___ time since last feeding
   ___ baby cries
   ___ baby sucks on hands
   ___ baby's arms and legs flexed toward body
   ___ don't know, hard to tell
   ___ other _____

7. How often does he/she awaken on his/her own for feedings? ____

8. How often do you need to awaken him/her for feedings? ____
   Code for questions 7 and 8
   1 = never 2 = sometimes 3 = most of the time 4 = always

9. If you had to awaken _____(baby's name) for feedings, what do you do?
   (check all that apply, do not read list)
   ___ 1. do nothing, go ahead and feed
   ___ 2. take blankets off
   ___ 3. talk to the baby
   ___ 4. change position: pick up, stand, bring to shoulder
   ___ 5.touch baby's face, arms, legs, body
   ___ 6.bathe the baby
   ___ 7.show baby something to look at
   ___ 8.jiggle baby
   ___ 9.other: _____

10. How often does _____(baby's name) fall asleep during feedings?
    1 = never 2 = sometimes 3 = most of the time 4 = always

11. If _____ (baby's name) falls asleep during feedings, what do you do? (check all that apply, do not read list)

| | |
|---|---|
| ___ 1. do nothing, go ahead and feed | ___ 5.touch baby's face, arms, legs, body |
| ___ 2. take blankets off | ___ 6.bathe the baby |
| ___ 3. talk to the baby | ___ 7.show baby something to look at |
| ___ 4. change position: pick up, stand, bring to shoulder | ___ 8.jiggle baby |
| | ___ 9. stop feeding |
| | ___10. other: _____ |

12. How do you know that your baby has had enough to eat? (check all that apply, do not read list)
    - ___ 1. baby falls asleep
    - ___ 2. number of ounces of formula or time nursing
    - ___ 3. baby no longer has stron suck
    - ___ 4. baby spits out nipple
    - ___ 5. baby's arms and legs relaxed
    - ___ 6. don't know, hard to tell for sure
    - ___ 7. other: _____

13. How much does _____ (baby's name) cry or fuss?
    - 1 = none
    - 2 = very little
    - 3 = moderate amount
    - 4 = quite a bit
    - 5 = a lot

14. If _____ (baby's name) cries, what kinds of things does he/she do to calm him/herself down? (check all that apply, do not read list)
    - ___ 1. doesn't do anything, just cries
    - ___ 2. looks at things in the house
    - ___ 3. listens to sounds
    - ___ 4. sucks on hands
    - ___ 5. other: _____

15. If you need to soothe your baby, what kinds of things do you usually do? (check all that apply, do not read list)
    - ___ 1. show baby caregiver's face
    - ___ 2. restrain baby's arms
    - ___ 3. wrap baby in blanket
    - ___ 4. pick up and hold
    - ___ 5. rock or walk baby
    - ___ 6. give pacifier
    - ___ 7. stroke feet or back
    - ___ 8. put baby in swing or front pack
    - ___ 9. give to someone to console
    - ___ 10. feed
    - ___ 11. other: _____

16. How easy is it to calm your baby? ___
    1 = not easy at all
    2 = sometimes it's easy
    3 = usually easy
    4 = very easy, no problem

17. During the first few days and weeks, mothers begin to learn what their babies need. How easy is it for you to tell what your baby wants? ____
    1 = cannot tell
    2 = usually difficult, confusing
    3 = usually easy, successful trial and error
    4 = consistently easy, no problem, know what to do right away

18. Verify phone number and establish date and time for observation session.
    Phone: _____ (day) _____(eve)
    Best date/time: _____
    Will call prior to next home visit to verify.

# Appendix E

**MOTHER CODE SHEET**

Subject Code____ Date_____

Intervention:
- A = Arousing
- S = Soothing
- B = Burp
- N = Neutral
- X = Other

Position of Infant:
- ET = En face, trunk to trunk
- EL = En face, lap
- EC = En face, infant seat/carrier
- A = Arm cradle
- L = Lap
- C = Infant seat/carrier
- S = Shoulder
- X = Other

I= Intervention P=Position Min= Minute

* Checkpoint for time synchronization (Code every 15 seconds)

| 15sec I/P | 30sec I/P | 45sec I/P | 60sec I/P | Min |
|---|---|---|---|---|
| /__ | /__ | /__ | /__ | 1 |
| /__ | /__ | /__ | /__ | 2 |
| /__ | /__ | /__ | /__ | 3 |
| /__ | /__ | /__ | /__ | 4 |
| / | / | / | / | 5 |

*

| 15sec I/P | 30sec I/P | 45sec I/P | 60sec I/P | Min |
|---|---|---|---|---|
| /__ | /__ | /__ | /__ | 16 |
| /__ | /__ | /__ | /__ | 17 |
| /__ | /__ | /__ | /__ | 18 |
| /__ | /__ | /__ | /__ | 19 |
| / | / | / | / | 20 |

*

| 15sec I/P | 30sec I/P | 45sec I/P | 60sec I/P | Min |
|---|---|---|---|---|
| /__ | /__ | /__ | /__ | 6 |
| /__ | /__ | /__ | /__ | 7 |
| /__ | /__ | /__ | /__ | 8 |
| /__ | /__ | /__ | /__ | 9 |
| / | / | / | / | 10 |

*

| 15sec I/P | 30sec I/P | 45sec I/P | 60sec I/P | Min |
|---|---|---|---|---|
| /__ | /__ | /__ | /__ | 21 |
| /__ | /__ | /__ | /__ | 22 |
| /__ | /__ | /__ | /__ | 23 |
| /__ | /__ | /__ | /__ | 24 |
| / | / | / | / | 25 |

*

| 15sec I/P | 30sec I/P | 45sec I/P | 60sec I/P | Min |
|---|---|---|---|---|
| /__ | /__ | /__ | /__ | 11 |
| /__ | /__ | /__ | /__ | 12 |
| /__ | /__ | /__ | /__ | 13 |
| /__ | /__ | /__ | /__ | 14 |
| / | / | / | / | 15 |

*

| 15sec I/P | 30sec I/P | 45sec I/P | 60sec I/P | Min |
|---|---|---|---|---|
| /__ | /__ | /__ | /__ | 26 |
| /__ | /__ | /__ | /__ | 27 |
| /__ | /__ | /__ | /__ | 28 |
| /__ | /__ | /__ | /__ | 29 |
| / | / | / | / | 30 |

*

## MOTHER CODE SHEET (page 2)

Intervention:
- A = Arousing
- S = Soothing
- B = Burp
- N = Neutral
- X = Other

Position of Infant:
- ET = En face, trunk to trunk
- EL = En face, lap
- EC = En face, infant seat/carrier
- A = Arm cradle
- L = Lap
- C = Infant seat/carrier
- S = Shoulder
- X = Other

I= Intervention P=Position Min= Minute
* Checkpoint for time synchronization (Code every 15 seconds)

| 15sec | 30sec | 45sec | 60sec | |
|---|---|---|---|---|
| I /P | I /P | I /P | I /P | Min |
| __/__ | __/__ | __/__ | __/__ | 31 |
| __/__ | __/__ | __/__ | __/__ | 32 |
| __/__ | __/__ | __/__ | __/__ | 33 |
| __/__ | __/__ | __/__ | __/__ | 34 |
| __/__ | __/__ | __/__ | __/__ | 35 |

*

| 15sec | 30sec | 45sec | 60sec | |
|---|---|---|---|---|
| I /P | I /P | I /P | I /P | Min |
| __/__ | __/__ | __/__ | __/__ | 46 |
| __/__ | __/__ | __/__ | __/__ | 47 |
| __/__ | __/__ | __/__ | __/__ | 48 |
| __/__ | __/__ | __/__ | __/__ | 49 |
| __/__ | __/__ | __/__ | __/__ | 50 |

*

| 15sec | 30sec | 45sec | 60sec | |
|---|---|---|---|---|
| I /P | I /P | I /P | I /P | Min |
| __/__ | __/__ | __/__ | __/__ | 36 |
| __/__ | __/__ | __/__ | __/__ | 37 |
| __/__ | __/__ | __/__ | __/__ | 38 |
| __/__ | __/__ | __/__ | __/__ | 39 |
| __/__ | __/__ | __/__ | __/__ | 40 |

*

| 15sec | 30sec | 45sec | 60sec | |
|---|---|---|---|---|
| I /P | I /P | I /P | I /P | Min |
| __/__ | __/__ | __/__ | __/__ | 51 |
| __/__ | __/__ | __/__ | __/__ | 52 |
| __/__ | __/__ | __/__ | __/__ | 53 |
| __/__ | __/__ | __/__ | __/__ | 54 |
| __/__ | __/__ | __/__ | __/__ | 55 |

*

| 15sec | 30sec | 45sec | 60sec | |
|---|---|---|---|---|
| I /P | I /P | I /P | I /P | Min |
| __/__ | __/__ | __/__ | __/__ | 41 |
| __/__ | __/__ | __/__ | __/__ | 42 |
| __/__ | __/__ | __/__ | __/__ | 43 |
| __/__ | __/__ | __/__ | __/__ | 44 |
| __/__ | __/__ | __/__ | __/__ | 45 |

*

| 15sec | 30sec | 45sec | 60sec | |
|---|---|---|---|---|
| I /P | I /P | I /P | I /P | Min |
| __/__ | __/__ | __/__ | __/__ | 56 |
| __/__ | __/__ | __/__ | __/__ | 57 |
| __/__ | __/__ | __/__ | __/__ | 58 |
| __/__ | __/__ | __/__ | __/__ | 59 |
| __/__ | __/__ | __/__ | __/__ | 60 |

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# VITA

Phyllis Ann Page

Education

| | | |
|---|---|---|
| 8/92 | Ph.D. | University of Washington<br>School of Nursing<br>Seattle, WA 98195<br>Major Field: Environments<br>Minor Field: Individual Adaptations to Wellness and Illness<br>Cognate: Developmental Psychology |
| 3/77 | M.N. | University of Washington<br>School of Nursing<br>Seattle, WA 98195<br>Pathway: Nursing Care of Children |
| 6/ 71 | B.S.N. | University of Maryland<br>School of Nursing<br>Baltimore, MD<br>Major: Nursing |
| 6/67 | Diploma | Nuremberg American High School<br>Nuremberg, Germany |