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Synchronous Interaction in the NICU: An Exploratory Intervention with Adolescent Mothers with Premature Infants

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Synchronous Interaction in the NICU: An Exploratory Intervention with Adolescent Mothers with Premature Infants

by

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Dissertation

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Dedication

This dissertation is dedicated to my daughters Abigail and Madeline.
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I would like to extend my sincere appreciation to my chair, Dr. Lynn Rew. She has been a great source of support and guidance throughout the dissertation journey. I am truly grateful for her hard work and generosity in guiding me through the process. I would like to express my appreciation and thanks to Dr. Adama Brown who has been a statistical mentor, sounding board, and voice of reason with a great sense of humor. Thank you to Dr. Sharon Horner. I am humbled by your vast research knowledge and editing skills. Thank you to Dr. Eileen Kintner. Your positive outlook and encouragement are always much appreciated. Thank you to Dr. Deborah Tharinger. Your willingness to participate on my committee is greatly appreciated.

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Synchronous interaction between adolescent mothers with preterm infants in the Neonatal Intensive Care Unit was examined in this study. Understanding the characteristics of synchrony in adolescent mother and premature infant interactions during this early period in the development of the relationship provides direction for the development of nursing strategies to foster synchronous interaction in the neonatal intensive care unit (NICU) setting and, subsequently, positive developmental outcomes for preterm infants.

The research design was a one-group, pretest-posttest, exploratory intervention assessing synchronous interaction using the Nursing Child Assessment Feeding Scale (NCAFS) among 27 adolescent mothers and their premature infants in the NICU. The study examined the differences in adolescent mother-premature infant interaction in the
NICU environment prior to an intervention and within 48 hours after receiving the Preterm Infant Cues Intervention (PICI). Additional variables including stress, social support, age of the adolescent mother and preterm infant, ethnicity, length of stay in the NICU, and preterm infant weight were considered.

Results showed a statistically significant difference between Time 1 and Time 2 synchronous interaction measurements indicating that the PICI may have resulted in the adolescent mother better understanding the preterm infant’s behavior. The Caregiver Total Scale score ($t = -3.93, p < .001$) and the Total Scale score ($t = -3.96, p < .001$) were the two main scales that the PICI could have affected. There were no correlations among the other independent variables and the dependant variable.

Future research should focus on a large scale longitudinal study to measure synchronous interaction over multiple time points beginning in the NICU carrying through the first year of child development. Adding a qualitative component to future studies would provide further insight into experience of adolescent mothers with preterm infants.
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Chapter 1: Introduction

Synchrony in interaction within the mother-newborn dyad is characterized by smooth, flowing transactions in which each individual responds to the other’s communications and behavioral cues. The importance of synchronistic mother-infant interaction has been examined extensively and has been correlated with future developmental outcomes in children (Cerezo, Pons-Salvador, & Trenado, 2008; Cusson, 2003; Davis, Edwards, & Mohay, 2003; Leitch, 1999; Mueller-Nix, Forcada-Guex, Pierrehumbert, Jaunin, Borghini, & Ansermet, 2004). Synchrony in mother-newborn interactions lays the foundation for the development of emotional stability, readiness to learn, social competence, self-confidence, and security in the child.

Premature infants are complex and often require special care related to their developmental status. Interpretation of the behavioral cues of premature infants demands great effort on the part of all new mothers, especially adolescent mothers. Adolescent mothers generally have achieved neither full autonomy nor mature abstract thinking (Bissell, 2000; SmithBattle, 2007). They may also face unique socioeconomic disadvantages not faced by their adult counterparts. Parenting during this period of adolescent mothers’ lives may have negative consequences for both adolescent mothers and their infants. These challenges continue beyond the hospital stay. In order to successfully care for premature infants, new mothers must learn the techniques of providing care, and the unique way their infants communicate behavioral cues. Although this is a complex process for all parents, it is particularly challenging for adolescent mothers whose own developmental status may make it difficult to see and meet the needs
of others.

Stressors for either the mothers or the infants can alter synchronous interaction. Stressors for the adolescent mother may include delivery of preterm infants, the neonatal intensive care unit environment, communicating with staff, lack of social support, and being responsible for making medical decisions for preterm infants. Stressors for preterm infants may include prematurity status, the neonatal intensive care unit environment, and having mothers who are uncertain about what they are doing. Synchronous interaction has been examined in adolescent mothers of term infants, premature infants of adult mothers, and adolescent mothers with premature infants after hospitalization. Adolescent mothers with healthy term infants have been shown to demonstrate difficulty communicating with their children through a variety of stages of their child’s development (Drake, Humenick, Amankwaa, Younger, & Roux, 2007; Dumbrowski et. al., 2000; Giardino, Gonzalez, Steiner, & Fleming, 2008; Letourneau, 2001). Adolescent mothers with healthy term infants have been shown to be less responsive to their children’s communication cues beginning in infancy and lasting through early school years resulting in behavioral issues, learning disabilities, poor school performance, and potential child abuse (Black, et. al., 2002; Koniak-Griffin & Turner-Pluta, 2000; Zelenko, Huffman, Lock, Kennedy, & Steiner, 2001). Preterm infants, as a population, have been shown to demonstrate difficulty with clarity of communication cues making it even more challenging for the adolescent mother to interpret cues and effectively meet her preterm infant’s needs (Als, 1982; Davis, Edwards, & Mohay, 2003; Feldman & Eidelman, 2007; Holditch-Davis, Brandon, & Schwartz, 2003). Understanding how to care for and
communicate with the premature infant is paramount to a successful synchronistic, mother-child relationship.

Synchronous interaction between adolescent mothers with preterm infants in the Neonatal Intensive Care Unit has not been examined. Understanding the characteristics of synchrony in adolescent mother and premature infant interactions during this early period in the development of their relationship could provide direction for the development of nursing strategies to foster synchronous interaction in the neonatal intensive care unit (NICU) setting and, subsequently, positive developmental outcomes for such infants.

**STATEMENT OF PROBLEM**

Adolescent mothers of premature infants often struggle to adapt to the mothering role as they face multiple obstacles as new mothers learning to care for high-risk infants while facing challenges in their own development. Premature infants may have complicated physical and/or developmental needs, requiring sensitive mothers capable of providing care and support consistently. How adolescent mothers relate to and interact with their infants during the NICU stay may have significant long-term ramifications for the mother-infant dyadic relationship and for infant development.

As mothers of premature infants, adolescents may be particularly vulnerable in their mother-infant interaction skills (Rich, 1991; Ruff, 1987; Ruff, 1990). Assessment of interaction capabilities between adolescent mothers and their preterm infants, available social support, and level of stress prior to premature infants transitioning home would be beneficial for short- and long-term relationship development (Booth, Barnard, Mitchell, & Spieker, 1987). Adolescent mothers do not have the luxury of making the transition
between childhood and adult responsibilities at a normal pace. They must rapidly transition from adolescence into the mothering role with premature infants who typically have more specialized needs than do healthy term newborns.

What we know is that compared to adult mothers, adolescent mothers are less verbal when interacting with their infants and less sensitive to their cues (Barnard, Bee, & Hammond, 1984; Field, Windmayer, Stringer, & Ignatoss, 1980; vonWindeguth & Urbano, 1989). As a result of their own developmental status, adolescents may be less receptive to the same nursing guidance provided to adult mothers. Premature infants display disorganized cues and may be more difficult to manage than their term counterparts (NCAST, 1995). The combination of adolescent motherhood and infant prematurity may lead to non-synchronous interaction within the dyad (Farel, et al., 1991; Koniak-Griffin & Verzemnieks, 1991). There is a gap in the research related to synchronous interaction between adolescent mothers with premature infants in the NICU setting. It is vital that adolescent mothers and premature infants are able to develop a style of synchronous communication as it is the basis from which all future interactions will stem.

Assessing the quality of adolescent mother premature infant interaction during a feeding in the NICU setting prior to transitioning home would provide baseline data regarding the adolescent mothers’ abilities to respond sensitively to the premature infants’ cues and distress signals. Assessment would also yield whether or not adolescent mothers interact in ways that foster healthy growth and development of premature infants. An intervention in which the nurse shares this assessment with adolescent mothers while
teaching them about infant cues might also foster healthy growth and development of infants and increase confidence in adolescents as they adapt to their new maternal role.

**PURPOSE**

The primary purpose of this study was to determine whether an intervention in the NICU setting would improve mother-infant interaction between adolescent mothers and their premature infants. A second purpose was to examine the relationship among the neonatal intensive care setting stress, social support, and synchronous interactions between adolescent mothers and their premature infants.

**BACKGROUND AND SIGNIFICANCE**

**Adolescents**

Becoming a mother is a complex process, particularly for adolescents who also grapple with schooling, determining future goals and developing an identity, which are critical components of adolescent level of development (Jumping-Eagle, Sheeder, Kelly, & Stevens-Simon, 2008; Luster & Mittelstaedt, 1993). Adolescent mothers’ developmental immaturity often results in their experiencing difficulty with tasks requiring abstract thinking, limiting their ability to plan, relate cause and effect, and anticipate results as a mother (Flanagan & McGrath, 1995). Since adolescent mothers generally have achieved neither full autonomy nor mature abstract thinking and may face unique socioeconomic disadvantages not faced by their adult counterpart, parenting during this period of their lives may have negative consequences for both adolescents and their infants. The situation is even more complex when adolescents are the parents of
premature infants with significant health and development needs as well (Bissell, 2000; Smith Battle, 2000).

There is an abundance of literature describing the educational, social, and financial ramifications of adolescent motherhood. Adolescent mothers comprise a large portion of high school drop outs and those who successfully finish high school rarely complete a secondary education (East, Reyes, & Horn, 2007). Adolescent mothers typically live in poor, disadvantaged social circumstances (Covington, Justason, & Wright, 2000; East, et al., 2007; Hillis, Anda, Dube, Felith, Marchbanks, & Marks, 2004; Meadows-Oliver, 2006; Talashek, Alba, & Patel, 2006). Fiscal consequences of adolescent pregnancy and prematurity are estimated to cost society greater than $25 billion per year (Jumping-Eagle, et al., 2008). Low education, inexperience with infants, poor social, and living conditions, and lack of financial stability impact the quality of mother-infant interaction (Farel, Freeman, Keenan, & Huber, 1991).

When adolescent mothers deliver preterm infants there is an increase in the risk for negative interaction and delayed development of the newborn. Maternal factors including poverty, lack of knowledge about child development, depression, stress, low self-confidence and the infants’ prematurity status contribute to poor development of infants (Barnard, 1996). How adolescent mothers relate to and interact with their infants during the NICU stay may have significant long-term ramifications for the mother-infant dyad and for infant development.
**Preterm Infants**

Preterm birth is defined as occurring prior to 37 weeks gestation. A premature infant has specific needs based on post-conceptional age, weight, and co-morbidities. Preterm infant behavior has been studied and well described in Als’ (1982) Synactive Theory of Neonatal Behavioral Organization. This conceptual and organizational model is a hierarchal integration of developmental subsystems that is continuously influenced and altered by the premature infant’s environment. The five subsystems from the basic to the most integrated include: autonomic/physiological, motor, state, attention/interaction, and self-regulation (Als, 1982). Due to immature neurodevelopment, premature infants lack stability in the five subsystems, which manifests in behavioral disorganization (Als, 1982). The stress/behavioral cues that are often difficult for adult parents to interpret may be completely foreign to the adolescent mother.

Neurobehavioral organization refers to infants’ abilities to maintain and manage subsystems of autonomic stability, motor system, behavioral states, attentional interactions and self-regulation in interactions with the environment (Als, 1982). The organization of these subsystems affects infants’ interactions with the environment and caregivers (Feldman & Eidelman, 2007).

In full-term infants, these subsystems interact and support each other, resulting in a well-organized, mature nervous system. Full-term infants do not have much difficulty tolerating the environment since stable autonomic and motor systems allow newborns to control state behaviors, self-regulate stress responses, and interact with caregivers (Wyly, 1995). The subsystems build upon one another and interact to create a well-organized
neurobehavioral system for infants. The functioning of these subsystems is described as synactive (Als, 1982).

The functioning of infants’ subsystems are observable (Wyly, 1995). The functioning of the autonomic system can be observed by assessing respiration, color changes, and visceral signals, such as gagging and hiccups (Als, 1982). Autonomic stability is required in order for the other subsystems to develop. The motor system is observable via tone, posture, and movements (Als, 1982). States of consciousness identify the state organizational system (i.e., quiet sleep, active sleep, drowsy, quiet alert, active alert, crying) (Als, 1982). State regulation allows infants to use all other subsystems effectively. The attention and interaction systems allow the infant to be in an alert attentive state and to use this state, attending to incoming cognitive and social emotional information and to respond to that information (Als, 1982). The regulatory subsystem is defined by strategies that infants use to maintain a balanced, relatively stable and relaxed state of subsystem integration.

These subsystems build upon one another. Infants have to have stability in the lowest subsystem before they can achieve stability in the next subsystem (Als, 1982). In other words, infants must have stability in the autonomic subsystems before motor control can be mastered. In order to attain state regulation, infants must have stability over the motor as well as over the autonomic subsystems (Als, 1982). Interactive capabilities require stability in the attentional, motor, and autonomic subsystems (Als, 1982). Self-regulation occurs when there is sufficient stability in all subsystems.
Premature infants have difficulty balancing the subsystems due to central and autonomic nervous system immaturity (Als, 1982). The subsystems do not function in an integrated and supportive manner causing infants to ignore environmental stimuli in order to stabilize autonomic functions necessary for survival. As a result, they are unable to coordinate their neurobehavioral system to interact appropriately with the environment (Als, 1982).

Although many NICUs have instituted developmental care guidelines to foster growth and development of preterm infants while in the unit, the NICU environment may still provide a barrier to effective mother-infant interaction. Depending on the preterm infant’s condition, isolettes (temperature control), and decreased stimulation (touching, stroking, holding) may be required for the preterm infants’ benefit. The transition from restricted interaction to gradual increased interaction between mothers and preterm infants may be disjointed and stressful for both mothers and infants.

In addition to the physiological complications inherent in preterm infants, the mother-infant relationship experiences complications. Maternal anxiety, insecurity about caring for premature infants, difficult infant temperament, dysregulation, and the NICU environment complicate the mother-infant relationship (Feldman & Eidelman, 2007; Holditch-Davis, et al., 2003; Neu & Robinson, 2008; Neu, 1999).

In summary, synchronous interaction between mother and infant lays the foundation for the development of social, emotional and cognitive growth of the child. Adolescent mother-premature infant dyads are at risk of developing and perpetuating a non-synchronous relationship due to the developmental status of adolescent mothers as
well as the developmental status of preterm infants. Characteristics unique to adolescent mothers (such as age, education, stress, and social support) and characteristics unique to preterm infants (gestational age, weight, and length of stay in the NICU) may contribute to interaction capacity. Assessing mother-infant interaction within the context of the NICU environment may allow nurses to develop and test interventions to foster synchronous interaction in the NICU setting.

**CONCEPTUAL FRAMEWORK**

The conceptual framework for this study was based on Belsky’s Process Model of Parenting and the Barnard Model of mother-infant interaction. A description of the Belsky and Barnard models will be followed by an explanation of how these two models inform the framework for this study. Both models consider environment and emphasize the child’s contribution to the interaction. Belsky defines parental competence as “sensitivity to the child’s developing abilities” (Belsky, 1984, p. 84). In Belsky’s model, mother-infant interaction is directly influenced by characteristics from within the individual parent (age, previous experience, attitudes and expectations about child rearing), characteristics within the individual child (gender, size, health status) and from the broader environmental context (social networks, support systems, culture) (Belsky, 1984). The Barnard model emphasizes contingent interaction and specifies roles or responsibilities of each partner in the dyad.

**Belsky’s Process Model of Parenting**

Belsky’s (1984) model assumes that parenting is influenced by three determinants: (1) the individual parent’s characteristics, (2) the individual child’s
characteristics and (3) contextual sources of stress and support. Contextual sources of stress and support refers to the social context in which adolescent mothers and preterm infants exist, which, for this study, includes the NICU environment. The three determinants are not equal with respect to their influence on parenting. Adolescent mothers’ developmental history and personality shape mother-infant interaction indirectly by influencing the broader social context.

Individual characteristics of adolescent mothers and preterm infants can mediate the impact of a process in each particular context. Luster and Okagaki (1993) commented, “individuals carry forward from their prior relationships experiences, attitudes, expectations, emotions, behavioral patterns that shape the way they function as parents in the families they establish” (p1). According to Belsky, parents need a buffer if one of these areas is weak. For example, if parents are living in poverty but are motivated to do well and have easy children, they might be more effective than if all systems were weak. An example with weak support would be uneducated, poor adolescent mothers with difficult preterm infants and no social support. The outcome in this instance is more negative than would be expected for adolescents with supportive boyfriends, extended family, school, and community support, and children with an easy temperament.

According to Belsky (1984), a parent’s contribution to the parenting process is influenced significantly by their personal developmental history and personality. Belsky discusses the literature on the type of parenting and parenting personality that is most conducive to promoting optimal functioning of a child from infancy through adolescence.
Belsky (1984) determined that attentive, warm and responsive care giving during infancy resulted in motivated, competent, and emotionally healthy children.

Early studies have focused on age as a determinant of parenting. Ragozin and colleagues (1982) stated that older mothers were more affectionate, stimulating and sensitive to their infants, while adolescent mothers displayed less desirable child rearing attitudes and behaviors. Ragozin, et al. (1982) concluded that increased maternal age was related to increased optimal parenting behaviors and greater satisfaction with parenting.

Child characteristics contribute significantly to the model. Belsky (1984) states that quality and quantity of care giving are greatly influenced by characteristics that make the child difficult to care for (i.e, preterm with medical needs versus full term with no medical needs). Belsky does not expand on additional characteristics of children that may alter parental care; instead he introduced the concept of “goodness of fit,” as first conceptualized by Lerner (1982). Belsky (1984) suggests that it is not the child’s specific characteristics that shape the parenting directly, but rather the compatibility or agreement between parent and child characteristics. Campbell (1979) found that difficult infant temperament resulted in adult mothers displaying less responsiveness toward their infants when compared with a matched control group.

The final determinant of parenting, according to Belsky’s (1984) model, is that parenting has multiple determinants; it is a dynamic, buffering system that is capable of protecting itself against threats. The most critical determinant is the individual parent’s characteristics, followed by contextual sources of support and stress and child
characteristics. High parent functioning may still occur if two of the three determinants
are at risk.

**Barnard Model**

The Barnard Model is based on the assumption that the mother and the infant each
have a responsibility to keep an interaction going. The infant must send clear cues and be
responsive to the mother. The mother must respond to the infant’s cues in a timely and
sensitive manner, ease distress in a timely and sensitive manner, as well as provide
growth and learning opportunities (NCAST, 1995).

The interactive system may break down when there is an interruption in the
adaptive process. The interruption can originate in adolescent mothers, premature infants,
or the environment. Adolescent mothers’ lack of knowledge regarding their preterm
infants’ behavior, illness, stress, or a crisis in the environment constitute examples that
cause interruptions in the mother-infant interactive process. These conditions may lead to
the mother being less sensitive to infant cues, unable to alleviate distress, and/or unable to
provide growth-fostering situations for infants.

Barnard’s model originated with three concepts: caregiver (mother), child, and
environment. All three of the concepts interact and affect one another (NCAST, 1995).
The caregiver concept includes physical health, mental health, coping, educational level,
care-giving style, and adaption skills. The child concept includes physical appearance,
temperament, self-regulation and feeding/sleeping patterns. The environment of the dyad
includes available social and financial resources, adequate food/housing, safe homes,
supportive adults, and community involvement. It is the mother’s task to mediate the
interaction between the infant and the environment through the provision of safe and age appropriate activities. The team that developed this model was certain that mother-infant interaction would be a potent predictor of child development (NCAST, 1995).

Barnard (1976) describes the mother-infant interaction system as a “dialogue or mutually adaptive waltz” between partners (p. 6). Both partners must have certain features for the dialogue to flow smoothly. First, each partner must have sufficient interactive behaviors such as smiling, talking, and body movements so that interlocking sequences like leading and following are possible and a smooth interactive system develops (i.e., a mother talks to her infant, the infant coos, the mother responds). Preterm infants (who are typically less responsive than term infants) and depressed mothers are two examples of partners with decreased interactive behaviors that prevent the dance from flowing smoothly (Barnard, Bee, & Hammond, 1984).

A second aspect of the model includes contingent responses for both partners. The mother has the responsibility to remain consistent and contingent (mutual eye contact, smiles, verbalizations) as the child matures and passes through developmental stages. A third feature of the interactive system requires the interactive content be rich in terms of positive affect (praising the child), verbal stimulation (talking about a variety of subjects), and the range of play materials (age appropriate) available. A fourth feature includes adaptive behaviors between mother and child over time relative to emerging developmental capacities of the child.

Specific responsibilities of the mother and child are outlined in the Barnard Model and are quantifiable through the feeding scale subsequently developed. The mother is
responsible for being sensitive to cues, recognizing and responding to the infant’s cues; alleviating distress, soothing or quieting a distressed infant; social-emotional growth fostering, mainly communicating a positive feeling tone toward the infant, and cognitive growth fostering or the learning experiences the mother provides for the infant (NCAST, 1995). The infant is responsible for sending clear cues to the mother, and responding to the mother’s attempts to communicate and interact.

**Interaction Framework**

The conceptual framework for this study, shown in Figure 1, was developed using components from the Belsky and Barnard models. The interaction framework for this study assumes that parenting is influenced by three determinants: (1) contextual source of the NICU environment, (2) adolescent mothers’ characteristics and (3) preterm infants’ characteristics. Contextual sources of stress and support refer to the social context in which adolescent mothers and preterm infants exist, which for this study includes the NICU environment and the larger social networks of support. The three determinants are not equal with respect to influence on parenting. Adolescent mothers’ characteristics including age, education, stress, and social support may shape mother-infant interaction indirectly by influencing the broader social context. The preterm infants’ characteristics that may contribute to/impact this parenting include: current age measured in weeks, current weight, and length of stay in the NICU.

The outcome variable for this study was synchronous mother-infant interaction. The Nursing Child Assessment Feeding Scale (NCAFS) was developed to quantify mother-infant interaction and will be used to rate adolescent mothers on sensitivity to
cues, response to distress, social emotional growth fostering and cognitive growth fostering. Preterm infants will be rated with regard to clarity of cues and responsiveness to caregiver. Ratings on six subscales of the NCAFS will provide quantitative data related to the assessment of synchronous mother-infant interaction for this study.

**Conceptual Framework and Study Variables**

Figure 1. Conceptual Framework and Study Variables
STUDY DESIGN

The design for the proposed study was a one-group, pretest-posttest, exploratory intervention assessing synchronous interaction between adolescent mothers and their premature infants in the NICU. This study will examine the difference in adolescent mother-premature infant interaction in the NICU environment prior to an intervention and within 48 hours after receiving the intervention. The intervention will include educating adolescent mothers about preterm infants’ cues using the Infant Behavioral and Communication Guide that discusses preterm infant engagement, disengagement, and self-regulation cues (Vierling, 2005). The videotape from the first feeding interaction will be reviewed with adolescent mothers to determine whether they recognize the behavioral cues from their infants introduced in the guide. The contextual support will be analyzed in the form of the mothers’ social support. The demographic characteristics of the adolescent mothers will include age, education, race/ethnicity. The variable of adolescent mothers’ stress will also be explored using the Parental Stress Scale: NICU (PSS:NICU). The preterm infants’ variables will include gestational age at birth and current age in weeks, weight (birth and current in grams), and length of stay in the NICU. These variables will be examined in relation to mother-infant interaction in the NICU.

RESEARCH QUESTIONS

The following questions will be examined in this study:

1. What is the relationship between stress and social support in adolescent mothers, and demographic characteristics of the adolescent mothers (age,
education) and preterm infants (length of stay in the NICU, current age, and current weight) at baseline?

2. What is the effect of adolescent mothers’ social support on synchronous interaction with their preterm infants at the first feeding observation?

3. What is the effect of adolescent mothers’ stress on synchronous interaction with their preterm infants at the first feeding observation?

4. What is the effect of a nursing intervention (Preterm Infant Cues Intervention-PICI) delivered in the NICU on synchronous interaction between adolescent mothers and their preterm infants?

**DEFINITION OF TERMS**

For this study, the following definitions were used:

1. **Neonatal Intensive Care Environment**: A unit in a hospital where premature infants remain until they are physiologically stable and ready to transition home. The unit is divided into open bays where premature infants are placed in isolettes and/or open cribs. Medical equipment such as cardiac and apnea monitors are attached to all premature infants. Alarms from the equipment are frequently heard. Nursing staff is present continuously (24 hours each day, seven days a week).

2. **Adolescent Mother**: Female aged 13-21 years (adolescent as defined by American Academy of Pediatrics, 2008) who gives birth and chooses to raise her child.

3. **Premature Infant**: An infant born prior to 37 weeks gestation.
4. **Feeding Interaction**: The communication between adolescent mothers and their premature infants during a designated feeding time. The communication can be verbal, non-verbal, and physical.

5. **Social Support**: Interpersonal transactions, which are multidimensional and include two functional properties: emotional support, which refers to the expression of positive feelings from one person to another as well as the endorsement of another person’s behavior, perceptions, or expressed views; and tangible support, which refers to the giving of symbolic or material aid to another (Brandt & Weinert, 1981).

6. **Self-Reported Stress**: Stress related to the NICU environment reported by adolescent mothers. Stress will be quantified using the Parental Stress Scale: Neonatal Intensive Care Unit (PSS: NICU) tool. The PSS: NICU captures stress in three domains including: the infant’s appearance/behavior, sights and sounds of the unit, and parental role or relationship the mother has with the premature infant (Carter & Miles, 1982; Carter & Miles, 1989).

7. **Expectations of the Behavioral Cues**: The adolescent mothers’ self-reports of behavior they expect from their premature infants.

8. **Gestational Age**: Age of infants (in weeks) at birth and at the time of the intervention.

9. **Current Age**: Age of infants (in weeks) at the time of the first feeding observation.
10. **Current Weight**: The weight of preterm infants (measured in grams) at the first feeding observation.

11. **Length of Stay**: Number of days infants have stayed in the NICU.

12. **Synchronous Interaction**: Implies a smooth flowing interactive relationship between mothers and infants. The mother’s ability to adapt to her infant’s cues by consistently alleviating distress and promoting growth-fostering behaviors; the infant’s ability to respond to the mother’s attempts to alleviate distress and growth fostering opportunities.

**ASSUMPTIONS**

In this study, the following assumptions were made:

1. Adaptation to parenting is challenging for adolescent mothers.

2. Each individual adolescent mother’s interaction with her premature infant is unique.

3. The quality dimension of adolescent mother-premature infant interaction is observable.

4. The development of adolescent mother-premature infant interaction is influenced by the healthcare setting.

5. Observations of dyads during a feeding represent the quality of mother-infant interaction.

6. The findings from this study will influence development of interventions to promote adolescent mother-premature infant interaction.
7. The PSS:NICU is typically administered within one week of admission to the NICU. Administration of the PSS:NICU will fall outside of that parameter but should be an adequate measure of NICU stress in adolescent mothers.

LIMITATIONS

This study used a nonrandomized convenience sample of 27 adolescent mothers in a single level III NICU. The findings from this study may not represent those from other adolescent mothers with premature infants in other level III NICUs; therefore, application to larger or other populations of adolescent mothers with premature infants should be done cautiously. The age span of 13-21 years for the adolescent group included a wide range of developmental stages. Small sample size was another limitation. The PICI (intervention) was both delivered and measured by the researcher, which may have resulted in bias toward a positive outcome.

SUMMARY

Synchrony in interaction, within mother-infant dyads are characterized by smooth, flowing transactions in which each individual responds to the others’ communications and behavioral cues. Synchrony in mother-infant interactions is the foundation for the development of emotional stability, readiness to learn, social competence, self-confidence, and security in the child. Adolescent mothers and premature infants are two vulnerable populations that could benefit from early interaction assessment and nursing intervention.

The aim of the proposed study was to describe mother-infant interaction between adolescent mothers and preterm infants in the NICU setting and determine whether a
brief nursing intervention within the NICU setting had a positive effect on synchronous interactions between the dyads. The findings from this study could be used to develop individualized interventions in the NICU aimed at educating adolescent mothers about their premature infants thus improving their synchronous interaction capabilities with their infants. In addition, determining stress levels and social support available to the dyad may impact referral to needed services. Findings from early assessment in the NICU could provide justification for future longitudinal intervention studies.
Chapter 2: Review of the Literature

This chapter contains a review of the literature following the conceptual framework of this study. The conceptual framework includes the contextual environment, characteristics of the adolescent mother, characteristics of the preterm infant, and synchronous mother-infant interaction as an outcome. The literature review begins with a brief description of the context of the interaction, which for this study is the neonatal intensive care unit (NICU). Characteristics of adolescent mothers included age, education, stress, and social support. Characteristics of preterm infants included gestational age, weight, and length of stay in the NICU. Finally, mother-infant interaction outcomes are discussed.

Mother-infant interaction is captured in the nursing, psychology and medical literature under a variety of topics including: mother-infant interaction, parenting, maternal role, synchronous relationships, and mothering. A literature search, using the key words mother-infant interaction, parenting, mothering, adolescent mothers, premature infants, NICU, stress, and social support, resulted in two broad themes: mother-infant interaction and parenting. This literature was further delineated by sample inclusion criteria. Typical populations included adult mothers with term or premature infants and adolescents with term infants, but rarely adolescent mothers with premature infants in the NICU setting.

CONTEXT OF INTERACTION

The interaction framework used in this study borrows from Belsky’s (1984) model in that the environment in which the interaction occurs, the characteristics of
adolescent mothers and characteristics of preterm infants are all considered. The contextual aspect of this study of adolescent mothers with premature infants focuses on the NICU environment. Belsky (1984) asserts that of the three contributing factors (environmental, infant, parental), parental attributes function as the most powerful determinant of parenting, which includes mother-infant interaction. In contrast, Bogenschneider, Small, and Tsay (1997) assert that child characteristics, followed by stress and/or support, appear most influential with the adolescent parent population. This study examined characteristics of the adolescent mother and characteristics of the premature infant while in the NICU setting to determine which characteristics impacted the interaction between the participating dyads.

**NICU ENVIRONMENT**

Challenges presented by the NICU environment, including physical features, policies, perceptions of staff presence, and appearance of the baby can be perceived as barriers to interaction, that impede mother-infant interaction. The physical environment of the NICU challenges nurses to integrate care that supports the development of premature infants while facilitating mother-infant interactions and supporting adolescent mothers as collaborators in the care of their preterm infants. Underlying the challenge is the intimidating environment of critical care equipment and the ongoing intensive care of the infants (Dudek-Shriber, 2004). Issues associated with noise, light, and biomedical equipment are widely discussed in current and historical literature. Mothers often report feeling intimidated and overwhelmed in the NICU environment (Gale & Franck, 1998).
Distractions in the NICU shift parents’ focus from their infants and the “normal” attachment process to equipment and technology.

The challenge of supporting infant interaction by merging technical aspects of neonatal nursing care with family-centered care is widely discussed in the literature. This approach is based on developing partnerships of care with families that support interaction and role development in the NICU. Lawhon (2002) developed an individualized nursing intervention for adult mothers and fathers in the NICU focusing on critical appraisal, which defines the parents’ abilities to understand the meaning of their infants’ behavior and respond appropriately. This exploratory study used the Nursing Child Assessment Feeding Scale (NCAFS) for parent competence interaction assessment with adult parents. A relatively high mean total parent score of 40 (of a possible score of 50) was reported. The premature infants scored higher on the NCAFS subscales than the norm of 17 with a mean total scale score of 19.75. Lawhon (2002) concluded that individualized interventions in the NICU lead to the adult parents’ abilities to interpret and respond to premature infant behavior cues. A limitation of this study was that it did not include adolescent mothers.

The NICU environment may be especially overwhelming to adolescent mothers. The presence of medical equipment attached to their premature infants combined with fear of the unknown alters mother-infant interactions. While many NICUs have incorporated developmental care guidelines for preterm infants, inclusive of parental decision-making, many adolescents are unaware and/or overwhelmed to the point of inaction. Depending on prematurity status, mothers in the NICU are instructed to refrain
from over stimulating (touching, talking, stroking, holding) their preterm infants until such a time that the infants do not become physiologically stressed by the interactions. The initial lack of physical contact ultimately affects the quality of mother-infant interaction in the NICU and perhaps beyond. Once premature infants transition to the point of physiologic stability and interaction is appropriate, adolescent mothers often struggle with interpreting their premature infants’ cues and responding appropriately.

There is a lack of literature examining interactions between adolescent mothers and their premature infants in the NICU setting. One of the few studies addressed adolescent mothers’ (ages 15-19 years) perceptions of the NICU environment (Bell, 1997). This particular study used the Parental Stress Scale for the NICU (PSS:NICU), an instrument developed by Miles and Carter (1983) was used to measure parental perceptions of stressors arising from the physical and psychosocial environment of the NICU. The adolescent mothers in Bell’s (1997) study perceived their relationships with their infants as the most stressful experience of being in the NICU. Limitations of this study included small sample size and use of convenience rather than random sampling. A strength of this study included ethnic diversity despite recruitment in a small, rural setting. Determining to what extent the environment plays a role in adolescent mother premature infant interaction after the infant is stabilized in the NICU will be addressed in this study.

In summary, adolescent mothers in the NICU setting have been rarely studied. In the context of environmental stress, stressors have been determined by questionnaires. This study also examined the adolescent mothers’ stress via the PSS:NICU.
ADOLESCENT MOTHERS

Adolescent mothers differ in their interactions with their infants and children, compared to adult mothers. The interaction framework for this study proposes that the characteristics of adolescent mothers, such as age, education, social support, and stress may contribute to the quality of the adolescent mother-premature infant interaction. Each of the variables that comprise the interaction framework are discussed.

Age

Becoming a mother during adolescence presents the developmental challenge of attaining infant care competence along with self-identity (Erikson, 1968) and empathy (Selman, 1971). Empathy is important in mother-infant interaction and allows the adolescent mother to respond appropriately to negative infant cues such as crying and fussy behavior. The younger, compared with older, adolescent mothers are likely more challenged by the physical, emotional and cognitive demands and problem solving required for competent infant care.

Age is an important factor in research studies focusing on mother-infant interaction. Most of the research reported in the literature targets ages 14-19 years in adolescent mother studies (Christopher, et al., 1999; Duetscher, et al., 2005; Giardino, et al., 2004). DeVito (2007) defined three distinct age groups in her study of adolescent mothers’ self-perceptions of parenting: early adolescence (14 years and younger), middle adolescence (15-17 years old) and late adolescence (18-19 years old). DeVito argued that one of the strengths of the study was defining subgroups of the sample according to these developmental stages. While the sample size was small in the early adolescent age group
(n = 5, 5.4%), this represented a greater proportion of early adolescent mothers than the national 1.9% of early adolescent births in the total birth population. Findings indicated statistically significant differences between the various stages of adolescence for the self-perceptions of parenting ($F = 7.7$, df = 2, 123, $p = .001$). Late adolescent mothers scored higher than middle and early adolescent mothers using the What Being a Parent is Like-Revised instrument (WPL-R). Despite the small sample size (N = 16), one strength of this study was determining differences among the early, middle, and late adolescent groups.

Hypothetically, young maternal age will impact mother-infant interaction. Adolescent mothers have not had time to mature and meet their own developmental milestones and, therefore, may have difficulty guiding their preterm infants development through positive, synchronous interaction. However, few studies have examined the quality of parent-infant interaction based on these developmental differences.

The current study did not recruit equal numbers of participants into the early, middle or late categories as it consists of a convenience sample of mother ages 13-21 years. Due to the small sample sizes of most studies with adolescent mothers, age is considered a descriptive statistic and generalizations are not made for specific adolescent groups. Participant age for this study was reported as a descriptive statistic and is a limitation.

**Education**

Level of education is a significant predictor of mother-infant interaction quality (NCAST, 1995). The Nursing Child Assessment Satellite Training (NCAST) database
provides information on 1,914 feeding cases. Mothers were divided into adolescent mothers’ ages 14-19 years, low education mothers (ages 19-25 years, with less than 12 years of education) and high education mothers (ages 19-25 years, with at least 12 years or more of education). Analysis of these three groups revealed significant differences between the high education mothers and the adolescent/low education mothers. There were no differences in interaction scale scores between the low education mothers and adolescent mothers’ scores (NCAST, 1995). These findings led researchers to conclude that the mother’s education is a much stronger factor than ethnicity in determining group differences (NCAST, 1995).

There is an association among lower educational attainment, socioeconomic disadvantage, and psychosocial difficulties in adolescent mothers (Coley & Chase-Lansdale, 1998; Corcoran, 1998). By definition, adolescents will have a lower educational achievement than many adult mothers since they have not had the opportunity to complete secondary or higher education. However, the outcomes for adolescent mothers create additional concerns since children of adolescent mothers tend to have fewer economic and social resources, are more likely to grow up in a single parent home, and have increased risk for problematic parent-child interactions (Deal & Holt, 1998; Fergusson & Woodward, 1999; Furstenberg, Brooks-Gunn, & Morgan, 1987).

In contrast to studies cited above, one researcher has reported results that are not bleak. Spears (2001) found that adolescent mothers who had future goals and were positive about becoming a mother and had plans to complete their education and possibly
continue on to college. Overall, education is an important variable to consider when researching mother-infant interaction.

A study exploring maternal responsiveness found that socio-demographic variables such as education and age (18-41 years) had little to no relationship to self-reported maternal responsiveness (Drake, et al., 2007). This is contrary to previous findings that indicated relationships between socio-demographic variables and maternal responsiveness (Mercer, 1981; Walker, Crain, & Thompson, 1986). The difference in findings is most likely accounted for in the measurement of maternal responsiveness, such as self-report vs. observation.

**Ethnicity**

Ethnicity is reported as a descriptive variable in all studies discussing mother-infant interaction, including those with adolescent mothers and preterm infants. None of the few studies discussing adolescent mother premature infant interaction found a significant relationship between mother-infant interaction and ethnicity. According to the NCAST database, early analysis of 1,914 feeding cases, ethnicity was a significant predictor of mother-infant interaction quality on only one subscale of the NCAFS. Significant differences between Caucasian and African American mothers and Caucasian and Hispanic mothers were found only on the cognitive growth subscale of the NCAFS (NCAST, 1995). Analysis of a small sample (N = 30) of American Indian mothers (17-36 years of age, mean age 26 years), revealed higher overall scale scores (NCAFS) than the non-American Indian mothers (Seideman, Haase, Primeaux, & Burrs, 1992). Seideman and colleagues speculated that higher NCAF scores reflected a cultural difference in
interaction, mainly a patient, unhurried approach to feeding and the ritualistic use of food characteristic of American Indian culture. Individual differences in interaction are a product of multiple influences, including ethnicity.

**Social Support**

Social support is an essential consideration in adolescent mothers’ adjustment to becoming mothers (Clemens, 2001). Social support is commonly measured using the Personal Resources Questionnaire-85 (PRQ85) (Brandt & Weintert, 1981; Weinert, 1987). Social support can be defined as interpersonal transactions, which are multidimensional and include five dimensions: social integration, provision for attachment/intimacy, opportunity for nurturing behavior, reassurance of worth, and availability of informational, emotional, and material help. Social support has been documented as one of the most significant factors affecting maternal responsiveness (Blank, Schroeder, & Flynn, 1996). Social support is important for new mothers and the impact of social support depends largely on the way it is perceived (Reinhardt, Boerner, & Horowitz, 2006). Emotional support during the NICU stay is necessary to help new mothers navigate through the experience. Material support is required in the form of transportation to and from the NICU during a lengthy stay.

Adolescent mothers may lack social support due to severed family communications and/or lack of community connections. Unmet expectations for social support and failure to receive anticipated support may lead to negative maternal-infant interaction (Logsdon, McBride, Berkimer, 1981).
Several early research studies have been conducted on the effect of social support for adolescents with term infants and older children. Social support of adolescent mothers has been shown to foster nurturing parental attitudes (Contreras, Mangelsdorf, Rhodes, Deiner, & Brunson, 1999; Turner, Grindstaff, & Phillips, 1990) and buffer the effects of stress (Passino et al., 1993). A direct relationship has been documented between social support and adolescent mothers’ interaction styles. For example, adolescent mothers who experienced higher levels of social support were expressive and sensitive during observed parenting tasks with infants and toddlers (Contreras, et al., 1999). Support from adolescents’ mothers, friends, and partners has been associated with positive interaction behaviors (Samuels, Stockdale & Chase, 1994; Voight, Hans, & Bernstein, 1996) and less rejection of their children (Colletta, 1981; Egeland, Jacobvitz, & Sroufe, 1988; Garbarino, & Crouter, 1978).

Social support can have protective effects on adolescent mothers against the negative impact of stress and adversity (Uno, Florshiem, & Uchino, 1998). Social support has been found to moderate the relationship between interpersonal conflict, maternal behavior (Nitz, Ketterlinus, & Brandt, 1995) and attenuate the association between the rejection adolescent mothers may have experienced in their family of origin and their current level of punitive parenting interaction style (Crockenberg, 1987).

Several studies indicated that social support can have a paradoxical effect on adolescent mothers’ parenting attitudes and interaction behaviors. This may be due to the close but conflictual relationships that adolescents may have with the people who provide the most support (Voight, Hans, & Bernstein, 1996). For example, high level of
grandmother involvement has been associated with diminished parental sensitivity and nurturance among adolescent mothers (Contreras, et al., 1999; Oyserman, Radin, & Saltz, 1994).

Social support has been shown to be a critical element in the positive adjustment of adolescent mothers (Clemmens, 2001) and serves a variety of functions such as guidance, social reinforcement, and tangible assistance. For adolescent mothers, the main function of social support is to promote psychosocial development and help negotiate developmental tasks (Logsdon & Davis, 2003; Mercer, 2004) and is most effective when tailored to meet the adolescent mothers’ specific needs.

Fathers have been identified as sources of social support in several studies (Carter, Mulder, & Darlow, 2007; DeVito, 2007). DeVito (2007) found that when adolescent mothers reported higher levels of social support from the fathers of the infants, the adolescent mothers’ self-perceptions of parenting increased. While mother-infant interaction has not been the outcome of research that discusses paternal social support, paternal support has been found to impact overall parenting in single mothers aged 15-35 (Smith & Howard, 2008). Although adolescent mothers who live with their own mothers receive less instrumental support from the infants’ fathers than women who do not live with their mothers, they are likely to receive social support from their mothers or other family members (Oberlander, Black & Starr, 2007). Even with family support, these mothers tend to be more disadvantaged economically than their counterparts who marry the child’s father (Smith & Howard, 2008).
Logsdon and colleagues (2004) studied pregnant and parenting adolescents, and their experiences of receiving social support. The adolescents described challenges in many areas of their lives including meeting developmental tasks of pregnancy (attaining maternal role) and adolescence (achieving economic and emotional independence from parents, completing school, establishing a career, and developing intimate relationships). Younger adolescents aged 13-14 years, reported receiving the most social support, whereas middle adolescents aged 15-16 years reported the most conflicts with work and partner relationships, and older adolescents aged 17-19 years had more realistic expectations for needed social support (Logsdon, et al., 2004).

Although social support has been shown to affect adolescent mothers and interactions with term infants and older children, there is a lack of research examining the dimensions of social support and its relationship to adolescent mother-premature infant interactions while in the NICU. Social support may be an important variable that affects the quality of interactions between adolescent mothers and their preterm infants.

**Stress**

Few researchers have studied parenting stress among adolescent mothers with premature infants. Most studies have focused on older parents of premature infants or those with medical or social problems (Docherty, Miles, & Holditch-Davis, 2002; Holditch-Davis & Miles, 2000; Miles, Burchinal, Holditch-Davis, Brunssen, & Wilson, 2002; Pelchat, et al., 1999). The higher incidence of poor developmental outcomes among children born to adolescent mothers (Brooks-Gunn & Furstenberg, 1986; Carlson,
Labarba, Selafani, & Bowers, 1986; Chase-Lansdale, Brooks-Gunn, & Paikoff, 1992) highlights the need for further investigation in this area.

For new mothers, stress is a common response to increasing physiological and psychological challenges, including fatigue/exhaustion, changes in relationships and worries about parenting (Holub, Kershaw, Ethier, Lewis, Milan, & Ickovics, 2007). Increased stress adversely affects the quality and experience of pregnancy, as well as maternal and infant outcomes (Lobel, DeVincent, & Kaminer, 2000). Stress is a factor for adolescent mothers with premature infants in an intensive care environment where contact is often limited. Studies examining maternal stress related to hospitalization of premature infants have primarily focused on the stress responses (to the sights/sounds of the NICU and appearance of the infant) of adult mothers and the environmental stressors (medical equipment, alarms, presence of other premature infants) present in the NICU (Miles, 1989; Miles, Funk, & Kasper, 1991; Perehudoff, 1990). Research findings support the notion that the stress of the NICU environment, paired with the stress of becoming a new mother, can impair the establishment of the mother-infant relationship.

In a study conducted in the NICU with married white adult mothers (mean age 28.6 years), researchers asked the mothers to rate events that they perceived as stressful during their premature infants’ hospitalization (Affonso, Hurst, & Mayberry, 1992). The researchers found that separation from the infants, where the mothers were unable to interact with their infants, was the most frequently reported stressor for this adult sample.

In a recent study conducted in New Zealand, researchers attempted to identify factors that contribute to parent stress in the NICU in order to improve parent-infant
interactions (Carter, Mulder, & Darlow, 2007). They found that the greatest source of stress for adult parents (mean age 33.2 years) was altered parental role with mothers reporting higher overall stress than fathers. The sample in this study, as with most studies researching stress in the NICU, included only adult parents.

Parents in the NICU have reported emotional stress (Buarque, Lima, Scott, & Vasconcelos, 2006). The emotional stress of the neonatal experience and the perception that the adult parents have a vulnerable, at-risk infant as different from a healthy term baby may influence the parents’ attitudes about the infants. The influence of the parent’s perceptions and ideas about the premature infant has been shown to last throughout the child’s development (Tideman, Nilsson, Smith, & Stjernqvist, 2002). If the perceptions are negative, this may have long term repercussions on the interaction quality of the dyad. Communication patterns are established early in relationships and may be difficult to alter once the pattern emerges. The amount of stress experienced by adolescent mothers will contribute to the mother-infant interaction quality. Quantifying stress levels and adolescent mothers’ experiences with an established instrument like the PSS: NICU is valuable for assessing stress created by the NICU environment.

In summary, the variables that will be examined related to adolescent mothers include age, education, social support and stress. In the context of adolescent mothers interacting with preterm infants in the NICU, there are minimal data detailing the phenomenon. This study will contribute to the literature by providing more detailed information about the social support and stress (self-report) of adolescent mothers in the
NICU setting as well as the relationships among these variables as they impact adolescent mothers’ interactions with their preterm infants.

**PREMATURE INFANTS**

The interaction framework for this study proposes that the characteristics of preterm infants influencing mother-infant interactions include: gestational age (birth/current), weight (birth/current), and length of stay in the NICU. Accurate measurement of infants’ temperaments in the neonatal period, however, presents a challenge to the child development field. Other, more easily measured variables such as low birth weight, prematurity, or use of NICU have been found to increase parental stress, and in some cases, maternal ratings of infants as more difficult, thus affecting the quality of mother-infant interaction (Oberklaid, Sewell, Sanson, & Prior, 1991; Snow, 1998).

**Behavioral Considerations**

Preterm infant behavior has been studied and well described in Als’ (1982) Synactive Theory of Neonatal Behavioral Organization. The conceptual and organizational model is a hierarchal integration of developmental subsystems that is continuously influenced and altered by the premature infants’ environment. Subsystems, from the basic to most integrated, include autonomic/physiological, motor, state, attention/interaction and self-regulation. Due to immature neurodevelopment, premature infants lack stability in the five subsystems that manifest as behavioral disorganization. The stress and/or behavioral cues that are often difficult for adult parents to interpret may be completely foreign to adolescent mothers.
Behavior of preterm infants falls into stress/avoidance cue categories (autonomic, motor system and state system), which are the infants’ ways of indicating overstimulation and inability to assimilate (Ritchie, 2002). Examples of autonomic stress/avoidance cues include gagging, gasping, sighing, respiratory pause, tachypnea, color changes, tremor, twitch, startle, vomiting, hiccups, bowl strain, cough, and sneeze. Motor system stress/avoidance cues include hyperflexion of trunk, limbs, feet, neck, frantic or diffuse activity, fixed postures, flaccidity of trunk, extremities or face, hypertonicity of legs, arms, head/neck, fingers, trunk arching, facial grimace and tongue extension. State system stress/avoidance cues include active averting, lack of facial expression, eye floating or staring, extreme irritability, crying, lack of consolability, diffuse sleep wake states and high pitched cry (Harrison, Roane, & Weaver, 2004; NCAST, 1995).

Physiological and behavioral stress in premature infants may be displayed via motor cues. The relationship between physiological and behavioral stress and motor activity cues in premature infants was studied in the NICU setting (Lawhon, Harrison, Roane, & Weaver, 2004). A group of premature infants with gestational ages of 27-29 weeks (n=14) were compared to a group of premature infants greater than 30-33 weeks (n=28) gestational age. Stress and motor variables were more often significantly related to low oxygen saturation than to low or high heart rate. This study did not include preterm infants older than 34 weeks gestational age. Including physiological measures in research with preterm infants is important as it is an indicator of the ability to self-regulate stress and behavioral cues.
Environmental Considerations

Although many NICUs use developmental care guidelines (Byers, 2003), NICU environments may contribute to the preterm infants’ disorganized behaviors. Developmental care guidelines include environment management (decreased noise and light), flexed positioning, non-nutritive sucking, kangaroo care, clustering of care, collaboration with parents and other activities that promote state regulation and self-regulation. It is unclear whether collaboration occurs with adolescent mothers. Depending on the level of critical care required, preterm infants will be exposed to aversive experiences, painful stimuli, and potential frequent handling. The NICU can be over-stimulating creating sensory overload and maladaptation in preterm infants. Multiple nursing staff cares for these infants resulting in a lack of consistent care.

The NICU environment affects adolescent mothers’ abilities to interact with their preterm infants (Edwards & Sanders, 1990). Adolescent mothers and their preterm infants often do not experience the same bonding process that is possible with term infants. In an effort to prevent overstimulation, adolescent mothers may find themselves sitting next to isolettes with minimal contact. Adolescent mothers are often unable to perform basic care (i.e., diapering, bathing, feeding) due to the infants’ health status. The combination of lack of hands-on experience with disorganized infant behavior leads to misinterpretation of cues and/or lack of responsiveness.

Bell (1997) studied adolescent mothers’ perceptions of stressors in the NICU and concluded that adolescent mothers and their preterm infants fail to bond because the parenting roles are unclear during hospitalization. Adolescent mothers reported that the
most stressful aspects of the NICU were parental role alterations and the appearance of their infants. These stressors affected adolescent mothers’ involvement and connection with their premature infants.

**Gestational Age**

Gestational age is routinely reported as a descriptive variable in studies including preterm infants. Gestational age may impact mother-infant interactions. There is a wide variety in infant responses to prematurity. Premature infants born appropriate for gestational age may require three years to “catch up” related to their physical growth (Ritchie, 2002). However, a study by Hack and colleagues (1996) reported “catch up” growth occurring as late as eight years in a small percentage of prematurely born infants. Adjusting for prematurity requires subtracting months of prematurity from the chronologic age. This may impact mother-infant interactions through altering the mothers’ perceptions and contributing to less than optimal interaction quality. It is important to educate parents about the concept of post-conceptual age in adjusting for growth and some behaviors. Post-conceptual age is defined as gestational age plus post natal age (American Academy of Pediatrics, 2008).

**Length of Stay in NICU**

Length of stay is commonly reported as a descriptive variable in studies including premature infants. Length of stay in the NICU may impact mother-infant interactions. The longer premature infants remain in the NICU, the longer it takes for some mothers to assume full responsibility for care and establish consistent interaction processes. No studies discussing adolescent mothers and the effect of length of stay on mother-infant interaction.
interactions were found in the published literature. For some adolescent mothers it may be difficult to maintain daily contact with their preterm infants during lengthy stays due to lack of transportation and financial constraints.

**Weight**

Birth weight and current weight are commonly reported variables in research with term and preterm infants. Weight is an important factor to consider with regard to the growth rates and development curves of preterm infants. The ability to maintain a stable temperature increases as weight increases. As weight increases, preterm infants waste less energy on maintaining physiological status quo and begin to work on interactive capabilities (Harrison, Roane, & Weaver, 2004; Ritchie, 2002).

Although a wide variety of research has been conducted with preterm infants, there is a gap in the literature related to preterm infants born to adolescent mothers and their interaction qualities in the NICU setting. This exploratory intervention study examined the relationship between the two vulnerable participants in such dyads.

**MOTHER-INFANT INTERACTION OUTCOMES**

It is important to consider the mother-infant outcome literature in order to understand why research with adolescent mothers and preterm infants is necessary. Interaction between mothers and their infants have the potential to set the dyad on a positive or negative course that will impact not only interpersonal relationships but developmental outcomes for their infants. Interaction can easily be observed in the NICU environment. When mothers and infants spend time in the NICU environment, there is an opportunity for nurses to affect the relationship in a positive way. Whether through
education or a formal intervention, it is an opportunity that should not be wasted as the potential to influence future outcomes has been documented (Landry, Smith, & Miller-Loncar, 1997; Lewis, 1999; Poehlmann & Fiese, 2001).

Synchronous interactions within mother-infant dyads are characterized by smooth, flowing transactions in which each individual responds to the other’s communications and behavioral cues. The importance of synchronous interaction between mothers and infants have been examined extensively and have been correlated with future developmental outcomes in children (Cerezo, Pons-Salvador, & Trenado, 2008; Cusson, 2003; Davis, Edwards, & Mohay, 2003; Leitch, 1999; Mueller-Nix, Forcada-Guex, Pierrehumbert, Jaunin, Borghini, & Ansermet, 2004). Synchronous mother-infant interactions are the foundation for the development of emotional stability, readiness to learn, social competence, self-confidence, and security in the child.

Providing sensitive and responsive care to infants in the first year of life is important for physical, psychological, and neurophysiologic development (Richter, 2004). The provision of sensitive, nurturing, stimulating and nonrestrictive interactions fosters optimal development (Berlin, Brooks-Gunn, McCarton, & McCormick, 1998). When well-timed interactions with adolescent mothers are contingent upon infant cues, they help regulate premature infants’ physiological responses (i.e., heart rate, respiration rate, and body temperature), behavioral, social and emotional responses (i.e., distress), and nutritional needs (Hofer, 1994). These relationships also provide the foundation for the development of self-regulation capacities (Sameroff & Fiese, 2000) in addition to fostering infant mental health.
Empirical evidence related to mother-infant interactions and future outcomes are available. Mother-infant interactions are critical to the development of infants (Poehlmann & Fiese, 2001). Synchronous communication between the dyad has been shown to lead to secure attachment between mothers and infants, which is necessary for healthy infant growth and development (Bretherton, 1995; Landry, Smith, & Miller-Loncar, 1997; Wakschlag, & Hans, 1989). Ineffective mother-infant interactions are associated with lack of attachment, low self-esteem, and problems in growth and development of infants. For example, diminished infant responses, lower intelligence, depression, social incompetence, and high risk behavior have all been related to inadequate or ineffective mother-infant interactions (Wakschlag, & Hans, 1989). Early maternal responsiveness, or effective mother-infant interactions, have been found to be strong predictors of children’s cognitive competency (Lewis, 1999).

**Interaction Characteristics of Mothers**

According to the Barnard model (NCAST, 1995), characteristics attributable to effective mother-infant interactions include sensitivity to cues, alleviating distress and fostering cognitive and socio-emotional growth. The Barnard model suggests that mothers may demonstrate sensitivity through positioning (i.e., holding the infant securely, maintaining eye to eye contact) and appropriate stimulation (i.e., touching, talking to, moving and looking at the infant).

The mothers’ abilities to alleviate distress depend upon several factors. Mothers must first recognize the infants’ cues as distress and subsequently take appropriate action to soothe their infants (NCAST, 1995). Timing of the mothers’ response is critical to
successful alleviation of distress. A study assessing high- and low-risk for child abuse (per Child Abuse Potential Inventory-CAPI scores) in mothers’ aged 16-38 years, found that high-risk mothers were less sensitive, more intrusive and less discriminate regarding infants’ behavior (Cerezo, Pons-Salvador, & Trenado, 2008). Researchers suggest that a heightened sense of responsiveness is needed for mothers of preterm infants because the infants’ cues are often less noticeable and require much more energy than those of term infants (Karl, 1995).

Growth fostering includes cognitive and social emotional domains. Cognitive growth fostering includes the learning experience provided by mothers. Positive growth fostering occurs when mothers introduce infants to a variety of sights, sounds and experiences. The mothers’ verbalizations are a rich source of stimulation (NCAST, 1995). Young infants are more responsive to auditory than visual stimuli. Mothers talk to infants for long periods of time in contrast to the infants’ short periods of verbalization (Goldberg, 1977). Mothers who communicate more with their infants in a style that encourages reciprocal communication promote language development (Cusson, 2003).

Social emotional growth fostering occurs during interactions when warmth is reflected in the mothers’ tone and voice pitch, facial expressions, types of touch, social forms of interactions, types of statements made to and about infants, and positioning of infants. Voice, touch and movement primarily serve the purpose of soothing, orienting and alerting infants and create a warm, supportive atmosphere (NCAST, 1995).

Stern and Karraker (1990) reviewed studies in which adults viewed preterm infants negatively. The most important influences were beliefs and attitudes about
expected behavior. Although most adult mothers initially had difficulty relating to their preterm infants, they typically made adjustments in their interactions as they got to know and understand their preterm infants’ behaviors (Yoos, 1989).

Mother-infant interactions in the NICU may be at risk for a variety of reasons including distinctive behavioral characteristics of premature infants, including decreased alertness and responsiveness (Goldberg, 1978); difficult temperament (Field, et al., 1980); and the adolescent mothers’ unfamiliarity and lack of contact with premature infants (Field, et al., 1980). These risks and conditions may lead adolescent mothers to hold unrealistic expectations for their premature infants’ future development, contributing to subsequent interaction deficits (Field, et al., 1980).

A study conducted in Brazil with a sample of mothers aged 14-43 years explored maternal expectations/concerns of 50 mothers with preterm infants and compared them to 25 mothers with term infants (Padovani, Linhares, Pinto, Duarte, & Martinez, 2008). The mothers of premature infants who had positive expectations were predicted to provide optimal infant development (Padovani, et al., 2008). This study analyzed the data per full term and preterm status, not per mother’s age. The preterm mothers reported more negative or conflicting feelings and reactions in relation to their infants’ birth (Padovani, et al., 2008).

Many studies report that adult mothers were confused and/overwhelmed by behavioral presentations of preterm infants (Barnard, et al., 1984; Field, et al., 1980; & Karl, 1995). Adolescent mothers may be more overwhelmed by the experience.
Understanding preterm infant behavioral cues may help alleviate the conflicting feelings mothers experience in the NICU.

Interaction Characteristics of Infants

The Barnard model outlines two factors infants contribute to the interaction: clarity of cues and responsiveness to the mother (NCAST, 1995). Clarity of cues refers to infants’ abilities to send clear cues to their mothers. The skill and clarity with which infants are able to communicate cues (hunger, distress, satiation, interaction, etc) typically determines the ease with which mothers are able to interpret and respond to the cues. Adolescent mothers have difficulty interpreting cues (Koniak-Griffin & Verzemnieks, 1991) and preterm infants have difficulty communicating cues clearly (Barnard, et al., 1984).

Infants’ responsiveness to their mothers refers to the infants’ abilities to respond to the mothers’ attempts to communicate through touch, verbalizations, movement, and interactions. Responsiveness may be problematic for premature infants who have not achieved state organization. The Barnard model states that mothers have the ultimate responsibility to recognize and adapt to their infants’ behavior so that their interactions become positive and flow smoothly (NCAST, 1995).

Significance of Interaction on Child Health and Development

The findings from multiple research studies consistently indicate that adolescent mothers are less verbally and emotionally responsive, show less positive affect, and have less intense emotional and behavioral interactions with their children than adult mothers (Christopher, Meehaet al., 1999; Deutscher, et al., 2006). A recent study found that there
were clear differences in physiologic responses to infants’ cues between adult mothers and adolescent mothers in the pattern of relations between the underlying physiology and subjective self-report (Giardino, et al., 2008). When adolescent mothers (ages 14-19 years) self-reported that they were responsive to their infants, objective physiological indicators (cortisol levels) suggested that they were less responsive than adult mothers (>19 years).

Children of adolescent mothers have been shown to have more profound behavioral problems and learning delays compared to children of adult mothers (Duetscher, et al., 2006; Keown, Woodward & Field, 2001). In 2006, the National Institute of Child Health and Human Development study of early child care and youth development reported that family characteristics have more influence on child development than experiences in childcare (Duetscher, et al., 2006). The most consistent predictor of child cognitive and social development was the quality of the mother-child interactions. Mothers who were more sensitive, responsive, attentive, and cognitively stimulating during observed interactions had children with the best outcomes.

An intervention study of adolescent mothers ages 13-20 years, investigated the impact of a short-term interaction-focused curriculum on maternal behaviors and child development outcomes (Deutscher, et al., 2006). The goal of the curriculum was to help adolescent mothers consistently watch and monitor their infants so they could read their cues and respond in ways that would facilitate infants’ development. The intervention group consisted of 48 mother-child (3-29 months) dyads who received a relationship-focused curriculum (PACES Program) in 24, 1-hour sessions. The control group included
48 mother-child dyads who attended a parenting class. Dyad interactions were videotaped pre- and post-intervention. Quality of interactions were evaluated using the Maternal Behavior Rating Scale-Revised (MBRS-R), a 12- item scale that assessed attributes of interactive style. This study also used the Language Facilitation Rating Scale (LFRS), a method of rating adult behaviors that facilitates a child’s language acquisition and the Developmental Activities Screening Inventory-II (DASI-II), a 67-item, nonverbal, informal measure to screen children between birth and 60 months of age for developmental delays. Significant differences were found in mothers of the intervention group compared to those in the control group including: Responsiveness factor, $F(1, 92) = 6.64, p=.012$; partial $n^2 = .07$, lower scores on the Directiveness factor, $F(1, 92) = 7.97, p=.006$; partial $n^2 = .08$, and higher developmental quotient scores on DASI-II, $F(1, 81) = 5.83, p=.018$; partial $n^2 = .07$. While this study was conducted solely with adolescent mothers, it did not include preterm infants. Behavioral cues of preterm infants could have been incorporated into the instructional aspect of the intervention.

A study from Spain included mothers aged 16-38 years divided into high- and low-risk for physical abuse categories (Cerezo, et al., 2008). Maternal interactive profiles and quality of attachment at 15 months of age were studied. This one year study consisted of videotaping 80 free play interactions between parent and child as well as eight episodes of the strange situation, an experimental condition set up to determine the child’s attachment status to a primary caregiver. The researchers found that high-risk mothers had infants who were significantly more likely to develop insecure attachment as a result of the high-risk mother being less sensitive, more intrusive and less discriminant
regarding infants’ behavior. Neither mothers younger than 16 years of age, nor premature infants were included in this time and labor-intensive project.

**Adult Mothers**

Leitch (1999) studied mother-infant interactions in an adult sample (aged 18-44 years) with infants (36 weeks gestation or greater) using a quasi-experimental design. The treatment group (n = 14) attended infant communication education two weeks prior to delivery. The control group (n = 15) attended routine teaching sessions discussing cord care, bathing and risk factors related to early discharge. The Nursing Child Assessment Teaching Scale (NCATS) was used as an interaction measurement tool. The researcher found a high correlation between infants’ clarity of cues and responsiveness to caregivers ($r = .80, p < .001$) in the treatment group. The study was limited by the small sample size. Older adolescents were included in this study (age range 18-44) but the number of participants aged 18-21 was not specified in the article.

Another study with adult mothers (ages 18-41 years) explored maternal responsiveness in a convenience sample of 180 new mothers using an on-line data collection method (Drake, et al., 2007). A 60-item survey with three subscales including Maternal Infant Responsiveness Instrument, Rosenberg Self-Esteem Scale and the Satisfaction with Life Scale along with socio-demographic questions and infant feeding items were used. A statistically significant regression equation was found ($F = 4.176, p < .01$), resulting in an $R^2$ of .201, or 20% explained variance in maternal responsiveness scores. Individual beta weights ($B$) were compared. Three variables, satisfaction with life
Drake and colleagues (2007) found that first-time mothers reported less maternal responsiveness than non-first time mothers. Unexpected findings in this study included low income mothers reporting equal maternal responsiveness to higher income mothers; working mothers reporting equal levels of responsiveness as those who did not work outside the home and single mothers were not significantly different from married mothers in their responsiveness reports. These findings contradict other research that indicate relationships between maternal responsiveness, age (Mercer, 1981, 1986), educational level (Walker, Crain & Thompson, 1986), and socioeconomic status (DeWolf & van Ijzendoorn, 1997; Mercer, 1981, 1986; Sroufe, 1985). The differences in this study may be due to self-report versus observation of their behaviors.

One study focused on adolescent mothers and their affectionate behaviors in the NICU setting using the Affectionate Behavior Assessment (ABA) (Christopher, et al., 1999). The intent of this study was to modify a previously used parent-infant interaction tool and demonstrate interrater reliability. While the authors did not report the results of the demonstrated affectionate behavior, they did report the status of the tool. The five behaviors assessed by two NICU nurses included 1) non-instrumental touch, 2) smiling at the baby, 3) looking at the baby, 4) looking en face, and 5) vocalizing to the infant. The purpose of the study was to determine whether nurses could observe these behaviors while performing usual care duties and to assess inter-rater reliability and measure Cronbach’s Alpha and construct validity. Findings indicated that nurses have the ability
(ICC = .86) to observe maternal behaviors while performing usual duties and that the ABA obtained acceptably reliable (Cronbach’s alpha = .85) and construct valid estimates of adolescent mothers’ affectionate behaviors towards their infants. This study examining affectionate behaviors (holding, touching, stroking, talking) is important in that it indicates the developing quality of interactions between the mothers and infants.

**Mother-Infant Interaction with Preterm Infants**

As with the parenting literature, adult mothers with premature and term infants have been frequently studied. The mother-infant interaction literature focuses on sensitivity to cues, developing a responsiveness and synchronicity with children in order to foster children’s growth and development (Cerezo, et al, 2008; Drake, et al, 2007; Leitch, 1999). Maternal responsiveness is a priority in the emotional and cognitive development of children (Milgrom, Westley, & Gemmill, 2004; Richter, 2004). Maternal responsiveness, with origins in attachment theory (Bowlby, 1969), is a construct that describes sensitive interactions between mothers and children.

Prematurity status complicates the quality of maternal-infant interactions in the NICU setting and in the home setting (Davis, et al., 2003; Mueller-Nix et al., 2004). Increased stress levels, due to prematurity status, alters maternal interaction behaviors and results in less sensitive approaches to parenting (Muller-Nix et al, 2004). The less sensitive interaction behaviors have been shown to persist through the formative childhood years (Davis, et al., 2003).

Schroeder and Pridham (2006) studied adult mothers, aged 20-42 years, with preterm infants in the NICU and their interaction/parenting skills using a guided
participation intervention. Findings indicated that mothers who participated in the intervention group demonstrated greater gains in the development of relationship competencies before the infants’ NICU discharge. Mothers were more attuned and adaptive to their infants’ needs. Limitations included a small sample size (N=16) and lack of descriptive statistics on non-participants.

An Australian study examined feeding interactions of adult mothers (aged 18-42 years) and preterm infants one month after birth while in the NICU setting and three months after NICU discharge (Davis, et al., 2003). As expected, preterm infants had a lower total score on the feeding scale than their term counterparts at both time points. The only significant correlation was found between infants’ total scores on the NCAST feeding scale and the mothers’ coping behaviors ($r=0.308$, $p=.029$), indicating an association between mothers who coped better while infants were in the NICU and those who had more responsive infants at three months after discharge from the NICU. Limitations of this study included a small and homogenous sample size.

Mother-infant interactions and maternal stress were examined in adult mothers (mean age =34 years, SD 5 years) with high-risk and low-risk preterm infants at 6 and 18 months (corrected age) and the relationships with perinatal risk factors and maternal stressful traumatic experience (Muller-Nix et al., 2004). The researchers found that mothers of high-risk infants and those that had experienced traumatic stress in the perinatal period were less sensitive and more controlling at six months than mothers of low-risk infants. The preterm infants were different from the full term infants at 18
months of age in terms of interactional behaviors and this was correlated with maternal traumatic stress but not with perinatal risk factors.

While there is abundant literature detailing mother-infant interactions and outcomes in adult mothers with term and premature infants, there is very little information regarding adolescent mothers with premature infants in the NICU setting. Assessing the quality of mother-infant interactions, social support, and stress of adolescent mothers and their premature infants while in the NICU will provide useful information for developing interventions to assist this vulnerable dyad.

SUMMARY

Infants’ relationships with their mothers provide the foundation for development of emotional stability, readiness to learn, social competence, self-confidence, and security. The provision of sensitive, nurturing, stimulating, and nonrestrictive actions fosters optimal development (Berlin, et al., 1998). Behaviors by adolescent mothers that indicate positive interaction include interpreting behavioral cues in a timely and sensitive manner, responding to infants’ distress by comforting premature infants, talking to infants, smiling, and watching infants respond to these actions. Researchers suggest that a heightened sense of awareness of positive mother-infant interactions is needed for mothers of preterm infants because the preterm infants’ cues are often less noticeable and require more energy than those of term infants (Karl, 1995).

There is a lack of information about adolescent mother premature infant interaction in the NICU setting. Important variables to consider in researching this population include age, education, social support, stress, and expectations of the
adolescent mother. Descriptive characteristics of premature infants including gestational
and current age, birth and current weight, and length of stay in the NICU are important to
consider as they may be related to the adolescent mothers’ variables. When researching
adolescent mother-premature infant interaction, premature infants are not expected to
bring equal interactive capabilities due to their prematurity status. The focus of the
nursing intervention, which was the focus of this study, was on adolescent mothers as
they are cognitively more mature than their preterm infants and they will be the ones to
guide their premature infants through the interactive process.
Chapter 3: Methods

This chapter includes a description of the study design, the target population, and the recruitment strategies used. Protection of human subjects in data collection, data collection procedures, instrumentation, and data analysis methods are presented.

DESIGN

The design for this study was a one-group, pretest-posttest, exploratory intervention assessing synchronous interaction between adolescent mothers and their premature infants in the neonatal intensive care unit (NICU). This method was selected because research in the NICU setting with adolescent mothers and their premature infants has not been widely reported in the literature. Exploring the characteristics of the adolescent mothers and their premature infants in the NICU environment and how they relate to one another is of importance. Although an experimental design would have been ideal for intervention research, this was a population that has not previously been addressed and this exploratory study was conducted to determine feasibility for a larger, more rigorous study.

HUMAN SUBJECTS PROTECTION

This study was reviewed by The University of Texas Institutional Review Board (IRB) and the Scientific Research Review Board of St. David’s Medical Center. Although this study involved two highly vulnerable populations, adolescent mothers and premature infants, this project received an expedited review due to the observational nature of the study. Approval from the IRB for the protection of Human Subjects at The
University of Texas at Austin and St. David’s Medical Center Research Review Committee was obtained prior to the beginning of the study.

Participants were videotaped during this study. In order to protect confidentiality, participants were not identified by name or in any other manner (e.g., medical record number, birth date, insurance identification) that could potentially identify them. The adolescent mothers and their guardians were informed of the procedures, potential risks, and benefits of the study. The guardians and adolescent mothers signed a consent/assent form assuring that the adolescent mothers agreed to participate in the research study. A participation number was assigned to the feeding scale forms, the social support survey, the stress survey, the demographic form, and the videotape for each dyad. Participants were informed that findings would be presented as group data with no personal identifying information reported. Information obtained from participants was guaranteed to be used only for the purposes of the study.

All study related data including consent forms, videotapes, feeding scale assessments, questionnaires, and demographic information were kept in a locked filing cabinet in the principal investigator’s home office. The videotapes were erased once the study was completed and the dissertation was defended.

SAMPLE

The population of interest was adolescent mothers with preterm infants. A convenience sample of 27 adolescent mother-premature infant dyads in a single NICU setting was recruited.
Inclusion criteria for the adolescent mothers included: (a) aged 13-21 years, (b) providing primary care of the infants post discharge, and (c) willingness to be videotaped.

Inclusion criteria for the premature infants included: (a) being ≥34 weeks post-conceptional age, (b) receiving level II care, (c) taking full oral feedings, and (d) maintaining a stable temperature. Inclusion criteria for the adolescent mothers included: (a) being 13-21 years of age, (b) speaking and understanding English, (c) planning to retain custody of the infants and functioning as primary caregivers of their infants, and (d) providing oral feedings (bottle or breast) to their premature infants in the NICU.

Exclusion criteria for the premature infants included: (a) history of congenital or genetic anomalies, (b) history of bronchopulmonary dysplasia, (c) experiencing drug withdrawal, and (d) history of intraventricular hemorrhage.

**Sample size determination**

Using GPower 3.0.10, the estimate of sample size was based on $t$ tests using synchronous interaction means of adult mothers: difference between two dependent means (matched pairs) model. The significance level was set at the .05 level (alpha = .05), and the power level was set at .80 because these levels have been suggested for use in many areas of behavioral science research (Munro, 2005). Using these parameters, the total sample size for this analysis was calculated to be 27 dyads.

**STUDY PROCEDURES**

**Setting**

The study was conducted at an urban medical center in central Texas. The 90-bed NICU has a continuing care bay where premature infants stay to master feeding skills
prior to being discharged home. Infants in this area remain on cardiac and apnea monitors throughout their stays. In the continuing care bay unit, premature infants are placed in open cribs. Rocking chairs are next to each crib and curtains may be drawn around each area for privacy during feeding or bonding times. For this study, the feeding observation videotaping took place at crib side with curtains drawn for privacy.

**Participant Recruitment Procedures**

The investigator worked cooperatively with the NICU director and the shift nurse managers to identify eligible participants. The principal investigator (PI) provided a list of inclusion criteria to all shift managers and bedside nurses. Shift managers were asked to review the unit census to identify eligible adolescent mothers. As an employee of the NICU, the PI was given potential participant names and phone numbers to call and determine interest. During the weekly visits to the unit, the PI occasionally encountered potential participants at the bedside and explained the study procedures in person at that time.

The study was explained to all potential participants and legal guardians for participants younger than 18 years of age, either by telephone or in person. After the explanation of procedure, risks and benefits, if adolescent mothers and their parents/guardians were willing to participate, written informed consent/assent was obtained and a copy was provided to the participants.

**Time 1 Observation (Pre-Test)**

After consent was obtained, demographic information was retrieved from the bedside chart as well as verbally from the adolescent mothers. The demographic
information included mothers’ age, ethnicity, grade level, infants’ gestational age at birth, current age, birth weight, current weight, number of days in NICU, and involvement of the infants’ fathers.

Adolescent mothers completed the study-related forms after signing the consent/assent form. Study participants completed the PRQ-85 part 2, providing a description of the adolescent mothers’ perceptions of available social support. The PSS: NICU Questionnaire was administered to determine stress levels relating to the NICU environment.

Observations of feeding interactions were conducted according to the infants’ individual feeding schedules. The feeding observations were videotaped with a Sony digital video recorder on a tripod while the PI observed and scored the feeding interaction. The adolescent mothers were informed that no verbal interaction would occur with the researcher during the feeding interaction periods and that the interactions should be as natural as possible.

During five of the 54 video tapings, family members, boyfriends, or nursing staff interrupted the feeding interaction despite being asked to wait until the videotaping was completed. The researcher continued to record these feeding interactions despite the interruptions and stressed to the adolescent mothers the importance of uninterrupted interaction during the subsequent taping. Nursing staff were re-educated about the purpose of the project and importance of not interrupting feeding interactions.
Preterm Infant Cues Intervention

The PI and the adolescent mothers remained at the crib side for the intervention phase of the study. The PI reviewed preterm infant cues using the Infant Behavior and Communication Guide (see Appendix I) with the adolescent mothers. The guide specifically discussed engagement, disengagement, and self-regulatory cues of preterm infants. The PI and adolescent mothers reviewed the video-taped interactions at the crib side in order to determine whether the adolescent mothers recognized preterm infant cues displayed by their infants during the feeding interaction. Using the NCAFS form as a guide, the PI discussed the positive aspects of the feeding interactions as well as highlighted infant cues that the mothers may have missed during the interactions. The adolescent mothers received a copy of the Infant Behavior and Communication Guide that detailed specific infant cues and suggestions about how to respond.

Observation of the feeding interaction with the NCAFS was completed according to the infant’s feeding schedule or feeding demands. All study participants were thanked for their time and were compensated with a $10.00 gift card and an infant cue guide for completion of part one of the study.

Intervention fidelity refers to ensuring that the intervention was delivered during a research study as planned (Horner, Rew, & Torres, 2006). For this study, intervention fidelity was ensured by establishing a fidelity checklist (Appendix G), audio-taping of each intervention session and independent review of all audiotapes. A Master’s Degree prepared Registered research nurse listened to the audiotapes while using the fidelity checklist to verify completeness and consistency of the intervention delivery.
**Time 2 Observation (Post-test)**

The second feeding interaction observations occurred within 24-48 hours after the first observations during a regularly scheduled infant feeding time. The curtains were drawn around the crib side for privacy. The feeding observations were videotaped with a Sony digital video recorder on a tripod while the PI observed the feeding and scored the NCAFS. The adolescent mothers were informed that no verbal interaction would occur with the researcher during the feeding interaction period and that the interaction should be as natural as possible. All study participants were thanked for their time and were compensated with a $15.00 gift card for completion of the study.

**INSTRUMENTATION**

Three instruments were used in this research study. The Nursing Child Assessment Feeding Scale (NCAFS) was used to quantify interactions between the adolescent mothers and premature infants. The Parental Stress Scale: Neonatal Intensive Care Unit (PSS:NICU) was used to assess the adolescent mother’s stress of having an infant in the NICU. The Personal Resource Questionnaire (PRQ85) was used to assess the quality of perceived social support of the adolescent mother.

**Nursing Child Assessment Feeding Scale**

*Description*

The Nursing Child Assessment Feeding Scale (NCAFS) provided an objective measure of parent-infant interactions during feeding episodes. This 76-item, binary (yes/no) scale assessed qualities that both the mothers and the infants brought to the relationships. Barnard and colleagues (1984) described the mother-infant interaction as a
dialogue or a mutually “adaptive waltz” between partners. This mutual mother-infant
dance has been defined by others as attunement (Stern, 1985), synchrony (Censullo,
Bowler, Lester, & Brazelton, 1987), contingency (Greenspan & Lieberman, 1980), and
emotional availability, reciprocity or mutuality (Brazelton, Koslowski, & Main, 1974).

The feeding scale was originally developed as a 7-point rating scale in 1972. The
scale was revised in 1979 and again in 1994 to simplify wording of some items (NCAST,
1995). The feeding scale has been widely used around the world by nurses, social
workers, occupational therapists, and psychologists with children birth to 1 year of age
for research, assessment, and teaching purposes (Farel, et al., 1991; Field, et al., 1980;
Karl, 1995; Lawhon, 2002; & NCAST, 1995).

Six concepts that comprise the feeding scale are described below. 1.) Contingency
is one of the processes by which behavior is shaped over time (NCAST, 1995). A
contingent pattern of communication between infants and mothers includes the infants
turning to listen or when mothers speak or when infants signal the need to disengage
from an interaction, mothers give infants a break in interaction. When mothers
immediately respond to infants, infants learn to connect individual behavior with the
mothers’ responses. Understanding the importance of this connection motivates mothers
to read the infants’ cues and respond based on the interpretation of the meaning of the
behavior. When contingent responses are positive, they tend to create behavioral patterns
since they provide a mechanism by which infants understand the relationship between
behavior and environment that builds security. Therefore, a contingent pattern of
communication between mothers and infants is essential. 2.) Positioning of infants during
a feeding requires sensitivity to the infants’ developmental stage. 3.) Mothers are encouraged to verbally communicate with their infants during feedings. Mothers alert their infants when they speak with them and foster cognitive growth using language and giving meaning to everyday experiences and objects. 4.) Sensitivity implies monitoring and responding to the infants’ needs. 5.) Affect or the expression of emotions (positive or negative) by mothers will result in communication patterns that are either positive or negative. 6.) Engagement and disengagement is an attention withdrawal pattern that is the basis of interaction and communication.

The NCAFS contains four maternal subscales that incorporate the six concepts within each subscale. The first subscale, sensitivity to cues, assesses mothers’ abilities to recognize and respond to infants’ cues. Mothers display sensitivity through positioning, stimulation, and timing. Sensitive mothers time their stimulation (i.e., touching, talking, movement) contingently with their infants.

The second subscale, response to distress, assesses mothers’ abilities to soothe or quiet the distressed infants. Distress is communicated by infants through potent disengagement cues such as: crying, back arching, halt hand, pushing away, pulling away, spitting up, coughing, and/or withdrawing from an alert state to a sleep state (NCAST, 1995). Disengagement cues are how infants communicate the need to take a break from an interaction. The mothers’ abilities to alleviate distress depend on their ability to recognize infants’ cues and their timely responses to the distress. Barnard and Kelly (1989) stated that “contingent responsiveness” communicates to infants that they are important and can affect their environment.
The third maternal subscale, social-emotional growth fostering, includes the affective domain and communicates a positive feeling tone toward infants. Behaviors such as mutual eye contact, facial expressions, touching, verbalizations, and voice tone are assessed. Cognitive growth fostering is assessed with the fourth maternal subscale. This scale focuses on the type of learning experiences mothers make available to infants. This is seen during interaction in both quality and quantity of verbalizations and in the exploratory behavior that is encouraged (NCAST, 1995).

There are two infant subscales: clarity of cues and responsiveness to caregiver. Clarity of cues refers to the infants’ abilities to communicate needs to their mothers. The skill and clarity with which infants communicate their needs makes it either easy or difficult for mothers to understand infants and make appropriate changes in behavior to meet infants’ needs. Ambiguous or confusing cues interrupt the mothers’ adaptive capabilities and affect the quality of the interaction.

During the feeding, infants communicate cues of hunger, distress, satiation, interaction, and rest. Infants who display clarity of cues, signal readiness to eat by displaying some tension at the beginning of the feeding followed by a decrease in tension once the feeding has commenced. Most infants begin feeding in the active alert or crying state. Alert infants are more likely to send cues to their mothers for interaction through vocalizations and smiles (Barnard & Kelly, 1989). Infants who are alert during the feeding are more likely to cue mothers for interaction through eye contact, vocalization, and smiles. Preterm infants often do not display clear cues, i.e., readiness to eat, and/or interact (Holditch-Davis, et al., 2003).
Responsiveness to caregiver refers to the infants’ abilities to respond to the mothers’ attempts to communicate and interact. Just as infants send cues so that mothers can modify their behaviors, infants also “read” and respond to mothers’ behaviors. Examples of infant responsiveness are demonstrated when: infants stop crying following the mothers’ attempts to soothe; infants look in the direction of mothers when mothers talk; infants vocalize or smile after mothers vocalize or smile. These behaviors are reinforcing to the continuation of positive care-giving behaviors and adaptive mother-infant interactions. Over time, infants improve in their abilities to send clear cues and respond to the mothers’ behavior.

**Inter-rater Reliability**

When the scale is used specifically for research purposes, the researcher must first receive training through the Nursing Child Assessment Satellite Training Center (NCAST) at the University of Washington and achieve at least 90% reliability on the feeding scale. Scale use for assessment and/or parent teaching purposes requires reliability achievement of 85%. The most appropriate time to observe mother-infant interactions using the feeding scale is during a regularly scheduled feeding time when the infant is hungry. The interaction assessment has been conducted in diverse settings including: homes, clinics, hospitals, research labs and professional offices.

**Data Collection Instructions**

The researcher (observer) followed standard procedures when collecting NCAST data. This included communicating to mothers that the feeding should be as normal as possible. Mothers were informed that the researcher would not speak to them or their
infants during the feeding and mothers should act as though the researcher was not present. The researcher was positioned to see the mother and child continuously. The mothers were informed that the researcher could change positions to better see them or their infant. The mothers were instructed to tell the researcher when the feeding began and when the feeding ended, so only the feeding interaction was being scored. Once the feeding ended, the researcher scored the scale.

**Observations**

There are three critical times during the feeding in which increased activity may be observed. These are at the beginning of the feeding, in the middle when infants are burped and at the end of the feeding. Typical cues include a build up of tension at the beginning of the feeding as infants are hungry and ready to eat, then a decrease in tension about one minute into the feeding. An increase in activity will be seen around the middle of the feed preparing for a burp. Towards the end of the feeding infants may gradually demonstrate cues of satiation or this may occur abruptly.

The length of the feeding will affect the researcher’s ability to identify interaction behaviors. Feeding times of 10-15 minutes should allow enough time for the researcher to observe adequate interactions. Feeding times less than 10 minutes may be difficult to score in that not enough interactions took place or the interactions were too rapid and items were missed.

The NCAST database, housed at the University of Washington, consists of 1,914 feeding cases with ethnic representation including Caucasian (n=791), African-American (n=431), Hispanic (n=301), Other (n=391) collected since 1980 (NCAST, 1995). Group
differences and standard scores are based on the database cases and are used as standard score comparisons for all research and clinical professionals using the scales. The comparison data includes mean scores and standard deviations for adolescents, low education adults, high education adults, and ethnicity. Feeding scale 10th percentile cutoffs by ethnic group are available as a quick comparison assessment. Worrisome scores are those that fall below the adolescent average or below the 10th percentile cutoff score.

Total Parent scores are consistently lower for adolescents, intrusive mothers, low education adults, Hispanic mothers, and black versus white adolescents (NCAST, 1995). Infant Total scores are consistently lower for preterm infants, newborns in a non-alert state during feeding, and avoidant-compliant children (NCAST, 1995). The Overall Total scores are lowest for adolescents and infants at high risk due to medical or social reasons (NCAST, 1995).

**Scoring**

Subscale items and contingency items within each subscale are totaled by the number of “yes” items. Scores for each of the subscales range from zero, indicating none of the behaviors were observed, to the total number of items in each subscale, indicating that all item behaviors in the subscale were observed in the interaction. The four caregiver subscale scores combine to create a caregiver total with a possible maximum score of 50 and the two infant subscales scores combine to create a infant total with a possible maximum score of 26. The caregiver and infant scores are combined to create a
dyadic total with a maximum score of 76. A high score represents more optimal interaction between mothers and infants.

Within the four caregiver subscales and one of the infant subscales, specific items represent the contingency items. For the instrument user these items are highlighted in gray as a visual clue to their significance in assessing contingency. There are 15 contingency items in the caregiver subscales and 3 contingency items in the infant subscale for a total of 18 items. These items are totaled by “yes” responses and a total is computed for the caregiver, the infant, and the dyad providing three contingency scores: mother-, infant-, and total-contingency score.

**Psychometrics**

Inter-rater reliability was calculated using the NCAST inter-rater reliability form. Six of the dyads (22%) in the present sample, were randomly chosen to test inter-rater reliability. The video recordings were coded by a second NCAST certified instructor. Scoring is considered reliable if the coders score 90% or above (NCAST, 1995). The inter-rater reliability between the researcher and the second certified instructor was .97, indicating excellent reliability.

Cronbach’s alphas for the subscales of the NCAFS demonstrate reliability with total parent score of .83, total infant score of .73, and a combined scale score alpha of .86 (NCAST, 1995). Internal consistency reliability was conducted using the cases from the NCAST feeding database inclusive of multiple ethnicities, adolescent and adult mothers, term and preterm infants, high and low educational samples.
NCAFS is meant to measure interactions between parents and infants that facilitate communication and learning for both parents and infants. Concurrent validity was assessed with correlations between the NCAFS and the Home Observation and Measurement of the Environment (HOME) scores. Barnard and colleagues (NCAST, 1995) assumed that the sample of interactions they were observing when scoring a feeding interaction was an overlapping but not identical set with the sample obtained on the HOME scale. A moderate correlation between the NCAFS and HOME scales was expected with the parent subscales and total score, but not necessarily with the infant subscales. The following correlations were significant (p < .01), thus demonstrating instrument validity: cue sensitivity, response to distress, social emotional and cognitive growth fostering, cue clarity, response to parent, total parent, total infant, and total scale scores (NCAST, 1995).

Discriminant validity, used to evaluate construct validity, determines whether the scale discriminates between groups who differ in interactive capability. Discriminant validity was demonstrated exploring difficult infant temperament (Zeanah, Keener, & Anders, 1986), preterm infants (Harrison, Sherrod, Dunn, Olivet, & Jeong, 1991; Kang, Barnard, Oshio, & Hammond, 1991), and adolescent mothers (Ruff, 1990; vonWindeguth & Urbano, 1989).

**Parental Stressor Scale: Neonatal Intensive Care Unit (PSS: NICU)**

**Description**

The Parental Stressor Scale: Neonatal Intensive Care Unit (PSS: NICU) was developed to measure parental perception of stressors in the physical and psychosocial
environment of the ICU. The instrument is comprised of three dimensions: Sights and sounds of the unit, infant behavior and appearance, and parental role alteration. This measurement tool has been widely used for over a decade with adult and adolescent populations with substantial support for reliability and validity of the scale.

The PSS: NICU was adapted from Parental Stressor Scale: Pediatric Intensive Care Unit (PSS: PICU), (1982; 1989) to measure parental perception of stressors arising from the physical and psychosocial environment of the intensive care unit. The PSS:NICU was adapted to reflect the stressors associated with the appearance of premature infants, changes in parental roles that differ for parents of sick infants, and differences in routines and environment of the NICU.

**Psychometrics**

The psychometric evaluation of the PSS: NICU included 190 parents (115 mothers and 78 fathers) in five NICUs in the United States and Canada. The majority of participants were white (79.8%). The age range was 13-41 with the mean age 27.5 years ($SD = 6.9$).

Two forms of this instrument are available: a self-report form and an interview form to be used when literacy is questionable. Parents are instructed to rate the stressfulness of each item on a scale from 1 (not at all stressful) to 5 (extremely stressful). Parents are also asked to indicate whether they experienced any of the descriptors during the NICU stay; they do not rate items they have not experienced. There are two metric scales Stress Occurrence Level (Metric 1) and Overall Stress Level (Metric 2). Miles stated that two metric scales strengthen the scale in that it can be scored in two different
ways (either by Metric 1 or by Metric 2). The reliability coefficient (Cronbach’s alpha) for metric one is .94 and metric two is .89, indicating high reliability (Carter & Miles, 1989). For this study, the PSS: NICU was scored using Metric 2: Overall Stress Level. This metric was chosen because of the variability of days spent in the NICU for this sample population.

**Personal Resource Questionnaire-85 – Part 2 (PRQ85)**

*Description*

The Personal Resource Questionnaire-85 (PRQ85) is a self-report measure of perceived social support based on Weiss’s multidimensional model of social support (Brandt & Weinert, 1981; Weinert, 1987). The five dimensions of social support considered include: social integration; opportunity for nurturant behavior; reassurance of worth; provision for attachment or intimacy; and availability of informational, emotional, and material help. Items are rated on a seven point scale from 1 (strongly disagree) to 7 (strongly agree). After reverse scoring one item in each dimension, item ratings are summed to produce a score between 25 and 175, where a higher score reflects a higher level of social support.

Yarcheski, Mahon, and Yarcheski (1992) reported a coefficient alpha of .89 among 325 female adolescents of multiethnic backgrounds. The coefficient alpha for the total sample of the study was .79. Cronbach’s alpha reliability for the English version of the PRQ85 was .84. Content validity of the original version of the PRQ85 was established by experts in social support. Construct validity of both the original and the
present version of the PRQ85 were established through correlation with measurements of related concepts (Brandt & Weinert, 1981; Yarcheski, Mahon, & Yarcheski, 1992).

**ANALYSES**

The data from the demographic form, the NCAFS, the PSS: NICU, and the PRQ85 Part 2 were entered into a database using the Statistical Package for the Social Science (SPSS) Windows release 17.0. The statistical significance level for all research questions was set at $p \leq .05$. Prior to conducting descriptive analyses, correlational analyses, and simple regression, all data were examined for accuracy, as well as missing values and normality.

Descriptive statistics, including means, standard deviations, ranges of scores, frequencies and percentages were used to describe characteristics of participants and provide a description of study variables including total scale scores and subscales for each instrument in the study. Frequencies and distributions were analyzed to identify outliers and skewness. The study variables of age, education, ethnicity, stress, social support, birth weight, current weight, gestation at birth, current age, and length of stay were individually examined for normality. The results supported normality of age, education, gestation at birth, current age, birth weight, current weight and length of stay.

The variables of social support and stress showed skewed scatter plots so all correlations were conducted using Spearman’s Rho. Cronbach’s alphas used to determine the internal consistency of the social support and stress surveys are reported in Chapter 4.
Question 1

What are the relationships between stress and social support in adolescent mothers, and demographic characteristics of the adolescent mothers (age, education) and preterm infants (length of stay in the NICU, current age, and current weight) at baseline?

To address this question, descriptive statistics were reported for the demographic characteristics of the adolescent mothers. Spearman rank correlation was used to determine the relationship between the independent and dependant variables. The assumptions for correlations are: a) the sample must be representative of the population; b) the correlated variables must have normal distribution; c) the assumption of homoscedasticity (equal variability) must be met; and d) the relationship between the variables must be linear. To satisfy the assumptions for correlation, normal distribution was assessed with histograms, homoscedasticity was checked using scatter plots, and linearity was examined by creating a graph of the independent and dependant variables and inserting a line of best fit. Since significant correlations were not found among the independent and dependant variables, a regression model was not tested.

Question 2

What is the effect of adolescent mothers’ social support on synchronous interaction with their preterm infants at the first feeding observation?

Descriptive analyses including percentages, means, standard deviations, and ranges were reported. Spearman rank correlation was used to determine the relationship between the self reported social support and the NCAFS scores.
Question 3

What is the effect of adolescent mothers’ stress on synchronous interaction with their preterm infants at the first feeding observation?

Descriptive analyses including percentages, means, standard deviations, and ranges were reported. Spearman rank correlation was used to determine the relationship between the self-reported social support and the NCAFS scores.

Question 4

What is the effect of a nursing intervention (Preterm Infant Cues Intervention-PICI) delivered in the NICU on synchronous interaction between adolescent mothers and their preterm infants?

The paired *t*-test was used to analyze the effect of the intervention. The NCAFS subscale and total scale scores were reported using descriptive statistics and then analyzed to test for a significant difference between the first and second feeding observation.

SUMMARY

The design for the proposed study was a one-group, pretest-posttest, exploratory intervention study assessing mother-infant interaction between adolescent mothers and premature infants in the NICU setting. Twenty-seven adolescent mother-premature infant dyads participated in this study of synchronous interaction in the NICU environment. All dyads were observed for synchronous behavior during two feeding sessions in the NICU. An intervention following the first feeding observation included educating adolescent mothers about their infants’ cues and reviewing their initial videotaped interaction. All
mothers completed the PSS: NICU scale and PRQ-85 Part 2. Data were analyzed using SPSS, 17.0 to answer the research questions.
Chapter 4: Results

This chapter contains findings from the data analysis procedures of the dissertation study. A significance level of .05 was set for all statistical analyses. A description of the study sample is presented and descriptive statistics for each of the study variables are presented. The findings for each research question are presented.

DEMOGRAPHICS OF THE SAMPLE

Twenty-seven adolescent mothers were recruited between mid October 2009 and mid February 2010. Demographic information for the adolescent mothers is presented in Table 1. A total of 27 dyads participated in the study. Adolescent mothers ranged in age from age 14 to 21 years ($M = 17$, $SD = 2.28$). The majority of the subjects were Hispanic (70.4%) and the remaining participants were Caucasian. This was the first birth for the majority of the adolescent mothers (70.4%). Fathers were involved in less than half of the sample (44.4%). Educational levels ranged from 8th to 12th grade for the sample ($M = 10.81$; $SD = 1.21$).

Demographic information for the preterm infants is presented in Table 2. The majority of the preterm infants were male (51.9%). Gestation at birth ranged from 23 to 37 weeks ($M = 32.56$; $SD = 2.89$) with a majority of the sample falling between 30-33 weeks (55.5%). Current age of the preterm infants at the time of study ranged from 34 to 42 weeks ($M = 36.26$; $SD = 1.43$), with a majority of the sample participating at the 37 week age (37%). Birth weight of the sample ranged from under 1000 to 2860 grams ($M = 1938.81$; $SD = 523.99$), with the majority of the sample falling in the 2001-2860 grams range (48.1%). Current weight of the preterm infants ranged from 1700 to 3585 grams ($M = 2020.61$; $SD = 549.24$).
= 2462.59; $SD = 428.09$). The majority of the sample ranged 2001 to 2000 grams (74%). Length of stay in the NICU ranged from 3 to 91 days ($M = 27.56; SD = 20.98$), with the majority of the study participants having spent 12-30 days in the NICU (51.9%). The preferred feeding type for the sample was bottle feeding (88.9%).

**DESCRIPTIVE STATISTICS**

In the following sections, results of the descriptive statistical analyses of the measures of social support (PRQ-85) and stress (PSS:NICU) are presented (Table 3). Scale reliabilities for this sample are presented. The descriptive statistical analysis of the dependent variable, synchronous interaction (NCAFS scores), follows (Table 4).

**Independent Variable: Social Support (PRQ-85)**

Descriptive results including scale reliability for the social support variable are presented in Table 3. Twenty-five items comprise the social support scale. Responses to statements of social support range from “1 = Strongly Disagree” to “7 = Strongly Agree” with higher scores indicating greater social support. The possible range for the PRQ-85 social support scale was 25-175. The range for this study sample was 90-172, with a mean score of 156.48 ($SD = 21.18$), indicating that the study participants overall reported high levels of social support available to them.

**Independent Variable: Stress (PSS:NICU)**

Descriptive results including scale reliability for the NICU stress variable are presented in Table 3. Thirty-four items including three subscales comprise the PSS:NICU
Figure 2. Consort E Flow Chart

Consort E-Flowchart

Assessed for eligibility
(n = 78)

Enrollment

Excluded (n = 51)
Not meeting inclusion criteria (n = 42)
Refused to participate (n = 9)

Time 1 Observation/PICI
(n = 27)

Time 2 Observation
(n = 27)

Analysis
(n = 27)
Table 1

*Adolescent Mother Demographics (N = 27)*

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Participant Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>3</td>
<td>11.1%</td>
</tr>
<tr>
<td>15</td>
<td>2</td>
<td>7.4%</td>
</tr>
<tr>
<td>16</td>
<td>2</td>
<td>7.4%</td>
</tr>
<tr>
<td>17</td>
<td>1</td>
<td>3.7%</td>
</tr>
<tr>
<td>18</td>
<td>6</td>
<td>22.2%</td>
</tr>
<tr>
<td>19</td>
<td>6</td>
<td>22.2%</td>
</tr>
<tr>
<td>20</td>
<td>3</td>
<td>11.1%</td>
</tr>
<tr>
<td>21</td>
<td>4</td>
<td>14.8%</td>
</tr>
<tr>
<td><strong>Education Level</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8&lt;sup&gt;th&lt;/sup&gt; Grade</td>
<td>1</td>
<td>3.7%</td>
</tr>
<tr>
<td>9&lt;sup&gt;th&lt;/sup&gt; Grade</td>
<td>4</td>
<td>14.8%</td>
</tr>
<tr>
<td>10&lt;sup&gt;th&lt;/sup&gt; Grade</td>
<td>4</td>
<td>14.8%</td>
</tr>
<tr>
<td>11&lt;sup&gt;th&lt;/sup&gt; Grade</td>
<td>8</td>
<td>29.6%</td>
</tr>
<tr>
<td>12&lt;sup&gt;th&lt;/sup&gt; Grade</td>
<td>10</td>
<td>37.0%</td>
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<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>19</td>
<td>70.4%</td>
</tr>
<tr>
<td>Caucasian</td>
<td>8</td>
<td>29.6%</td>
</tr>
<tr>
<td><strong>Birth Order of Infant</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt; Child</td>
<td>19</td>
<td>70.4%</td>
</tr>
<tr>
<td>2&lt;sup&gt;nd&lt;/sup&gt; Child</td>
<td>4</td>
<td>14.8%</td>
</tr>
<tr>
<td>3&lt;sup&gt;rd&lt;/sup&gt; Child</td>
<td>4</td>
<td>14.8%</td>
</tr>
<tr>
<td><strong>Father of Baby Involved</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>15</td>
<td>55.6%</td>
</tr>
<tr>
<td>Yes</td>
<td>12</td>
<td>44.4%</td>
</tr>
</tbody>
</table>
Table 2

*Preterm Infant Demographics (N = 27)*

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Infant Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>13</td>
<td>48.1%</td>
</tr>
<tr>
<td>Male</td>
<td>14</td>
<td>51.9%</td>
</tr>
<tr>
<td><strong>Feeding Type</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breast</td>
<td>1</td>
<td>3.7%</td>
</tr>
<tr>
<td>Bottle</td>
<td>24</td>
<td>88.9%</td>
</tr>
<tr>
<td>Bottle and Breast</td>
<td>2</td>
<td>7.4%</td>
</tr>
<tr>
<td><strong>Current Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34 Weeks</td>
<td>2</td>
<td>7.4%</td>
</tr>
<tr>
<td>35 Weeks</td>
<td>5</td>
<td>18.5%</td>
</tr>
<tr>
<td>36 Weeks</td>
<td>9</td>
<td>33.3%</td>
</tr>
<tr>
<td>37 Weeks</td>
<td>10</td>
<td>37.0%</td>
</tr>
<tr>
<td>42 Weeks</td>
<td>1</td>
<td>3.7%</td>
</tr>
<tr>
<td><strong>Gestation at Birth (Weeks)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23-29</td>
<td>3</td>
<td>11.1%</td>
</tr>
<tr>
<td>30-33</td>
<td>15</td>
<td>55.5%</td>
</tr>
<tr>
<td>34-37</td>
<td>5</td>
<td>18.5%</td>
</tr>
<tr>
<td><strong>Length of Stay in NICU (Days)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-10</td>
<td>5</td>
<td>18.5%</td>
</tr>
<tr>
<td>12-30</td>
<td>14</td>
<td>51.9%</td>
</tr>
<tr>
<td>31-60</td>
<td>6</td>
<td>22.2%</td>
</tr>
<tr>
<td>61-90</td>
<td>1</td>
<td>3.7%</td>
</tr>
<tr>
<td>91+</td>
<td>1</td>
<td>3.7%</td>
</tr>
<tr>
<td><strong>Current Weight (Grams)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1700-2000</td>
<td>4</td>
<td>14.8%</td>
</tr>
<tr>
<td>2001-2999</td>
<td>20</td>
<td>74.0%</td>
</tr>
<tr>
<td>3000-3585</td>
<td>3</td>
<td>11.1%</td>
</tr>
<tr>
<td><strong>Birth Weight (Grams)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Under 1000</td>
<td>2</td>
<td>7.4%</td>
</tr>
<tr>
<td>1001-2000</td>
<td>12</td>
<td>44.4%</td>
</tr>
<tr>
<td>2001-2860</td>
<td>13</td>
<td>48.1%</td>
</tr>
</tbody>
</table>
Responses range from “0 = Not experienced” to “5 = Very stressful” with higher scores indicating higher levels of stress. The possible range for the PSS:NICU is 0 – 170. The range for this study sample was 22-146, with a mean score of 50.85 (SD = 34.08), indicating that the study participants overall reported low stress related to the NICU experience.

**RELIABILITY**

**NCAFS Reliability**

Table 4 reports the Cronbach’s α values that have been established by the Nursing Child Assessment Satellite Training (NCAST, 1995) and the Cronbach’s α values obtained with the current study sample at time 1 and time 2. The study subscale and total scale reliability scores are similar to those established by NCAST. The total scale score Cronbach’s α were .88 and .86, thereby confirming the NCAFS suitable for measuring synchronous interaction in the adolescent mother preterm infant population.

**Inter-rater Reliability**

Inter-rater reliability was calculated using the NCAST inter-rater reliability form. Six of the dyads (22%) of the sample, were randomly chosen to evaluate inter-rater reliability. The video recordings were coded by a second NCAST certified instructor. The second coder reviewed both feeding interactions for six dyads. The second coder was blinded to dates and times of the feeding interactions among the dyads. Scales scores are considered reliable if coders score 90% or above (NCAST, 1995). The inter-rater reliability between the researcher and the certified instructor was .97, indicating that the interactions that were scored are reliable.
Fidelity

Each intervention was audio-taped with a hand-held digital audio recorder. Upon completion of recruitment, the researcher sent the digital recorder with the 27 interventions to a Master’s Degree Registered nurse researcher who listened to all 27 interventions for fidelity purposes. All 27 interventions were certified as having fully met the six criteria outlined in the fidelity checklist, found in Appendix G.

ANALYSES

In the following sections, the results of the statistical analyses are presented as they relate to each research question.

Question 1

What are the relationships between stress and social support in adolescent mothers, and demographic characteristics of the adolescent mothers (age, education) and preterm infants (length of stay in the NICU, current age, and current weight) at baseline?

Table 5 presents the Spearman correlation coefficients for the independent variables of stress, social support, age, and education of the adolescent mothers, and length of stay in the NICU, current age, and current weight of the preterm infants.
### Table 3

**Descriptive Statistics for Social Support (PRQ-85) and Stress (PSS:NICU) (N = 27)**

<table>
<thead>
<tr>
<th>Reliability Variable (Instrument)</th>
<th>Number of items</th>
<th>Scale range</th>
<th>Study range</th>
<th>Mean</th>
<th>SD</th>
<th>Scale α</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Support (PRQ-85)</td>
<td>25</td>
<td>25 - 175</td>
<td>90 - 172</td>
<td>156.48</td>
<td>21.18</td>
<td>0.91</td>
</tr>
<tr>
<td>Stress (PSS:NICU)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Scale Score</td>
<td>34</td>
<td>0 - 170</td>
<td>22 - 146</td>
<td>50.85</td>
<td>34.08</td>
<td>0.98</td>
</tr>
<tr>
<td>(Metric 2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subscales – PSS:NICU</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sights and Sounds</td>
<td>6</td>
<td>0 - 30</td>
<td>5 - 22</td>
<td>10.0</td>
<td>4.60</td>
<td>0.80</td>
</tr>
<tr>
<td>Looks and Behaves</td>
<td>17</td>
<td>0 - 85</td>
<td>3 - 79</td>
<td>19.67</td>
<td>19.06</td>
<td>0.97</td>
</tr>
<tr>
<td>Parental Role</td>
<td>11</td>
<td>0 - 55</td>
<td>9 - 55</td>
<td>21.19</td>
<td>12.55</td>
<td>0.95</td>
</tr>
</tbody>
</table>
Table 4

*Descriptives and Reliabilities for the Nursing Child Assessment Feeding Scale (NCAFS)*

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Number of items</th>
<th>Scale possible range</th>
<th>Study range</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>NCAFS Time 1</td>
<td>76</td>
<td>0 - 76</td>
<td>37 – 67</td>
<td>51.00</td>
<td>8.09</td>
</tr>
<tr>
<td>NCAFS Time 2</td>
<td>76</td>
<td>0 - 76</td>
<td>41 – 67</td>
<td>55.89</td>
<td>7.22</td>
</tr>
</tbody>
</table>

NCAFS Reliability Subscales

<table>
<thead>
<tr>
<th>Subscales</th>
<th>NCAST Established α</th>
<th>Time 1 α</th>
<th>Time 2 α</th>
</tr>
</thead>
<tbody>
<tr>
<td>Established α</td>
<td>(NCAST, 1995)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PARENT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitivity to Cues</td>
<td>.60</td>
<td>.63</td>
<td>.61</td>
</tr>
<tr>
<td>Response to Distress</td>
<td>.69</td>
<td>.83</td>
<td>.61</td>
</tr>
<tr>
<td>Socio-Emotional Growth Fostering</td>
<td>.63</td>
<td>.70</td>
<td>.55</td>
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<tr>
<td>Cognitive Growth Fostering</td>
<td>.69</td>
<td>.90</td>
<td>.80</td>
</tr>
<tr>
<td>CHILD</td>
<td></td>
<td></td>
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<tr>
<td>Child Clarity of Cues</td>
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<td>.56</td>
<td>.64</td>
</tr>
<tr>
<td>Responsiveness to Parent</td>
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<td>.61</td>
<td>.40</td>
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<tr>
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<td>.65</td>
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<tr>
<td>Contingency Child</td>
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<td>.14</td>
<td>.19</td>
</tr>
<tr>
<td>Total Parent</td>
<td>.83</td>
<td>.89</td>
<td>.85</td>
</tr>
<tr>
<td>Total Child</td>
<td>.73</td>
<td>.68</td>
<td>.69</td>
</tr>
<tr>
<td>Combined Total</td>
<td>.86</td>
<td>.88</td>
<td>.86</td>
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Participants in this study reported low stress related to the NICU experience and high social support. Correlations among age, education, length of stay in the NICU, current weight, current age, and variables of stress and social support were not statistically significantly. Age of adolescent mothers and education were correlated at \( r_s = .76, p < .001 \). Older adolescent mothers reported completing higher grade levels in high school. Correlations among current age and current weight of the preterm infants were \( r_s = .59, p < .001 \); the older the preterm infant, the more the preterm infant tended to weigh.

Although there were no statistically significant correlations among variables other than mothers’ age/education and infants’ gestational age/weight the Bonferroni correction was applied to prevent Type I errors. The critical value for the correlations was \( p = .016 \).

**Question 2**

*What is the effect of adolescent mothers’ social support on synchronous interaction with their preterm infants at the first feeding observation?*

Correlation using Spearman’s correlation coefficient was used to determine whether relationships among social support, total scale scores for time 1, as well as the adolescent mothers’ ages, and education exist. Spearman’s correlation coefficient was used since the social support data were not normally distributed. Table 7 presents the results of the Spearman’s correlation coefficients for the variables. There were no statistically significant correlations except the expected correlation of mothers’ age and education \( r_s = .76, p < .001 \).
Table 5

*Spearman Correlation Coefficients between the Independent Variables Stress, Social Support, Age, Education, Length of Stay in the NICU, Current Age and Current Weight of the Preterm Infant*

<table>
<thead>
<tr>
<th></th>
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<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Education(^a)</td>
<td></td>
<td>.83*</td>
<td>1</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>3. Length of Stay in NICU</td>
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<td>.03</td>
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<td></td>
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<td></td>
<td></td>
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<tr>
<td>4. Current Age</td>
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<td>.01</td>
<td>.19</td>
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<td></td>
<td></td>
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<td>5. Current Weight</td>
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<td>-.00</td>
<td>.16</td>
<td>.59*</td>
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<td></td>
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<tr>
<td>6. Stress</td>
<td>-.17</td>
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<td>.15</td>
<td>-.03</td>
<td>-.26</td>
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<td></td>
</tr>
<tr>
<td>7. Social Support</td>
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<td>-.18</td>
<td>-.01</td>
<td>.14</td>
<td>-.16</td>
<td>.12</td>
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</tbody>
</table>

\(^a\)Ordinal variables

* p < .01
Question 3

What is the effect of adolescent mothers’ stress on synchronous interaction with their preterm infants at the first feeding observation?

Correlation using Spearman’s correlation coefficient was used to determine whether relationships among stress, total scale scores for Time 1, as well as the adolescent mothers’ ages, and education exist. Spearman’s correlation coefficient was used since the social support data were not normally distributed. Table 8 presents the results of the Spearman’s correlation coefficients for these variables.

There were no statistically significant correlations other than the expected correlation of age and education ($r_s = .76, p < .001$). Despite the fact that there were no statistically significant correlations and all regression assumptions were violated, a regression analysis was conducted using the social support scale and the three subscales of the PSS:NICU as predictors of synchronous interaction.

Question 4

What is the effect of a nursing intervention (Preterm Infant Cues Intervention-PICI) delivered in the NICU on synchronous interaction between adolescent mothers and their preterm infants?

Paired samples $t$-tests were used to analyze the difference of the NCAFS subscales and total scale scores between Time 1 and Time 2. The Caregiver Total, Infant Total, Total Scale Score, Caregiver Contingency, Infant Contingency, and Contingency Total scores were compared. All comparisons demonstrated statistically significant
Table 6

Paired T-tests on NCAFS Subscales and Total Scales

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>M</th>
<th>SD</th>
<th>t</th>
<th>p</th>
<th>df</th>
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<td>Caregiver Total Time</td>
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<td>33.85</td>
<td>6.24</td>
<td>-3.93</td>
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<td>26</td>
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<td>Caregiver Total Time 2</td>
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<td>5.26</td>
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<td>.033</td>
<td>26</td>
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<td>Infant Total Time 1</td>
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<td>16.85</td>
<td>3.50</td>
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<td>.013</td>
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<tr>
<td>Infant Total Time 2</td>
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<td>3.37</td>
<td>3.96</td>
<td>.001</td>
<td>26</td>
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<tr>
<td>Total Scale Score Time 1</td>
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<td>8.09</td>
<td>2.29</td>
<td>.030</td>
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<tr>
<td>Total Scale Score Time 2</td>
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<td>.030</td>
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<td>9.37</td>
<td>2.98</td>
<td>1.89</td>
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<td>2.49</td>
<td>1.89</td>
<td>.070</td>
<td>26</td>
</tr>
<tr>
<td>Infant Contingency Time 1</td>
<td>27</td>
<td>1.37</td>
<td>.69</td>
<td>0.95</td>
<td>.335</td>
<td>26</td>
</tr>
<tr>
<td>Infant Contingency Time 2</td>
<td>27</td>
<td>1.63</td>
<td>.57</td>
<td>0.95</td>
<td>.335</td>
<td>26</td>
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<tr>
<td>Caregiver/Infant Contingency Total Time 1</td>
<td>27</td>
<td>10.93</td>
<td>3.52</td>
<td>2.29</td>
<td>.030</td>
<td>26</td>
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<tr>
<td>Caregiver/Infant Contingency Total Time 2</td>
<td>27</td>
<td>12.19</td>
<td>2.70</td>
<td>2.29</td>
<td>.030</td>
<td>26</td>
</tr>
</tbody>
</table>
Table 7

*Spearman’s Correlation Coefficients of Social Support and Synchronous Interaction at Time 1 for Adolescent Mothers*

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Social Support</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Synchronous Interaction</td>
<td>0.12</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Age</td>
<td>-0.33</td>
<td>0.37</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4. Education</td>
<td>-0.27</td>
<td>0.23</td>
<td>0.76*</td>
<td>1</td>
</tr>
</tbody>
</table>

* p < .001
Table 8

*Spearman’s Correlation Coefficients of Stress and Synchronous Interaction at Time 1 for Adolescent Mothers*

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
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</tr>
</thead>
<tbody>
<tr>
<td>1. Stress</td>
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<td></td>
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<tr>
<td>2. Synchronous Interaction</td>
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<td></td>
</tr>
<tr>
<td>3. Age</td>
<td>.05</td>
<td>.37</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4. Education</td>
<td>-.01</td>
<td>.23</td>
<td>.76*</td>
<td>1</td>
</tr>
</tbody>
</table>

* *p < .001*
Improvements, except the Infant Contingency Score. Table 6 presents the results of the paired t-tests.

The infant total and infant contingency total were not expected to demonstrate a statistically significant difference as preterm infants vary in their behaviors from feeding to feeding and over time.

**ANECDOtal FINDINGS**

Following the intervention component of the research study, several adolescent mothers commented that they had not thought about how the infant’s behavior had meaning. Most adolescent mothers were able to quickly identify engagement, disengagement and self-regulatory behaviors upon play back of the video tape after the first feeding. Most adolescent mothers expressed appreciation and verbalized that they felt they would be better able to understand what the infant was trying to communicate by understanding certain behaviors.

**SUMMARY**

Data were analyzed using SPSS version 17.0. This chapter described the sample and presented statistical results. The primary purpose of this study was to determine whether an intervention in the NICU setting would improve mother-infant interaction between adolescent mothers and their premature infants. A second purpose was to examine the relationships among variables of the neonatal intensive care setting stress, social support, and synchronous interactions between adolescent mothers and their premature infants. The participants ranged in age from 14-21 years, with the majority of
the sample > 16 years. The majority of the participants were Hispanic 70.4% and the remainder of the sample was Caucasian. African American adolescent mothers \( (n = 9) \) who met eligibility criteria for this study but declined to participate after learning they would be videotaped. All adolescent mothers were single.

There were no statistically significant relationships between the adolescent mothers’ characteristics (age, education, stress, social support), or the preterm infants’ characteristics (birth and current age, birth and current weight, length of stay in the NICU). A statistically significant difference was demonstrated between Time 1 and Time 2 feedings after the preterm infant cues intervention.
Chapter 5: Discussion

This chapter provides a discussion of the dissertation study. The purpose, methodology, and findings are described. Conclusions based on the findings are discussed. The findings are considered with the conceptual framework of the study. Limitations of the study are presented. Implications for practice and recommendations for future research are offered.

SUMMARY AND PURPOSE

The purpose of this study was to determine whether an intervention in the NICU setting would improve mother-infant interaction between adolescent mothers and their premature infants; and to examine relationships among the neonatal intensive care setting stress, social support, and synchronous interactions between adolescent mothers and their premature infants.

This study explored synchronous interaction between adolescent mothers and their preterm infants in the NICU setting. Independent variables included characteristics of adolescent mothers, specifically age, education, and the variables of stress and social support. Characteristics of preterm infants were also explored including: age (birth/current), weight (birth/current) and length of stay in the NICU were examined.

The proposed linkages between the variables contained in the conceptual framework were supported by a review of the literature. This study differed from previous mother-infant interaction studies in that the focus was adolescent mothers with preterm infants in the NICU setting. The dependant variable, synchronous interaction would be affected by the adolescent mothers’ ages, education levels, and variables of
stress, and social support. The literature review did not specifically include adolescent mothers with preterm infants in the NICU setting, thus supporting the need for this exploratory investigational, one-group, pretest-posttest design study.

**METHOD**

This was a one-group, pretest-posttest, exploratory intervention study. Four research questions were proposed to guide the analyses of the data, and these data were collected by the researcher in the NICU setting. Adolescent mothers with preterm infants meeting eligibility criteria were invited to participate, consent/assent were obtained. Adolescent mothers completed a stress and social support survey prior to the initial feeding interaction.

The initial feeding interactions between adolescent mothers and their preterm infants were videotaped at the crib side in the NICU during regularly scheduled feedings. The researcher completed the NCAFS form to measure synchronous interaction. The preterm infant cues intervention was delivered by the researcher after the initial feeding. After the feeding, the adolescent mothers and the researcher reviewed the preterm infant cues booklet. The videotape of the feeding interaction was replayed for the adolescent mothers to review preterm infant cues displayed by the infants. All interventions were audio-taped for fidelity. A second feeding observation was video-taped within 24 to 48 hours of the first taping. A significant difference between Time 1 and Time 2 feeding observations was demonstrated for the feeding scale (NCAFS), indicating an improvement in overall synchronous interaction between adolescent mothers and the preterm infants following the intervention.
Data collection commenced following study approval by the Institutional Review Board (IRB) at The University of Texas at Austin and the St. David’s Research Review Committee. Adolescent mothers with preterm infants meeting eligibility criteria were invited to participate in the research study. A total of 27 dyads completed the study, which was adequate based upon the sample size estimated through GPower program.

The data were entered into SPSS version 17.0 by the investigator and double-checked for accuracy. There were no missing data. A two-tailed significance level of .05 was used for all statistical analyses.

Cronbach’s alphas were calculated to determine internal consistency of all study related instruments. According to Nunnally and Bernstein (1994), a reliability coefficient above 0.70 is considered acceptable. The Cronbach’s alpha for the measure of social support (PRQ-85) was 0.91. The Cronbach’s alpha for the measure of stress (PSS: NICU) scale was 0.98. The PSS: NICU subscales had the following Cronbach’s alphas: Sights and Sounds 0.80, Looks and Behaves 0.97, and Parental Role 0.98. The Cronbach’s alphas for the total Nursing Child Assessment Feeding Scale (NCAFS) at time 1 was 0.88 and total scale NCAFS at time 2 was 0.86. Thus, the three study instruments demonstrated satisfactory reliability.

Inter-rater reliability was calculated using the NCAST inter-rater reliability form. Six of the dyads (22%) of the sample, were randomly selected to evaluate inter-rater reliability. Leitch (1999) tested inter-rater reliability with 22% of the total dyads (N = 29) of first time mothers on a labor and delivery unit within 24 hours of birth using the NCAFS. The video recordings were coded by a second NCAST certified instructor.
Scales scores were considered reliable if the coders score 90% or above (NCAST, 1995). The inter-rater reliability between the researcher and the certified instructor for this analysis was .97, indicating that the interactions that were scored were reliable.

The descriptive analyses for the study included the determination of means, standard deviations, ranges, percentages, and medians. Spearman rank correlations were used to determine relationships among the independent and dependant variables. Paired t-tests were used to determine differences in synchronous interaction between the Time 1 feeding observation and the Time 2 feeding observation. Simple linear regression was not performed due to lack of significant correlations among the independent and dependant variables.

FINDINGS AND DISCUSSION

Interpretation of the findings and comparisons with existing studies are discussed in this section. The discussion focuses on the sample, the descriptive findings, and the research questions. Conclusions based on the data and the conceptual framework are presented.

Sample

The sample for this study was Hispanic (70.4%) and Caucasian (29.6%) adolescent mothers. Nine African American adolescent mothers who met eligibility criteria for this study declined to participate after learning they would be videotaped while feeding the preterm infant. Five African American adolescent mothers specifically stated they did not want to be video-taped. Four African American adolescent mothers projected body language that they were uninterested in participating in videotaping.
Findings from this study differed from other studies that included adolescent mothers. One study including an intervention with adolescent mothers who were videotaping reported 63.8% African American, 30.9% Hispanic and 5.3% Caucasian (Deutscher, et. al, 2006). Christopher, (1999) tested reliability of a scale measuring affectionate behaviors of adolescent mothers towards their infants while in the NICU. This sample was also predominantly African American (49.1%), Caucasian (41.5%), and Hispanic (7.5%). The differences in ethnic population may be due to regional differences and/or location of research recruitment. This was the first time research of this nature has been conducted on the unit. Hospitals associated with university medical/research centers, have a culture of research present that may account for differences in ethnic populations willing to participate.

**Descriptive Findings**

**Social Support (PRQ-85)**

Social support, an independent variable in the study, was assessed using the Personal Resource Questionnaire, Part II. Participants in the study all reported high levels of social support; the range was 90-172, \( M = 156.48, \) \( SD = 21.18 \). Social support has been documented as one of the most significant factors affecting maternal responsiveness (Blank, Schroeder, & Flynn, 1996). Social support is important for new mothers and the impact of social support depends largely on the way it is perceived (Reinhardt, Boerner, & Horowitz, 2006). The participants in this study perceived high levels of social support. This could be related to the fact that many required rides to and from the hospital and may have received increased levels of social support during the time the infant was
hospitalized. Several adolescent mothers commented that various family members and friends provided transportation and support.

The predominant ethnicity in this sample was Hispanics (70.4%). The Hispanic participants brought to mind the concept of familismo, a common concept in Hispanic culture (Guilamo, Ramos, Dittus, Jaccard, Johansson, Bouris, & Acosta, 2007). Familismo includes ensuring close monitoring of adolescents; maintaining warm and supportive relationships characterized by high levels of parent-adolescent interaction and sharing; explaining parental decisions and actions; making an effort to build and improve relationships; and differential parenting practices based on adolescents’ gender. Support of the Hispanic adolescent mothers was evident in the large number of family members in the waiting room, gifts of clothing and baby supplies present at the crib side, as well as photos of family members and religious icons inside the crib. Cultural values and support of the Hispanic adolescent mothers was quite obvious in this research sample.

Social support of adolescent mothers has been shown to foster nurturing parental attitudes in adolescent mothers who are currently parenting children (Contreras, Mangelsdorf, Rhodes, Deiner, & Brunson, 1999; Turner, Grindstaff, & Phillips, 1990). A direct relationship has been documented between social support and adolescent mothers’ interaction styles in other studies. For example, adolescent mothers who experienced higher levels of social support were expressive and sensitive during observed parenting tasks with infants and toddlers (Contreras, et al., 1999). Social support can have protective effects on adolescent mothers against the negative impact of stress and adversity (Uno, Florshiem, & Uchino, 1998). Social support has been found to moderate
the relationship between interpersonal conflict and maternal behavior (Nitz, Ketterlinus, & Brandt, 1995); it also attenuates the association between rejection adolescent mothers may have experienced in their family of origin and their current level of punitive parenting interaction style (Crockenberg, 1987). The adolescent mothers in this study, particularly the Hispanic adolescents, appeared to have tremendous support from family and friends as reported in the survey and the number of family members and friends present in NICU waiting room.

Future longitudinal studies could examine social support of the dyad while in the NICU and social support once the dyads are in the home environment. The level of social support the dyad received during hospitalization could decrease once the dyad has transitioned to the home setting. There was no statistically significant correlation between social support and synchronous interaction in this study. Considering social support is important with this population. Lack of statistical significance is likely related to the homogeneity of this relatively small sample size of this research study.

**Stress (PSS:NICU)**

Stress, an independent variable in the study, was assessed using the Parental Stress Survey: Neonatal Intensive Care Unit. Participants in the study reported low levels of stress the range was 22-146, ($M = 50.85$, $SD = 34.08$). It is possible that three of the adolescent mothers who reported high stress misread the value labels associated with each question. These three mothers unstapled the surveys and completed the social support survey prior to completing the stress survey. The social support survey responses indicate high social support (better outcome) with “7”. The PSS:NICU scale scores in the
opposite direction where a “5” response indicates high stress. The PSS:NICU is typically administered within the first week of admission, but has been administered much later in the NICU stay (Miles, 1989). Low levels of reported stress may be due to the level of care the preterm infant was receiving. All preterm infants in this sample were 34 weeks or older receiving level II care instead of level III critical care. The older age and relative health of this sample may have led to a decrease in the perceived stress levels of the adolescent mothers in this study.

Although low stress levels were reported in this sample, research findings support the notion that the stress of the NICU environment, paired with the stress of becoming a new mother, can impair the establishment of the mother-infant relationship (Affonso, Hurst, & Mayberry, 1992; Miles, Funk, & Kasper, 1991). Adolescent mothers did not allude to experiencing stress and self-reported low overall stress levels on the questionnaire. The researcher observed the adolescent mothers looking concerned when the cardiac and apnea monitors alarmed. Future research studies should consider stress as a variable for synchronous interaction between adolescent mothers and preterm infants.

**Research Questions**

**Question 1**

Question one asked: “What are the relationships between stress and social support in adolescent mothers, and demographic characteristics of adolescent mothers (age, education) and preterm infant (length of stay in the NICU, current age, and current weight) at baseline?” The Spearman correlation coefficients between the independent and dependant variable, synchronous interaction, are presented in Table 5 in chapter four.
The results of the correlations indicated that of the seven independent variables (i.e., stress, social support, adolescent mothers’ ages, education, length of stay in the NICU, current age of the preterm infant, and current weight of the preterm infant), only the adolescent mothers’ ages and education ($r_s = .76, p < .001$) and preterm infant current weight and current gestation ($r_s = .65, p < .001$) were statistically significantly correlated. These significant correlations among adolescent mothers and preterm infants were expected due to the nature of the population. These correlations indicated a relatively stable sample of adolescent mothers and preterm infants. This sample differed from other interaction studies in the NICU that included adult mothers and/or older adolescents aged > 17 years.

This convenience study did not contain equal numbers of participants into the early, middle or late categories of adolescence. Due to the small sample sizes of most studies with adolescent mothers, age is considered a descriptive statistic and findings are not meant to be generalized. Participant ages for this study were reported as a descriptive statistic.

None of the remaining independent variables was significantly correlated with synchronous interaction. Social support, stress, and length of stay in the NICU were explored as possible contributing factors to synchronous interaction between adolescent mothers and preterm infants. The adolescent mothers in this sample reported high levels of social support and low levels of NICU related stress. Length of stay in the NICU was not a contributing factor as proposed in the conceptual framework (Figure 1, page 16).
The characteristics associated with the adolescent mothers (age, education, stress, and social support) and the preterm infants (age, weight, length of stay), as proposed in the conceptual framework did not reach statistical significance related to the dependant variable of synchronous interaction. The lack of significance could be related to the small sample size and homogenous nature of the sample. Due to the investigational nature of this research study there were no preconceived expectations. The independent variables were chosen based upon previous literature findings that demonstrated poor synchronous interaction among adolescent mothers with low education, high stress, and low social support. The preterm infant characteristics were chosen based upon clinical experience of the researcher and how they might logically be incorporated in the model.

**Question 2**

Question two asked: “What is the effect of adolescent mothers’ social support on synchronous interaction with their preterm infants at the first feeding observation?” The Spearman’s correlation coefficient was used to determine relationships among the adolescent mothers self report of social support and synchronous interaction. The only significant correlation was between age of adolescent mothers and their education. There were no statistically significant correlations of social support or ethnicity related to the dependent variable, synchronous interaction. The entire sample in this study self-reported their marital status as single. The adolescent mothers in this study reported high levels of social support despite 55.5% of the sample reporting that the father of the preterm infant was not involved. There is no literature describing paternal support in the NICU environment with adolescent mothers, so this is a new finding.
Previous researchers report that paternal support was found to positively impact overall parenting in single mothers, ages 15-35 (Smith & Howard, 2008). Paternal support provided additional emotional support, physical support, and income. The adolescent mothers in this sample were primarily Hispanic with numerous support personnel available in the NICU waiting room. The family and friend support may have compensated for what the paternal support provided in previous studies.

Self-report of high social support leads to the conclusion that this sample had enough support of family and/or friends to meet social support needs. The results of this study differed from Logsdon et. al., (2004) who found that younger adolescents (13-14 year-olds) reported receiving the most social support, 15-16 year olds reported the most conflicts with work and partner relationships, and older adolescents (17-19 year-olds), had more realistic expectations for needed social support.

Perhaps the adolescent mothers in this sample received high levels of social support due to the fact that the preterm infant was still in the NICU. For study purposes, high social support was evident in this sample in that most adolescent mothers required transportation to and from the hospital. Every participant in the study was present for the second feeding observation as initially scheduled. Several participants commented that various family members or friends had provided transportation and support. Further studies should be conducted exploring whether the level of social support remains high once the adolescent mothers and the preterm infants are discharged home to more predictable routines.
**Question 3**

Question three asked: “What is the effect of adolescent mothers’ stress on synchronous interaction with their preterm infants at the first feeding observation?”

Spearman’s correlation coefficient was used to determine relationships among the adolescent mothers self-report of stress and synchronous interaction.

There were no statistically significant correlations of stress or ethnicity related to the dependent variable, synchronous interaction. The adolescents in this study sample reported low levels of stress. The PSS:NICU is usually administered within two weeks of admission to the NICU but has been used in samples with time frames longer than two weeks (Miles, 1989; Miles, Funk, & Kasper, 1991). The timeframe for the participants in this sample completing the questionnaire ranged from 10 days upon admission to the NICU up to 91 days upon admission to the NICU. While there are a few studies that researched NICU stress in adolescents, most of the literature focused on NICU stress involving adult mothers and fathers (Holditch-Davis & Miles, 2000; Miles, Burchinal, Holditch-Davis, Brunssen, & Wilson, 2002).

Perhaps the adolescent mothers in the sample did not report high stress levels due to the relatively healthy nature of their preterm infants. At time of enrollment, preterm infants in this study had to be 34 weeks or older. While the environment can be overwhelming, perhaps this sample did not perceive their situations to be as critical as others on the unit. The dyads that participated were receiving care in the continuing care area of the NICU and this may have affected the perceptions of stress of the adolescent
mothers. It is possible that the PSS: NICU did not capture the stress the adolescent mothers may have been experiencing.

Further studies exploring adolescent stress in the NICU may be beneficial. Although most adolescent mothers reported low environment stress, during several of the feedings the researcher noted that the adolescent mothers spent a lot of time watching the monitors (measuring heart rate and respirations) and reacting to the apnea alarms sounding on the unit. Some adolescent mothers reported being concerned that something “bad” would happen to their infants and they did not want this to happen. Some adolescent mothers in the study reported being afraid that they would not know how to respond properly should problems arise with their infants.

Question 4

Question four asked: “What is the effect of a nursing intervention (Preterm Infant Cues Intervention-PICI) delivered in the NICU on synchronous interactions between adolescent mothers and their preterm infants”? The paired samples $t$-tests were used to analyze the difference in synchronous interaction action scores (NCFAS) between Time 1 and Time 2.

Statistically significant differences between Time 1 and Time 2 feeding interactions were found in this study sample indicating that the Preterm Infant Cues Intervention (PICI) may have had a positive effect on synchronous interaction between adolescent mothers and their preterm infants in the NICU setting. The Caregiver Total Scale score ($t = -3.93, p < .001$) and the Total Scale score ($t = -3.96, p < .001$) were the two main scales that the PICI could have affected. The effect size was 0.61. The
intervention was designed to introduce adolescent mothers to preterm infant cues and provide suggestions about how to respond to preterm infant cues appropriately. Therefore, it is assumed that the adolescent mothers could presumably increase the NCAFS interaction score after intervention. Similar results have been found in studies of adult mothers Leitch (1999). The findings from this study are consistent with findings from the studies in adult mothers.

The Caregiver Total score is comprised of four subscales. It measures the adolescent mother’s score on the NCAFS (range 0-50). Time 1 Caregiver Total scores reported a mean score of 33.85 (SD = 6.24) and Time 2 Caregiver Total scores reported a mean score of 37.37 (SD = 6.26). The Total Scale Score is a combination of all six subscales for adolescent mothers and their preterm infants (range 0-76). Time 1 Total Scale scores had a mean score of 51.00 (SD = 8.09) and Time 2 had a mean score of 55.89 (SD = 7.23). This is a fairly dramatic increase in scale scores in a twenty-four to forty-eight hour period. While the PICI may have had an effect on the adolescent mothers’ scale scores, it is also possible that the adolescent mothers had an increased comfort level with the researcher during the second videotaping, thus increasing Time 2 scale scores. The initial videotaping occurred at Time 1. Adolescent mothers were not familiar with the researcher and had minimal interaction with the researcher at this point. After the initial videotaping, the researcher spent 30-60 minutes with adolescent mothers discussing preterm infant cues and reviewing the videotape of the feeding interaction. The time spent with the researcher may have increased the comfort level of the
adolescent mothers for the second videotaping, thus rendering the adolescent mothers more comfortable interacting with their preterm infants.

The intervention component of this study focused on sensitivity to cues, developing a responsiveness and synchronicity with the child in order to foster the infants’ growth and development. The adolescent mothers responded well to the intervention and were able to identify preterm infant cues upon review of the videotape of the initial feeding. Previous research studies on synchronous interaction have included intervention components that include dividing the sample into random educational cohorts (Leitch, 1999), using guided participation (Schroeder & Pridham, 2006), and collecting on-line survey data (Drake, et al., 2007). These studies were similar to the current study in that some type of educational component was offered to the mothers. Most of the research has been conducted with adult mothers. This study is unique in that the sample consisted of adolescent mothers with preterm infants in the NICU.

Previous research has indicated that prematurity status complicates the quality of the mother-infant interaction processes in the NICU setting and in the home setting (Davis, et al., 2003; Mueller-Nix et al., 2004). This was evident in the Infant Contingency Scale Scores of this study sample ($t = -1.89, p = .07$). Contingency is defined by NCAST (1995) as “a process by which behavior is shaped” (p. 12). An example of contingent communication would include preterm infants turning to look at adolescent mothers when adolescent mothers speak, or adolescent mothers provide a break in interaction when their preterm infants display disengagement cues. For the purposes of this research study, contingency is synonymous with synchronous interaction. Preterm infants are
often poor social partners in the interaction process. This less sensitive interaction behavior has been shown to persist through the formative childhood years (Davis, et al., 2003).

Researching synchronous interaction early in the mother-infant relationship is important as the quality of the interaction has long-term effects on infants in particular. The most consistent predictor of child cognitive and social development was the quality of the mother-child interaction (Duetscher, et al., 2006; Keown, Woodward & Field, 2001). Mothers who were more sensitive, responsive, attentive and cognitively stimulating during observed interactions had children with the best outcomes (Duetscher, et al., 2006).

Adolescent mothers who showed the most interest in learning about their preterm infants’ behavioral cues showed the most improvement on the NCAFS scores during the second interaction observation. If positive interactions were to continue throughout the relationships of adolescent mothers and their preterm infants, it is predicted that the infants would have better outcomes in the future related to communication, education, and socialization.

The three predominant disengagement cues displayed by the preterm infants in this study were withdrawing to a sleep state, halt hand, and fussing. The adolescent mothers were excited to learn that these behaviors had meaning that they had not previously considered. During the second feeding interaction many of the adolescent mothers commented on the behaviors that the preterm infant displayed. Two mothers commented that they felt they had a better understanding of how their infant was able to
communicate, that behaviors have meaning and are not purely random. This was an unexpected finding and there was no tool to quantify the feedback from the adolescent mothers. Previous studies researching synchronous interaction have not reported feedback received from participants.

The conceptual framework (Figure 1, page 16) for this study is partially supported by the significant findings in the differences of the scale scores. The PICI significantly affected synchronous interaction between adolescent mothers and preterm infants in the NICU setting. However, the relationships among characteristics of the NICU environment, the adolescent mothers and the preterm infants were not supported and warrant further study. The primary reason the relationships were not statistically significant in this investigational intervention study was most likely due to the small sample size. Future funded studies with larger sample sizes should explore the relationships in the model.

**CHALLENGES**

This was the first published research study of this type to be conducted in the participating neonatal intensive care unit. Educating staff about the research project was challenging in that some did not see the purpose of nursing research or research with adolescent mothers. The unit has an open bay design with many cribs and isolettes that can lead to an increase in noise level on the unit when visitors are present. Curtains can be drawn for privacy but other parents were aware that videotaping was taking place and they were asking questions.
The videotaping was problematic at times due to a limited amount of space. The interaction was videotaped from one angle and some cues may have been missed on the recording. The researcher had the ability to sit and stand at various times to observe from all vantage points. The adolescent mothers, the families, and the nursing staff were aware of the videotaping process and that the interaction being videotaped was to be between adolescent mothers and their preterm infants. During five of the tapings, family members, boyfriends, or nursing staff entered the area to engage adolescent mothers in conversations.

Review of some videotapes revealed background noise including monitors alarming, nurses talking, family members talking, and the phones ringing. Three adolescent mothers were wearing face masks due to flu season making it difficult to hear audio sounds. The researcher used field notes to record when participants spoke.

LIMITATIONS

This study enrolled a convenience sample of 27 adolescent mothers in a single level III NICU. The findings from this study may not represent those from other adolescent mothers with premature infants in other level III NICUs; therefore, application to larger or other populations of adolescent mothers with premature infants should be considered with caution. The age span of 13-21 years for the adolescent group includes a wide range of developmental stages and life experiences. The sample in this study was represented by only Hispanic and Caucasian participants. African American adolescent mothers met eligibility criteria for this study but declined to participate upon learning they would be videotaped. It is possible that the African American adolescent
mothers declined to participate since the researcher was not African American. The inclusion of African American adolescent mothers is important as this ethnicity is the third largest population on this unit. Small sample size is another limitation.

This one-group, pretest-posttest design suffered from several threats to internal and external validity (LoBiondo-Wood & Haber, 2006). Threats to internal validity included confounding where change in the dependent variable is attributable to the existence of a variable related to the dependent variable; maturity (something that happened between the two observed feedings may have accounted for differences seen between Time 1 and Time 2; for instance preterm infants may have been more alert and hungrier at the Time 2 observation which could account for a better feeding episode); selection bias (e.g., adolescents who wanted to learn more about parenting may have been more willing to participate than other adolescents); repeated testing (scale scores for adolescent mothers may have improved after intervention if the mothers were aware of their behaviors being rated). Threats to external validity included the interaction of sample selection and the intervention, and the interaction of testing and the intervention. Social desirability during the second feeding observation was a possibility. Some of the adolescent mothers were very curious about what the NCAFS was measuring and how they were being perceived. The adolescent mothers who inquired about the feeding scale received generalized feedback. The general discussion of the feeding scale as well as the preterm infant cues discussion may have led some participants to a better understanding of what was being measured, thus resulting in improved scale scores at Time 2.
NURSING RECOMMENDATIONS AND FUTURE RESEARCH

Practice

This study supports recommendations for practice that include educating adolescent mothers with preterm infants in the NICU about preterm infant behavioral cues and how to respond appropriately. Educational programs and materials should be available to adolescent mothers to enhance synchronous interaction with the preterm infant.

Staff education in neonatal intensive care units is key to the success of disseminating the preterm behavioral cues information to mothers of preterm infants. While the majority of the nursing staff was supportive of the prospect of conducting research with the adolescent mother population, a vocal few expressed dismay. Educating staff members is important to make a difference in future outcomes of these dyads with knowledge that most already possess.

The behavioral cue guide used in this research study provided a starting point for dialogue between the adolescent mothers and the researcher. It was relevant in that it provided a pictorial display of preterm infants and their engagement, disengagement, and self-regulatory cues in a concise, easy to understand format. The guide and review of the Time 1 feeding allowed adolescent mothers to point out behaviors they may have previously noted but perhaps did not associate a meaning. During the Time 2 feeding, many adolescent mothers identified behaviors as they were expressed. There were several
adult mothers who asked to participate in the research study and requested a copy of the behavioral cue guide.

**Future Research**

There are no studies in the published literature that focus solely on adolescent mothers and preterm infants in the NICU setting. The findings from this one-group pretest-posttest exploratory intervention study served as the foundation for future research.

Recommendations for future research are as follows.

1. Determine the barriers to recruiting multiple ethnicities in order to conduct studies that represent all ethnicities in the NICU environment.
2. Conduct a large scale longitudinal study to measure synchronous interaction over multiple time points that begins in the NICU and transitions through the first few years of life.
3. Randomize participants to the behavioral cues intervention (based on developmental levels rather than age).
4. Develop instruments to assess stress of adolescent mothers with preterm infants.
5. Develop intervention materials to be used throughout the first year of life specific to preterm infants and their developmental milestones.
6. Conduct a mixed methods study (quantitative and qualitative) to determine the adolescent mothers’ perspectives of caring for preterm infants.
CONCLUSIONS

This chapter discussed the findings of the present study in relation to the existing literature and proposed conceptual framework. Conclusions based on the data do not completely support the conceptual framework developed to guide the study, however, certain key findings will be considered when changes to the conceptual framework are implemented. While there were no statistically significant correlations among the independent and dependant variables, there were significant differences in synchronous interaction between Time 1 and Time 2 feeding observations. The difference in scale scores of synchronous interaction may indicate that the preterm infant cues intervention was beneficial to the adolescent mothers and assisted the adolescent mothers in interpreting and responding to the preterm infants’ cues during a feeding.
Appendix A
In accordance with Federal Regulations for review of research protocols, the Institutional Review Board has reviewed the above referenced protocol and found that it met the conditions for approval under an Expedited category as follows:

Initiation of work with the NICU at St. David's Medical Center (SDMC) is not approved until a copy of the SDMC Research Committee approval letter for this specific study is recorded and on file with this office.

Expedited category of approval:

(1) Clinical studies of drugs and medical devices only when condition (a) or (b) is met. (a) Research on drugs for which an investigational new drug application (21 CFR Part 312) is not required. (Note: Research on marketed drugs that significantly increases the risks or decreases the acceptability of the risks associated with the use of the product is not eligible for expedited review). (b) Research on medical devices for which (i) an investigational device exemption application (21 CFR Part 812) is not required; or (ii) the medical device is cleared/approved for marketing and the medical device is being used in accordance with its cleared/approved labeling.

(2) Collection of blood samples by finger stick, heel stick, ear stick, or venipuncture as follows: (a) from healthy, non-pregnant adults who weigh at least 110 pounds. For these subjects, the amount drawn may not exceed 350 ml in an 8 week period and collection may not occur more frequently than 2 times per week; or (b) from other adults and children, considering the age, weight, and health of the subjects; the collection procedure, the amount of blood to be collected, and the frequency with which it will be collected. For these subjects, the amount drawn may not exceed the lesser of 5 ml or 3 ml per kg in an 8 week period and collection may not occur more frequently than 2 times per week.

(3) Prospective collection of biological specimens for research purposes by Non-invasive means.

Examples:
(a) hair and nail clippings in a non-disfiguring manner;
(b) deciduous teeth at time of exfoliation or if routine patient care indicates a need for extraction;
(c) permanent teeth if routine patient care indicates a need for extraction;
(d) eccrine and external secretions (excluding sweat);
(e) unstimulated saliva collected either in an unstimulated fashion or stimulated by chewing gumbase or was or by applying a dilute citric solution to the tongue;
(f) phlebotomy at delivery;
(g) amniotic fluid obtained at the time of rupture of the membrane prior to or during labor;
(h) supraventricular dental plaque and calculus, provided the collection procedure is not more invasive than routine prophylactic scaling of the teeth and the process is accomplished in accordance with accepted prophylactic techniques;
(i) mucosal and skin cells collected by buccal scraping or swab, skin swab, or mouth washings;
(j) sperm collected after saline mist sterilization.
X (4) Collection of data through noninvasive procedures (not involving general anesthesia or sedation) routinely employed in clinical practice, excluding procedures involving x-rays or microwaves. Where medical devices are employed, they must be cleared/approved for marketing. (Studies intended to evaluate the safety and effectiveness of the medical device are not generally eligible for expedited review, including studies of cleared medical devices for new indications). Examples:
(a) physical sensors that are applied either to the surface of the body or at a distance and do not involve input of significant amounts of energy into the subject or an invasion of the subject's privacy;
(b) weighing or testing sensory acuity;
(c) magnetic resonance imaging;
(d) electrocardiography, electroencephalography, thermography, detection of naturally occurring radium or radon, diagnostic ultrasound, diagnostic infrared imaging, doppler blood flow, and echocardiography;
(e) moderate exercise, muscle strength testing, body composition assessment, and flexibility testing where appropriate given the age, weight, and health of the individual.

X(5) Research involving materials (data, documents, records, or specimens) that have been collected, or will be collected solely for non-research purposes (such as medical treatment or diagnosis). (NOTE: Some research in this category may be exempt from the HHS regulations for the protection of human subjects. 45 CFR46.101(b)(4). This listing refers only to research that is not exempt).

X(6) Collection of data from voice, video, digital, or image recordings made for research purposes.

X(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies. (NOTE: Some research in this category may be exempt from the HHS regulations for the protection of human subjects. 45 CFR46.101(b)(2) and (b)(3). This listing refers only to research that is not exempt).

X Please use the approved informed consent forms...

You have been granted Waiver of Documentation of Consent According to 45 CFR 46.117, an IRB may waive the requirement for the investigator to obtain a signed consent form for some or all subjects if it finds either:

- The research presents no more than minimal risk
- The research involves procedures that do not require written consent when performed outside of a research setting

OR

- The principal risks are those associated with a breach of confidentiality concerning the subject's participation in the research
- The consent document is the only record linking the subject with the research

AND

This study is not FDA regulated (45 CFR 46.117)

AND

Each participant will be asked whether the participant wishes documentation linking the participant with the research, and the participants wishes will govern.

You have been granted Waiver of Informed Consent according to 45 CFR 46.116(c), an IRB may waive or alter some or all of the requirements for Informed consent if:

- The research presents no more than minimal risk to subjects;
- The waiver will not adversely affect the rights and welfare of subjects;
- The research could not practicably be carried out without the waiver; and
- Whichever appropriate, the subjects will be provided with additional pertinent information they have participated in the study.
RESPONSIBILITIES OF PRINCIPAL INVESTIGATOR FOR ONGOING PROTOCOLS:

1. Report immediately to the IRB any unanticipated problems.

2. Proposed changes in approved research during the period for which IRB approval cannot be initiated without IRB review and approval, except when necessary to eliminate apparent immediate hazards to the participant. Changes in approved research initiated without IRB review and approval initiated to eliminate apparent immediate hazards to the participant must be promptly reported to the IRB, and reviewed under the unanticipated problems policy to determine whether the change was consistent with ensuring the participants continued welfare.

3. Report any significant findings that become known in the course of the research that might affect the willingness of subjects to continue to take part.

4. Insure that only persons formally approved by the IRB enroll subjects.

5. Use only a currently approved consent form (remember approval periods are for 12 months or less).

6. Protect the confidentiality of all persons and personally identifiable data, and train your staff and collaborators on policies and procedures for ensuring the privacy and confidentiality of participants and information.

7. Submit for review and approval by the IRB all modifications to the protocol or consent form(s) prior to the implementation of the change.

8. Submit a Continuing Review Report for continuing review by the IRB. Federal regulations require IRB review of ongoing projects no less than once a year (a Continuing Review Report form and a reminder letter will be sent to you 2 months before your expiration date). Please note however, that if you do not receive a reminder from this office about your upcoming continuing review, it is the primary responsibility of the PI not to exceed the expiration date in collection of any information. Finally, it is the responsibility of the PI to submit the Continuing Review Report before the expiration period.

9. Notify the IRB when the study has been completed and complete the Final Report Form.

10. Please help us help you by including the above protocol number on all future correspondence relating to this protocol.

Thank you for your help in this matter.

Sincerely,

[Signature]

Judy A. Sisson, Ph.D.
Professor
Chair, Institutional Review Board

Protocol #: 2009-08-0074

Approval dates: 10/01/2009 - 09/30/2010
OFFICE OF RESEARCH SUPPORT
THE UNIVERSITY OF TEXAS AT AUSTIN

FWA # 00020302
Date: 10/26/09

PI(IE): Angela R. Cook
Department & Mail Code: NURSING-SCHOOL

Title: Synchronicity Interaction in the NICU: An Exploratory Intervention with Adolescent Mothers with Premature Infants

IRB APPROVAL - IRB Protocol #: 2009-08-0074

Dear: Angela R. Cook

In accordance with Federal Regulations for review of research protocols, the institutional review board has reviewed your response to the explicit conditions and found it satisfactory. The institutional review board approves your study for the following period of time:

Your study has been approved from 10/16/2009 to 09/30/2010.

☐ Please use the attached approved informed consent forms.

☐ You have been granted Waiver of Documentation of Consent. According to 45 CFR 46.117 and/or 21 CFR 56.109(b)(1), an IRB may waive the requirement for the investigator to obtain a signed consent form for some or all subjects if it finds either:

☐ The research presents no more than minimal risk, and

☐ The research involves procedures that do not require written consent when performed outside of a research setting 45 CFR 46.117, 21 CFR 56.109(b)(1).

☐ The principal risks are those associated with a breach of confidentiality concerning the subject’s participation in the research, and

☐ The consent document is the only record linking the subject with the research, and

☐ This study is not FDA regulated (45 CFR 46.117), and

☐ Each participant will be asked whether the participant wishes documentation linking the participant with the research, and the participants wishes will govern.

☐ You have been granted Waiver of Informed Consent. According to 45 CFR 46.116(d), an IRB may waive or alter some or all of the requirements for informed consent if:

☐ The research presents no more than minimal risk to subjects;

☐ The waiver will not adversely affect the rights and welfare of subjects;

☐ The research could not practically be carried out without the waiver; and

☐ Whenever appropriate, the subjects will be provided with additional pertinent information they have participated in the study.

☐ This study is not FDA regulated (45 CFR 46.117)
RESPONSIBILITIES OF PRINCIPAL INVESTIGATOR FOR ONGOING PROTOCOLS:

1. Report immediately to the IRB any unanticipated problems.

2. Propose changes in approved research during the period for which IRB approval cannot be initiated without IRB review and approval; except when necessary to eliminate apparent immediate hazards to the participant. Changes in approved research initiated without IRB review and approval initiated to eliminate apparent immediate hazards to the participant must be promptly reported to the IRB, and reviewed under the unanticipated problems policy to determine whether the change was consistent with ensuring the participants continued welfare.

3. Report any significant findings that become known in the course of the research that might affect the willingness of subjects to continue to take part.

4. Ensure that only persons formally approved by the IRB enroll subjects.

5. Use only a currently approved consent form (remember approval periods are for 12 months or less).

6. Protect the confidentiality of all persons and personally identifiable data, and train your staff and collaborators on policies and procedures for ensuring the privacy and confidentiality of participants and information.

7. Submit for review and approval by the IRB all modifications to the protocol or consent form(s) prior to the implementation of the change.

8. Submit a Continuing Review Report for continuing review by the IRB. Federal regulations require IRB review of on-going projects no less than once a year (a Continuing Review Report form and a reminder letter will be sent to you 2 months before your expiration date). Please note however, that if you do not receive a reminder from this office about your upcoming continuing review, it is the primary responsibility of the PI not to exceed the expiration date in collection of any information. Finally, it is the responsibility of the PI to submit the Continuing Review Report before the expiration period.

9. Notify the IRB when the study has been completed and complete the Final Report Form.

10. Please help us help you by including the above protocol number on all future correspondence relating to this protocol.

Sincerely,

[Signature]

Jody L. Jensen, Ph.D.
Professor
Chair, Institutional Review Board

Protocol # 2009-08-0074
Approval dates: 10/16/2009 to 09/30/2010
October 14, 2009

Selma Berry Morrison, RPh  
Chair, St. David’s Research Committee  
St. David’s Medical Center  
919 East 32nd Street  
Austin, TX 78705

Re: “Synchronous Interaction in the NICU: An Exploratory Intervention with Adolescent Mothers with Premature Infants”  
Principal Investigator: Angela Cook, RN

Dear Ms. Morrison:

The Austin Multi-Institutional Review Board has received your request for a waiver of IRB jurisdiction for the above referenced study. The Board understands that the study will be conducted at St. David’s Medical Center.

St. David’s Medical Center does not require review by this Board as the University of Texas IRB has been designated as responsible for reviewing this study. Therefore, a waiver of jurisdiction is granted.

Sincerely,

[Signature]

Virginia Remeny, RN, CNS  
Chair, Austin Multi-Institutional Review Board
Appendix B
Informed Consent to Participate in Research
The University of Texas at Austin

Title of Research Study: Synchronous Interaction in the NICU: An Exploratory Intervention with Adolescent Mothers with Premature Infants

You are being asked to allow your daughter to participate in a research study. This form provides you with information about the study. The Principal Investigator (the person in charge of this research) or his/her representative will provide you with a copy of this form to keep for your reference, and will also describe this study to you and answer all of your questions. Please read the information below and ask questions about anything you don’t understand before deciding whether or not to take part. Your participation is entirely voluntary and you can refuse to participate without penalty or loss of benefits and or care to which you are otherwise entitled.

Principal Investigator: Angela Cook, RN, MNHP, Doctoral Candidate, School of Nursing 512-745-0644

Faculty Sponsor: Lynn Rew, EdD, RN, FAAN (School of Nursing) 512-471-7941

Funding source: Not Applicable

What is the purpose of this study?
The primary purpose of this study is to determine if a nursing intervention in the NICU setting will improve mother-infant interaction. Thirty-five (35) adolescent mothers (ages 13-21) of preterm infants will participate.

What will be done if you take part in this research study?
- Your daughter will be asked to fill out a brief survey.
- Your daughter will be videotaped and observed by the researcher during a feeding at the infant’s crib side on two separate occasions within one week.
- Your daughter will receive information in the form of a booklet about infant communication cues. Your daughter will review the videotape of the first feeding with the researcher to identify cues the baby displayed during the feeding.

The Project Duration is: This study should take no more than two hours of your daughter’s time on two separate occasions.

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10/16/2009
Page 1 of 7
IRB PROTOCOL #2009-08-0074
What are the possible discomforts and risks?
Physical risks and discomforts are not expected for participating in this study. There may be risks that are unknown at this time. If you wish to discuss the information above or any other risks you may experience, you may ask questions now or call the Principal Investigator listed on the front page of this form.

What are the possible benefits to you or to others?
Your daughter may benefit from this study by learning about preterm infant communication cues which will help her to better understand and interact with her baby.

If you choose to take part in this study, will it cost you anything?
There is no cost to you or your daughter for participating in this study.

Will you receive compensation for your participation in this study?
Your daughter will receive a $10.00 gift card after the first feeding observation and a $15.00 gift card after the second observation.

What if you are injured because of the study?
There are no known risks for participating in this study. The University has no program or plan to provide treatment for research related injury or payment in the event of a medical problem. In the event of a research related injury or unforeseen risks, please contact the principal investigator.

If you do not want to take part in this study, what other options are available to you?
Your daughter’s participation in this study is entirely voluntary. You are free to refuse permission for your daughter to be in the study, and your refusal will not influence current or future relationships with The University of Texas at Austin and or St. David’s Medical Center.

How can you withdraw from this research study and who should you call if you have questions?
If you wish to stop your daughter’s participation in this research study for any reason, you should contact the principal investigator:

Angela Cook, RN, MNHP
University of Texas School of Nursing
1701 Red River
Austin, Texas 78701
512-745-0644

You should also call the principal investigator for any questions, concerns, or complaints about the research. You are free to withdraw your consent and stop your daughter’s participation in this research study at any time without penalty or loss of benefits for which you or she may be entitled. Throughout the study, the researchers will notify you and your...
daughter of new information that may become available and that might affect your decision to allow her to remain in the study.

In addition, if you have questions about your daughter's rights as a research participant, or if you have complaints, concerns, or questions about the research, please contact:

Jody Jensen, Ph.D., Chair, The University of Texas at Austin Institutional Review Board for the Protection of Human Subjects
(512) 232-2685

Office of Research Support at (512) 471-8871.

How will your privacy and the confidentiality of your research records be protected?

All data will be collected in a private room adjacent to the NICU. When mother and baby are videotaped, curtains will be drawn completely around the mother, infant, and the researcher. The researcher will not use any personal identifying information. Survey forms, demographic forms, feeding observations and videotapes will be assigned a study code. All study related information will be kept in files in a locked office.

Confidentiality will be maintained in that the videotapes will be coded so that no personally identifying information is visible on them; they will be kept in a secure place (a locked file cabinet in the investigator's home office); they will be viewed only for research purposes by the researcher and her associates; and they will be erased after the completion of this project.

If in the unlikely event it becomes necessary for the Institutional Review Board to review your research records, then The University of Texas at Austin will protect the confidentiality of those records to the extent permitted by law. Your research records will not be released without your consent unless required by law or a court order. The data resulting from your participation may be made available to other researchers in the future for research purposes not detailed within this consent form. In these cases, the data will contain no identifying information that could associate you with it, or with your participation in any study.

If the results of this research are published or presented at scientific meetings, your daughter's identity will not be disclosed.

Will the researchers benefit from your participation in this study?
The researcher will benefit from your daughter's participation by being able to fulfill requirements for completing her dissertation project.
Signatures:

As a representative of this study, I have explained the purpose, the procedures, the benefits, and the risks that are involved in this research study:

Signature and printed name of person obtaining consent

You have been informed about this study's purpose, procedures, possible benefits and risks, and you have received a copy of this form. You have been given the opportunity to ask questions before you sign, and you have been told that you can ask other questions at any time. You voluntarily agree to allow your daughter to participate in this study. By signing this form, you are not waiving any of your legal rights.

You are making a decision about allowing your adolescent child to participate in this study. Your signature below indicates that you have read the information provided above and have decided to allow her to participate in the study. If you later decide that you wish to withdraw your permission for your daughter to participate in the study, simply tell me. You may discontinue his or her participation at any time.

Printed Name of Subject (Adolescent mother)

Signature of Subject's Parent/Guardian

Signature of Principal Investigator

Adolescent's Assent

I have read the description of the study titled *Synchronous Interaction in the NICU: An Exploratory Intervention with Adolescent Mothers with Premature Infants* that is printed above, and I understand what the procedures are and what will happen to me in the study. I have received permission from my parent(s) to participate in the study, and I agree to participate in it. I know that I can quit the study at any time.

Signature of Adolescent

Page 4 of 7
IRB PROTOCOL #2009-08-0074
*AUTHORIZATION TO USE AND DISCLOSE PERSONAL HEALTH INFORMATION FOR Synchronous Interaction in the NICU: An Exploratory Intervention with Adolescent Mothers with Premature Infants*

A new privacy rule has been issued to protect the privacy rights of patients. This rule was issued under a law called the Health Insurance Portability and Accountability Act of 1996 (HIPAA). The Privacy Rule is designed to protect the confidentiality of your health information. This document called a HIPAA Authorization, explains how your health information will be used and disclosed for Synchronous Interaction in the NICU: An Exploratory Intervention with Adolescent Mothers with Premature Infants and describes your rights, including the right to see your health information.

Angela Cook, RN, MNHP and St. David’s Medical Center are working together to study mother infant interaction in the neonatal intensive care setting. By signing this Authorization, you allow Angela Cook, RN, MNHP and St. David’s Medical Center to use your Personal Health Information to carry out this research study. Your Personal Health Information is information about you that could be used to identify you, such as your name, address, telephone number, videotape, date of birth, social security number, new and existing medical records. This may include information in your medical record and information created or collected during the study.

By signing this Authorization, you allow Angela Cook, RN, MNHP and St. David’s Medical Center to disclose your Personal Health Information to The University of Texas Institutional Review Board for this study. Angela Cook, RN, MNHP will use this information to evaluate interaction between adolescent mothers and premature infants.

Angela Cook, RN, MNHP and St. David’s Medical Center will assign a code number to your study questionnaires and videos for study purposes. Your study materials may be reviewed by the investigator’s dissertation committee and/or its representatives, and regulatory authorities or other oversight agencies. The purpose of these reviews is to assure that the study is safely conducted, the study data are accurately collected, or for other uses allowed by law.

Your Personal Health Information may no longer be protected by the Privacy Rule once it is disclosed by the Angela Cook, RN, MNHP and St. David’s Medical Center although other confidentiality safeguards apply. Please refer to the Informed Consent document to see how Angela Cook, RN, MNHP will treat your Personal Health Information confidentially. If you have questions about how your Personal Health Information will be protected, you can ask Angela Cook, RN, MNHP. Angela Cook, RN, MNHP, may add your Personal Health Information to a research databases so that it can study better measures of mother-infant interaction.

You have the right to see and copy your Personal Health Information related to the study for as long as this information is held by Angela Cook, RN, MNHP and St. David’s Medical Center. However, to ensure the scientific integrity of the study, you agree that
you may not be able to review some of your records related to the study until after the study has been completed.

You may cancel this Authorization at any time by sending a written notice to Angela Cook, RN, MNHP at the following address 1701 Red River, Austin, TX, 78701. If you cancel this Authorization, Angela Cook, RN, MNHP and St. David’s Medical Center will no longer use or disclose your Personal health Information under the Authorization for this Study, unless the Angela Cook, RN, MNHP and St. David’s Medical Center need to use or disclose some of your Personal Health Information to preserve the scientific integrity of the study. Information collected before you cancel this Authorization may still be disclosed to Angela Cook, RN, MNHP and dissertation committee members.

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This Authorization does not have an expiration (ending) date.

You will be given a copy of this form to keep.

Signature of Participant or Participant’s Legal Representative    Date

Printed Name of Participant or Participant’s Legal Representative

Signature of Witness    Date

Printed Name of Witness

If signed by a personal representative of the individual, describe the representative’s legal authority to act on behalf of the individual (e.g., father):

*
*RESEARCH SUBJECT’S BILL OF RIGHTS

What are your rights as a research subject?

Following is the Research Subject’s Bill of Rights. Please read and keep this information for future reference. Although study staff may be available to answer any study related questions, those pertaining to subject rights listed below should be addressed to the Chair of the Austin Multi-Institutional Review Board, Virginia Remeny, RN, CNS, at (512) 342-0310.

1. To be told what the study is trying to find out.

2. To be told what will happen to you and whether any of the procedures, drugs, or devices are different from what would be used in regular practice.

3. To be told about the frequent and/or important risks, side effects or discomforts of the things that will happen to you for research purposes.

4. To be told if you can expect any benefit from participating, and, if so, what the benefit might be.

5. To be told the other choices you have and how they may be better or worse than being in the study.

6. To be allowed to ask questions about the study, both before agreeing to volunteer and during the study.

7. To be told what kind of medical treatment is available if you have any problems.

8. To refuse to participate at all or to change your mind about participating after the study is started. This decision will not affect your right to receive the care you would receive if you were not in the study.

9. To receive a copy of the consent form.

10. To be free of pressure when deciding whether you wish to agree to be in the study
Informed Consent to Participate in Research
The University of Texas at Austin

Title of Research Study: Synchronous Interaction in the NICU: An Exploratory Intervention with Adolescent Mothers with Premature Infants

You are being asked to participate in a research study. This form provides you with information about the study. The Principal Investigator (the person in charge of this research) or his/her representative will provide you with a copy of this form to keep for your reference, and will also describe this study to you and answer all of your questions. Please read the information below and ask questions about anything you don’t understand before deciding whether or not to take part. Your participation is entirely voluntary and you can refuse to participate without penalty or loss of benefits and or care to which you are otherwise entitled.

Principal Investigator: Angela Cook, RN, MNHP, Doctoral Candidate, School of Nursing 512-745-0644

Faculty Sponsor: Lynn Ror, EdD, RN, FAAN (School of Nursing) 512-471-7941

Funding source: Not Applicable

What is the purpose of this study?
The primary purpose of this study is to determine if a nursing intervention in the NICU setting will improve mother-infant interaction. Thirty-five (35) adolescent mothers (ages 13-21) of preterm infants will participate.

What will be done if you take part in this research study?
- You will be asked to fill out a brief survey.
- You will be videotaped and observed by the researcher during a feeding at the infant’s crib side on two separate occasions within one week.
- You will receive information in the form of a booklet about infant communication cues. You will review the videotape of the first feeding with the researcher to identify cues the baby displayed during the feeding.

The Project Duration is: This study should take no more than two hours of your time on two separate occasions.

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10/16/2009
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IRB PROTOCOL #2009-08-0074
What are the possible discomforts and risks?
Physical risks and discomforts are not expected for participating in this study. There may be risks that are unknown at this time. If you wish to discuss the information above or any other risks you may experience, you may ask questions now or call the Principal Investigator listed on the front page of this form.

What are the possible benefits to you or to others?
You may benefit from this study by learning about preterm infant communication cues which will help you to better understand and interact with your baby.

If you choose to take part in this study, will it cost you anything?
There is no cost to you for participating in this study.

Will you receive compensation for your participation in this study?
You will receive a $10.00 gift card after the first feeding observation and a $15.00 gift card after the second observation.

What if you are injured because of the study?
There are no known risks for participating in this study. The University has no program or plan to provide treatment for research related injury or payment in the event of a medical problem. In the event of a research related injury or unforeseen risks, please contact the principal investigator.

If you do not want to take part in this study, what other options are available to you?
Your participation in this study is entirely voluntary. You are free to refuse to be in the study, and your refusal will not influence current or future relationships with The University of Texas at Austin and or St. David’s Medical Center.

How can you withdraw from this research study and who should you call if you have questions?
If you wish to stop your participation in this research study for any reason, you should contact the principal investigator.

Angela Cook, RN, MNHP
University of Texas School of Nursing
1701 Red River
Austin, Texas 78701
512-455-0644

You should also call the principal investigator for any questions, concerns, or complaints about the research. You are free to withdraw your consent and stop participation in this research study at any time without penalty or loss of benefits for which you may be eligible.
entitled. Throughout the study, the researchers will notify you of new information that may become available and that might affect your decision to remain in the study.

In addition, if you have questions about your rights as a research participant, or if you have complaints, concerns, or questions about the research, please contact:

Jody Jensen, Ph.D., Chair, The University of Texas at Austin Institutional Review Board for the Protection of Human Subjects
(512) 232-2685
or:

Office of Research Support at (512) 471-8871.

How will your privacy and the confidentiality of your research records be protected?

All data will be collected in a private room adjacent to the NICU. When you and your baby are videotaped, curtains will be drawn completely around you, your baby, and the PI. The researcher will not use any personal identifying information. Survey forms, demographic forms, feeding observations and videotapes will be assigned a study code. All study related information will be kept in files in a locked office.

Confidentiality will be maintained in that the videotapes will be coded so that no personally identifying information is visible on them; they will be kept in a secure place (a locked file cabinet in the investigator’s home office); they will be viewed only for research purposes by the investigator and her associates; and they will be erased after the completion of this project.

If in the unlikely event it becomes necessary for the Institutional Review Board to review your research records, then The University of Texas at Austin will protect the confidentiality of those records to the extent permitted by law. Your research records will not be released without your consent unless required by law or a court order. The data resulting from your participation may be made available to other researchers in the future for research purposes not detailed within this consent form. In these cases, the data will contain no identifying information that could associate you with it, or with your participation in any study.

If the results of this research are published or presented at scientific meetings, your identity will not be disclosed.

Will the researchers benefit from your participation in this study?
The researcher will benefit from your participation by being able to fulfill requirements for completing her dissertation project.
Signatures:

As a representative of this study, I have explained the purpose, the procedures, the benefits, and the risks that are involved in this research study:

Signature and printed name of person obtaining consent  
Date

You have been informed about this study’s purpose, procedures, possible benefits and risks, and you have received a copy of this form. You have been given the opportunity to ask questions before you sign, and you have been told that you can ask other questions at any time. You voluntarily agree to participate in this study. By signing this form, you are not waiving any of your legal rights.

Printed Name of Subject  
Date

Signature of Subject  
Date

Signature of Principal Investigator  
Date

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10/16/2009
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IRB PROTOCOL #2009-08-0074
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_________________________________________  ______________
Signature of Participant or Participant’s Legal Representative  Date

_________________________________________
Printed Name of Participant or Participant’s Legal Representative

_________________________________________  ______________
Signature of Witness  Date

_________________________________________
Printed Name of Witness

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Appendix C
March 13, 2009

Angela Cook-Saunders, RN, MNHP
University of Texas at Austin
2909 Centennial Olympic Park
Austin, TX 78732

Dear Angie,

Congratulations on completing the requirements for the NCAST Instructor Certification. Here is your certificate! Your case study write up using the Feeding and Teaching Scales, Personal Environment Assessments (minus the Network Survey!), and Sleep Activity Record has been accepted. Your interventions flowed from what you observed. You have integrated all the assessments in a well thought out and thorough manner. Your working knowledge in this area will be an asset to you as you teach and mentor others.

Angie, I look forward to working with you in the future! I will be eager to hear about your research and how it all comes together. I hope you will be able to teach. It is so important to get one class under your belt in that first 6 months to a year. Please call or email anytime with questions. It’s great having you as part of our NCAST family!

Warm regards,

Denise Findlay
Director of Education & Outreach
NCAST-AVENUW PROGRAMS

This certifies that

Angela Cook, RN, Ph.C.

Has successfully met the requirements for certification as an

NCAST Instructor

October 20-25, 2008 Workshop
NCAST-AVENUW Programs
University of Washington School of Nursing
& Center on Human Development and Disability

Signature: [Signature]
Date: 3/1/09

Director of Education & Outreach

Signature: [Signature]
Date: 3/1/09

Treasurer Director, NCAST-AVENUW Programs
Nurses and others who work in neonatal intensive care units are interested in how the experience of having a sick baby hospitalized in the neonatal intensive care unit (NICU) affects parents. We would like to know what aspects of your experience as a parent are stressful to you. **By stressful, we mean that the experience has caused you to feel anxious, upset, or tense.**

This questionnaire lists various experiences parents have reported as stressful. Please indicate how stressful each item listed below has been for you using the following scale:

1 = Not at all stressful: the experience did not cause you to feel upset, tense, or anxious
2 = A little stressful
3 = Moderately stressful
4 = Very stressful
5 = Extremely stressful: the experience upset you and caused a lot of anxiety or tension

If you did not have the experience, indicate this by circling N/A meaning that you have "not experienced" this aspect of the NICU.

Now let's take an item for an example: The bright lights in the NICU.

If for example you feel that the bright lights in the neonatal intensive care unit were extremely stressful to you, you would circle the number 5 below:

NA   1   2   3   4   5

If you feel that the lights were not stressful at all, you would circle the number 1 below:

NA   1   2   3   4   5

If the bright lights were not on when you visited (not likely), you would circle NA indicating "Not Applicable" below:

NA   1   2   3   4   5

Now begin

Below is a list of the various **SIGHTS AND SOUNDS** commonly experienced in an NICU. We are interested in knowing about your view of how stressful these **SIGHTS AND SOUNDS** are for you. Circle the number that best represents your level of stress.

1. The presence of monitors and equipment
   
   NA   1   2   3   4   5

2. The constant noises of monitors and equipment
   
   NA   1   2   3   4   5

3. The sudden noises of monitor alarms
   
   NA   1   2   3   4   5

4. The other sick babies in the room
   
   NA   1   2   3   4   5
5. The large number of people working in the unit
6. Having a machine (respirator) breathe for my baby

Below is a list of items that might describe the way your BABY LOOKS AND BEHAVES while you are visiting in the NICU as well as some of the TREATMENTS that you have seen done to the baby. Not all babies have these experiences or look this way, so circle the NA, if you have not experienced or seen the listed item. If the item reflects something that you have experienced, then indicate how much the experience was stressful or upsetting to you by circling the appropriate number.

1. Tubes and equipment on or near my baby
2. Bruises, cuts or incisions on my baby
3. The unusual color of my baby (for example looking pale or yellow jaundiced)
4. My baby's unusual or abnormal breathing patterns
5. The small size of my baby
6. The wrinkled appearance of my baby
7. Seeing needles and tubes put in my baby
8. My baby being fed by an intravenous line or tube
9. When my baby seemed to be in pain
10. When my baby looked sad
11. The limp and weak appearance of my baby
12. Jerky or restless movements of my baby
13. My baby not being able to cry like other babies
14. My baby crying for long periods
*15 When my baby looked afraid
NA 1 2 3 4 5
*16 Seeing my baby suddenly change color
(for example, becoming pale or blue)
NA 1 2 3 4 5
*17 Seeing my baby stop breathing
NA 1 2 3 4 5

The last area we want to ask you about is how you feel about your own RELATIONSHIP with the baby and your PARENTAL ROLE. If you have experienced the following situations or feelings, indicate how stressful you have been by them by circling the appropriate number. Again, circle NA if you did not experience the item.

1. Being separated from my baby
NA 1 2 3 4 5
2. Not feeding my baby myself
NA 1 2 3 4 5
3. Not being able to care for my baby
   myself (for example, diapering, bathing)
   NA 1 2 3 4 5
4. Not being able to hold my baby
   when I want
   NA 1 2 3 4 5
5. Feeling helpless and unable to
   protect my baby from pain and
   painful procedures
   NA 1 2 3 4 5
6. Feeling helpless about how to help
   my baby during this time
   NA 1 2 3 4 5
7. Not having time to be alone with my baby
   NA 1 2 3 4 5
*8. Sometimes forgetting what my baby
   looks like
   NA 1 2 3 4 5
*9. Not being able to share my baby
   with other family members
   NA 1 2 3 4 5
*10 Being afraid of touching or holding
    my baby
    NA 1 2 3 4 5
*11 Feeling staff is closer to my
    baby than I am
    NA 1 2 3 4 5
Appendix E
June 10, 2009

Angela Cook
2909 Centennial Olympic Park
Austin, TX 78732

Dear Angela,

Thank you for requesting the PRQ85. Any changes to question stems or answer sets must be approved in advance. Translation of the PRQ into other languages is acceptable and encouraged. A copy of the translated version of the PRQ should be sent to us.

If you have not already done so, please send us a brief abstract of your proposed study, the population that you plan to sample in your research, and which version of the PRQ you intend to use. We will include this information in our database. If you are a student please send us the name of your university and the name of your advisor. If you do, in fact, use the PRQ for data collection in your study, we ask that you send us an abstract of your findings, PRQ results, and conclusions whenever they are available.

Should you have any questions or need clarification, kindly write or e-mail cweinert@montana.edu. We will try to respond in a timely manner. Our web site is www.montana.edu/cweinert.

Thank you for your interest in the PRQ. We hope that this tool will help you in your research.

Sincerely,

Clarann Weinert, SC,PhD,RN,FAAN
Professor
PERMISION TO USE THE PERSONAL RESOURCE QUESTIONNAIRE

PERMISSION TO USE THE PRQ85 and PRQ2000

IS GRANTED TO: Angela Cook

THE PRQ85 IS A TWO PART INSTRUMENT. EITHER PART -1 OR PART -2 OR BOTH PARTS MAY BE ADMINISTERED. HOWEVER, NO PART OF PRQ85 OR PRQ2000 MAY BE MODIFIED WITHOUT CONSULTATION WITH THE AUTHORS.

__________________________
Clarann Weinert, SC,PhD,RN,FAAN

DATE: June 10, 2009
PERSONAL RESOURCE QUESTIONNAIRE (PRQ85)

Below are some statements with which some people agree and others disagree. Please read each statement and CIRCLE the response most appropriate for you. There is not a right or wrong answer.

1 = STRONGLY DISAGREE
2 = DISAGREE
3 = SOMEWHAT DISAGREE
4 = NEUTRAL
5 = SOMEWHAT AGREE
6 = AGREE
7 = STRONGLY AGREE

a. There is someone I feel close to who makes me feel secure

b. I belong to a group in which I feel important..

c. People let me know that I do well at my work (job, homemaking).

d. I can't count on my relatives and friends to help me with my problems..

e. I have enough contact with the person who makes me feel special.....

f. I spend time with others who have the same interests I do........

g. There is little opportunity in my life to be giving and caring to another person.

h. Others let me know that they enjoy working with me (job, committees, projects)..

i. There are people who are available if I needed help over an extended period of time.

j. There is no one to talk to about how I am feeling...

k. Among my group of friends we do favors for each other..

l. I have the opportunity to encourage others to develop
their interests and skills...  

m. My family lets me know that I am important for keeping  
the family running... 1 2 3 4 5 6 7

n. I have relatives or friends that will help me out even if I  
can't pay them back..... 1 2 3 4 5 6 7

o. When I am upset there is someone I can be with who lets  
me be myself.. 1 2 3 4 5 6 7

p. I feel no one has the same problems as I ... 1 2 3 4 5 6 7

q. I enjoy doing little "extra" things that make another  
person's life more pleasant.... 1 2 3 4 5 6 7

r. I know that others appreciate me as a person. 1 2 3 4 5 6 7

s. There is someone who loves and cares about me. 1 2 3 4 5 6 7

t. I have people to share social events and fun activities with.. 1 2 3 4 5 6 7

u. I am responsible for helping provide for another person's  
needs. 1 2 3 4 5 6 7

v. If I need advice there is someone who would assist me to  
work out a plan for dealing with the situation... 1 2 3 4 5 6 7

w. I have a sense of being needed by another person 1 2 3 4 5 6 7

x. People think that I'm not as good a friend as I should  
be........... 1 2 3 4 5 6 7

y. If I got sick, there is someone to give me advice about  
caring for myself 1 2 3 4 5 6 7
Preterm Infant Cues Intervention
NICU Intervention with Adolescent Mothers

PURPOSE:

To instruct adolescent mothers about (a) preterm infant cues and (b) how to respond to infant cues appropriately in order to achieve synchronous interaction during a feeding.

OUTCOME LEARNER OBJECTIVES:

By completion of the intervention, adolescent mothers will be able to:
1. Identify cues displayed by preterm infants.
2. Categorize of cues displayed by their preterm infants as engagement, disengagement, and self-regulation.
3. Demonstrate appropriate responses to communication cues displayed by their infants during a second feeding interaction.

PROTOCOL:

1. Adolescent mothers will be instructed to feed their infant per their usual routine. The researcher will observe the interaction and score the feeding scale. The interaction will be videotaped.
2. After the feeding the adolescent mothers and the researcher will meet in a conference room to discuss behavior of the preterm infant using the Infant Behavior and Communication Guide, specifically, engagement, disengagement, and self-regulatory.
3. The videotape of the feeding interaction will be reviewed with the adolescent mothers to highlight engagement, disengagement, and self-regulatory cues displayed during the feeding.
4. A second feeding observation will be scheduled within one week, with at least 24 hours between feeding sessions.

MATERIALS:

Videotape of feeding interaction between the adolescent mothers and preterm infants. Infant Behavior and Communication Guide, developed by Victoria Vierling, O.T., M.Ed.
RE: Infant Behavior and Communication Guide

From: "Victoria Vieirting" <vievirling@memorialtd.org>
To: "Angie Cook" <arc_austin@yahoo.com>

Dear Angela,

It is absolutely fine with me if you use the guide. I did forward your message on to the departmental director in case there is some more formal permission that needs to be documented. I will let you know as soon as possible. I am glad that you found it and that it will be helpful to you.

Any chance you will share your work with me? I have participated in several research projects (filling out surveys, supplying information, etc.) and people always promise to share their results - but I never hear back!

Best wishes!

Victoria

From: Angie Cook [arc_austin@yahoo.com]
Sent: Tuesday, July 21, 2009 11:17 AM
To: Victoria Vieirting
Subject: Infant Behavior and Communication Guide

Hello Ms. Vieirting,

I am a nursing doctoral candidate at The University of Texas at Austin. My dissertation will focus on adolescent mothers with preterm infants in the NICU setting and their understanding of behavioral cues. I came across the guide that you developed regarding Preterm Infant Behavior and Communication Cues and am requesting your permission to use this as part of my study. I believe your guide will be more appropriate/beneficial than the NCAST Baby Cues cards for my population as they depict only preterm infant cues.

I look forward to hearing from you.

Sincerely,

Angela Cook, RN, MNHP
Doctoral Candidate
UT School of Nursing
Infant Behavior
And Communication

Developed By:
Victoria L. Vierling, O.T., M.Ed.
NICU Developmental Specialist

Memorial
Hospital of South Bend
Infant Behavior and Communication Cues

All babies have special ways of letting their caregivers know what they want and need. Knowing your baby’s behavior and ways of communicating will help you to care for him or her in the best way.

Communication cues can be generally divided into 3 groups:

Engagement: Signs that your baby is ready for interaction; this is a good time to hold, talk to, feed and or play with your baby.

Disengagement: Signs that your baby is overwhelmed by stimulation, in need of your help to make a change, experiencing exhaustion, discomfort or even pain. They may need to have a rest period from being held, talked to, played with or fed. They may need a short break, a longer rest or other intervention to help them regain comfort.

Self regulation: Signs that your baby is making efforts on his or her own to help themselves be comfortable.

Cues can be easy to see or not so easy to recognize. Every baby has their own individual ways of communicating. Being familiar with general cues and then recognizing and responding to your baby’s special communications will help you care for your baby in NICU and when you go home.
The following are pictures of infant communication signs and suggestions for ways to interact with your baby.

**Engagement Cues** — This is a good time to play with, hold or feed your baby. He or she feels comfortable and likes what you are doing.

Communications from babies born very early are often read through the heart and respiration monitors in the NICU. The NICU staff will help you become familiar with the monitors, and when your baby is “reading well.”

Babies who are comfortable have a look of **calm restfulness**. They have **pink skin tones**. Tiny babies are usually swaddled; all covered up. You can watch their facial expressions and feel their movements as you hold them.

When babies are interacting, they focus on caregivers or toys. Their facial expressions look like they are interested in what they are seeing and hearing. Holding them in a comfortable position and supporting their arms and legs can help them.

A **bright alert facial expression, smooth movement of hands and open “ohh” or “ahh” face** shows that your baby is ready to play. This is a good time to talk to her, feed her or show her a bright picture or toy.
More Engagement Cues

When your baby has his eyes open and hands up by his face (and it is close to the time to eat) he might be showing you the “hunger posture.”

Sometimes something as simple as shading your baby’s eyes from the direct light will help her open her eyes and show you that she really is awake and alert for feeding or interaction.

Smooth even respirations (you can see this on the monitor, but you can also feel and/or see your baby’s breathing). The nurses and doctors will talk with you about breathing rates that are related to your baby.
More Engagement Cues

Turning toward you with their eyes, head, or even their whole body (snuggling) is a way of saying that your baby is comfortable and interested.

Stilling (stopping movement) shows that your baby is focusing his or her attention – you can help your baby to calm his or her movement by swaddling in a blanket or simply holding his or her arms contained in your hands.
Disengagement cues – signs that your baby is overwhelmed, uncomfortable and in need of your help. He or she may need to rest, take a break from stimulation or even be put down. Stress cues can also include the heart and respiration monitors alarming. This may indicate a need for intervention; your baby’s nurse will also assist your baby if needed.

Crying and fussiness are cues that are easy to recognize as signs that your baby needs your help and comforting. Babies cry for many reasons – even preemies express hunger, need for a diaper change and need for holding with fussing and crying.

Babies on ventilators cry too. You won’t hear your baby cry, but can tell by looking at his/her facial expression and body movement that your baby needs comforting.

Long periods of crying when you aren’t successful in calming your baby may indicate that he or she is sick or in pain. When in the hospital, please bring this to the attention of your baby’s nurse or doctor. After you take your baby home, you will need to call your doctor if your baby cries a lot.
More disengagement cues

“Worried” expression – may mean that your baby is feeling overwhelmed by the light, noise or activity.

Yawning – doesn’t always mean that your baby needs sleep – but may mean that they are “tired” of the stimulation and need a rest.

Turning away from interaction – also called “gaze averting.” Sometimes babies just need a short break from the direct stimulation of being looked at and talked to.

Open mouth posture sometimes called “gape face.” Baby’s mouth is open as if exhausted. Often goes along with sleepy facial expression. This baby needs a period of rest.
More disengagement cues

Withdrawal to sleep or drowsy state this may occur during feeding as the baby fatigues or during interaction when the stimulation becomes overwhelming. Allowing for a rest break will be helpful.

Limpness of arms, legs or whole body. This may be seen during feeding or handling. Swaddling the baby with her hands up close to her face will provide support. A rest period may be needed.

Turning away from interaction – also called “gaze averting.” Sometimes babies just need a short break from the direct stimulation of being looked at and talked to.

Strong extension (stretching or straightening) movements use up lots of energy – keeping your baby swaddled, using your hands to contain his or her arms and legs can help.
More disengagement cues

If your baby arches his or her back and neck or seems to be pulling away from stimulation, rest, comforting and repositioning can help.

A look of exhaustion or generally uncomfortable posturing indicates that your baby needs your assistance to get into a more comfortable position and get some rest.

Splaying of fingers ("stop in the name of love" sign) is often the first sign babies give when they are starting to get overwhelmed.

Fussing or facial grimacing are ways that your baby tells you that he or she needs a change.
More disengagement cues

Falling asleep or becoming drowsy are ways that babies withdraw from stimulation. Rest breaks can help.

Hiccoughs, fast breathing, apnea (stopping breathing), coughing, gagging, choking, and spitting up are also signs of stress.
Self regulation cues are behaviors and movements that your baby uses to help himself or herself to stay calm and manage the stimulation of sound, light, handling, activity or discomfort.

Sucking on fingers, thumb or pacifier is a common way for babies to calm themselves.

Hands to face or clasping hands together are ways babies “pull themselves together.”

Babies can calm and control extra movements and find support by bracing their feet against soft rolls, infant clothing or caregiver’s hands.

Babies use cycling of attention or withdrawing to sleep or just closing their eyes from time to time during interaction as a way to rest.
More self calming abilities

Babies can get into **flexed or tucked positions** to gain comfort and deal with stimulation.

**Visual focusing** is a way that babies can still their movements and calm down. Talking to your baby when he or she is fussing can help your baby to calm and focus.
Things that can help

Holding

Cover the isolette or bassinet with a special blanket

Ensure periods of uninterrupted sleep between feedings.

Swaddle and “nest” your baby for comfort.*
(At home your baby should sleep on his back without toys or blankets near his face.)

“Being near by” – gentle touch and quiet talking

Move your baby slowly
Contain his arms & legs
More things that help

Watch your baby’s cues

Tell the nurses about special care ideas for your baby.

Ask questions, get all the information you need!

Be together as a family!

These are just a few ideas; talk with your baby’s nurse, doctor, the developmental specialist, the social worker and other families too! Getting to know your baby as an individual and seeing and responding to your baby’s communication will help you get to know each other and grow as a family.
A very special thank you to all of the wonderful families and their terrific babies who appear in these pages!!

References:

Keys to Caregiving. NCAST Programs, University of Washington, Seattle Washington, 1990.


Appendix H
Fidelity Checklist
NICU Intervention

Introduced Communication Guide □ YES □ NO

Discussed Engagement Cues □ YES □ NO

Discussed Disengagement Cues □ YES □ NO

Discussed Self-Regulation Cues □ YES □ NO

Replayed video of feeding interaction □ YES □ NO

Discussed infant cues displayed □ YES □ NO
Appendix I
Demographic Data
Adolescent Mom

Participant ID:

Participant Age:

Race:

Education:

FOB Involved:

Infant

Gestation Age at birth (in weeks):

Current Age (in weeks):

Birth Weight (grams):

Current Weight (grams):

Feeding type:

Length of Stay in NICU (days):
References


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VITA

Angela R. Cook was born in Cedar Rapids, Iowa. She graduated from the University of Northern Iowa in 1991 with a Bachelor of Arts in Criminology. Following college she became employed in the healthcare field, finally working at The University of Iowa Holden Comprehensive Cancer Center in Oncology Clinical Trials. The experience in oncology motivated her to obtain a nursing degree. In 2004 she graduated from The University of Iowa College of Nursing with a Masters in Nursing and Healthcare Practice degree. She worked pediatric intensive care and neonatal intensive care units following graduation. In 2005, Angela and her family relocated to Austin, Texas where she worked in the neonatal intensive care unit. In 2007 she began her doctoral studies at The University of Texas at Austin.

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