

INTERRATER RELIABILITY OF THE PEDIATRIC INFANT PARENT EXAM:
NURSING SCREENING AS A COMPONENT OF WELL-BABY VISITS

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BY

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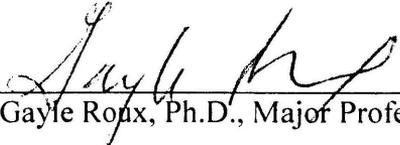
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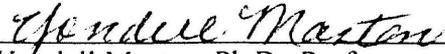
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I am submitting herewith a dissertation written by Kathryn Sridaromont entitled "Interrater Reliability of the Pediatric Infant Parent Exam: Nursing Screening as a Component of Well-Baby Visits." I have examined this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy with a major in Nursing.



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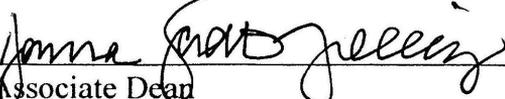
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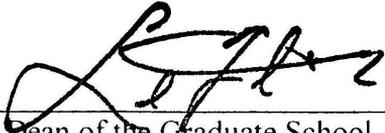


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DEDICATION

To Those I Love

Dr. and Mrs. Arthur Cummings, thank you for your exemplar inspiration as grandparents and the love of medicine and nursing you instilled so early in my life.

Mr. and Mrs. George McAdams, I offer deepest appreciation for your parental devotion in a lifetime of showing us how to live, love, and die. You would be proud-your excitement at mid-study was felt and inspired me in completion yes, there is work left to be done.

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ABSTRACT

KATHRYN SRIDAROMONT

INTERRATER RELIABILITY OF THE PEDIATRIC INFANT PARENT EXAM: NURSING SCREENING AS A COMPONENT OF WELL-BABY VISITS

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The purpose of the dissertation study was to determine the interrater reliability, overall impression, and scoring of typicality of the interaction and time required for nurses' use of the Pediatric Infant Parent Exam (PIPE) to screen the interaction of a convenience sample of 50 mother-infant dyads during a well-baby visit in a clinic setting. After IRB consent was obtained, the PI and three pediatric clinical nurses completed training based on the PIPE manual. The research assistant identified English speaking mother-infant dyads using the pediatric clinic as a medical home. Infants were between six and nine months of age. Exclusion criteria were infants with congenital anomalies, fever or illness. On reporting for the scheduled well-baby visits, Mothers who expressed an interest received further information about the study. Once they expressed an interest in participation, informed consent was obtained and the one time brief observations were carried out in the private exam room by the PI and pediatric clinical nurse. A book was presented to each dyad who participated. Raw scores were transformed with SAS, version 9.3 and analyzed using Cohen's *kappa*. The *kappa* was 0.809 and the weighted *kappa* was 0.840 for cumulative paired ratings of the various stages of the PIPE while the

“overall synchrony” ratings did not meet the assumption of symmetric distribution making any *kappa* analysis questionable at best. As to the “judgement of typicality”, *kappa* was 0.666. Two of the pediatric clinical nurses rated use of the Pediatric Infant Parent Exam as “somewhat easy” while one nurse rated the instrument as “easy to use”. The time for scoring the observation ranged from 60 to 202 seconds with a mean of 90.57 seconds, a median of 67.5 seconds, and a standard deviation of 44.13 seconds.

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CHAPTER I

INTRODUCTION

Interactional synchrony is an essential component of the interaction of the mother-infant dyad and is fundamental to the attachment relationship (Fiese, Poehlmann, Irwin, Gordon, & Curry-Bleggi, 2001; Reyna & Pickler, 2009). Maternal-infant interactional synchrony is a dyadic interaction between mother and infant that provides an observable mutually regulated pattern of contingent reciprocal rhythm as each member makes behavioral adjustments to maintain a balance in the system (Barnard, 1987; Foss, Hirose, & Barnard, 1999; Reyna & Pickler, 2009). Reciprocal synchronous interaction results in greater maternal sensitivity and more secure infant attachment (Foss, Hirose, & Barnard, 1999; Karl & Keefer, 2009). However, there remains a lack of user-friendly, empirically valid methods to measure maternal-infant interactional synchrony across disciplines to provide clinically significant reliable data (Puura, Guedeney, Mantymaa, & Tamminen, 2007).

While the structure and function of synchrony changes from early infancy through childhood, the ability to achieve maternal-infant interactional synchrony may provide a crucial developmental achievement for dyadic relationships thereby facilitating healthy emotional, social, and cognitive development of a child (Feldman, 2006; Harrist & Waugh, 2002; Kelly, Leckman & Mayes, 2007; Reyna & Pickler, 2009; Spiker, Boyce, & Boyce, 2002). Researchers from the disciplines of psychology (Ainsworth, Bell, &

Stayton, 1974; Bowlby, 1969; Erikson, 1964; Fiese et al., 2001; Fonagy, 2001; Steele, Steele, & Fonagy, 2001), linguistics (Hsu & Fogel, 2003; Paavola, 2006; Wetherby & Prizant, 2002), medicine (Brazelton, 1975; Brazelton & Tronick, 1982), child development (Dunham & Dunham, 1990; Isabella & Belsky, 1991; Sroufe, 2005; Stern, 1985) and nursing (Barnard, 1994; Byrne & Keefe, 2003; Horowitz, Logdon, & Anderson, 2005; Reyna & Pickler, 2009; Stiles, 2005) have contributed to the foundational science of attachment theory and maternal-infant relationships.

Problem of Study

Healthy People 2020 (U.S. Department of Health & Human Services, 2012) declared an urgent need to support at risk mothers and infants. Adverse events in the first year of life can greatly derail normal developmental pathways. The far-reaching and potentially devastating effects of altered infant development include altered self-perceptions, the inability to form close interpersonal relationships, and failed academic performance (Leckman, 1999). The World Health Organization estimates a worldwide prevalence of mental health morbidity in children of approximately 20% and identifies mental health in the early years as a key target for intervention (Lee, 2005).

A major anticipatory need has been identified to screen for altered maternal-infant interaction early in life to identify at risk dyads and guide appropriate interventions to ameliorate maladaptive patterns. Nurses are well suited to screen early maternal-infant interactional synchrony as a component of well-baby visits via direct observation of the

dyad. A psychometrically sound instrument for use during clinic visits would satisfy such a need.

Purpose and Research Questions

The purpose of this dissertation study was to examine: 1) the interrater reliability and feasibility of the Pediatric Infant Parent Exam (PIPE) screening tool (Fiese et.al., 2001), and 2) the feasibility of administering the tool during a well-baby visit on six to nine month old infants in a busy clinic setting. Research questions included:

1. What was the interrater reliability between the principal investigator (PI) and three pediatric clinical nurses (PCN) using the Pediatric Infant Parent Exam (PIPE) in a busy pediatric clinic as a component of the well-baby visit?
2. What was the amount of time required for the principal investigator (PI) and the three pediatric clinical nurses (PCN) to administer and score the PIPE in a busy pediatric clinic as a component of the well-baby visit?
3. What was the difference between the PIPE scores and the usual traits of interaction score?
4. How did the three pediatric clinical nurses (PCN) rate the feasibility of use of the PIPE in a busy pediatric clinic as a component of the well-baby visit?

Rationale for the Study

The importance and meaning of maternal-infant interactional synchrony and infant attachment security is noted in subsequent physiological and psychological development of an infant. Beginning with the initial encounter after birth, mothers and

infants engage one another through gazes and gestures, and the first relationship forms the basis for all future relationships (Bozzette, 2007). A current view of the parent and child actively shaping the relationship was articulated in the ecological approach to development (Feldman, 2007) and in the relationship-focused early intervention model (Kelly & Barnard, 1999). Viewed as a formative experience for maturation of the social brain, maternal-infant interactional synchrony contributes to the development of self-regulation, symbol use, and empathy (Feldman, 2007). Parent-child relationships marked by mutual affection, warmth, trust, and minimal conflict positively influence children's optimal social, cognitive, and emotional development (Bornstein & Tamis-LeMonda, 1989; Feldman, 2007; Kelly, Morisset, Barnard, Hammond, & Booth, 1996).

Some potential outcomes of unsatisfactory mother-infant interactional synchrony development include impaired cognitive, linguistic, socio-emotional development (Paavola, 2006) and insecure attachment (Feldman, 2007). For example, the maturing mechanisms of emotional regulation can be facilitated in a maternal-infant synchronous relationship. Expression of emotions in the process of infant regulatory development may be manifested by incessant crying, inability to be soothed, problems in eating, sleeping, and elimination, hyper-arousal, and intense distress during times of change.

Although young children come to the attention of child welfare authorities for a variety of reasons, by the time the children enter the foster care system some commonalities are noted. Many have experienced at least one major disruption in primary-caregiver relationships, have typically been exposed to maladaptive care-giving

at an early age, have likely witnessed traumatic events, and often have delayed physical and emotional development (Harrist & Waugh, 2002; Gardener & Shaw, 2008). For these reasons, infants and young children in foster care face multiple risks and are especially vulnerable to poor mental health outcomes.

In summary, maternal-infant interactional synchrony is assumed to have a significant impact on the development of the infant's cognitive, linguistic, and socio-emotional skills and the parent's sense of competence and enjoyment (Kelly & Barnard, 1999). Recent findings from neuro-psycho-biological studies showed early maternal-infant interactional synchrony also has effects on the growth and maturational organization of the maturing brain (Mantymaa et al., 2003; Schore & Schore, 2008). Current literature emphasized different aspects of caretaker behavior, such as maternal-infant interactional synchrony, may facilitate the learning process to support development of the infant and young child's social, emotional and cognitive abilities (Reyna & Pickler, 2009).

Early detection and appropriate intervention for developmental problems are crucial to prevent long-term negative outcomes. Associated threats to infant health include young age of the mother (Feldman, 2007), single parent status (Gardener & Shaw, 2008), low socio-economic status and withdrawn-depressed maternal status (Mantamya, 2006), lack of medical services and social support (Sameroff & Fiese, 2000) with subsequent risk for poor parenting. Lee (2005) suggested the quality of the parent-child relationship could promote children's resilience to impoverished conditions.

Mental health in early childhood exerts a significant influence on subsequent mental health outcomes (Feldman, 2007). Poor mental health in early childhood also has a negative impact on the child's physical health and school achievements (Schiffman, Omar, & McKelvey, 2003).

Several major campaigns strived to deal with threats to infant health. In the *United Way Success by 6 Child Well-Being Report Card* (2010), a commitment was made to develop a comprehensive system of care and education for children from ages prenatal to six years. A desirable goal for child specialists, including maternal child nurses, is to intervene early in the first year of life when risk for altered interactional synchrony of the mother-infant dyad can be addressed. For referrals to be made there must be instruments to screen for at risk dyads. The Pediatric Infant Parent Exam (PIPE) is an instrument with potential for screening purposes (Fiese et al., 2001).

Theoretical Framework

John Bowlby's theory of attachment, based on psychological, ethological, and evolutionary theories, explained the phenomenon of the natural balance between exploration and proximity of an infant to the mother (Bowlby, 1969, 1973). Bowlby posited attachment-seeking as a primary human motivation, rejecting the orthodox psychoanalytical view of attachment is the derivative of sexual or oral instinctual drives (Bowlby, 1973). The essence of Bowlby's attachment theory is the proposition stating affectional bonds between individuals and patterns of interactions early in life between caregivers and children produce internal working models serving as templates guiding

interpersonal expectations and behaviors in subsequent relationships. Stable, consistent, and predictable caregivers tend to encourage the development of internal working models of the self as valued and others as trustworthy and reliable sources of nurturance.

Unstable, inconsistent, or unpredictable caregiving in early life can produce maladaptive internal working models reflected in insecurity and anxious forms of attachment (Karl & Keefer, 2010).

Theoretical and empirical evidence suggested the nature of early caregiving has a profound impact on long-term child outcomes and the potential to alter a child's developmental course by changing the nature of the interactions between a very young child and primary caregivers (Brofenbrenner, 1979; Sameroff, 1993). The seminal work of Barnard and colleagues (1994) advanced the use of attachment theory. The work provided evidence for use of brief observations of parent and child in semi-structured situations to identify infants at increased risk for poor outcomes. While the instruments used by Barnard and colleagues have adequate psychometric properties, the tools require considerable training at a relatively high cost with a need for videotaping and analysis. Zeanah, Mammen, and Lieberman (1993) shared several domains of the infant-parent relationship can be observed in brief dyad interactions including caregiver emotional availability and nurturing as well as infant emotion regulation and security.

The Relationship-Focused Early Intervention Model

The Relationship-Focused Early Intervention Model (Kelly & Barnard, 1999) guided this study with use of the infancy component since the focus is on mother infant

dyads. In the original form, the model also addressed toddlerhood. The model (see Figure 1, p. 9) is defined as an interventional model primarily intended to foster growth-producing parent-professional and parent-child relationships. Barnard's research with mothers and infants indicated all dimensions of child development (physical, emotional, intellectual, and social development) interact with one another in complex ways and a deficit in one of the domains affects the others (Barnard, 1976). Another insight Barnard and the research team gained from the work was infants and young children undergo behavioral changes and internal reorganization in response to caregiving and environmental stimuli suggesting one cannot understand early childhood development without taking into consideration interactions between the child, caregiver, and environment (Barnard, 1994). As a result of Barnard's early work, the Parent/Caregiver-Child Interaction Model (PCIM) was developed to depict strengths and weaknesses in interactions between infants and parents/caregivers and to direct behavior specific interventions to foster children's social, emotional, and cognitive development (Barnard, 1976).

The PCIM used the language of systems and developmental theories in the introduction of ideas. Barnard called the elements of the model "an interactive system" (Barnard, 1994, p. 6). In contrast to reductionist theories, systems theory focused on understanding how the parts of the system are arranged, what each part does, the relationships, the evolution, and acquisition of new properties (Bertalanffy, 1968). Developmental theory is also evident in the PCIM model. According to developmental

theory, learning occurs when individuals interact with the environment. The learner actively constructs understanding from processing behavioral interactions and making meaning of every new experience (Sameroff & Fiese, 2000). Barnard asserts the child’s emotional, intellectual, and physical needs are met or not met within the interactive system with the environment (Barnard, 1994) as demonstrated in Figure 1. The parent-child relationship during the infant period by Kelly and Barnard.

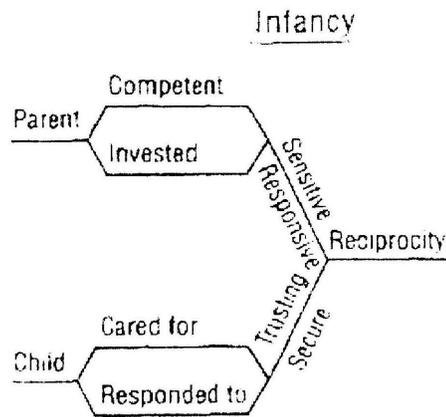


Figure 1. The parent-child relationship during the infant period. By Kelly, J.F. & Barnard, K.E., 1999. Parent Education Within a Relationship-Focused Model. *Topics in Early Childhood Special Education*. 19(3), p. 152.

The PCIM model expanded on existing knowledge by focusing on the parent/caregiver-child environmental interactive process, reflecting the infants and young children influence the parent and environment while simultaneously depending on the parents to mediate life experiences and create learning opportunities. The central focus

of Barnard's PCIM model is to assess the child's health in the context of interpersonal interaction and adaptation occurring between the child and caregiver in any environment. The integral component of Barnard's PCIM is the interactive system consisting of the parent/caregiver, the child, and the environment (Barnard, 1994). The concepts in the adapted model are directly observable, and include: (1) the parent/caregiver behaviors, (2) the infant behaviors, and (3) the parent/caregiver and infant environment. Interactional synchrony is the interactive descriptive quality of the mother-infant relationship that develops over time through series of interactional reciprocity interactions.

Parent/caregiver behaviors. Parent/caregiver behaviors refers to the child's mother, father or a primary caregiver's characteristics including the psychosocial skills, concerns about the child, physical and mental health, expectations of the child, parenting style, and ability to adapt to new situations (Barnard, 1994). A caregiver's lack of knowledge of infant behavior, illness, depression, stress, or a crisis are examples of factors likely to interfere with the interactive process of mother-infant dyads (Sumner & Spietz, 1994). This study will focus on the mother as caregiver for the observation.

Infant's behavior. Infant behavior refers to the infant's ability to clearly communicate needs and wants through cues such as changes in facial expressions, alertness, fussiness, and body posture as examples. Inconsistent cues can cause difficulties in the parent/caregiver's adaptation process (Barnard, 1994). During the early months of life, infants learn through touching, watching, and mouthing various objects in

the environment. The crucial skills infants bring to the interaction also include the capacity to respond regularly and predictably (Sumner & Spietz, 1994, p. 11).

Parent/caregiver and infant environment. The environment shared by parent and infant relates to availability (or the lack of) social and financial resources such as the presence of a supportive adult, adequate food and housing, a safe home, and community involvement (Sumner & Spietz, 1994, p. 3). Resources of animate and inanimate nature are considered in the environment.

Synchrony. Synchrony in the relationship is established when the infant's and mother's unique attributes merge in mutually satisfying reciprocal interactions sustained over time (Kelly & Barnard, 1999). Barnard (1976) described the mother-infant interaction system as "a dialogue" or "mutually adaptive waltz" between partners. The mother and infant must have an adequate repertoire of behaviors contingent on one another with richness of stimulation and affect (Sumner & Spietz, 1994, p. 9).

The model has been discussed widely in the nursing literature (Margolis, et al., 2001; Marriner-Tomey, 2006; Sumner & Spietz, 1994). Major insights of Barnard and colleagues include the impact of caregiving on infant behavioral changes and internal reorganization (DeChesney & Anderson, 2008). The model guided the Nursing Child Assessment Project in a study measuring the health and caregiving of infants and young children (Sumner & Spietz, 1994).

Barnard (1994) noted the following theoretical propositions for the model:

1) In the child health assessment the goal is to identify problems at a point before they develop and when intervention would be most effective. 3) The caregiver-infant interaction provides information that reflects the nature of the child's ongoing environment. 9) Assessing the child's social environment and the quality of caregiver-child interaction is important in any comprehensive child health assessment model. (p. 127). (Note: Propositions 1, 3, and 9 are particularly relevant to this study.)

Summarizing more than three decades of research in the World Health Organization, Dr. Lee (2005) noted as a component of Make Every Child Count:

The child-caregiver relationships with the mother, father, grandparent, and other caregivers are critical for providing infants and toddlers support, engagement, continuity, and emotional nourishment necessary for healthy development, and the development of healthy attachments. Within the context of caregiving relationships, the infant builds a sense of what is expected, what feels right in the world, as well as skills and incentives for social turn-taking, reciprocity and cooperation. There is an urgent need to develop effective ways of organizing continuity of care. (p. xv).

An example illustrating the process is a young mother-infant dyad sharing regular experiences where the infant is able to rely on the mother for needs to be attended to in a prompt and appropriate manner. Over time the infant is able to provide subtle cues as the

mother anticipates well in advance the likely needs expressed. The infant will likely feel secure and be able to express needs freely with the likelihood for the mother to consistently and accurately interpret and act on the infant's cues. Key to the process is the ongoing interactional reciprocity each member of the dyad provides. Over time, interactional synchrony is expected to develop.

Assumptions

Several assumptions apply to this study and are based on the model developed by Kelly and Barnard (1999). First, the etiology of mother-infant reciprocal communication and interaction is complex and may be attributed to characteristics of caregiver, infant, and environment (Kelly & Barnard, 1999). Second, a positive, mutually satisfying parent-child relationship is based on a reciprocal relationship where the unique characteristics of parent and child are recognized and valued by each member of the dyad (Kelly & Barnard, 1999). Third, development of a mutually adaptive interaction of the dyad is based upon several requisite characteristics including a repertoire of behaviors, contingent responses, rich interactive content, and adaptive developmental changes in patterns (Kelly & Barnard, 1999). Fourth, the parent who feels competent and invested provides sensitive responsive care to the infant and as a result, the infant feels cared for and responded to, resulting in development of a trusting, secure relationship (Kelly & Barnard, 1999). Fifth, the mother-infant interaction can be measured, in terms of quality, with some degree of accuracy by busy clinicians. Lastly, mothers and babies behave in a typical manner during clinical visits (Kelly & Barnard, 1999).

Definition of Terms

The research study relied on several theoretical and operational definitions of major terms. Terms for the purposes of the study were defined as interactional synchrony, inter-rater reliability, the k value, overall impression of parent-infant interaction, raters, scoring, time, typicality, well-baby visit, pediatric clinic, and ease.

Interrater Reliability

The interrater reliability was a major psychometric focus for the study. The agreement of the raters was assessed for the various stages and for pooled observational scores using the PIPE. Several assumptions for best use of *kappa* according to the ordinal level of the variables were met.

Theoretical definition. “The degree of consistency two or more raters can obtain the same ratings for a given variable” (Portney & Watkins, 2008, p. 745).

Operational definition. Interrater reliability is defined as degree of agreement among raters. In this study, Cohen’s *kappa* will be calculated using the individual assigning of scores by the clinic nurses and the primary investigator. Scores will be obtained by simultaneously observing interactional synchrony and positive affect at the beginning, middle, and end of the game of “peek-a-boo” using the PIPE.

Interactional Synchrony

Interactional synchrony was the major variable for the observational component of the study. The term was defined by Fiese and Poehlmann (2001) with reference to Barnard’s descriptions related to reciprocal attending of the mother-infant dyad. The

behaviors of each member of the dyad as they interacted in the various stages of playing a game were major features of interactional synchrony.

Theoretical definition. “The mutual contingent reciprocal attendance to one another in engagement with back and forth sharing of affect between parent and infant evolving over time” (Barnard et al., 1989, p. 41).

Operational definition. The score obtained on the Pediatric Infant Parent Exam based on observed parent-infant interaction and positive affect at the beginning, middle, and end of the game. The range of scores is 0-5. The score used is the average of the primary investigator and the pediatric clinical nurse.

The *k* value

The *k* or *kappa* value was used to measure agreement of the raters for the study. A unique feature for the *kappa* statistic is the ability to allow for agreement beyond chance. The variation of the weighted *kappa* was used for the study according to the ordinal level of the PIPE scale items.

Theoretical definition. The *k* value or *kappa* statistic can be used when two binary variables are attempted by two individuals to measure the same thing.

The *kappa* (*k*) statistic is defined as follows:

$$k = (P_o - P_e) / (1 - P_e)$$

The numerator represents the discrepancy between *P_o* (observed agreement) and *P_e* (expected agreement) as noted in Kundel and Polansky (2003).

Operational definition. The k value is defined as an overall measure of the agreement of two different raters observing the same phenomenon beyond the measure expected by chance (Sim & Wright, 2005).

Overall Impression of Interactional Synchrony

The term of overall impression of interactional synchrony seemed similar to the pooled interrater reliability but they were clearly two separate components. The term provided the opportunity to capture the intuitive feeling of the individual raters regarding the mother-infant mutuality. This impression offered one of the components of agreement.

Theoretical definition. The pediatric clinical nurse's feeling or perception of the mutual communication between the parent and infant.

Operational definition. A single item numerical scale measuring the rater's overall impression of the exam ranging from 1 to 7. Anchor terms for scaling range from a 1 "adaptive" to a 7 for "maladaptive" (Poehlmann, 2001).

Raters

The PI and three pediatric clinical licensed vocational pediatric nurses served as raters for the study. Ratings were obtained prior to examination of the infant by the primary care provider. The PI and one of the three pediatric clinical nurse raters were paired to score the one-time observation of each of the 50 mother-infant dyads.

Theoretical definition. A person who determines a rating or classification.

Operational definition. Raters are defined as the primary investigator and three pediatric clinical nurses.

Scoring

Scoring of the various components of maternal-infant interaction generated data for analysis. Scoring was carried out independently and simultaneously by the PI and respective pediatric clinical nurse rater. Scoring was completed and secured by the research assistant for later analysis by the biostatistician.

Theoretical definition. A numerical value or rating of a phenomenon.

Operational definition. Scoring is defined as the value of 1 to 5 for each of the three observed segments. Lower scores reflect more favorable interaction patterns. A total score would range from 0 to 15 (Poehlmann & Fiese, 2001). The lower end of the score is characterized by easy engagement between mother and infant. At the higher end of the score, the mother is either disengaged or intrusive and infant responds with negative affect.

Time

Time required for scoring the observation was central to feasibility for the study. Time was also crucial to the through-put of the clinic. Every effort was made to not impede the flow for the patients seen in the pediatric clinic.

Theoretical definition. The specific duration of an event or activity (Webster's New World Dictionary, 1982, p. 1489).

Operational definition. The number of minutes to the nearest second, as measured by a stopwatch, required for the pediatric clinical nurse to complete and score the PIPE from the moment the nurse begins reading instructions until all interactions about the PIPE are scored as the PI states “the game is over now” not to exceed 5 minutes.

Typicality

Typicality was a component of the original PIPE. The usual ways of maternal-infant interaction were paramount to allow for unusual circumstances encountered that had the potential to alter interaction of mother and baby. An example of atypical interaction was for the infant to be distracted by the paper lining the exam table rather than playing a game with mother.

Theoretical definition. The representation of a phenomenon to be expected.

Operational definition. Scoring of how representative of the usual traits of interaction the exam is for the interaction as measured by a 1 to represent very typical, 2 to represent somewhat typical, and 3 to represent an atypical engagement (Poehlman & Fiese, 2001).

Well-Baby Visit

The well-baby visit was considered the ideal setting for the study. The usual preventive visits at 6 and 9 months provided a semi-naturalistic setting for observation of maternal-infant interactional synchrony. The infant at 6 months is able to smile, laugh,

and follow with gaze in response to caregiving behaviors. Enjoyment of the dyad by mother and infant is often seen in playing of simple games.

Theoretical definition. “The clinic appointment scheduled for purposes of primary preventive health checks of infants within the first few days to weeks after birth which typically include height, weight, head measurements, a head to toe exam, developmental assessments, and vaccinations” (Kyle, 2008, p. 218).

Operational definition. The appointment scheduled for purposes of preventive health checks during which potential participants for the mother-infant interactional reciprocity may be screened. The screening will be carried out at a pediatric clinic site in West Texas beginning the first day of the infant’s sixth month until the last day of the infant’s ninth month.

Pediatric Clinic

The pediatric clinic provided the setting for the study. The clinic was housed within a university-based health sciences center. Typically the clinic is held Monday through Friday from 8:00a.m. until 5:00p.m.

Theoretical definition. The facility where primary health care for infants and children is provided (Kyle, 2008, p. 9).

Operational definition. The outpatient pediatric primary health care facility located in West Texas.

Feasibility (Ease)

Feasibility is one of the attributes considered for use of an instrument. For this study the feasibility was an important factor to be determined by the raters using the PIPE. Practical measures have greater likelihood of future use if they also have demonstrated reliability and validity.

Theoretical definition. A descriptive term denoting freedom from difficulty, worry, or strain (Webster's New World Dictionary, 1982, p. 439).

Operational definition. The assigned score on a single item numeric scale asking the pediatric clinical nurse to rate the ease of using the PIPE in screening mother-infant interactional reciprocity. Scores range from 1 (very easy), 2 (somewhat easy), to 3 (not easy). A summary of the research questions and variables is included in Table 1, Table of Pediatric Infant Parent Exam variables below:

Table 1.

Table of Pediatric Infant Parent Exam Variables

Variable	Measure	Level of Data	Possible Score
Interactional Synchrony	PIPE	Ordinal	0-5
Overall Impression Of Interaction	Single Item	Ordinal	1-6
Typicality Of Exam	Single Item	Ordinal	1-3
Time	Stop Watch With Second Hand	Ratio	1-5 min.
Feasibility (Ease)	Single Item	Ordinal	1-3

(Fiese, Poehlman, Irwin, Gordon, & Curry-Bleggi, 2001)

Limitations

A major limitation of the study acknowledged was screening was not intended as a complete diagnostic assessment. Although interaction is an important component of the infant-parent relationship, observed interaction between infants and parents is not equivalent to the actual interaction between infants and parents (Puura et al., 2007). Observation is like a brief photograph of a relationship and admittedly cannot fully capture the full range of behaviors. The opportunity of observing parent-infant interaction does provide insight into several domains of the dyadic relationship including caregiver emotional availability, infant emotion regulation, caregiver nurturance/support, security in the infant, and play (Puura et al., 2007).

Several threats to the study were acknowledged. The Hawthorne effect was a potential threat as the pediatric clinical nurses or mother-infant dyads could have changed behaviors simply as a result of participation in the research study. The threat was lessened by having the nurse wait at least three minutes before beginning the PIPE to allow the mother and infant time to feel more at ease. The nurse might have felt rushed or pressured to do the PIPE screening in addition to the complete examination of the infant, creating an unreliable or invalid scoring. Training attempted to alleviate such a threat. The nurses may have experienced difficulty in use of the PIPE, resulting in unreliable or invalid scoring. This threat was also addressed by training. The halo effect was a potential threat as the nurses may have been influenced by one characteristic in judging another unrelated characteristic. Training may have lessened the potential for

this outcome. The error of leniency or severity could have threatened the study as the nurses could have rated everything positively or too harshly, respectively. Training may have lessened the possibility of this threat.

The threat of fidelity loss and drift were major considerations for this study. Treatment fidelity refers to the methodological practices used to ensure a research study reliably and validly tests a clinical intervention (Resnick, Inguito, Orwig, Yahiro, Hawkes, Werner, Zimmerman, & Magaziner, 2005). Although this study did not have a clinical intervention in the strict definition of the term, the proper use of the PIPE will be considered the intervention. Treatment fidelity included study design, training, delivery, receipt, and enactment. Treatment fidelity may have impacted the internal and external validity of a study. If the treatment did not adhere to the stated protocol, then the study results of poor internal validity and inaccuracy as to the utility of the treatment could occur. Subsequent effects may have included decreasing likelihood of replication and diminished external validity. Another positive benefit of treatment fidelity was minimizing the drift in treatment adherence over time. Assuring optimal treatment fidelity also decreased the costs of the study as power can increase and findings may be recognized with a smaller sample utilized (Resnick et al., 2005).

Treatment fidelity related to design for the research study sought to assure the study adequately addressed the questions in relation to the underlying theory of attachment (Bowlby, 1969, 1973) and the Caregiver/Parent-Child Interaction model (Kelly & Barnard, 1999). Fidelity training included assessment and ongoing evaluation

of training of the pediatric clinical nurses serving as observers and raters in the study to ensure a satisfactory potential to carry out the study. Pre-study training use of the PIPE was carried out according to the standardized manual developed by Fiese and Poehlman (2001) including interrater reliability of video scenarios. The pre-study goal was an agreement of at least 0.70 on five ratings of each of the nursing research assistants and the PI. The selection of the pediatric clinical nurses to assist in the study was based on the criterion of competence (per annual evaluation of a senior pediatric supervisor) and a minimum of three years' experience in nursing assessment and care of pediatric clientele. Ongoing assessment was carried out with opportunities to discuss and clarify issues as the topics arise. Fidelity receipt and enactment was addressed by review of the training video tapings and discussion to guide any needs for retraining or issues for clarification to ensure adherence to the protocol. A checklist was included for pre-study, ongoing/mid-study, and post-study monitoring of the raters' training and the PI's adherence to implementation guidelines.

Summary

A valid, reliable, practical, and psychometrically sound screening instrument of maternal-infant interaction is needed for identification of at risk dyads. Evaluating the quality of the maternal-infant relationship is a challenge to researchers and clinicians interested in infant development and quality of early parenting. There is a lack of user-friendly, empirically valid methods to measure such a complex phenomenon across disciplines to provide clinically significant details. The dissertation study examined the

interrater reliability and feasibility of the Pediatric Infant Parent Exam (PIPE) screening tool used by nurses during a well-baby visit on six to nine month-old infants in a well-baby visit in a clinic setting.

A major rationale for the study was to support the importance of interactional reciprocity in a mutually satisfying mother-infant dyad as a formative experience for maturation of the social brain, self-regulation, symbol use, and empathy. These maturing mechanisms may be altered by experience of multiple and intense negative emotions (Mantymaa et al., 2003). A desirable goal for child specialists, including maternal child nurses, is to intervene early in the first year of life when risk for altered communication of the mother-infant dyad can be addressed. The PIPE is an instrument to potentially satisfy such a need for mother-infant screening in settings of outpatient well child clinics.

The study was guided by Bowlby's (1969, 1973) theory of attachment and the Parent/Caregiver-Child Interaction model (Barnard, 1994). The essence of Bowlby's attachment theory is the proposition that affectional bonds between individuals and patterns of interactions early in life between caregivers and children produce internal working models that serve as templates guiding interpersonal expectations and behaviors in subsequent relationships. The seminal work of Barnard and colleagues (1994) advanced the use of attachment theory with brief observations of parent-child interaction in semi-structured situations to identify risk for poor outcomes. The primary investigator and three pediatric clinical nurses determined the interrater reliability of the PIPE, explored the relationship between scores for the PIPE interactional reciprocity and scores

for overall impression of reciprocity of the mother-infant interaction, and identified the nurses' judgment of typicality of the exam. Additionally, feasibility per amount of time and rated ease required for the pediatric clinic nurses to implement and score the PIPE was determined. The study was conducted in a pediatric clinic during a well-baby visit for mother-infant dyads when the infant was between six and nine months of age.

The definitions for terms of the study included interactional synchrony, inter-rater reliability, the k value, overall impression of parent-infant interactional synchrony, raters, scoring, time, judgment of typicality, well-baby visit, pediatric clinic, and ease.

Limitations of the study included the acknowledgement that the screening was not intended as a complete diagnostic assessment. The brief observation provided a window into the relationship of the mother-infant dyad including caregiver availability, infant emotion regulation, caregiver nurturance support, security in the infant and play (Puura et al., 2007). A variety of threats were noted including the Hawthorne effect, the halo effect, and the error of leniency or severity. Additionally, the major issue of fidelity was addressed as a means of strengthening the development, training, and implementation of the research study thereby reducing the likelihood of observer drift. A fidelity assessment grid was used to monitor fidelity for the study.

CHAPTER II

REVIEW OF LITERATURE

Introduction

The content for Chapter II addressed the background and context for the study. The problem identification offered a context for the study. An abbreviated historical perspective of the care of infants and children provided a context for the importance of maternal-infant interaction in nursing. Use of the construct of maternal-infant interactional synchrony was provided to offer guidance interpreting the literature. The various criteria for the review of literature were noted. The organization of the review of literature was carried out with the intent of showing selected current literature to reflect the paucity of instruments suitable for this study. Exemplars are shared with the culmination in choice of the use of the Pediatric Infant Parent Exam for this study.

From a historical perspective, theory and research on maternal-infant relations emphasized the concept of interactional synchrony. Maternal-infant interactional synchrony is a construct capturing the mutuality and reciprocity of parent-child interaction (Harrist & Waugh, 2002). Interactional synchrony is characterized by joint attention experiences between the mother and infant. Maternal infant interactional synchrony is a dyadic interaction between mother and infant that provides an observable mutually regulated pattern. A contingent reciprocal rhythm is noted as each member

makes behavioral adjustments to maintain a balance in the system (Barnard, 1987; Foss, Hirose, & Barnard, 1999; Reyna & Pickler, 2009). The bidirectional mutually responsive quality of interaction describes well-functioning maternal-infant relationships (Feldman, 2007; Mantymaa, Puura, Luoma, Vihtonen, Salmelin, & Tamminen, 2009).

Problem Identification

Research is lacking in describing the quality of maternal-infant relationship dyadic interactional synchrony with effective practical instruments based on direct observation of the maternal-infant dyad in the first year of life in a well-baby clinic setting. To further describe the major variables of the study, the following section included a review of the literature for the relevance and measurement of interactional synchrony. The culmination of the literature review provided the context to support the choice for the instrument used in the study.

As maternal responsiveness and affect are postulated as vital maternal components of interactional synchrony, so too are essential characteristics of the infant to facilitate active and cooperative participation (Cohn & Tronick, 1987; Isabella & Belsky, 1991 and Lindsey, Cromeens, Colwell, & Caldera, 2008) emphasized the care giving and surrounding relationship is more powerful than individual assessments of mother or infant.

Dyadic interactional synchrony has been measured using practical instruments based on direct observation of the maternal-infant dyad in the first year of life in a well-baby clinic setting (Fiese et al., 2001). The following section also included a review of

the literature for the measurement of interactional synchrony. The literature review provided the context to support the choice for the instrument used in the study.

Because few studies have measured the quality of the maternal-infant relationship in a practical dyadic manner, the literature review for the dissertation study highlighted selected instruments used in measurement of maternal-infant interactional reciprocity to demonstrate a need for instruments with practical and adequate psychometric properties. Usefulness of the Pediatric Infant Parent Exam (PIPE) as an instrument to facilitate screening of maternal-infant dyads in a clinic setting within the first 6 to 9 months of life during a well-baby visit is documented in the literature (Fiese et al., 2001).

The quality of the interactional synchrony of the maternal-infant dyad is considered to play a major role in the process of socialization (Ereky-Stevens, 2008). Several related fields of inquiry such as psychology, child development, linguistics, human development and parenting have provided knowledge of interactional synchrony for the infant's development of cognition, language, bio-physiology, self-regulation, and attachment (Spiker, Boyce, & Boyce, 2002; Hsu & Fogel, 2003; Leckman & Mayes, 2007; Lindsey et al., 2009; Paavola, 2006).

The reciprocal and responsive parenting involved in interactional synchrony aligns well with the premise for attachment. Attachment, for purposes of this study, was defined as an enduring emotional tie of the infant to his/her caregiver, characterized by a tendency to seek and maintain closeness, especially during times of stress (Bowlby, 1969). The attachment process includes ethological and innate biological components

which contribute to the quality of the attachment. When the infant enjoys responsive, timely and appropriate care in the relationship with his/her caregiver, the infant is likely to gain a sense of security and confidence (Ainsworth et al., 1978; Reyna & Pickler, 2009). As the maternal-infant dialogue develops in the early months, individual differences from one dyad to another will become apparent. A key characteristic of synchrony is the dyadic quality reflective of the interaction style of the dyad (Lindsey et al., 2009). Thus, identification of several characteristics of any successful relationship during this period is possible. Lindsey and colleagues (2009) reported support for contingent and mutual response interactions of mother and child in setting the stage for optimal patterns of development. Amelioration of components of the maternal-infant dyadic interactional pattern is also possible when challenges to effective interactional synchrony are identified early (Richter, 2004).

Historical Highlights of Nursing Research on the Parent-Child Relationship

The culmination of various aspects of mother-infant interactional synchrony was considered in the following segment as a focus to illustrate the importance of mother-infant interaction in nursing. Today, it is accepted that parents have a right to stay in the hospital when sickness of a child occurs based on the knowledge that children especially need the comfort and caring of parents during times of illness (Jolley & Shields, 2009). However, such has not always been the case. While initial practice included overt affection from nurses as noted in notes of Nightingale, children perceived nurses as uncaring in the early 20th century (Jolley & Shields, 2009). By the 1920's, a more

industrialized environment prevailed as hospitals became grim places for children (Jolley & Shields, 2009). Routines of wards suited staff rather than patients as parents relinquished care of children to hospital staff. During the early 20th century, parents were not allowed to visit a sick son or daughter more than approximately thirty minutes per week largely due to infectious protocols and hospital routines (Jolley & Shields, 2009).

The founding of The Children's Hospital of Philadelphia, Pennsylvania in 1855 marked the beginning of pediatric nursing as a specialty (Taylor, 2006). The Children's Hospital was uniquely designed for the care of children with a goal of decreasing childhood mortality in the United States by provision of excellent care (Taylor, 2006). Soon to follow were hospitals in other major US cities including Boston, New York, San Francisco, Albany, and St. Louis (Taylor, 2006).

Nurses occupied a central role in the "child-saving movement" during the early twentieth century including improvement of artificial feeding of infants and children to decrease mortality rates (Taylor, 2006). The work of Lillian Wald and Mary Brewster offered major milestones in home visitation, community nursing educational programs and social clubs for children. Wald thought mothers were essential for the survival of children while many nurses of the twentieth century "viewed mothers as unnecessary, bothersome, and at times even harmful in the care of hospitalized children" (Taylor, 2006, p. 130). A major catalyst for change was ushered by events of World War II (Jolley & Shields, 2009).

Cumulative research initiatives from the 1940s to the 1960s brought about changes in attitudes and policies on the effects of maternal deprivation. Bowlby and Robertson demonstrated serious emotional, psychological, and developmental consequences of separation between mother and child in the hospital (Harrison, 2010). The earliest description of the multiple components of family-centered pediatric nursing care was shared by Florence Blake (1954). Blake (1954) asserted understanding the parent-child relationship is fundamental to nursing of children and families in the author's seminal work on experiencing care for a child with a congenital cardiac anomaly. Blake called for individualized responsive care of children in the context of family, developmental capacity, and parental participation. The initiative for true family-centered care began in the 1980s (Taylor, 2006). Family Centered Care for children and families came in response to professional and parental concerns about the approach to health care for children with special needs as infants were born earlier with greater needs (Harrison, 2010).

Family Centered Care is currently funded as a national center by the Bureau of Maternal and Child Health and was legislatively mandated as an expectation of service delivery for children with special health care needs in the Maternal and Child Health Block Grant Amendments in the Omnibus Budget Reconciliation Act of 1989 (Public Law 101-239), the individuals with Disabilities Education Act (Public Law 101-476), the Developmental Disabilities Assistance and Bill of Rights Act (Public Law 101-639) as

reported by Harrison (2010). Family Centered Care has been recommended as the standard for all children and families who enter the health care system (Harrison, 2010).

Pediatric nursing scholarship has emphasized the parent-child relationship as the context in which parenting occurs as the health and development of the child is supported (Pridham, Lutz, Anderson, Riesch, & Becker, 2010). Following a surge in developmental research, a significant change in paradigm in child development was adopted in the 1970's. Conventional wisdom evolved to recognize newborn infants were generally contributors to their environment (Osofsky & Fitzgerald, 2000). Infants were acknowledged as being capable of complex social interactions and well-organized protective behaviors (Brazelton, 1973). Brazelton and colleagues (1975) studied the communication system that develops between mothers and infants during the first months of life and found rhythmicity to be a key component. Such ideas provided new impetus to scholarship for the discipline of nursing (Pridham et al., 2010).

The work of Barnard, Eyres, Lobo and Snyder (1983) on the Nursing Child Assessment Satellite Training (NCAST) was ground breaking for support of the empirical study of mother-infant interaction. Publications by Barnard (1979) were guided by developmental psychobiology with a clinical orientation for working with maternal-infant dyads as interactions were observed. The four major components Barnard (1979) noted to be essential for interactional synchrony were a sufficient repertoire of behaviors to notice and respond to one another, contingent responses, richness in affect, and change over time. The pivotal work of Barnard revolutionized

pediatric health care during a 30-year career including research, publications, and establishing the Center for Infant Mental Health at the University of Washington, her current work site. In 2003, Barnard received the Episteme Award, considered the Nobel Prize of nursing by some.

The widespread use of the NCAST has demonstrated evidence for the impact of Barnard in mother-infant interactional studies. Nursing research including contributions of the infant to the parent-child relationship was advanced by the development of several new valid and reliable instruments. In the informative article critiquing commonly used observer-rated measures of maternal-infant interaction, Horowitz and others (2005) shared findings to inform mental health nurses and other clinicians regarding the use of measures in research and practice. The quality of the parent child relationship was soon highlighted as screening for relationship risk and outcomes for nursing interventions to support health and development of the child was considered. The Pediatric Infant Parent Exam was developed with a similar basis for the purpose of early identification of interactional synchrony risk dyads during regular health visits when the window of timing could best be availed (Fiese et al., 2001). Numerous assessment instruments were considered with a focus on theoretical operationalization of the interactional synchrony construct and methodological approaches for measurement and psychometrics.

Literature Review Method

An integrative review method was used to synthesize findings from published empirical studies about maternal-infant relationships. The framework for conducting this

integrative review followed the general process outlined by Whitemore and Knafl (2005) emphasizing data analysis. Rigor was ensured by stages of problem identification, literature search, data evaluation, and data analysis. The major theoretical and conceptual framework for the study included selected interactional components of attachment and the Kelly and Barnard model of maternal-infant interaction, the Parent-Child Interactive Model in Infancy (PCIM), as noted in Figure 1, Chapter 1 text (Kelly & Barnard, 1999).

Electronic and Ancestral Searching of the Literature

Reference librarians specializing in medical, psychological, sociological, and nursing research assisted with the global literature search. Additionally, the reference librarian of the Tavistock Clinic provided access to documents on reserve including historical attachment and methodological holdings on attachment theory and observation. All the following terms were searched: mother or infant or interaction or maternal-infant interaction or maternal sensitivity or maternal responsiveness or interactional synchrony or reciprocity or attachment or contingency or measures of or screening or observation. The following electronic databases were searched from January 1980 to April 2010 to identify studies meeting the inclusion/exclusion criteria: MEDLINE< CINAHL, PsychINFO, Ovid, and Goldrush. The search strategies were customized for each database. Indexing terms such as MeSH, in addition to the text terms, were used in each database. Searches were carried out over a period of eight years. Results of each of the searches were exported into a reference manager as titles, abstracts and appropriate articles were retrieved and reviewed. Extraction was carried out according to the purpose

and methods for the study. Ancestral searching was completed by reviewing reference lists of selected studies and the major works of nursing experts in mother-infant interaction.

Narrowing the Dissertation Study to the Quality of Mother-infant Interaction

A concept analysis and instrumentation study assisted in narrowing the dissertation study to the quality of maternal-infant interaction as defined by interactional synchrony. The rationale for selection of interactional synchrony as the concept for the research study of maternal-infant interaction is the dyadic focus on the quality of the interaction between mother and infant and the unique consideration of each in the relationship (Barnard, 1987; Brazelton, Ksloowski, & Main, 1974; Harrist & Waugh, 2002). A comparative analysis assisted in selection of the Pediatric Infant Parent Exam as the most appropriate instrument for the study. Correspondence with developers of the chosen instrument was completed. Fiese and Poehlmann granted permission to use the PIPE (Fiese et al., 2001) as first published and shared training materials for the study.

Inclusion and Exclusion Criteria for the Literature Search

Theoretical, descriptive, methodological, or experimental studies were included based on purpose of the study. Studies required a focus on the maternal-infant relationship specifically, as indicated by terms such as relationship, synchrony, reciprocity, attachment, measurement, and interaction, among others. Observational measures for achieving inclusion criteria included infants aged 6 to 9 months based on adequate demonstration of psychometric properties and utility for use in clinical practice.

When several potential measures were identified, exemplars were selected and described to illustrate advantages and possible disadvantages for use in the study. The year, 1980, was chosen due to the initial appearance in the literature of works by Brazelton (1974), Barnard (Barnard & Bee, 1979), and Bowlby (1969). Several landmark studies were included with less current dates. Ongoing searches were conducted from 2005 through 2010.

Studies were excluded from the review on maternal-infant interactional synchrony if published in a language other than English or a purpose dealing with content other than the focus of the study. Exclusion was based on failure to contribute to the knowledge of instruments to measure interactional synchrony in a practical manner as used by pediatric clinical nurses during a well-baby visit for infants six to nine months of age in a pediatric clinic. Self Report, Q-Sort, and videography were considered and excluded after analysis as the methods are inappropriate for the focus on practical issues (time required) of measurement of interactional synchrony during clinic visits of mother infant dyads. The chosen focus on observation as the primary method of study of mother-infant interactional synchrony was supported by the available instruments and developers.

Varied Use of the Construct of Interactional Synchrony from Early Literature

As noted in Chapter I, maternal-infant interactional synchrony was defined as “the mutual contingent attendance to one another in engagement with back and forth sharing of affect between parent and infant evolving over time” (Barnard et al., 1989, p. 41). The term construct was defined as a highly abstract concept not directly observable and

constructed of less abstract concepts observed directly or indirectly (Waltz, Strickland, & Lenz, 2005). Application of the definition considered interactional synchrony as a construct of the concept of maternal-infant interactional quality and was inferred through a combination of direct observation and measurement according to an instrument (Fiese et al., 2001).

The review highlighted selected theoretical, conceptual, and methodological literature adding to the understanding of the measurement of dyadic interactional synchrony. The Kelly and Barnard Parent-Child Interactive Model of maternal-infant interaction guided the study. In the Parent-Child Interactive Model (PCIM) as noted in Figure 1 (Kelly & Barnard, 1999), maternal-infant interactional synchrony is comprised of both parental sensitive responsiveness and infant trust and security. The infant is both the recipient of, and participant in, the mutually satisfying contingent reciprocal interactions of the dyad as affect is shared.

Ideally, the theoretical definition of a concept is consistent with use within a discipline (Waltz et al., 2005). However, maternal-infant interactional synchrony was reported in a variety of ways across multiple disciplines such as linguistics, infant mental health, child development, and nursing. Some researchers have defined interactional synchrony as the “extent to which an interaction appears to be reciprocal and rewarding” (Isabella, Belsky, & von Eye, 1991, p. 13), whereas others have used the term synchrony to refer to synchronized cycles detected in cross-spectral analysis (Goldstein, Field, & Healy, 1990). For the dissertation study, the meanings of reciprocal interaction and

synchrony as used by Kelly and Barnard (1999) and Fiese et al. (2001) are considered equivalent. The descriptions of interactional reciprocity and synchrony by both groups of authors identified the components of mutual adaptive interactions with engagement of both mother and infant in response to one another. The same theoretical foundation underpins each of these definitions according to the developers (Barnard et al., 1989; Sumner & Spietz, 1994; Fiese et al., 2001).

Despite the dyadic nature of interactional synchrony, some studies focused only on mothers or infants. Some researchers separated interactional synchrony into discrete components (Isabella & Belsky, 1991). Others argued such an approach might fail to capture the systemic wholeness and co-constructed nature of mother-child interaction (Fogel, 1993; Harrist & Waugh, 2002). Different interactional synchrony studies proposed different definitions for behaviors to be coded. For example, emotional qualities as genuine and congruent affect are emphasized in the Emotional Availability Scales (Biringen & Robinson, 1991). In the Parent-Child Early Relational Assessment Scale (Clark, 1985), maternal sensitivity behaviors included enjoyment, connectedness, mirroring, structuring, and mediating the environment. Although parent-child interactions may be guided largely by parents (Isabella & Belsky, 1991; Lindsey et al., 1997; Mize & Pettit, 1997), the interactional synchrony construct reflects the interactional style of the dyad rather than the behavior of individual participants (Harrist & Waugh, 2002).

The abundance of studies on maternal-infant interactional synchrony and the diversity in definitions suggested a hierarchy for use of the construct. A meta-analysis conducted on studies of attachment and sensitive maternal care (DeWolfe & van IJzendoorn, 1997; Bowlby, 1969) revealed some problems with the literature due to differing definitions of sensitive care. When meta analyses were carried out the variance in context or use of the terms and measurement created difficulty in use of the information across disciplines. Thus, reliance on conceptual and theoretical underpinnings for the study provided guidance for the literature review.

Infant Attachment, Maternal Sensitivity, and Interactional Synchrony

Bowlby's theory of attachment, based on psychoanalytical, ethological, and evolutionary theories, explained the phenomenon of the natural balance between exploration and proximity of an infant to the mother (Bowlby, 1969, 1973). Through attachment in the first relationship infants gain a sense of self-worth, security, trust, and the ability to self-regulate (Bowlby, 1969). John Bowlby departed from the classical Freudian tradition and developed a different set of views about human development with an evolutionary perspective (Cassidy, 1999; Bowlby, 1969). Bowlby put forth two central hypotheses: first, individual differences in the quality of infant caregiver attachment relationships were largely the product of the history of interaction with the caregiver, and second, variations in attachment quality provided the foundation for later individual differences in personality (Sroufe, 2005).

Bowlby's dynamic view of development includes a non-linear, transactional model where both history and present circumstances are important. Also, established patterns of adaptation may be transformed by new experiences. At the same time, new experiences are framed by, interpreted within, and in part, created by prior history of adaptation (Sroufe, 2005; Waters, Hamilton, & Weinfield, 2000). Central to the concept of the Bowlby's attachment behavioral system is the organization of a variety of attachment behaviors within the individual in response to internal and external cues (Cassidy, 1999) now known to include interactional reciprocity (Reshke, 2010). Rutter (1995) concluded the key features of Bowlby's theory, especially the importance of early relationships for later personal and social competence, were empirically supported. Bowlby's thinking revolutionized the conceptualization of risk experiences related to mental health and development (Rutter, 2009).

To elaborate on Bowlby's work, Ainsworth and colleagues (1978) performed observations of 26 maternal-infant dyads over a one-year period, with more than 60 observational hours per dyad. Findings revealed sensitive maternal responses to infant cues and behaviors (interactional synchrony) form the basis for secure attachments (Ainsworth and colleagues, 1978). Conversely, Ainsworth and colleagues (1978) provided information to support the likelihood for insecure attachments to develop from insensitive or inaccessible mothers in the first year of life. Maternal sensitivity is a dyadic concept entailing responsiveness to the infant's characteristics, mood, and current state (Ainsworth, Bell, & Stayton, 1974). Specifically, a sensitive mother is able to: 1) be

aware of infant's signals, 2) interpret infant's signals correctly, 3) respond appropriately to infant's signals, and 4) respond promptly to the infant's signals (Ainsworth et al., 1978). All of these components contribute to and are measured as maternal-infant dyadic interactional synchrony (Reschke, 2010; Reyna & Pickler, 2009).

Mother-infant interactional synchrony is also recognized as a contributory component of the mother-infant attachment relationship because the frequency and quality of the interactions may affect the development of the prefrontal cortex mediating the ability to be emotionally balanced and socially appropriate (Feldman, Greenbaum, & Yirmiya, 1999; Meissner, 2006). When combined with the evidence for the existence of 'critical periods' in early development, some findings point in the direction of early epigenetic programming in the central nervous system and the rest of the body (Leckman & Mayes, 2007). Such programming may have enduring effects on gene expression as a means of preparing the newborn for the environment soon to be encountered.

Investigating the interactional synchrony between mother and infant was important for better understanding each member's contribution to the development of the mother-infant relationship and how to intervene when threatened (Schiffman, Omar, & McKelvey, 2003). Some examples of threats to mother-infant interactional synchrony included maternal factors such as adolescent status, maternal depression, low levels of education, poverty and drug abuse (Schiffman et al., 2003). Some infants may be predisposed to risk for altered interactional synchrony due to prematurity, medically fragile status, or difficulties in the first months of life (Censullo, 1994). Poverty and

economic vulnerability have been repeatedly linked to altered functioning for family systems including the development of the child and mental health of all members (Brooks-Gunn et al., 2000). Such threats provided a focus for many of the studies of maternal-infant synchrony.

Major Maternal and Infant Aspects of Dyadic Interactional Synchrony

At the heart of this dissertation study was the measurement of interactional synchrony in maternal-infant dyads. Unique characteristics and the ways of acting of both mother and infant shape the nature of the mother-infant interaction. Major potential maternal interactional behaviors include sensitivity, responsiveness, contingency, intrusiveness, remoteness, and affective components.

As noted previously, a sensitive mother has awareness, accuracy in interpretation, appropriateness, and promptness in response to the signals of the infant (Ainsworth et al., 1978). The term described a sensitive but not overly sensitive mother allowing the infant to signal needs and then appropriately adapting maternal behaviors to the needs of the infant. An attentive mother would maintain proximity to her infant using visual, auditory, and tactile stimuli to sense cues for interaction. Conversely, an unresponsive mother would not attend to the infant's cues with awareness, accuracy in interpretation, appropriateness, and promptness. Moreover, an intrusive mother would physically poke or over-stimulate and interfere with the infant's exploratory activities while showing more hostile or irritable affect (Feldman, 2007).

More attention has been given to the mother's role, but evidence suggesting infants also have an important role in maintaining or enhancing the quality of the interaction by eliciting better responses from the mother exists (Kivijarvi et al., 2001). Some infants may be better at interacting due to more favorable motor organization and behavioral characteristics (Field et al., 2003). Major crucial skills the infant brings to the encounter include perceptual abilities of seeing, hearing, the capacity for mutual regard, smiling, physical adaptation to holding or movement, soothability, and regularity or predictability of response (Barnard et al., 1989; Schore & Schore, 2008).

Benefits of Interactional Synchrony

Harrist and Waugh (2002) shared several functional benefits of interactional synchrony. Perceptual information of one sense is vital for processing data from other senses. For instance, gazing at the caregiver helps the infants interpret vocalizations the caregiver makes. If the infant and caregiver are in a state of harmonious and adaptive interactional synchrony, information from the caregiver is transmitted to the infant in a non-interfering way providing the infant with the ability to process across the five senses thereby increasing the likelihood the process will be maximized (Harrist & Waugh, 2002; Reyna & Pickler, 2009).

Interactional synchrony appears to facilitate homeostatic regulation as noted previously by Schore & Schore (2008). Neonates have a limited ability to regulate arousal level, sleep patterns, and other processes; the caregiver can help the infant establish the rhythms through interactions until the infant gets better at self-regulation.

Such synchronous interactions are especially helpful regarding the functions, because when the caregiver is tuned in to the cues of the infant, the interaction between caregiver and infant can help the infant transition smoothly from one state to another. The interactional synchrony provides the infant with practice to accomplish the same interaction independently at a later time (Harrist & Waugh, 2002). Various theoretical perspectives propose sensitive and responsive parenting may facilitate the organization of infants' physiological systems to achieve regulation vital to support more complex social-emotional and cognitive development (Moore et al., 2009; Schore & Schore, 2008).

Additionally, interactional synchrony appears to increase the likelihood the infant will feel effective. Children need to learn in the early stages of life the concept that actions make a difference and how to express needs with the expectation the needs will be met. Children do not understand the concept in a conscious way, but there is reason to believe infants feel whether or not interactions are going well resulting in altered interactional synchrony.

Feldman and Eidelman (2006) demonstrated small-for-gestational age (SGA) infants showed less organized state with mother-infant interactional synchrony characterized by maternal intrusiveness, mis-coordination and negative infant engagement. The study (Feldman & Eidelman, 2006) was comprised of 120 singleton premature infants (gestational age <36 weeks) with 40 SGA infants matched to two control groups: group 2 (Appropriate Gestational Age-Birth Weight [AGA]), 40 AGA infants matched for birth weight (± 100 g), and group 3 (Appropriate Gestational Age-

Gestational Age), 40 AGA infants matched for gestational age (within the same week). Each group included 22 girls and 18 boys. Approximately 10 minutes of mother-infant interaction were videotaped during a home visit at three months and in a laboratory visit at 24 months. Coding was carried out by trained observers using the Coding Interactive Behavior, a global rating system of parent-interaction that includes 42 behaviors rated from 1 (low) to 5 (high). The system has been validated in numerous studies of at risk infants and has shown sensitivity to infant age, interacting partner, cultural background, and developmental risk conditions. The 2 factors for the study were maternal intrusiveness and infant negative engagement. Maternal intrusiveness was measured based on 5 items: parent's physical manipulation of infant's body, interruption of infant's activities, breaking gaze while infant is looking, disregard of infant's signals, and parent leading the interaction (Cronbach $\alpha = 0.82$ and 0.86 at 3 and 24 months, respectively). Infant negative engagement was calculated from 4 items at 3 months and from 5 items at 24 months. Indications of negative engagement included the infant demonstrating manifestations of fatigue, emitting fuss-cry vocalization, averting gaze, or withdrawing and/or physically avoiding mother (Cronbach $\alpha = 0.87$ and 0.83 at 3 and 24 months, respectively). Two coders, who did not participate in testing and were not aware of the infant's group membership or medical risk, were trained at 90% agreement. Reliability was measured on 15 scorings at each stage and reliability averaged 96% ($\kappa = 0.86$).

When interactional synchrony is mistimed, or when the caregiver is not responding appropriately to the actions of the infant, interactions do not feel right to the

infant and are displayed as distress. When the caregiver and infant are interacting synchronously, the interactions feel right to the infant, and the sense of rightness may translate into a sense of self-efficacy or self-worth as growth occurs (Harrist & Waugh, 2002). A major benefit of interactional synchrony for the infant is related to feeling capable of having needs met and worthwhile. Infants engaged in repeated episodes of interactional synchrony with primary caregivers are further likely to establish a secure attachment with the caregiver (Harrist & Waugh, 2002). Theorists claim when children are in a relationship with an appropriately responsive caregiver, children learn the concepts of worth, love, and other people can be trusted to “be there” to provide care (Harrist & Waugh, 2002). Once the concepts have been learned, the children are considered securely attached to caregivers and approach future relationships with positive expectations and a positive sense of self (Harrist & Waugh, 2002).

A relevant study (Isabella & Belsky, 1991) suggested parent child interactional synchrony can facilitate the formation of a secure attachment, most likely because sensitive responsiveness on the part of the parent is required for attachment to occur. Isabella and Belsky (1991) replicated previous work in testing the hypothesis that interactions of dyads developing secure relationships would be characterized by disproportionately synchronous and those of dyads developing insecure relationships by disproportionately asynchronous exchanges. Additional a priori hypotheses were tested as to expected differences in the interactional histories of dyads developing insecure-avoidant and insecure-resistant attachment with an independent sample from the

designated secure and insecure samples. Specifically, the expectation was insecure-avoidant dyads are disproportionately characterized by intrusive, unresponsive maternal behavior and those of insecure resistant dyads as poorly coordinated and under-involved (Isabella & Belsky, 1991).

The sample was comprised of 153 mothers and their firstborns in the second (B: $n = 51$) and third (C: $n = 102$) cohorts of the Pennsylvania Infant and Family Development Project (IFDP: Belsky, Gilstrap, & Rovine, 1984; Belsky, Rovine, & Fish, 1989). Mothers in the last trimester of pregnancy were studied intensively throughout the infants' first year of life. Observations were also carried out when infants in the second cohort were 1 month of age although data for the cohort are not reported given the absence of 1-month and the resulting inability to replicate 1-month findings (Isabella & Belsky, 1991). All families were Caucasian and of predominantly middle- and working-class socioeconomic status. The longitudinal data-gathering effort (Belsky & Isabella, 1988, p. 378) included observation of the dyad when infants were 3 and 9 months of age and infant-mother attachment was assessed at 1 year of age. In-home observations were carried out within the first week, 3 months, and 9 months post-delivery. Observations occurred for 45 minutes in naturalistic conditions as mothers went about usual daily routines. The “three-step contingent exchange” was observed in interactional turn-taking such as when mother stimulated infant and infant responded, or if mother then spoke to infant or baby vocalized and mother responded to the vocalization, and lastly if infant smiled back at mother (Isabella & Belsky, 1991). Observers were trained intensively

over a period of 2 months with mean agreement in excess of 80%. In the case of the third cohort, the unit reliability sampling was the 15-second episode. Agreement, adjusted for chance agreement using Cohen's (1960) *kappa*, ranged from 0.66 to 0.95 across behaviors with a mean of 0.76.

As predicted, the insecure group of 3 and 9 month interactions of avoidant dyads were characterized at both ages by maternal intrusiveness and overstimulation; resistant dyads were characterized at both ages by poorly coordinated interactions in which mothers were under-involved and inconsistent (Isabella & Belsky, 1991).

Turn-taking such as parental behavior to encourage displays of child competence and displays of affection during interactional synchrony are advocated for strengthening the mother-child relationship (Kassow & Dunst, 2005). Benefits to the mother include gratification in assuming the role of caregiver and the development of maternal identity (Mercer, 2004). If the process of becoming a mother goes well, a woman develops an intimate knowledge of her infant serving as a catalyst for acceptance of persona as a mother (Fowles & Horowitz, 2006). Two related components of becoming a mother are critically relevant: (1) feeling love for and attachment to the infant as a constant, and (2) engagement adaptive to the needs of the infant as demonstrated by interactional synchrony (Fowles & Horowitz, 2006).

Exemplar Instruments of Observation: NCAST, MICS, and PIPE

Objective evaluation of components of maternal-infant interactional synchrony was best accomplished by observation (Fowles & Horowitz, 2006). An effective

interaction screening instrument should take into account the reciprocal nature of parent-infant interactions and involve direct observation of the maternal-infant dyad (Fiese et al., 2001). Systematic observation of parent-child interactions by nurse researchers was advanced with the establishment of the National Center for Nursing Research (National Institute for Nursing Research, NINR, 2007) and the designation of a national research priority for studies of infant and reproductive health.

Early data collection methods included professional observation of maternal behavior and infant responses with an overall impression summary of the interactional synchrony. Esther Bick and colleagues at Tavistock Clinic pioneered infant observation of the interplay between mother and child in the 1940's (Rustin, 2008). The focus is on the relationship of the mother and infant. A justification for the procedure was provided by Winnicott's (1964, p. 88) famous statement, "There is no such thing as a baby, there is a baby and someone." Recognition of the importance of not only the infant, but also the "someone," most often the mother of the infant, provided a rationale for the need to include both in studies of early relationships. In the first months of life, the primary entity observed is the maternal-infant dyadic interaction. The method of infant observation emerged earlier than development of new understandings of the complexities of mother-infant relationships achieved in laboratory studies by developmental psychologists such as Brazelton and Cramer (1973, 1991) and Stern (1985). Nursing researchers and interdisciplinary clinicians united to create a synergistic force with effective measurement of maternal-infant interaction based on theory. The instruments

included as exemplars share theoretical values and emphasize the importance of maternal-infant interactional synchrony.

The Nursing Child Assessment Satellite Training Instruments

The Nursing Child Assessment Satellite Training (NCAST) instruments (Barnard et al., 1989; Sumner & Spietz, 1994) are exemplars of observations to evaluate parent-child interaction. The NCAST measures were developed under the direction of Kathryn Barnard and a research team at the University of Washington School of Nursing sponsored by a federally funded Nursing Child Assessment Project (Horowitz et al., 2005). Theoretical components of attachment, developmental psychology, psychobiology, and nursing served as the foundation for NCAST and the child assessment model (Byrne & Keefe, 2003).

There are 2 NCAST scales to score an observed caregiver-child interaction or a videotaped interaction. The scales were developed together and share the same conceptual basis but differ in the following component: The Nursing Child Assessment Teaching Scale (NCATS) is used during a developmentally appropriate teaching situation and the Nursing Child Assessment Feeding Scale (NCAFS) is used during a feeding situation, considered a familiar and frequent interaction between parent and child (Byrne & Keefe, 2003). The teaching and feeding scales are currently known as the Parent-Child Interaction Program (PCI Scales). The binary (observed, not observed) PCI scales were developed from a longitudinal study of interaction of mothers and both healthy infants

born at term and prematurely born infants through the first chronological year after delivery (Pridham et al., 2010).

The NCATS (Barnard et al., 1989; Sumner & Spietz, 1994) is 1 of 2 instruments making up the NCAST tools. The purpose of the NCATS is to assess the ability of parent and child to engage in “synchronous mutual interaction” during a teaching-learning situation (Huber, 1991, p. 65). The NCATS can be used with parents and infants from birth to 3 years of age. The 6 subscales are: Sensitivity to Cues, Response to Distress (if it occurs), Social-Emotional Growth Fostering, Cognitive Growth Fostering, Child Clarity of Cues, and Child Responsiveness to Parent (Sumner & Spietz, 1994). Calculation of a contingency score from identified items across the subscales is possible. Hence, a total of 73 binary items are observed and scored. Dyadic interactive disturbance is considered when responses number less than 43 items (1-6 months), 46 items (9-12 months), 52 items (13-24 months), or 53 items (25-36 months).

Administration of the NCATS entails observation of the parent and child during a novel teaching situation to assess a dyad’s strengths and areas needing improvement. Administration begins by directing the parent to select an age-appropriate skill from the list in the training manual and asking the parent to teach the skill to the child. The selected teaching activity is developmentally appropriate but not yet mastered by the child. The observer scores parent-infant interactive behaviors during the 1 to 5 minute session. All NCATS items describe behaviors of the caregiver, infant, or both.

Behaviors observed are scored as “1” while behaviors not observed are scored as “0” (NCAST-AVENUW, n.d.).

The original research team field tested the NCATS in a longitudinal study of 193 mother-infant dyads at 1, 4, 8, and 12 months of age (Sumner & Spietz, 1994). Trainees were required to achieve a minimum of 85% agreement with a partner in scoring the NCAT; achievement of inter-observer reliability at 85% is a requisite for certification to administer the scale for clinical use (Huber, 1991). An inter-observer score of 90% is required for research purposes (Sumner & Spietz, 1994). The NCATS is a measure of caregiver-infant interaction with widely published strengths for use in clinical practice and research with parents across age, ethnic, and racial groups (Horowitz et al., 2005).

The NCAST Manual summarizes evidence of reliability. Measures of internal consistency, Cronbach’s alphas, were 0.87, 0.90, and 0.88 for White, Black, and Hispanic samples respectively. Test re-test reliability over 4 weeks was calculated 0.85 for the parent score and 0.55 for the infant score (Sumner & Spietz, 1994). The lower scores for infants are likely related to rapid infant developmental changes.

The NCAFS is a reliable and valid measure of observing and rating caregiver-child interaction during a feeding from birth to 1 year of age (Barnard et al., 1989; Sumner & Spietz, 1994). The NCAFS consists of 76 items within 6 subscales. Four subscales measure the behavior of the parent: Sensitivity to Cues, Response to Distress, Social Emotional Growth Fostering, and Cognitive Growth Fostering. The remaining 2 subscales measure the behavior of the child: Clarity of Cues and Responsiveness to

Caregiver (Horowitz et al., 2005). During the observation, behaviors noted are given a score of 1; if they do not occur they are scored as 0 (NCAST-AVENUW, n.d.).

Extensive training and certification are pre-requisites for eligibility as a trainer. Attendance at a 2 and one-half day workshop and achievement of reliability at a minimum of 85% for non-research and 90% for research is required as previously noted (NCAST-AVEUW, n.d.). The instrument can be used in a lab or natural setting with adaptive feeding or teaching components.

The Mother Infant Communication Screening Scale

The Mother Infant Communication Screening (MICS) (Raack, 1989) is an observational instrument developed for the purpose of identification of high-risk mother-child interactions in clinical practice and in research (Byrne & Keefe, 2003; Horowitz et al., 2005). The MICS was developed with a conceptual foundation of attachment, developmental psychology, and psychobiology (Byrne & Keefe, 2003). The MICS Manual additionally emphasizes deviations from optimal communication as the basis for dysfunctional interaction and how such interaction affects nurturing and nutrition versus failure to thrive (Raack, 1989a). Raack, a speech pathologist, used verbal and nonverbal components of language readiness and related aspects of maternal interaction to form the foundations for the MICS items. The Child Assessment Model (Barnard et al., 1989; Sumner & Spietz, 1994) is further considered to influence communication and maternal interaction. Three concepts are central to the MICS: synchrony, reciprocity, and mutuality (Raack, 1989b). The 3 concepts provide a foundation for the NCAST (Byrne

& Keefe, 2003; Sumner & Spietz, 1994) and the Dyadic Mutuality Code (DMC) (Censullo, 1991) as well.

The MICS can be scored during a routine health visit during history taking. The Language/Synchrony subscale contains 8 items, and the Activity subscales range between 3 and 5 items each. The items in the subscale are scored for all interactions and are supplemented by observations from one or more additional subscales according to current activity of the infant. The choice of Activity subscales includes: Rest, Distress, Feeding, or Play/Neutral State. Each MICS observation item has five options scored from “1” to “5”; a score of “3” or less indicates need for further assessment.

Speech and language experts conducted pilot studies to identify item content and determine content validity (Horowitz et al., 2005; Raack, 1989). The MICS demonstrated evidence of construct validity (Byrne & Keefe, 2003). Byrne and Keefe (2003) reported significant positive correlations between similar subscales for the MICS and NCATS to provide support for criterion validity of the MICS. The Distress subscale on MICS did not correlate with the NCATS Response to Distress subscale, or with any other NCATS subscale except for a moderate correlation with Sensitivity to Cues ($r = 0.36, p = 0.04$); the difference in operational definitions of infant distress may account for such a finding (Byrne & Keefe, 2003).

Limited evidence of validity and potential threats to reliability inherent in a tool with few items and brief, non-standardized administration have been the weaknesses associated with the MICS (Horowitz et al., 2005). Byrne and Keefe (2003) assessed the

comparative reliability and validity of the MICS and NCATS and reported Cronbach's alphas of 0.89 to 0.94 for the MICS total score and 0.79-0.87 for the NCATS total score. Materials for self-training including video and manual are readily available at a cost of less than \$100. Scoring grids are also available for purchase. The MICS was piloted as a component for the comparative analysis and considered as a potential instrument for the study. Pediatric clinical nurses were able to use the MICS in an outpatient clinic setting at the time of a well-infant visit.

The Pediatric Infant Parent Exam

The Pediatric Infant Parent Exam (PIPE) was developed as a screening instrument to detect problematic interactions between infants and parents as part of a pediatric well-baby exam (Fiese et al., 2001). The authors designed the PIPE as an observational measure focused on the reciprocal nature of dyadic interactions between parents and 6 to 9-month-old infants. The intent was to focus on how the mother and infant related to one another rather than on the individual characteristics of either (Fiese et al., 2001). Theoretical underpinnings of the instrument include transactional, psychobiological, developmental, and attachment concepts in addition to the Parent-Child Interaction Model of Barnard and colleagues (see Figure 1) (Kelly & Barnard, 1999).

In the article on initial use of the PIPE, the authors declared "an effective interaction screening instrument should take into account the reciprocal nature of parent-infant interactions and involve direct observation of the dyad" (Fiese et al., 2001, p. 465). Recommendation for inclusion of direct observation of the child-caregiver interactions

has further been endorsed by the National Center for Clinical Infant Programs (Greenspan & Meisels, 1994). Additionally, Zeanah and colleagues (1997) suggested although observing infant-parent interaction is not equivalent to assessment of the relationship, several insights to the infant-parent relationship can be observed in brief dyadic interactions. Such domains include caregiver emotional availability, nurturance, support, play, and infant security (Zeanah et al., 1997). Laboratory-based research demonstrated infant-parent sequences typically included an identifiable beginning, middle, and end (Cohn & Tronick, 1989; Field, 1987).

The PIPE was implemented by systematically observing parent and infant playing a game such as “peek-a-boo” (Fiese et al., 2001). Scoring of the interaction was completed during the beginning, middle, and end segments of the game as single item scores on a scale of 0 to 5. The three segment scores are totaled across a continuum from a score of 0 to 15. The more adaptive end of the spectrum is characterized by easy engagement, smooth back and forth movements of the dyad and a gradual cool down. A high score indicated a healthy interaction. The more mal-adaptive end is characterized by parental disengagement, intrusive behaviors, or infant response of negative affect, protest, and/or an abrupt end of the game (Fiese et al., 2001). The 3 segments (beginning, middle, and end), overall impression of interaction (single item scored “1”- “7”) and typicality of exam judgment (single item scored 1 -3) were the 5 items of the original instrument. A copy of the Pediatric Infant Parent Exam (PIPE) (Fiese et al., 2001) can be found in Appendix A.

In one study, interrater reliability of 0.75 was determined for exact agreement across all segments of the observation (Fiese et al., 2001). Disagreements between observers were minor and typically a one point difference. Interrater reliability of 0.92 was found for agreement within one point across all segments of the observed interactions. Training of raters was carried out by the developers with use of the training manual and DVD component (Fiese et al., 2001).

Summary

Support is noted for the importance of maternal-infant interactional synchrony as evidenced by the numbers of studies completed between 1970 and 2010. While there have been impressive numbers of studies completed on the assessment of maternal-infant interaction over the past 40 years, the contribution for knowledge is limited by the varied conceptual, theoretical, and methodological fragmented approaches. Specifically, there remains a range of conceptual and theoretical approaches to the paradigm of early development with varied use of definitions and concepts of interactional synchrony. Such variation often resulted in challenges associated with the operationalization of the construct of interactional synchrony. Review of the works of Bowlby (1969, 1973); Ainsworth (1974, 1978); and Barnard (1987, 1989, & 1994) demonstrated the value of foundational theoretical guidance for measurement of interactional synchrony with the relevance for observation as a method. Sroufe and colleagues (2001) provided support for the complexity and dynamic nature of development with support for the study of interactional relationship as a most powerful outcome variable.

The review of literature yielded variable times and contexts of studies of interactional synchrony completed but few instruments were appropriate to the study. Some focused only on mothers while some focused only on infants. The requisite focus of interactional synchrony guided the exploration of quality of how mother and infant relate to one another. The lack of programmatic efforts for a systematically accumulated knowledge base was reflected in the diverse approaches to the study of interactional synchrony. As techniques have emerged to study the quality of relationships, a gap remains between knowledge and application. Specifically, risks have been identified for maladaptive outcomes of the mother-infant dyad related to the infant, mother, or environmental conditions. The most salient component of this study is the emphasis on maternal-infant interactional synchrony as a most relevant measure for how mothers and infants are getting along. Cultural practices may alter interaction in ways unable to specify. Instruments must be able to screen maternal-infant dyads if referrals for altered interactional synchrony are to be addressed early in life.

The infant benefits of interactional synchrony include facilitation of homeostatic regulation and a sense of self-worth. Benefits to the mother include gratification in assuming the role of caregiver and the development of maternal identity (Mercer, 2004). If the process of becoming a mother goes well, a woman develops an intimate knowledge of her infant serving as a catalyst for acceptance of her persona as a mother (Fowles & Horowitz, 2006). Two related components of becoming a mother are critically relevant: (1) feeling love for and attachment to the infant as a constant, and (2) engagement

adaptive to the needs of the infant (Fowles & Horowitz, 2006). Turn-taking, parental behavior encouraging displays of child competence, and displays of affection and warmth during interactional synchrony are advocated for strengthening of the mother-child relationship (Kassow & Dunst, 2005).

Barnard's contribution to the study of mother-infant interactional synchrony is appreciable. The research studies using NCAST are global with continued acceptable psychometric evidence. Publications by Barnard (1979) were guided by developmental psychobiology with a clinical orientation for working with mother-infant dyads. The Pediatric Infant Parent Exam was developed with a similar basis for the purpose of identification of dyads during regular health visits when the window of timing could best be availed (Fiese et al., 2001). Other instruments reviewed were considered, however, videography is not practical for use during the well-infant visit. The Mother Infant Communication Screening Scale was seriously considered but falls short in psychometric support and has a theoretical component in the discipline of linguistics rather than health. Thus, the 2 factors make the instrument less desirable than the Pediatric Infant Parent Exam as shown in Table 2.

Table 2.

Observational Measures of Mother Infant Interaction

Instrument/ Developer	Description	Reliability	Comments +Advantages - Disadvantages
Nursing Child Assessment Satellite Training NCAST / Barnard et al., 1989	73 Binary items, six subscales	0.87-0.90	+Standardized, well validated; widespread use; multiple aspects of mother-infant interaction measured during a teaching or feeding session or both; may be used in practice; video recording, or direct observation possible for coding
NCAT Teaching Scale Barnard et al., 1989	73 Binary items, six subscales	0.87-0.90	--Requires extensive training. May be used in natural (Continued) requires adapting clinical setting for task or feeding
NCAF Feeding Scale Barnard et al., 1989e	76 Binary items, six subscales	0.89-0.92	+Standardized, well validated; widespread use; multiple features of mother-infant interaction measured during a feeding, structured play, unstructured play, may be used in clinical practice. --Requires extensive training and video recording. May be used in natural or lab setting; requires adapting clinical setting for types of interactions
Parent Child Early Relationship Assessment / Clark, et. al, 1984	65 items	0.83-0.93	+Well validated, widespread use in research, multiple features of mother- infant interaction measured, coding system identifies subtle changes

Instrument/ Developer	Description	Reliability	Comments +Advantages - Disadvantages
Parent Child Early Relationship Assessment - revised / Burns, Chethik, & Clark, 1991; Pridham, Lin, and Brown, 2001	42 items with parent, child, and dyadic subscales	0.78-0.94	--Requires extensive training and video recording, live coding not possible. Microanalysis precludes regular use in practice. Suited for natural or lab setting, but not busy clinical setting
Mother Infant Communication Screening Raack, 1989	11-13 items, two subscales	0.89-0.94	+Evidence of validation, designed for live coding in practice, video recording is possible (Continued) or clinical use, brief, accessible with self-training manual --Self-training by manual may reduce reliability, range of coding items is limited
Dyadic Mutuality Code	11-13 items	0.86 for total	+Evidence of validation, live coding or video recording possible, appropriate for clinical use
Censullo, Bowler, Lester, & Brazelton, 1991	11-13 items, two subscales	0.63-0.92 for items	--Training required, number of items and scoring range limited
The Pediatric-Infant Parent Exam Fiese & Poehlman, 1991	5 items	0.74-0.92	+Evidence of validation, designed for live coding in an outpatient clinic, suitable for use with mother-infant dyads, training materials available with manual and DVDs --Trainings required, number of items and scoring range limited

Identified Gap in the Literature

The essential findings of the review of literature provided a context for use of the Pediatric Infant Parent Exam to assess mother infant dyads. While there are numerous studies on interventions to address problems with mother-infant interaction, identification of at risk mother-infant dyads was compromised by the lack of screening instruments. In fact, the only 2 identified instruments deemed appropriate and practical for use in the first year of life in an outpatient setting were the Mother Infant Communication Screening Scales and the Pediatric Infant Parent Exam.

The relevance for early social-emotional well-being rooted in the development of early caring relationships emphasized the adaptive needs of the maternal-infant dyad. The various approaches to researching the variable of maternal-infant interactional synchrony prevail. Several questions go unanswered: Is the affective matching of both members of the dyad essential at all times? Is the nature of synchrony a continuous dialogue versus a discrete state communication? Is synchrony an all or none phenomenon? Clearly the operationalization of the construct of maternal-infant interactional synchrony yields meaningful ways to know how the mother and infant relate to one another. The importance of early caregiving for infant development assumes a priority for all who care for mothers and their infants. The importance of mutual adaptation for maternal-infant dyads is a major essential component for overcoming threats. Nurses and those who care for mothers and infants are privileged to continue

seeking best practices including how to understand human behavior through continued observation.

The review of literature resulted in support for observation as a method for studying maternal-infant interactional synchrony. The selected content provided documentation for how nurses have pioneered many research efforts in assisting parents and infants to enjoy the maternal-infant relationship as scientific knowledge increases. Various scientists have underscored the critical need for replication of research findings in the development of science, including behavioral science (Drotar, 2010). The reality for rarity of such studies (Drotar, 2010) is related to current emphasis on new and innovative research findings rather than replications. The editorial process for scholarly journals places a high premium on innovative research findings rather than replications as do grant criteria at the National Institutes of Health (NIH, Drotar, 2010). The field of pediatric psychology and mental health is a relatively new science with many measures and interventions yet to be well understood with various degrees of validation. The scientific body of knowledge is reliant on methodological excellence as a critical prerequisite for meeting these much needed research initiatives among all who wish to contribute.

CHAPTER III

METHODOLOGY

The descriptive psychometric study examined the interrater reliability and judgment of typicality and feasibility in using the Pediatric Infant Parent Exam (PIPE) during a well-baby visit for infants 6 to 9 months of age in a busy pediatric clinic setting. According to Portney and Watkins (2008), methodological research involves the development and testing of measurement instruments for use in research or clinical practice; the focus is not evaluation of treatment effectiveness, but rather, establishing the methods used to carry out the research. Methodological studies make major contributions to research efforts since conducting meaningful research is all but impossible without suitable measurement tools. These types of studies are of special importance to scientific disciplines such as nursing, where the focus is on human behavior research, and direct measurement tools are often unavailable (Portney & Watkins, 2000; Drotar, 2008).

One specific application of methodological studies is finding ways to improve the use of existing instruments. A major consideration for the study was the need for a practical and psychometrically sound approach to screen maternal-infant dyads for promotion of interactional synchrony development. Reliability refers to the degree of consistency of an instrument to measure a phenomenon (Portney & Watkins, 2008). Reliability testing is a measure of the amount of random error in the measurement technique (Nunnally, 1978) and is an important component of the study.

Feasibility refers to the ease the instrument is used by the researcher (Nunnally, 1978). Feasibility issues included such factors as cost, time, researcher expertise, user-friendly considerations, availability of subjects, facility, equipment, and the level of cooperation of others required. Tool reliability and feasibility were especially relevant for the study to provide the potential to truly discriminate patterns of interactional reciprocity of mother-infant dyads early in a child's life and to increase usage by nurses and other developmental clinicians in a semi-natural setting. The measurement properties of the PIPE offered relevance for nursing use in a well-baby clinic for evaluating the quality of the maternal-infant relationship. The study outcome was intended to augment the body of knowledge regarding effective use of the PIPE.

Research Questions

Research questions for the dissertation study were the following:

1. What is the inter-rater reliability between the principal investigator (PI) and the three pediatric clinical nurses using the Pediatric Infant Parent Exam (PIPE) in a busy pediatric clinic as a component of the well-baby visit?
2. What is the amount of time required for the principal investigator (PI) and the three pediatric clinical nurses to administer and score the PIPE in a busy pediatric clinic as a component of the well-baby visit?
3. What is the difference between the PIPE scores and the usual traits of interaction scores?

4. How do the pediatric clinical nurses rate the feasibility of use of the PIPE in a busy pediatric clinic as a component of the well-baby visit?

Setting

The setting for the study was a busy pediatric clinic in rural West Texas. The pediatric clinic facility included a reception area and approximately 8 private exam rooms. The exam rooms were approximately 10 feet by 12 feet equipped with an exam table, a cupboard with medical supplies, sinks and related supplies for hand-washing, and several chairs. The well-lit rooms afforded privacy once the door was closed. The clinic was staffed with pediatricians, nurses, and nurse practitioners board certified according to respective disciplines. The average time spent in observation of an infant was approximately one minute and 30 seconds during an interval between placement in the exam room and awaiting the visit with primary care provider.

Population and Sample

The primary investigator (PI) and three pediatric clinical nurses (PCNs) used the PIPE to screen a convenience sample of 50 mothers, English-speaking, with 6 to 9 month-old infants scheduled for well-baby checks in the pediatric clinic. Flyers were posted on clinic bulletin boards, in the waiting room, and at the reception area to provide information about the study. Recruitment was carried out in the clinic with the assistance of the PCNs. The primary rationale for infant age criteria was based on several factors. A major factor was the interactive potential represented by the mother-infant dyad when the infant is six to nine months of age. Between six and nine months, the mother-infant

dyad is capable of touch synchrony, mutual engagement, and increasing visual, verbal, and non-verbal interaction (Harrist & Waugh, 2002; Feldman, 2007).

The 6 to 9-month time period was selected because a sufficient amount of time will have passed for the mother to make the post-partum transition and embrace the demands of getting to know the infant. Most 6-month-old infants are able to smile and vocalize to make social contact and gain attention (Kyle, 2008), as well as enjoy such simple interactional games as peek-a-boo with the mother.

The three PCNs who performed screening using the Pediatric Infant Parent Exam instrument in the study were chosen based on a minimum length of three years of service in the clinic, previous clinical experience in hospital pediatric units, and recommendation of the supervisor. Additionally, the nurses had expressed an interest in the study.

Inclusion criteria for mothers included being English-speaking, and having a 6 to 9 month-old infant utilizing the pediatric clinic as a medical home. One major rationale to use English-speaking mothers was the clinic reported less than 7% prevalence of Spanish as the primary language for mothers. Additionally the PIPE instrument has not yet been translated to another language. Exclusion criteria included infants with congenital anomalies, fever, or illness as such factors may interfere with usual maternal-infant interaction. The major variable of interest was mother-infant interactional reciprocity demonstrated during the “peek-a-boo” game. According to Frank-Stromberg and Olsen (1997), a common recommendation is “to have 10 times as many subjects as variables” (p. 14). The PIPE is comprised of five items. For agreement of approximately

50% one would use a sample size of 44 at the relative error margin of 30%. Thus, a sample size of 50 is satisfactory for the purposes of estimating interrater reliability and feasibility for use of the PIPE in an outpatient clinic (Sim & Wright, 2005).

Protection of Human Subjects

Institutional Review Board approval by Texas Tech University Health Sciences Center and Texas Woman's University was obtained. Full review and full signed informed consent was required based on the vulnerable population requirements (see Appendix B). The nursing research assistant (NRA) is a Certified Research administrator for the clinic who reviewed the scheduled patient roster for eligible mother-infant dyads meeting study criteria for inclusion and exclusion during the regularly scheduled well-baby clinic visits, typically held at least three times per week, except during holidays.

The NRA informed all eligible mothers of the study and inquired whether they had an interest in participating in the study. Once a mother expressed an interest in participating, the NRA took the mother and infant to a private room within the clinic and read the consent form. The potential participating mother had an opportunity to ask questions or clarify any aspect of the consent form. The mother was asked to describe the study to validate understanding of the study and consent form. If the mother chose to participate, the consent form was signed and a copy of the form given to the mother. The mother was informed of the freedom to withdraw from the study at any time without loss of clinic services. Once the mother indicated willingness to participate, informed consent was obtained by the NRA. Additionally, any adolescent mother less than 18 years of age

and not emancipated needed signed informed consent from a legal guardian. Once consent was obtained, the screening of the mother and infant was completed in a private exam room with the PI and one of the PCNs.

Threats and Remedies

Several threats and protective measures for participants in the study were noted. Loss of confidentiality was a risk addressed. Every effort was made to protect the privacy of participant information. Consent was obtained in a private room and the actual collection of data took place in a private exam room. All data was kept confidential and locked in a file cabinet in the principal investigator's private locked office within the health sciences center. Only the statistician, the NRA, and the PI's major professor, Gayle Roux, Ph.D., had access to the information. Study results used in publications or presentations was aggregated with no use of names for any participants. The identifiable data will be destroyed within three years after the study is completed. A potential exception to confidentiality which may have arisen during the study was noted. The mandate to report suspected child abuse to the appropriate authorities was upheld according to the Texas Family Code. The consent form included the statement, "Confidentiality were protected to the extent that is allowed by law" (IRB consent form, 2010). The affected mother-infant dyads were still to be included in the study. If the interaction was scored as maladaptive, further screening was recommended. Based on the outcome of further screening, options for referral for counseling with child

development specialists and contact information in the community per a handout were available and included the name of Paul Douthit, PhD, Pediatric Psychologist.

Potential risk factors for informed consent included coercion. Coercion refers to the participant feeling a sense of being forced to take part in the study. The risk of coercion was addressed by emphasis on voluntary participation, information in clear language, and opportunities to ask questions at any time during the study. The legal status of the mother determined consent forms to be utilized. As noted previously, any adolescent mothers less than 18 years of age and not emancipated required informed consent of a legal guardian. Additionally, participants were reminded no penalty or loss of usual clinic benefits exists when choosing at any time to not participate in the study.

Another potential risk was the experience of emotional discomfort due to researcher's observations. Participants may also have felt judged. Such risks were addressed by encouraging participants to let the NRA and PI know of discomfort at any time and the offer for licensed counselor availability. Additionally, the mothers had the right to withdraw at any time.

If participants wished to speak with the PI, a phone number was available with an answering machine. If participants wished to speak to someone not involved in the study about rights or any other matter related to the study, the Texas Tech University Health Sciences Center Research Protection Hotline was also shared. The Texas Women's University's Institutional Review Board phone number was provided on the consent

form. Additionally, the phone number for the professor and chair of the PI was listed on the consent form.

Instrument

The Pediatric Infant Parent Exam (PIPE) was designed as an observational measure focusing on the interactional synchrony between parents and 6 to 9 month-old infants (Fiese et al., 2001). The intent was to focus on how the mother and infant relate to one another, rather than on the individual characteristics of either. The PIPE is carried out by systematically observing parent and infant playing a game such as “peek-a-boo” (Fiese et al., 2001). The interaction is observed and scored for degree of interactional synchrony at the segments including beginning, middle, and end of the game. The first segment beginning is determined as when the mother gets the infant’s attention, often when the mother says “peek-a-boo.” The middle segment is the interaction after the beginning and prior to the ending and is typically the longest portion of the interaction. The end of the game is the component signaled by the infant looking away or other related activity as the interaction stops and the PI states, “the game is over,” to designate scoring is now complete and the nurse goes on to another topic. In the instance of prolonged interaction, the nurse will consider the limit for time to be five minutes, if the game has not stopped by this length of time. The possible range of scores for each of the single item segments (starting the game, keeping the game going, and stopping the game) is from the low of zero to a high of five. The lower end of the scores is characterized by

easy engagement between mother and infant. At the higher end of the score, the mother is either disengaged or intrusive and the infant responds with negative affect.

The overall impression of interactional synchrony typicality, and feasibility are single item measures and not included in the PIPE scores. The single overall impression of interaction is scored on a continuum of 1 to 7 with “highly adaptive” scores defined as 1 to 3, “marginally” adaptive scores 4 to 6, and “maladaptive” score 7, respectively. “Highly adaptive” scores are characterized by easy engagement, reciprocity, and playfulness between mother and infant. “Marginally adaptive” scores are characterized by occasional signs of marginal disengagement or intrusiveness and negative infant affect. “Maladaptive” scores are characterized by sustained maternal disengagement or intrusiveness combined with negative affect.

The judgment of how typical the nurse considers the interaction when compared to interactions note prior to interaction with the dyad. This scale is scored on a continuum of 1 to 3 with “very typical” scored 1, “somewhat typical” scored 2, and “atypical” scored 3, respectively on the tool. These scoring components are included in the manual for use of the PIPE as developed by Fiese, Poehlmann, Irwin, Gordon, & Curry-Bleggi (2001). The pediatric clinical nurse’s view of “ease” of exam was added to the PIPE with permission by the authors and is scored on a continuum of 1 to 3 with “very easy” scored 1, “somewhat easy” scored 2, and “not easy” scored 3.

Data Collection

Data collection commenced as soon as the essential components for training of the pediatric clinic nurses was completed with the assigned rater reliability of at least 0.70 percent agreement. The PI provided regular updates for the process by e-mail, and daily face to face contact throughout the 9 weeks of data collection.

Training

The nursing research assistant and the PI completed required IRB training and certification prior to the study. Pre-study training was carried out in a private room within the university health sciences facility. The PI provided a 2- hour training session for the group of pediatric clinic nurses on use of the PIPE according to a script developed by Fiese and colleagues (2001) (see Appendix C). The PI adhered to the standardized PIPE training manual with a power point on the PIPE plus videotaped vignettes for practice in preparation of the planned observations. Training Manual Part 1 was completed during a 30 minute viewing of the training vignettes focusing on the descriptions of codes for starting the game, keeping the game going and stopping the game. Part 2 provides 40 brief (average time of 35 seconds) video clips for 30 minute group discussions. Part 3 contains 30 brief (average time of 35 seconds) video clips for independent coding for interrater reliability to be completed within 30 minutes. Once the coding was completed, a discussion was held to clarify any concerns during the remainder of the period. Training included achievement of the pre-study goal of at least 0.70 percent agreement on ratings from each of the PCNs and the PI.

Treatment Fidelity and Drift

Fidelity refers to the methodological strategies used to monitor and enhance the reliability and validity of behavioral studies or interventions (Bellg et al., 2004, p. 443). Drift refers to the tendency to stray from intended research study design, intervention, or monitoring of behaviors of researchers over time (Bellg et al, 2004, p. 444). By reducing random and unintended variability in a study, improving treatment fidelity can also improve statistical power. Guidelines for future use of the PIPE were influenced by treatment fidelity of the study.

The plan for monitoring fidelity of assessment included completion of a checklist for each of the PCNs at the pre-study, mid-study, and post-study phases (see Appendix D). The scores on the checklist were compared and monitored over the course of the study for agreement. The PI and PCNs adhered to the research protocol with weekly entries to address any occurring issues. Ongoing monitoring was reflected in the Treatment Fidelity Assessment Grid (See Appendix D). Steps taken to ensure fidelity included PI review, initial training and testing of providers, monitoring of provider and participants, and rater agreement. Assessment of fidelity included components of documenting of training, reviewing of video examples, and scoring procedures with practice scoring of videos according to the Training Manual for the PIPE. Emphasis was on recognition of adaptive and maladaptive behaviors as noted previously according to the PIPE descriptors. The research protocol was reviewed and training repeated on a bi-weekly basis at scheduled research team meetings. The PCNs and the demands of the

nurse clinician role in a busy pediatric clinic were acknowledged for a practical, achievable, and effective plan for monitoring and improving treatment fidelity. Addressing fidelity issues served to satisfy “best practices” as set forth by the National Institutes of Health Behavior Change (Bellg et al., 2004).

Procedures

The potential participants who met inclusion criteria and expressed an interest in participating received information about the study by the nurse research assistant (NRA). If the candidate chose to participate after hearing and reading about the study, consent was obtained in a private room. Every effort was made to allow questions to be answered. Once consent was obtained, the screening was done in a private exam room with the PI and PCN prior to the visit with the primary care provider. At the beginning of the exam, the PCN asked the mother to play a brief game of “peek-a-boo” with the infant as the PI and PCN observed and independently scored the interaction using the PIPE (see Appendix A). The PI monitored the time of game onset (nurse begins reading instructions) to completion (nurse goes to another topic), to the nearest second using a stopwatch. The PCN completed the infant’s exam, after which the PI and PCN averaged results for the purpose of reporting to the mother. The PI informed the mother of results within five minutes after the PCN had completed the well-baby exam. The option of referral to the pediatric developmental specialist was offered to all participants by the PCN for additional concerns for the dyadic pattern of communication.

Treatment of Data

Data was entered into Statistical Analysis Software, version 9.3. Raw data was coded and entered into Microsoft Excel. Descriptive statistics were completed for variables as appropriate for infant age, mother's age and level of education, race and ethnicity. A bar graph displayed the various time findings. Contingency tables displayed agreement data for mid-study and end of study cumulative ratings.

Inter-rater reliability is defined as “the degree to which one or more raters can obtain the same ratings for a given variable” (Portney & Watkins, 2008, p. 745). Inter-rater reliability assessment is often recommended in studies involving measurements to assess raters' ability to classify a variable of interest appropriately and serves as an important statistical tool to control the quality of data collection (Sim & Wright, 2005). The value of the *kappa* statistic ranges from -1 (perfect disagreement) to +1 (perfect agreement), with “0” indicating agreement is no better than chance. Landis and Koch (1977) proposed the following as standards for strength of agreement for the *kappa* coefficient: ≤ 0.00 = poor, 0.01-0.20 = slight, 0.21-0.40 = fair, 0.41-0.60 = moderate, 0.61-0.80 = substantial, and 0.81-1.0 = almost perfect.

Prevalence of the attribute measured has an influence on the *kappa* coefficient (Sim & Wright, 2005). Caution should be exercised when comparing the magnitude of *kappa* across variables with different prevalence or bias, measured on dissimilar scales, or across situations where different weighting schemes have been applied to *kappa* (Sim & Wright, 2005, p. 267). An important assumption underlying the use of the *kappa*

coefficient is related to errors associated with clinicians' ratings. Each observer should generate a rating without knowledge of or influence on the other observer's rating. In other words, *kappa* assumes independent ratings.

As noted previously, the potential threat of bias and fidelity on the part of the pediatric clinical nurses was acknowledged. An important strategy to reduce bias and observational drift is training to increase adherence and competence (Bellg et al., 2004). Castorr and colleagues (1990) recommended three distinct phases of the process of rater training including: 1) training raters to use the instrument; 2) evaluating rater performance on completion of training; and 3) determining the extent to which rater training is maintained during the course of a reliability study. Thus, fidelity was addressed with training, including the training videotaped vignettes for practice, and pre-study discussion for major differences in the use of the instrument. Rater training was assessed midway through the study and at the end of the study to satisfy the criterion of maintenance of training to minimize drift and other potential threats.

Pilot Study

Neither researchers nor clinicians have an ideal, efficient, clinically applicable, and psychometrically sound instrument to measure mother-infant interaction (Byrne & Keefe, 2003). During the pilot study the PI used the Mother-Infant Communication Screening Instrument (MICS), as developed by Raack (1989), emphasizing deviations from optimal communication as a basis for disordered interaction. Raack focused on the relationship between nurturing and nourishment in mother-infant dyads including

identification of infants at risk for failure to thrive (1989). The MICS is one of the lesser known instruments specifically developed to screen for high-risk mother-infant interaction in busy clinic settings based on conceptual variables of reciprocity, synchronicity, and mutuality.

Purpose

The purpose of the pilot study was to test the feasibility of conducting a psychometric study during a well-baby exam in a clinic setting. The study explored use of the Mother Infant Communication Screening tool of Hispanic and non-Hispanic mother-infant dyads during a well-child visit in the first three to six months. Specific aims of the pilot study included the following:

1. Determine adherence to the protocol.
2. Formulate the plan for recruiting participants to generate sufficient numbers each of Hispanic and non-Hispanic mother-infant dyads.
3. Monitor the time required for each screening.
4. Test the plan for maintaining timely communication between the Primary Investigator and Pediatric Clinical Nurse for participant clinic confirmation for screening.
5. Generate the guidelines for screening.
6. Identify the environmental barriers or threats to integrity of the study.
7. Estimate the cost for the study.

8. Determine the t scores for the Hispanic and non-Hispanic adolescent dyads and determine the inter-rater reliability for the PI and PCN.
9. Calculate the weekly time devoted to research study.
10. Identify a statistician to assist with data analysis.

Setting

The setting for the pilot study was a pediatric clinic with a reception area and average-sized private exam rooms located in West Texas. Each exam room was equipped with an exam table, a cupboard with medical supplies, sinks and related supplies for hand-washing, and several chairs. The rooms were well-lit and afforded privacy with the door closed. The clinic was staffed with pediatricians, nurses, and nurse practitioners. All staff members were board certified according to respective disciplines. The average time spent in examination of an infant is approximately twenty minutes by report of the PCNs.

Population and Sample

The primary investigator and one pediatric clinical nurse used the MICS to screen a convenience sample of eight mother-infant dyads with equal numbers of Hispanic and non-Hispanic adolescent mothers less than 20 years of age. The infants were between three and six months of age and were seen at the pediatric clinic for well-checks. Inclusion criteria constituted a population at risk for altered mother-infant communication. Exclusion criteria included infants diagnosed with congenital

anomalies, fever or illness as such factors may interfere with usual mother-infant interaction.

Recruitment

Recruitment was carried out by the PI with use of flyers approved by the IRB. The receptionists of the clinic assisted in making mothers aware of the study by placement of flyers in the clinic check-in desk. At the time of scheduled well-infant visits, mother-infant dyads meeting inclusion criteria were approached and provided information for the study. If an interest in participation was expressed, the PI shared the details of the study including the consent form. According to guidelines of IRB, the consent forms were shared and participants were given an opportunity to ask questions or to seek clarification about the study. Each participant was given a \$10.00 voucher for the Stork's Nest. The Stork's Nest is an affiliate of the local March of Dimes organization and provides numerous products for infant and childcare. Once consent was obtained, the PI and PCN carried out the MICS assessment of the dyad during the scheduled well-infant clinic visit.

Protection of Human Subjects

Several risks for the mother-infant dyads participating in the study were considered. The population constitutes a vulnerable population because of infants and potential adolescent mothers. Therefore, full review and signed consent was obtained. Additionally, one participant, less than 18 years of age and not emancipated, required signed informed consent of a legal guardian. An identified risk was loss of

confidentiality. Participants were informed, through the informed consent form, confidentiality would be protected to the degree allowed by law. In accordance with the obligation to protect the welfare of and minimize risks to research participants, the IRB also complies with the need to report cases of known or suspected child abuse coming to the attention of the research at any time during the course of the research process. The information was included in the consent form and will be used in this study with minimal updates.

The MICS assessment of 9 mother-infant dyads (11 were approached, 2 did not meet age criteria for infants) was carried out in the privacy of the clinic examination room. Steps to minimize the risk for loss of confidentiality included separating all demographic information and scores from identifying information such as the consent form. Identifiable data including consent forms and scored assessments were stored in a locked file cabinet in the office of the PI. Only the PI and advisor had access to the locked file. Identifiable data were stored and protected for 2 years after completion of the pilot study (8/31/09). Shredding will be carried out on August 31, 2014 as scheduled, 7 years following completion of the study. Publication or reporting of data related to the study were aggregated without use of names and reported in such a manner to never reveal names.

Another risk to participants was emotional discomfort related to observation by the PI and the PCN. The risk was addressed to participants by awareness in the consent form by stating whether the participant experienced discomfort at any time; participation

could be withdrawn without fear of loss of usual medical care. The participants were informed of access to the child developmental specialists within the clinic and available upon request. Participants were reminded at beginning and end of the assessment of the option to ask questions with the PI in person and a telephone office number for the PI was shared as well. The opportunity to ask questions was also addressed on the consent form. No participants had questions and no participants sought information about results of the study.

An additional potential risk to participants was coercion. Participants were reminded participation was voluntary and no penalty or loss of usually entitled benefits would occur should the decision to opt out of the study be made. Participants were reminded of the option of electing to not continue during the assessment in the study and the \$10.00 voucher for the Stork's Nest would still be provided. Participants were told there may be no additional direct benefits for participation other than knowledge of mother-infant communication gained by the study findings.

Instrument

The Mother Infant Communication Screen (MICS) is an instrument specifically developed to screen for high-risk mother-infant interaction in busy clinic settings (Raack, 1989). The three concepts of synchronicity, reciprocity, and mutuality form the theoretical foundation for the instrument with an emphasis on deviation from optimal communication as the basis for dysfunctional interactions (Raack, 1989).

The MICS can be scored during a routine health visit according to the 3 subscales. The Language/Synchrony subscale contains 8 items, and the Activity subscales range between 3 and 5 items each. The items in this subscale are scored for all interactions and are supplemented by observations from one or more additional subscale based on the current activity or state of the infant. The choice of Activity subscales includes: Rest, Distress, Feeding, or Play/Neutral State. Each MICS observation item has 5 options scored from 1 to 5; a score of 3 or below indicates need for further assessment.

A comparison of the MICS and the NCAT revealed an acceptable correlation between total scores. The MICS total scores correlated positively and significantly with the NCAT total scores ($r = 0.504, p < 0.001$). When these 2 sub-scores are compared across instruments, the correlations are strong and highly significant ($r = 0.492, p < 0.001$). The 8-item Language/Synchrony subscale seems to capture the same data as the 32-item contingency subscale (Byrne & Keefe, 2003). Reliability results were 0.89 to 0.94 for the MICS total score (according to subscales used), while the NCAT result was 0.79. The Distress subscale of the MICS did not correlate with the seemingly comparable Response to Distress subscale, or any other subscale of the NCAT except for a weak association with Sensitivity to Cues ($r = 0.359, p = 0.04$). Validity of the MICS was demonstrated through comparison with an established instrument

Training

The PI and one PCN reviewed the guidelines for screening with a focus on guidelines according to Castorr et al (1999). Three distinct phases of treatment were

considered: 1) training the rater to use the instrument; 2) evaluating rater performance at completion of training; and 3) determining the extent of rater training maintenance during the study (Castorr et al., 1990). The PI and the PCN also viewed the training video and practice scored five vignettes prior to research coding. Agreement prior to the study was achieved at 0.90. An agreement was made to have a discussion occurring after 4 assessments using the MICS had been completed for the study and again after 8 assessments were completed to determine whether issues had arisen needing clarification for the study. The MICS (Raack, 1989) was copyrighted to be self-taught by professionals with packets of 25 and a manual. The process may pose a threat as the use of the instrument could vary by the raters.

Threats

Several threats were acknowledged for the pilot study. The Hawthorne effect was acknowledged as the nursing research assistant or mother might have changed behaviors simply because of participation in the research pilot study. The threat was lessened by the nurse allowing 3 to 5 minutes for the mother to get situated and comfortable in the exam room prior to beginning the MICS screening. The nurse might have experienced a sense of feeling rushed or pressured to do the MICS screening in addition to the complete examination of the infant creating an unreliable or invalid scoring. The effect was alleviated by training and the discussion of any related issues. The threat of fidelity loss and drift were also considered as serious threats to the pilot study. Treatment fidelity was strengthened by training in as much as the intervention for the study is considered the

proper use of the MICS. The pre-study rating for five vignettes was at 0.90. The pilot study was carried out over 6 weeks, with a review of the scoring for the MICS completed every 2 weeks.

Data Collection Procedure

Once consent was obtained and the mother-infant dyad was called to the private clinic examination room, the PI and PCN reminded the mother of the planned assessment using the MICS. Scoring began once the PCN stated the process was to begin. The PCN began scoring immediately after the PI stated “the observation would be done to learn more about how young mothers and their infants interact” and was completed once the PCN began the well-baby exam. Scoring was carried out and completed within an 8 week period.

Findings

Results of the study were noted according to the overall aims to refine the research plan:

1. The plan to ensure adherence to the protocol was developed. The pre-study training was completed with review of training materials in three training sessions of approximately one hour each. A pre-study agreement of 0.90 between raters was attained for scoring the vignettes. After 4 assessments, another session was held with discussion regarding the issue of differential voice animation by one of the mothers in the study.

Difficulty in discerning the difference between “somewhat exaggerated”

and “appropriately exaggerated” was noted. If difficulty in rating between the terms was discovered, the decision was made to allow comments to serve to distinguish the reason why a particular rating was assigned. In one instance, the difficulty was related to limited speech by the mother.

The plan for adherence to the protocol was begun at the first formal meeting held with the PI, one NRA, and Department Chair for the pediatric clinic. The research protocol was reviewed and discussed. An important issue was maintenance of confidentiality. A new clinic practice is the use of temporary pagers to notify clinic patients to go to the examination rooms. The PI and the NRA maintained non-client notes from each of the meetings with entries to address considerations for future to include such issues as seating within the clinic room, safety issues, and flow of activity from the reception area to patient exam room. No patient names or data were in the notes.

2. The recruitment plan was not realized for convenience matching of equivalent Hispanic and non-Hispanic mother-infant dyads according to inclusion criteria. The 5 Hispanic dyads outnumbered the three non-Hispanic dyads. The major challenge for recruitment was related to the time limit of 6 weeks for the pilot study. A possible solution for recruitment included the identification of future scheduled appointments in advance for those infants meeting the criteria. The time required to obtain

eight dyads was approximately 6 weeks. For the final study a decision was made to not use Hispanic and non-Hispanic equal groups. The rationale for this decision was the obtaining of equal groups required extra time in recruitment of participants. Additionally the intent is to uphold sensitivity to the mothers and infants using the clinic which includes all ethnicities. All participants spoke English.

3. The time required for each screening ranged from 8 to 14 minutes. The variation was related to the feedback provided by mothers to questions. Time dedicated for consultation with the statistician was approximately 2 hours.
4. The NRA notified the PI by cell phone for clinic confirmation of clinic visits. Communication between the PI and NRA has taken place via weekly regularly scheduled meetings, office phone, and cell-phone. Discussions and meetings have been held in private offices. One meeting was held in a small clinical simulation classroom to view the training video.
5. General guidelines for screening were developed as noted in the plan for adherence guided by the article by Castorr et al. (1990). The article reviewed the process of interrater reliability and sources of error. The major identified sources are the category of the variable, inadequate rater performance, decay in rater training, and operational rules used. Three

distinct phases of the process of rater training are noted: 1) rater training to use the instrument, 2) evaluating rater performance at the end of training, and 3) determining the extent of rater training maintenance during the course of a reliability study (Castorr et al., 1999).

The PI and NRA viewed the training video and practice-scored five vignettes prior to research coding. The degree of animation in 2 of the mothers' voices was difficult to rate between "somewhat exaggerated" and "appropriately exaggerated." The PI and NRA recognized the more reserved speech of the two mothers was a factor. After occurring twice, the decision was made to define the term "appropriately" as "according to the different times an interaction with speech with the infant allows" because the term definition would be the primary underlying factor for how many opportunities present to rate the speech. Additionally, a decision was made to include comments to assist in defining contextual issues. For the 5 screenings carried out, no items received a score of 4 or less. Additionally, to maintain fidelity to observation, review of the article and protocol after each 5 screenings and discussion of scoring issues on an ongoing basis would be considered helpful.

For the pilot study, a brief review of the screenings took place after the PI and NRA had completed the scoring. The discussions revealed the importance for each rater to remain focused on the mother-infant

interaction during the entire screening. During the observation, the PCN did not observe a mother gently caress the infant's cheek. In the discussion afterward, a decision was made for the PCN to observe and then write down observations. Additionally, the need to clearly identify the onset of the observation according to the beginning of the statement about the instrument became apparent. The onset is a major feasibility issue for the primary nurse in a busy clinic. Thus far, aside from the 1 incident involving the PCN not observing the mother gently caress her infant's cheek, the nurse has performed the usual role and screening without difficulty. The overall observation was structured during a focused visit with agreement for the onset of coding to be after the PI re-introduction and reminding the participant the observation is done to learn more about how young mothers and-infants interact. Termination was signaled as the NRA verbalized intake for the visit is completed after the well-baby exam. The PI then verbally thanked the mother and awarded the Stork's Nest voucher for participation in the study. Evaluation of the rater performance was carried out. The PI and PCN agreed reviewing the training materials before, during, and after completion of the study proved helpful.

6. No environmental barriers to the study were identified. The environment of the clinic was ideal and no factors arose that posed a threat to the study.

The pace was busy but personnel worked well together. Participants were promptly received as were all clients during the clinic. Threats were identified and strategies developed to minimize or eliminate the threats as follows:

- a. loss of confidentiality was acknowledged as a threat to the study and was addressed by adherence to the protocol to provide assurance no names were shared; information was maintained in a locked file of the PI's office with access by the PI only; and
 - b. drift or loss of fidelity was lessened somewhat by the relatively short duration of the study and was addressed by adherence to the plan for use of the MICS and discussion for issues that arose.
7. Cost for the study was \$187.00. The training video, manual, and 25 instrument scoring brochures amounted to \$87.00. Eighty dollars was spent in compensation vouchers for the Stork's Nest for participants. The remaining \$20.00 covered copying costs for training and study forms.
 8. The correlation between the Hispanic and Non-Hispanic adolescent mother-infant dyads was not carried out due to a lack of equivalent groups. SPSS version 13 was used to compute the interrater reliability for the total scores which was 0.89.
 9. The amount of time required weekly for the pilot study was between three and 6 hours. Coordination of schedules for the NRA and PI was readily

carried out. The greater amount of time in some weeks reflected training and post-study conference time.

10. A statistician associated with the university and health sciences center was consulted to assist with data analysis and will be available for the data analysis of the dissertation study.

Conclusions

This methodological study sought to address the need for a practical and psychometrically sound approach to screening for maternal-infant interactional synchrony. Specifically, the study sought to determine the interrater reliability and feasibility of the PIPE as used by pediatric clinical nurses during a well-baby visit for infants six to nine months of age in a pediatric clinic. The reliability and feasibility of the tool were especially relevant for this study by providing the potential to discriminate patterns of interactional reciprocity of mother-infant dyads early in the life of a child with usage by nurses and other developmental clinicians.

In summary, the pilot study provided answers to the major feasibility questions of the research proposal. A plan was generated to ensure adherence to the protocol. A major finding was the lack of non-Hispanic adolescent mother-infant dyads. The recruitment was explored to allow a wider potential for obtaining the equivalent groups desired for the study and later dismissed. Time for each screening ranged from 8 to 14 minutes. The time required meets a major criterion for the study as the screening should not demand more than 15 minutes of the scheduled well-baby exam. The communication

between the PRI and NRA was facilitated via telephone and e-mails. Guidelines for screening were developed and resulted in refinement of the major focus of the study with a new instrument used by pediatric clinical nurses during a well-baby visit for infants 6 to 9 months of age in a pediatric clinic. The reason for a change in instrument was related to the limited use of the MICS and the reliance on linguistics as a major developmental component. Training and actual practice in use of the MICS Instrument was carried out in private office and classroom settings. The interrater reliability of 0.89 based on the small group is promising. Cost for the study was minimal with no unusual equipment required. The study purpose was revised and resulted in no need for equivalent groups. The age of the infants was justified to capitalize on the developmental likelihood of mother-infant behaviors in playing games with each other between 6 and 9 months postpartum. Infants at 3 to 6 months of age were not as easily measured due to their decreased ability to interact. The pilot study strengthened the plan for the proposed study and validated the importance of conceptual and theoretical adherence for the instrument chosen.

Recommendations

Subsequent to the proposal process, the issue of instrument psychometrics was considered. To strengthen the dissertation study, the MICS was replaced with the PIPE instrument based on its current psychometric stability and theoretical foundation. The MICS and the PIPE instruments were based on the Parent Child Interaction Model of Barnard (Barnard et al., 1989), attachment theory, and transactional theory. The MICS

also was heavily influenced by communication principles. Some concern arose for the use of the MICS due to limited use. Consideration was given the Maternal Behavior Rating Scale (MRBS) (Mahoney, Powell, & Finger, 1986). A comparison of the PIPE (Fieses et al., 2001) and the Maternal Behavior Rating Scale (MBRS) (Mahoney, Powell, & Finger, 1986) was carried out. Review of the MBRS concluded the instrument captured maternal responsiveness but failed to capture the interaction of both mother and infant. Additionally, the MBRS (Mahoney, Powell, & Finger, 1986) was developed to screen for communication problems with mentally handicapped children with a major focus on maternal interactive behavior. The PIPE was deemed most appropriate for the study. The major decision for use of the PIPE was related to the shared theoretical and conceptual framework for the instrument and recent reported use with the intent of screening for problematic interactions between infants and mothers as a component of the well-infant exam (Fiese et al., 2001). The PIPE captures the construct of maternal-infant interactional synchrony during mutually, contingent, and reciprocal interactions of the mother-infant dyad.

The change of instrument required revisions. The research study purpose was also revised to reflect the goal of determining the interrater reliability of the Pediatric Infant Parent Exam (PIPE) for interactional synchrony when used by pediatric clinical nurses in a busy university-based clinic during a well-baby visit for mother-infant dyads when the infant is between 6 and 9 months of age. The PIPE includes the theoretical construct of interactional synchrony and is based on the seminal Parent-Child Interaction

model of Barnard (Kelly & Barnard, 1999) and attachment theory (Bowlby, 1969, 1973). The article by Fiese and colleagues (2001) provided initial satisfactory psychometrics. Poehlmann made available training materials including the manual and DVDs. Use of the PIPE will contribute to knowledge for measurement of the interactional synchrony between mother-infant dyads early in life, reflective of the quality of the mother-infant relationship in a practical dyadic manner.

Rationale for Selection of the Pediatric Infant Parent Exam

The Pediatric Infant Parent Exam satisfies study requisites. The instrument is based on the same theoretical components as the Parent Child Interaction Model (Kelly & Barnard, 1999). Hence, the measurement of interactional synchrony as defined by Fiese and colleagues (2001) in development of the PIPE is congruent. The PIPE has a demonstrated psychometric acceptability with initial use. Training materials are readily available with sufficient standardization to guide use of the instrument. The PIPE was designed for use by pediatric nurses to screen for altered mother-infant interaction during a well-baby visit on 6 to 9 month-old infants and thus, meets the ultimate goal of this research study as an ideal match for assessing mother-infant interactional synchrony in a busy clinic setting.

Summary

In conclusion the study to determine the interrater reliability and feasibility of the Pediatric Infant Parent Exam as used by nurses during a well-baby visit for infants 6 to 9 months of age has been developed with a purposeful plan. During the course of doctoral

studies the student has focused on maternal-infant interaction in both quantitative and qualitative aspects. A concept analysis helped to clarify the construct of maternal-infant interactional synchrony. A comparative study of the Maternal Behavior Rating Scale and the Pediatric Infant Parent Exam yielded the match for the study as the theoretical guidance of Bowlby's attachment theory (Bowlby, 1969) and Barnard's Parent Child Interaction Model (Kelly & Barnard, 1999). Improvement of the use of the PIPE addresses one of the major applications of methodological studies as noted in the introduction of this chapter.

Each phase of designing the research study was guided by the desire to uphold research integrity. The setting and sample were considered in how to support the greatest likelihood for measurement of maternal-infant interactional synchrony to be free of barriers or threats. Fidelity drift was addressed with the checklist and planned review of the PIPE by the PI and the three PCNs. Protection of Human Subjects in compliance with the Institutional Review Boards of both the Texas Tech University Health Sciences Center and the Texas Woman's University is a major priority. Contact information for the faculty chair of the study, Gayle Roux, PhD, will be available on the consent form as the PI is a doctoral student at Texas Woman's University. Every effort will be made to protect the identity of all participants. The pilot study provided the opportunity to test the research plan, data collection, and data analysis. A change in instrument to strengthen the theoretical foundations for the study was also an outcome of the pilot study. The research study has been designed with caution to uphold the purpose of the study. A

reliable, practical screening instrument of mother-infant interaction satisfies the need for discovery of the best practice for nurses and all health care professionals to carry out further assessment and make appropriate referrals.

CHAPTER IV

RESULTS AND PROCEDURAL PROCESS OF ANALYSIS

Statistical analyses for the paired ratings of the PI and each of the three pediatric clinic nurse raters for the study in use of the Pediatric Infant Parent Exam are presented in the following pages. A brief procedural table on the following page highlights the data collection process with an overview of the sample of fifty maternal-infant dyads to provide an introductory context for the results. Results include statistical analysis using Cohen's weighted *kappa*, major assumptions for use of the weighted *kappa* statistic, and specific findings to address the research questions of the study. The PI shared scored data with the research assistant and biostatistician while upholding confidentiality for all subjects with use of Statistical Analysis Software, version 9.3.

Sample

The convenience sample of fifty mother-infant dyads served as subjects for the observational ratings for the study. The maternal age of the group ranged from 16 to 28 years while the infants of appropriate age presented for either six or nine-month well-baby visits. Demographics of the same sample are presented in Table 3 including maternal and infant age, maternal level of education, race, and ethnicity.

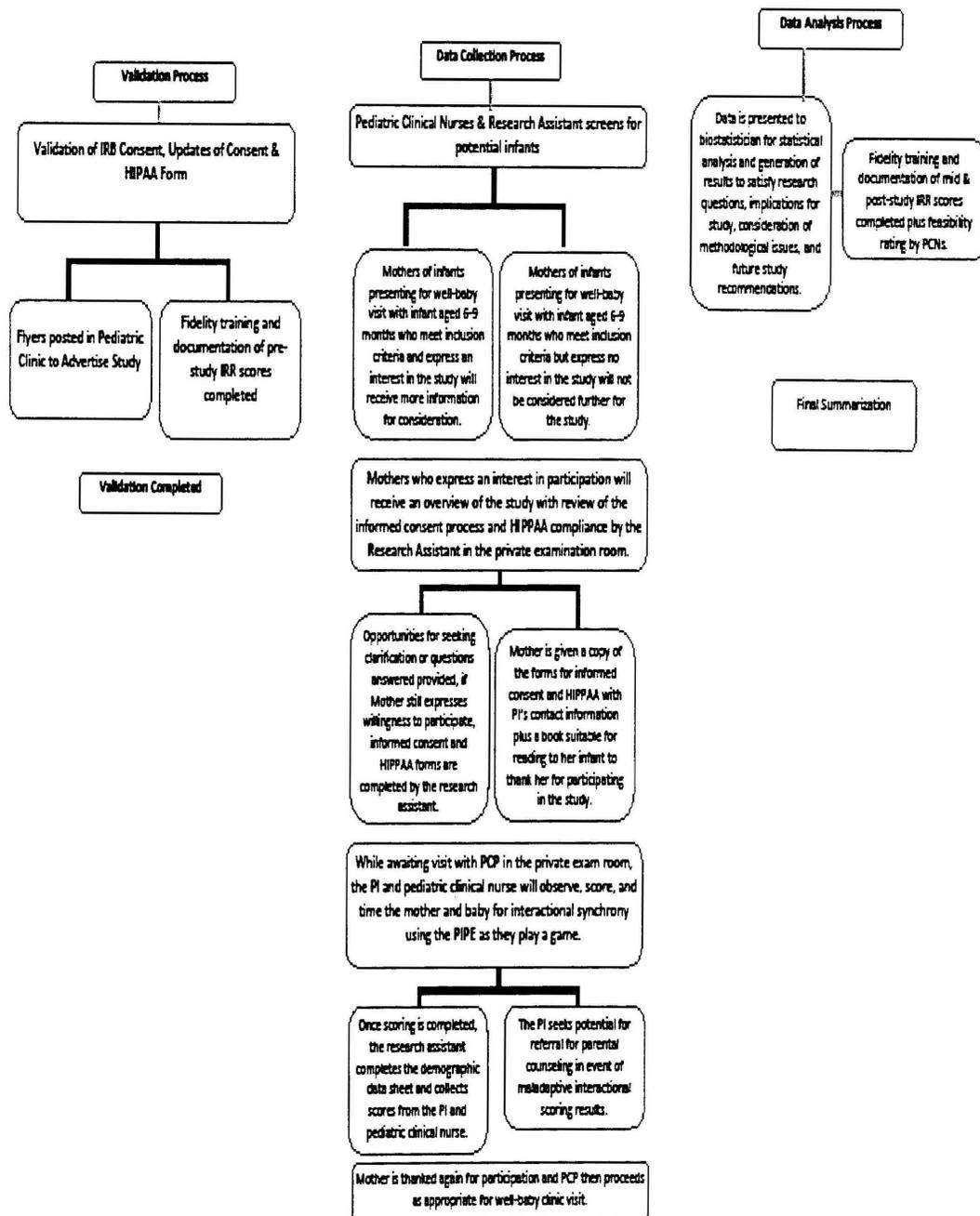


Figure 2. The procedural overview for data collection and analysis

The raters were three licensed vocational nurses currently employed in the university based pediatric clinic. Two of the pediatric primary care providers were pediatric nurse practitioners while the third provider was a pediatrician. All members attended the pre-study orientation and agreed to participate in the study. The three pediatric clinic nurses attended the training sessions, mid-study review, and post-study review for the study.

A certified pediatric nursing research assistant served during the pre-study, data collection, and post study phase. The biostatistician provided assistance for data collection, management and analysis. With respect to data management and analysis, the research assistant recorded scores on paper to be shared later with the biostatistician. Raw data from paper was coded and entered into Microsoft Excel. Count and sum commands were used to construct frequency tables based on: (1) rater vs. rater-pooled starting, continuing and ending raters ($N=50$ for each rater pairing) and (2) stage of rating-pooled all raters ($N=50$ for each stage) analysis of starting, continuing, ending, overall, and judgment ratings. Frequency tables were imported into SAS 9.3. The frequency procedure of SAS was used to conduct the appropriate *kappa* analyses. For rater vs. rater analysis a weighted *kappa* (*KW*) was conducted. For stage of rating analysis a simple *kappa* analysis was conducted.

Table 3.

Demographics for Subjects Observed in use of the PIPE

Maternal Age	Maternal Educational Level	Infant Age	Race/Ethnicity
16-28 years	High School – 10 th grade – G.E.D., College- Undergraduate Graduate/Doctoral	6-9 months	African American, White Hispanic Asian

Statistical Analysis of Interrater Reliability Using Cohen’s Weighted *Kappa*

Kappa is a measure of the pair wise agreement between observers that reflects the proportion of observed agreement beyond that expected by chance alone. Whereas the *kappa* coefficient reflects complete agreement between raters, the weighted *kappa* (*KW*) statistic allows partial agreement to be taken into account and maintains the ordinal nature of the scale used. The three assumptions for use of *KW* were considered: the units of analysis were independent, the categories of the scale were independent, and the raters operated independently. The crossed study intended for the three pediatric clinical nurses was modified secondary to one of the nurses opting to go part-time; thereby, making equal ratings not possible. For this reason, the decision was made to continue with convenience observational ratings with the two remaining nurses.

For 2 x 2 tables, the weighted *kappa* coefficient equals the simple *kappa* coefficient. PROC FREQ displays the weighted *kappa* coefficient only for tables larger than 2 x 2. PROC FREQ computes the *kappa* weights from the column scores, by using

Fleiss-Cohen weights. The overall *kappa* coefficient can be calculated when there are multiple strata. PROC FREQ combines the stratum-level estimates of *kappa* into an overall estimate of the supposed common value of *kappa*. Assume there are *q* strata, indexed by *h*=1, 2....*q*, and let var (*kh*++++), the overall *kappa* coefficient is computed as:

$$\hat{\kappa}_T = \frac{\sum_{h=1}^q \frac{\hat{\kappa}_h}{\text{var}\{\hat{\kappa}_h\}}}{\sum_{h=1}^q \frac{1}{\text{var}\{\hat{\kappa}_h\}}}$$

Results

The first research question sought the interrater reliability between the principal investigator and three pediatric clinical nurses using the Pediatric Infant Parent Exam (PIPE) in a busy pediatric clinic as a component of the well-baby visit. Data is presented to demonstrate the pooled interrater reliability for support to answer this question (see Appendix E for expanded data).

Table 4.

IRR Summary for Pooled Stages (N = 44).

Beginning the Game	Continuing the Game	Ending the Game
<i>K</i> = 0.679, 95% Conf. Int: (0.486, 0. 873)	<i>K</i> =0.748, 95% Conf. Int: (0.566, 0.930)	<i>K</i> = 0.887, 95% Conf. Int: 0.766-1.0
<i>KW</i> =0.665, 95% Conf. Int: (0.459, 0.870)	<i>KW</i> = 0.768, 95% Conf. Int: (0.601, 0.934)	<i>KW</i> =0.907, 95% Conf. Int: (0.808-1.0)

Table 5.

IRR for Pooled Judgement Ratings (N = 41)

Judgment Ratings (pooled nurses)				
Investigator	Nursing Staff			
Frequency Percent	1	2	3	Total
1	16 39.02	6 14.63	1 2.44	23 56.1
2	0 0	11 26.83	3 7.32	14 34.15
3	0 0	0 0	4 9.76	4 9.76
Total	16 39.02	17 41.46	8 19.51	41 100

*Without meeting the assumptions of a symmetric distribution, any kappa analysis is questionable at best.

Table 6.

Agreement, kappa, and Weighted kappa for Secondary Rating (Stages Pooled)

Nurse 1 (N=42)	Nurse 2 (N=54)	Nurse 3 (N=36)
Agreement=85.71% Disagreement=14.29%	Agreement=88.89% Disagreement=11.11%	Agreement=86.11% Disagreement=13.89%
$K=0.726$, 95% Conf. Int: (0.521, 0.930)	$K=0.783$, 95% Conf. Int: (0.625, 0.941)	$K=0.751$, 95% Con. Int: (0.556, 0.947)
$KW=0.765$, 95% Conf. Int: (0.579, 0.952)	$KW=0.798$, 95% Con. Int: (0.654, 0.942)	$KW=0.750$, 95% Con. Int: (0.542, 0.957).

Agreement and Simple *kappa* for Stage of Rating

The second research question sought to determine the amount of time required for the principal investigator and the three pediatric clinical nurses to administer and score the Pediatric Infant Parent Exam (PIPE) in a busy pediatric clinic as a component of the well-baby visit. As noted in Figure 3, the time for administering and scoring the PIPE ranged from 35 seconds to 202 seconds with a mean of 90.57 seconds. The median was 67.5 seconds, and the standard deviation was 44.13 seconds. The asymmetry is appreciable.

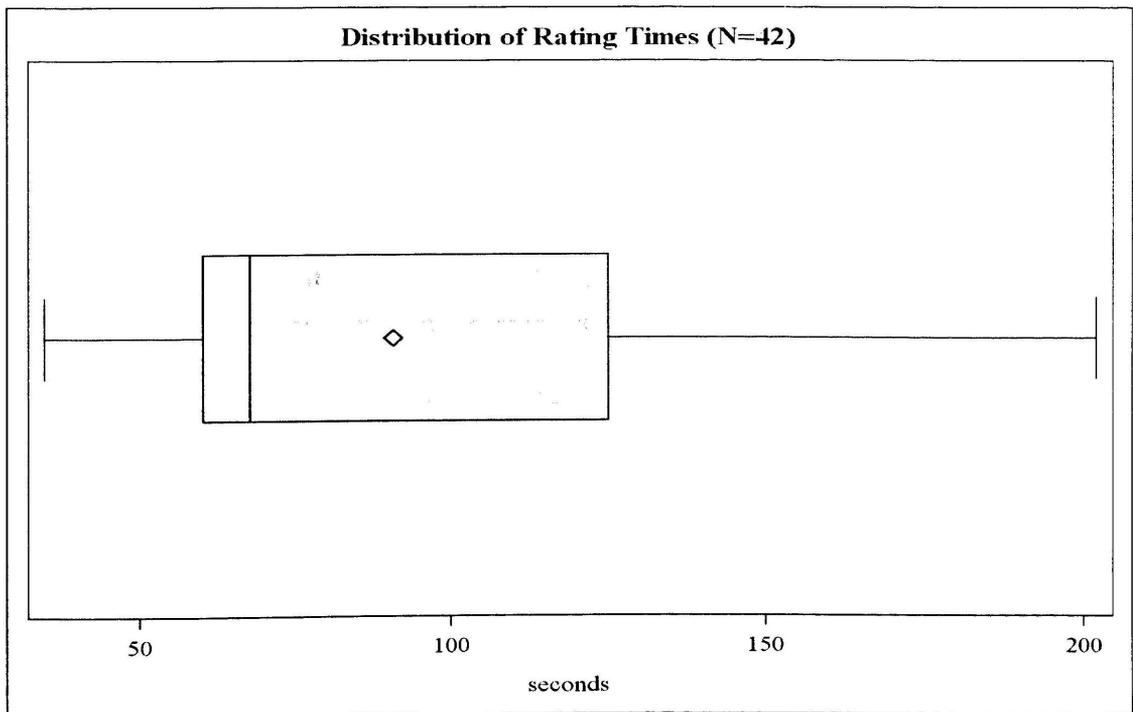


Figure 3. Bar graph depicting time required for observations and scoring using the PIPE

The third research question sought to determine the difference between the PIPE scale “overall impression” interactional scores and the “usual/typicality” traits of interactional synchrony scores. The frequency and correlation for overall scores PIPE scores and usual traits (typicality) scores are presented in the contingency table 7 as noted.

Table 7.

Contingency Table for Overall and Typicality Scores for use of the PIPE

	Other Rater 1	Summary
Rater 1	Category	<i>K</i> <i>KW</i>
	Overall	<i>K</i> .=18 , <i>KW</i> =.40
	Usual Traits/Typicality	<i>K</i> .=19, <i>KW</i> =.41
Total	N = 44	

The fourth research question related to how the three pediatric clinical nurses rated the feasibility of use of the PIPE. The summary is presented in the graph with the three pediatric clinical nurses rating at beginning, middle, and end of the study for ratings for use of the PIPE. The rating options given were “easy to use,” “somewhat easy to use”, and “not easy to use”. Two raters chose “somewhat easy to use” at all three times and one rater chose “easy to use”.

Table 8.

Raters Scoring of Ease of Use for the PIPE

Rater 1	Rater 2	Rater 3
Somewhat Easy	Somewhat Easy	Easy

CHAPTER V
IMPLICATIONS OF FINDINGS

This chapter begins with a brief summary in Table 9 reviewing major research components of the proposed and completed study. The brief rationale for choice of research design and methodological strands demonstrated congruence for the proposed study and the completed study. A concerted effort has been made to value both quantitative and qualitative components of the study to best address the research questions with integrity. The conclusions and implications of the study results will be highlighted followed by study limitations and future implications.

Table 9.

Congruence of Proposed and Actual Study Components

Research Component	Proposed Study	Completed Study
Methodological Type of Study	Descriptive & Psychometric	Descriptive & Psychometric
Philosophic Strands	Embedded Pragmatism & Feminism	Embedded Pragmatism & Feminism
Theoretical Framework	Attachment Theory	Attachment Theory
Barnard's Conceptual Model of Parent Child Interaction	Component of Barnard's Conceptual Model of Parent Child Interaction with focus on infancy, to assess mother infant interactional synchrony	Specific components of Barnard's Conceptual Model of Parent Child Interaction with focus on infancy, to assess mother-infant interactional synchrony

Research Component	Proposed Study	Completed Study
Participants who will carry out observations and collect data.	The principal investigator (PI) and three pediatric clinical nurses (PCNs) will perform direct observation of mother-infant interactional Synchrony in first 6-9 months of fifty mother-infant dyads.	The principal investigator (PI) and three pediatric clinical nurses (PCNs) will perform direct observation of mother-infant interactional Synchrony in first 6-9 months of fifty mother-infant dyads.
Psychometric/Research Focus	Determine the interrater reliability between the principal investigator and three pediatric clinical nurses (PCNs) using the Pediatric Infant Parent Exam, determine the feasibility of carrying out the observations & scoring of interactional synchrony as a component of the well-baby visit, determine the time required for observations & scoring of the PIPE, determine difference between the PIPE scores and usual traits of interaction scores, and determine ratings by the three PCN's for feasibility of use of the PIPE as a component of the well-baby visit.	Determine the interrater reliability between the principal investigator and three pediatric clinical nurses (PCNs) using the Pediatric Infant Parent Exam, determine feasibility of carrying out the observations & scoring of interactional synchrony as a component of the well-baby visit, determine the time required for observations & scoring of the PIPE, determine difference between the PIPE scores and usual traits of interaction scores, and determine ratings by the three PCN's for feasibility of use of the PIPE as a component of the well-baby visit.
Instrument/Major Variable	Pediatric Infant Parent Exam, assessment of maternal-infant synchrony.	Pediatric Infant Parent Exam, assessment of maternal-infant synchrony.
Sample	50 English speaking mothers and respective infants aged 6-9 months of age	50 English speaking mothers and respective infants aged 6-9 months of age

Research Component	Proposed Study	Completed Study
Fidelity	Checklist for training pre-study, mid-study, and post-study.	Checklist for training pre-study, mid-study, and post study.
Protection of Human Subjects	IRB training, permission from IRB at TTUHSC and TWU including appropriate attention to use of consent forms /HIPPA forms, and research integrity.	IRB training, permission from IRB at TTUHSC and TWU including appropriate attention to use of consent forms /HIPPA forms, and research integrity. *Study was audited as a component of usual Research Center timeline at TTUHSC.

The various quantitative and qualitative research components provided a framework to address the need for an instrument with scores and respective interpretation best-suited for assessing maternal-infant interactional synchrony early in life. A comparative concept analysis was carried out to differentiate maternal sensitivity from maternal responsiveness. An outcome of the concept analysis was the relevance of a need to consider both mother and infant during interaction to best capture interactional synchrony. While the initial emphasis was on exploring various qualitative components of this construct, the ongoing research effort was then directed to identifying an appropriate instrument to explore the interrater reliability and feasibility for use in a busy clinic setting by nurses. The literature review yielded few practical instruments with the theoretical underpinnings of attachment theory and early parent child interactional assessment for use in mother infant dyads in the first six to nine months of age. The

practicality for use represented strands of pragmatism. Pragmatism seeks to better understand real-world phenomena with desired ends using induction and deduction.

Best clinical, research, and educational practice requires sound assessment methods. The instrument chosen for the study had been used and reported in one study (Poehlmann and Fiese, 2001). Interrater reliability was measured using Cohen's *kappa* and weighted Cohen's *kappa* according to the ordinal level of the instrument subscales. Reliance on both qualitative and quantitative methodologies yielded an integrated study within a circumscribed context to best address the research questions of the construct of maternal-infant interactional synchrony. The resulting knowledge is maximal to the objectives of the study.

Elaboration and Summary of Results for Research Questions

The use of the Pediatric Infant Parent Exam by the principal investigator and three pediatric clinical nurses for screening interactional synchrony provided several major outcomes. First, the study was completed as proposed. The overall purpose for the research study was to determine the interrater reliability, overall impression, and scoring of usual traits and time required for nurses' use of the Pediatric Infant Parent Exam (PIPE) to screen the interaction of mother-infant dyads during a well-baby visit in a clinic setting.

Agreement among the raters and the Principal Investigator using the Pediatric Infant Parent Exam ranged from $k = 0.81$ to $KW = 0.84$ for the pooled stages analysis. Weighted *kappa* for the pooled analyses of scoring of interactional synchrony using the Pediatric Infant Parent Exam for the PI and each of three pediatric clinical nurses was 0.840 at the 95%

Confidence Interval (0.761, 0.919). According to criteria recommended by Landis and Koch (1977) Table 10. The agreement would be considered to be at the level of almost perfect.

Table 10.

Interpretation of kappa

<i>Kappa</i>	Interpretation
<0.00	Poor
0.00 – 0.20	Slight
0.21 – 0.40	Fair
0.41 – 0.60	Moderate
0.61 – 0.80	Substantial
0.81 – 1.00	Almost perfect

Data collection was carried out over a 9 week period according to the proposed study with several modifications. The PI and three pediatric clinical nurses were present for clinic operation Monday through Friday with appointments scheduled often for the day of the visit according to the plan for well-infant visits. During this time clinic was canceled for a funeral and a seminar.

The proposed study included three pediatric clinical nurses with the intent for fully crossed design. A confounding variable was the change from full time to part-time status of one of the three pediatric clinical nurses during the last three weeks of data collection. This altered the fully crossed plan in which equal numbers of ratings would have been done by all raters. The point in time for dealing with this issue was after completing thirty six observations. The best plan to maintain the study integrity was to aim for the greatest number of equal paired ratings by all three pediatric clinical nurses with the PI. This resulted in the total of fifty observations scored by the third rater and each of the other two raters

being unequal. The option to introduce a new third rater would have threatened the study due to training and potential difference in acquired expertise in use of the PIPE and planned analyses in the interest of time.

The weighting of the various categories may be seen as a potential threat to the study due to subjectivity. Justification for use in this study of weighting was to maintain the ordinal level of the rating options. In general the unit chosen should match the construct and maintain the anchoring of the item. The scores of the “overall” and “judgment of usual or typical” scale items did not meet the test of symmetry. Bias was detected and suggested these two items were not clearly differentiated. For this reason the results for these components of “overall synchrony” and “judgment or typicality” are subject to questionable interpretation.

Conclusions to the Psychometric Analysis

Reliability refers to the reproducibility or consistency of scores from one assessment to another. Statistical approaches to reliability assessment are based upon measurement of classical test theory which assumes a specific score once a measure includes a true score and an error component. Error may be caused by many factors: the subjects, poor rating technique, insufficient time to carry out the assessment, accurate representation of the construct studied, and poor wording of items on the instrument. In all statistical assessments of interrater reliability the assumption is accepted that obtained scores are never totally free of error. The reliability coefficient obtained from the application of the weighted *kappa* statistical technique to the data set expressed the amount of variance in observed scores considered true-score variance. In summary, support for interrater reliability of the Pediatric

Infant Parent Exam with the PI and three pediatric clinical nurses was consistent with the initial study results. Moreover the PIPE was perceived as “somewhat easy” by two of the pediatric clinical nurses and as “easy” by the third pediatric clinical nurse.

Implications of Findings

The importance for the completion and results of the study provide support for use of the Pediatric Infant Parent Exam for early detection of at risk maternal-infant dyads early in life. The standardization and use of the instrument with a larger population would be timely. While the analytical process for the study was rigorous there may be a translational gap satisfied with more basic agreement directed at the three sub-scale items of “beginning the game”, “keeping the game going”, and “ending the game”. In this use a scoring might be used such as that for the APGAR (Apgar, 1953).

Findings Linked to Relevant Research

The study responded to the published recommendation for use of the Pediatric Infant Parent Exam as described in the article by Fiese and Poehlmann, 2001. Few instruments intended for screening maternal-infant interactional synchrony in the first year of life have been developed. In recent years researchers and clinicians have identified the need for simple and brief screening tools validated for use with young children during the most opportune time for intervention.

Increased incidence of maternal-infant attachment disorders and altered infant mental health signaled the need for early identification of at risk dyads with a focus on teaching parents to deal with stress. Early relationship of mother and infant has been

shown to influence the physical architecture of the brain, literally shaping the neural connections of the developing brain National Scientific Council on the Developing Child, 2005). The caregiving relationship has been identified as the major influence on the learning and growth of early years.

Limitations

The limitations of this study included that (1) the setting and context of the observations could not be controlled beyond the procedural scope of the study, (2) the nonrandom purposive sample will limit generalizability, and (3) the characteristics and expertise of the three pediatric clinical nurses in the busy well-baby clinic also limits generalizability. The reliability is specific to the sample tested and the context for the study. There may have been fidelity drift due to the eight week time period for data collection despite the mid-study refresher training. Another threat may be the busy and intense pace of the clinic which impacts how the nurses may have perceived the additional component of observation and scoring.

Recommendations for Future Research

Future research will further determine the PIPE's clinical utility with the goal of developing an instrument to enhance the identification of maternal-infant dyads at risk for interactional problems and the evaluation of prevention and early intervention services. Future studies could focus on the possible modification for the scale items of the PIPE "overall interactional synchrony" (1-7 rankings) and "judgment of typicality" (very typical, somewhat typical and atypical).

The Pediatric Department of the study plans to incorporate use of the PIPE as a component of the well-infant checks during the first year of life. Currently they are using The Ages and Stages Questionnaire for assessment of development. The instrument could also be shared in interprofessional endeavors for early identification of communication and emotional regulation. A major goal would be widespread use of the instrument with standardization and norm-referencing. To further validate the PIPE usage, predictive and concurrent validity with other measures of parent-child relationships and child development is needed. Most importantly, determination of dyads as at risk must be followed to ascertain subsequent effects in development.

Educating nursing students and medical students in use of the PIPE as a measure of maternal-infant dyadic interaction is also to be implemented in the institutional health sciences center with support from the child development specialists. At risk premature infants can also be followed longitudinally to monitor interactional synchrony along with growth and development.

As more infants survive, the need for reliable screening instruments for detection of problematic dyadic interactions is required. As evidence-based knowledge supports the importance of the early relationship for subsequent development of the child, screening techniques must likewise reflect this progress. The newly identified realm of infant mental health will provide a timely impetus for bringing joy to the first relationship for mothers and babies.

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Toddlers, and Young Children Act, Public Law 101-239 Maternal Child Health

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APPENDIX A
Pediatric Infant Parent Exam

APPENDIX B

Consent to Take Part in a Research Study

CONSENT TO TAKE PART IN A RESEARCH STUDY
Signed copy to be provided to subject or authorized representative

This is a research study for subjects who voluntarily choose to take part. Please take your time to make a decision, and discuss the study with your personal doctor, family and friends if you wish.

STUDY TITLE: Interrater reliability of the Pediatric Infant Parent Exam Instrument for screening interactional synchrony during a well-baby visit.

INVESTIGATOR: Kathryn Sridaromont, RN, MSN, Doctoral Student, Texas Woman's University

CONTACT NUMBER: 806-252-1361

(You may contact the investigator at the number listed above at any time if you develop any of the conditions listed in Question #6 of this form or if you have any unexpected complications.)

INSTITUTION: Texas Tech University Health Sciences Center and Texas Woman's University.

1. Why is this study being done?

This is a research study to see how mothers and their 6 to 9 month old infants interact while playing a simple game prior to a well child exam at a pediatric clinic. The study will look to see how the mother and infant begin a game, keep the game going, and end the game using the Pediatric Infant Parent Exam. The usefulness of this special form for recording mother-infant interaction will be tested.

2. How many people will take part in this study?

50 mothers and their 6 to 9 month old infants will participate in this research.

3. Why am I being asked to take part in this research study?

You are the parent of an adolescent mother with a 6-9 month old infant who is attending a well child clinic.

4. What will happen during this study? What will be done that is different from my usual care?

Your daughter and grandchild will participate in a well-child clinic visit with their usual nurse. The researcher will sit in on the clinic visit to observe and complete a form about interaction. This will make the clinic visit run about 20 minutes longer than usual. Your daughter will be asked for information about the baby's age.

5. How long will my daughter and my grand child be in this study? How much of their time will this take?

About 30 minutes.



6. What are the risks and/or discomforts to me if I join this study?

One risk is potential release of confidential information. Every effort will be made to protect the privacy of this information. Another potential risk is that your daughter may feel emotional discomfort at having researchers observing her and asking her questions. She may feel she is being judge. She should feel free to let the researchers know if she is experiencing discomfort at any time. The phone numbers of several licensed counselors are provided as well as the Parenting Guidance Center and Outreach Center You or your daughter may call them at any time if you or your daughter feels discomfort. Your daughter will be given the child's book for her interest in the study regardless of your decision or your daughter's decision to continue in the study.

7. Will there be any added risks to my daughter from this study because she is a female?

No.

8. Are there any benefits to my daughter if she takes part in this study?

No.

9. What other choices does my daughter have if she does not take part in the research?

This study does not involve treatment. You do not have to take part in this study.

10. What about confidentiality and the privacy of my records?

We will keep your involvement in this research study confidential to the extent permitted by law. In addition to the staff carrying out the study, others may learn that you are in the study. This might include federal regulatory agencies such as the Food and Drug Administration (FDA) and the Office of Human Research Protection (OHRP), Texas Tech University Health Sciences Center (TTUHSC) representatives, Texas Woman's University (TWU), and the Institutional Review Board (a committee that reviews and approves research) at TTUHSC and TWU. These people may review and copy records involving the research.

11. Who is funding this study?

The Texas Tech University Health Sciences Center, School of Nursing is providing the space and supplies for this study. No one on the research staff will receive anything of value from other agencies, organizations, or companies to carry out this research.

12. Will it cost my daughter anything to take part in this study?

No.

13. Will my daughter receive anything for taking part in this research study?

Your daughter will be given a child's book to share with her infant.

14. Does anyone on the research staff have a personal financial interest in this study?

No.



15. What if my daughter is hurt by participating in this study?

- Texas Tech University Health Sciences Center and its affiliates and Texas Woman's University and its affiliates do not offer to pay for or cover the cost of medical treatment for research related illness or injury. No funds have been set aside to pay or reimburse you in the event of such injury or illness unless specifically stated.
- If she has a research related illness or injury, care will be available to her as usual, but you and/or her medical or hospital insurance company will be responsible for the cost of treatment. Before entering this study, you should check whether your insurance company might limit your insurance coverage if she takes part in a research study.

16. What are my rights as a voluntary participant?

Having your daughter take part in this study is your choice. You may choose for her not to be in it. If you decide for her not to be in the study, it will not affect any medical care, benefits, or rights to which she is entitled. If you sign this form, it means that you choose for your daughter to be in the study. If new information becomes available during the study that may affect your willingness for her to take part in the study, you will be told.

17. Can my daughter stop being in the study?

- Your daughter may leave the study at any time. If she does, discuss it with the investigator, who will help you leave the study in the safest way.
- If she leaves the study, your right to standard care will continue.
- If you leave the study, we cannot remove any information we have collected to that point.

18. Can someone else end my participation in the study?

Under certain circumstances, the investigators, TTUHSC, TWU, or the study sponsor may decide to end your participation earlier than planned. This might happen because your daughter becomes too upset to continue in the study.

19. What if I have questions?

For questions about this study, contact the Investigator, Kathy Sridaromont, RN, MSN at 806-252-1361 or the Dissertation Chair, Gayle Roux, PhD, Associate Professor at Texas Woman's University at 940-898-2424.

If you would like to speak to someone who is not involved in the study about your rights as a participant, research-related injuries, or any other matter related to the study, you can call the TTUHSC Research Protection Hotline: 1-800-396-0918



Your signature indicates that this research study has been explained to you, that you've been given the opportunity to ask questions, and that you agree for your daughter to take part in this study. You will be given a copy of this form.

Printed Name of Subject

Signature of Parent/Guardian
Or authorized Representative

Date Time

_____ Subject was unable to read and understand the written consent.

Signature of Witness to Oral Presentation

Date Time

I have discussed this research study with the subject and his or her authorized representative, using language that is understandable and appropriate. I believe I have fully informed the subject of the possible risks and benefits, and I believe the subject understands this explanation. I have given a copy of this form to the subjects.

Signature of authorized research personnel who
Conducted the informed consent discussion

Date Time

NOT VALID WITHOUT TTUHSC IRB
SEAL OF APPROVAL



Texas Tech University HSC
IRB NUMBER: L11-116
IRB APPROVAL DATE: 7/18/2012
IRB EXPIRATION DATE: 4/17/2013

TEXAS TECH UNIVERSITY HEALTH SCIENCES CENTER ("TTUHSC")

STUDY TITLE: Interrater reliability of the Pediatric Infant Parent Exam Instrument for screening interactional synchrony during a well-baby visit.

**AUTHORIZATION TO USE AND/OR DISCLOSE YOUR PROTECTED HEALTH INFORMATION
for a RESEARCH STUDY**

This form is intended to tell you about the use and/or disclosure (sharing) of your personal **Protected Health Information** (PHI) if you decide to participate in the research study described on the previous pages. The health information about you that may be used or disclosed is described below. This information is usually found in your medical records. Only the health information about you that is needed for this research study will be used or disclosed. When you consider taking part in this research study, you are also being asked to give your permission for your Protected Health Information to be released from your doctors, clinics, and hospitals to the research personnel approved for this research study. This Authorization specifically relates to the research study described in the attached Informed Consent document.

1. This Authorization is valid indefinitely or until such time as legal requirements will allow this Authorization to be destroyed.
2. If you choose to cancel this Authorization, please give notice in writing to:

**Shauna Baughcum
Institutional Privacy Officer
Office of Institutional Compliance
3601 4th St MS 8165
Lubbock TX 79410**

If you sign this Authorization, the following persons, groups or organizations may rely on this Authorization to disclose your Protected Health Information to the Principal Investigator and other research personnel who are conducting this Study:

- your treating physicians and healthcare providers and their staff,
- associated healthcare institutions and hospitals where you have or may receive care.

While this research study is in progress, the Principal Investigator or research personnel working on this study will inform you whether or not you will be allowed to see the research related health information that is created about you or collected by the research personnel prior to the end of the study. After the study is finished you may request this information as allowed by the TTUHSC Notice of Privacy Practices.

The Protected Health Information that you authorize to be used or disclosed for research purposes may include your current or future health information from some or all of your health records, including:



<ul style="list-style-type: none"> ▪ hospital records and reports ▪ admission history, and physical examination ▪ X-ray films and reports; operative reports ▪ laboratory reports, treatment and test results (including sexually transmitted diseases, HIV or AIDS) ▪ any other Protected Health Information needed by the research personnel listed above. <p>(* use separate form for disclosure of psychotherapy notes)</p>	<ul style="list-style-type: none"> ▪ immunizations ▪ allergy reports ▪ prescriptions ▪ consultations ▪ clinic notes ▪ mental health records ▪ alcohol / substance abuse records
--	--

For the purposes of this study, your Protected Health Information may need to be reviewed or disclosed to individuals or organizations within and/or outside of TTUHSC who sponsor, approve, assist with, monitor or oversee the conduct of research studies. This includes, but is not limited to, the TTUHSC Institutional Review Board, TTUHSC compliance reviews, the US Food and Drug Administration (FDA) or governmental agencies in other countries. Some of these individuals or organizations may share your health information further, and your health information may not be protected by the same privacy standards that TTUHSC is required to meet.

If you choose to sign this Authorization form, you can change your mind about this later. If you change your mind, send a letter to the person identified above telling us to stop collecting and sharing your Protected Health Information. When we receive your request, you may be asked to leave the research study if all the necessary information has not been collected. We may still use the information about you that we have already collected. We need to know what happens to everyone who starts a research study, not just those people who stay in it.

You have the right to refuse to sign this form. If you choose not to sign this form, your regular health care will not be affected. However, not signing this form will prevent you from participating in this research study and prevent you from receiving research related health care services provided under this study.

I have had the opportunity to review and ask questions regarding this Authorization to use or disclose my personal health information, and I will receive a copy of this form. By signing this Authorization, I am confirming that it reflects my wishes.

Signature of Individual or Authorized Representative

Date

Printed Name

If applicable, Relationship of Authorized Representative or Authority to Sign



Texas Tech University HSC
IRB NUMBER: L11-115
IRB APPROVAL DATE: 7/18/2012
IRB EXPIRATION DATE: 4/17/2013

CONSENT TO TAKE PART IN A RESEARCH STUDY

Signed copy to be proved to subject or authorized representative

This is a research study for subjects who voluntarily choose to take part. Please take your time to make a decision, and discuss the study with your personal doctor, family and friends if you wish.

STUDY TITLE: Interrater reliability of the Pediatric Infant Parent Exam Instrument for screening interactional synchrony during a well-baby visit.

INVESTIGATOR: Kathryn Sridaromont, RN, MSN, Doctoral Student, Texas Woman's University

CONTACT NUMBER: 806-252-1361

(You may contact the investigator at the number listed above at any time if you develop any of the conditions listed in Question #6 of this form or if you have any unexpected complications.)

INSTITUTION: Texas Tech University Health Sciences Center

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You are a mother with a 6-9 month old infant who is attending a well child clinic

4. What will happen during this study? What will be done that is different from my usual care?

You and your son or daughter will participate in a well-child clinic visit with their usual nurse. The researcher will sit in on the clinic visit to observe and complete a form about interaction. This will make the clinic visit run about 20 minutes longer than usual. You will be asked for information about the baby's age.

5. How long will my child and I be in this study? How much of their time will this take?

About 30 minutes.



Texas Tech University HSC
IRB NUMBER: L11-115
IRB APPROVAL DATE: 7/19/2012
IRB EXPIRATION DATE: 4/17/2013

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Subject/AR Initials _____
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Mother Consent Form

6. What are the risks and/or discomforts to me if I join this study?

One risk is potential release of confidential information. Every effort will be made to protect the privacy of this information. Another potential risk is that you may feel emotional discomfort at having researchers observing you and asking you questions. You may feel you are being judged. You should feel free to let the researchers know if you are experiencing discomfort at any time. The phone numbers of several licensed counselors are provided as well as the Parenting Guidance Center and Outreach Center. You may call them at any time if you feel discomfort.

You will be given the child's book for your interest in the study regardless of your decision to continue in the study.

7. Will there be any added risks to me from this study because I am a female?

No.

8. Are there any benefits to me if I take part in this study?

No.

9. What other choices do I have if I do not take part in the research?

This study does not involve treatment. You do not have to take part in this study.

10. What about confidentiality and the privacy of my records?

We will keep your involvement in this research study confidential to the extent permitted by law. In addition to the staff carrying out the study, others may learn that you are in the study. This might include federal regulatory agencies such as the Food and Drug Administration (FDA) and the Office of Human Research Protection (OHRP), Texas Tech University Health Sciences Center (TTUHSC) representatives, Texas Woman's University (TWU), and the Institutional Review Board (a committee that reviews and approves research) at TTUHSC and TWU. These people may review and copy records involving the research.

11. Who is funding this study?

The Texas Tech University Health Sciences Center School of Nursing is providing the space and supplies for this study. No one on the research staff will receive anything of value from other agencies, organizations, or companies to carry out this research.

12. Will it cost me anything to take part in this study?

No.

13. Will I receive anything for taking part in this research study?

You will be given a child's book to share with your infant.



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Mother Consent Form

14. Does anyone on the research staff have a personal financial interest in this study?

No.

15. What if I am hurt by participating in this study?

- Texas Tech University Health Sciences Center and its affiliates and Texas Woman's University and its affiliates do not offer to pay for or cover the cost of medical treatment for research related illness or injury. No funds have been set aside to pay or reimburse you in the event of such injury or illness unless specifically stated.
- If you have a research related illness or injury, care will be available to you as usual, but you and/or your medical or hospital insurance company will be responsible for the cost of treatment. Before entering this study, you should check whether your insurance company might limit your insurance coverage if you take part in a research study.

16. What are my rights as a voluntary participant?

Taking part in this study is your choice. You may choose to be in it. If you decide not to be in the study, it will not affect any medical care, benefits, or rights to which you are entitled. If you sign this form, it means that you choose for you and your child to be in the study. If new information becomes available during the study that may affect your willingness to take part in the study, you will be told.

17. Can I stop being in the study?

- You may leave the study at any time. If you do, discuss it with the investigator, who will help you leave the study in the safest way.
- If you leave the study, your right to standard medical care will continue.
- If you leave the study, we cannot remove any information we have collected to that point.

18. Can someone else end my participation in the study?

Under certain circumstances, the investigators, TTUHSC, TWU, or the study sponsor may decide to end your participation earlier than planned. This might happen because you become too upset to continue in the study.

19. What if I have questions?

For questions about this study, contact the Investigator, Kathy Sridaromont, RN, MSN at 806-252- 1361 or the Dissertation Chair, Gayle Roux, PhD, Associate Professor at Texas Woman's University at 940-898-2424.

If you would like to speak to someone who is not involved in the study about your rights as a participant, research-related injuries, or any other matter related to the study, you can call the TTUHSC Research Protection Hotline: 1-800-396-0918.



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Subject/AR Initials _____
ICF version date 7/17/2012
Mother Consent Form

Your signature indicates that this research study has been explained to you, that you've been given the opportunity to ask questions, and that you agree for your daughter to take part in this study. You will be given a copy of this form.

Printed Name of Subject

Signature of Parent/Guardian
Or authorized Representative

Date Time

_____ Subject was unable to read and understand the written consent.

Signature of Witness to Oral Presentation

Date Time

I have discussed this research study with the subject and his or her authorized representative, using language that is understandable and appropriate. I believe I have fully informed the subject of the possible risks and benefits, and I believe the subject understands this explanation. I have given a copy of this form to the subjects.

Signature of authorized research personnel who
Conducted the informed consent discussion

Date Time

NOT VALID WITHOUT TTUHSC IRB
SEAL OF APPROVAL

TEXAS TECH UNIVERSITY HEALTH SCIENCES CENTER ("TTUHSC")

STUDY TITLE: Interrater reliability of the Pediatric Infant Parent Exam Instrument for screening interactional synchrony during a well-baby visit.

**AUTHORIZATION TO USE AND/OR DISCLOSE YOUR PROTECTED HEALTH INFORMATION
for a RESEARCH STUDY**

This form is intended to tell you about the use and/or disclosure (sharing) of your personal **Protected Health Information** (PHI) if you decide to participate in the research study described on the previous pages. The health information about you that may be used or disclosed is described below. This information is usually found in your medical records. Only the health information about you that is needed for this research study will be used or disclosed. When you consider taking part in this research study, you are also being asked to give your permission for your Protected Health Information to be released from your doctors, clinics, and hospitals to the research personnel approved for this research study. This Authorization specifically relates to the research study described in the attached Informed Consent document

1. This Authorization is valid indefinitely or until such time as legal requirements will allow this Authorization to be destroyed.
2. If you choose to cancel this Authorization, please give notice in writing to:

**Shauna Baughcum
Institutional Privacy Officer
Office of Institutional Compliance
3601 4th St MS 8165
Lubbock TX 79410**

If you sign this Authorization, the following persons, groups or organizations may rely on this Authorization to disclose your Protected Health Information to the Principal Investigator and other research personnel who are conducting this Study:

- your treating physicians and healthcare providers and their staff,
- associated healthcare institutions and hospitals where you have or may receive care.

While this research study is in progress, the Principal Investigator or research personnel working on this study will inform you whether or not you will be allowed to see the research related health information that is created about you or collected by the research personnel prior to the end of the study. After the study is finished you may request this information as allowed by the TTUHSC Notice of Privacy Practices.

The Protected Health Information that you authorize to be used or disclosed for research purposes may include your current or future health information from some or all of your health records, including:

<ul style="list-style-type: none"> ▪ hospital records and reports ▪ admission history, and physical examination ▪ X-ray films and reports; operative reports ▪ laboratory reports, treatment and test results (including sexually transmitted diseases, HIV or AIDS) ▪ any other Protected Health Information needed by the research personnel listed above. <p>(* use separate form for disclosure of psychotherapy notes)</p>	<ul style="list-style-type: none"> ▪ immunizations ▪ allergy reports ▪ prescriptions ▪ consultations ▪ clinic notes ▪ mental health records ▪ alcohol / substance abuse records
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For the purposes of this study, your Protected Health Information may need to be reviewed or disclosed to individuals or organizations within and/or outside of TTUHSC who sponsor, approve, assist with, monitor or oversee the conduct of research studies. This includes, but is not limited to, the TTUHSC Institutional Review Board, TTUHSC compliance reviews, the US Food and Drug Administration (FDA) or governmental agencies in other countries. Some of these individuals or organizations may share your health information further, and your health information may not be protected by the same privacy standards that TTUHSC is required to meet.

If you choose to sign this Authorization form, you can change your mind about this later. If you change your mind, send a letter to the person identified above telling us to stop collecting and sharing your Protected Health Information. When we receive your request, you may be asked to leave the research study if all the necessary information has not been collected. We may still use the information about you that we have already collected. We need to know what happens to everyone who starts a research study, not just those people who stay in it.

You have the right to refuse to sign this form. If you choose not to sign this form, your regular health care will not be affected. However, not signing this form will prevent you from participating in this research study and prevent you from receiving research related health care services provided under this study.

I have had the opportunity to review and ask questions regarding this Authorization to use or disclose my personal health information, and I will receive a copy of this form. By signing this Authorization, I am confirming that it reflects my wishes.

Signature of Individual or Authorized Representative

Date

Printed Name

If applicable, Relationship of Authorized Representative or Authority to Sign



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 IRB EXPIRATION DATE: 4/17/2013

APPENDIX C

Instructions for Use of the PIPE for Pediatric Clinical Nurse

Instructions for Use of the Pediatric Infant Parent Exam

You and the principal investigator will be observing mother-infant dyads as they interact in a brief game of “peek-a-boo” prior to the normal well-baby exam. If a mother is not familiar with this game then ask her to play a game she does play with her infant, such as, “pat-a-cake” or “this little piggy went to market.”

The intent is to focus on how the mother and her infant relate to one another rather than on the individual characteristics of either. The mother is allowed adequate time to capture the infant’s attention and play the game. The interaction between the parent and infant is to be observed and scored for degree of interactional reciprocity and positive affect at the beginning, middle, and end of the game. Each of the three segments of the game is scored on a scale of 0 to 5, with lower scores reflecting more favorable interaction patterns. A total score is calculated by summing the scores from the three segments of the game. The more adaptive end of the scoring system is characterized by easy engagement between parent and infant. The game is sustained by smooth back and forth movements, and there is a gradual cool down at the end. At the more maladaptive end of the continuum, the parent is either disengaged or intrusive and infants respond with negative affect. The game persists despite infant protest, and there is an abrupt ending to the game.

Each of the three segments (**starting the game, keeping the game going, and stopping the game**) is scored on a continuum of 0 to 5 with a 0 representing easy engagement while a 5 represents inappropriate and bizarre engagement.

The **overall impression of interaction** is scored on a continuum of 1 to 6 with the scores of 1, 2, and 3 representative adaptive interactions while 6 is representative of maladaptive interactions. Scores of 4, 5, and 6 are minimally adaptive.

The judgment of exam as to **how typical you consider this interaction for parent and child** is scored as 1, representative of very typical; 2, as representative of somewhat typical; and 3, as atypical and a brief explanatory note. This note provides input as to why you consider the interaction atypical for this mother and her infant. The impression you have of this interaction is determined by what you observe and your perceptions.

Your view of “**ease**” of exam is scored on a continuum of 1-3 with “very easy” scored 1, “somewhat easy” scored 2, and “not easy” scored 3.

After the mother and her infant are called into the exam room and verification of consent and the opportunity to ask questions has been satisfied, you will tell the mother, “I am now going to carry out the observation of you interacting with your infant in a brief game of “peek-a-boo.” Please make sure your baby is protected from falling. You may place your infant on the exam table or on your lap. We will consider the game over when I go on to another topic.”

APPENDIX D

Fidelity Assessment Grid

Checklist for Treatment Fidelity Training

Participant: Christina, Hope, & Lezlee (Pediatric Clinical Nurse)

Trainer: Kathy Sridaromont (PI)

Activity	Outcome	Recommendation
Initial PIPE training for group of PCNs and PI to include DVD, training video viewing and practice codings Pre-study training was completed on July 20, 2012. The following week training videos were viewed and PCNs rated the various examples for beginning, keeping the game going, and end of game.	Success in training, prepare for session for interrater reliability assessment with PI and PCN.	Review materials of the PIPE manual, seek clarification as needed
	Pre-Study IRR <u>.80</u>	
	Fifth Assessment IRR <u>.80</u>	
	End of Study IRR <u>.80</u>	
	Demonstrates ability to use and score the PIPE simple & (weighted <i>kappa values</i>) <u>.80&</u> <u>.84</u>	

Checklist for Treatment Fidelity Training

Participant: Christina, Hope, & Lezlee (Pediatric Clinical Nurse)

Trainer: Kathy Sridaromont (PI)

Activity	Outcome	Recommendation
Re-training & follow-up Q 2 weeks	Interrater reliability assessment with PI	Seek clarification as needed/identify issues to share with other members
Week 2	Maintenance of training knowledge/review of training content	8/14 /12 Question & answer sessions held weekly for issues. One was the potential for paper on exam table distracting infants.
Week 4	Review of concept of fidelity/drift	8/28 /12
Week 6	Ongoing ability to perform screening using the PIPE	9/04 /12
Week 8		9/28 /12
Week 9 Last Data Collected		

Checklist for Treatment Fidelity Training

Participant: Christina, Hope, & Lezlee (Pediatric Clinical Nurse)

Trainer: Kathy Sridaromont (PI)

Activity	Outcome	Recommendation
Identification of known study concerns	Analyze to assess for fidelity Assess reliability of rater Strengths: Each of the PCNs reviewed the video tapes for examples and express comfort with expectations. Issues discussed include script for accuracy in use of the PIPE	Clarification of differences or patterns suggesting drift or lack of fidelity Review training manual and practice codings
	Deficits: Factors confounding included one PCN going part time with availability limited to afternoon clinics.	
Reassessment of interrater reliability	Success for interrater reliability .84 Weighted <i>kappa</i> <u> </u>	Continued review and discussion as issues arise
Post observational evaluation of use of the PIPE	Discussion and identification of post study issues Group met and assessed feasibility issues, 2 PCNs rated PIPE "somewhat easy to use" and 1 PCN rated the PIPE "easy to use". 9/25 <u> </u> /12	Completion of Study Defense 11/1/12

APPENDIX E

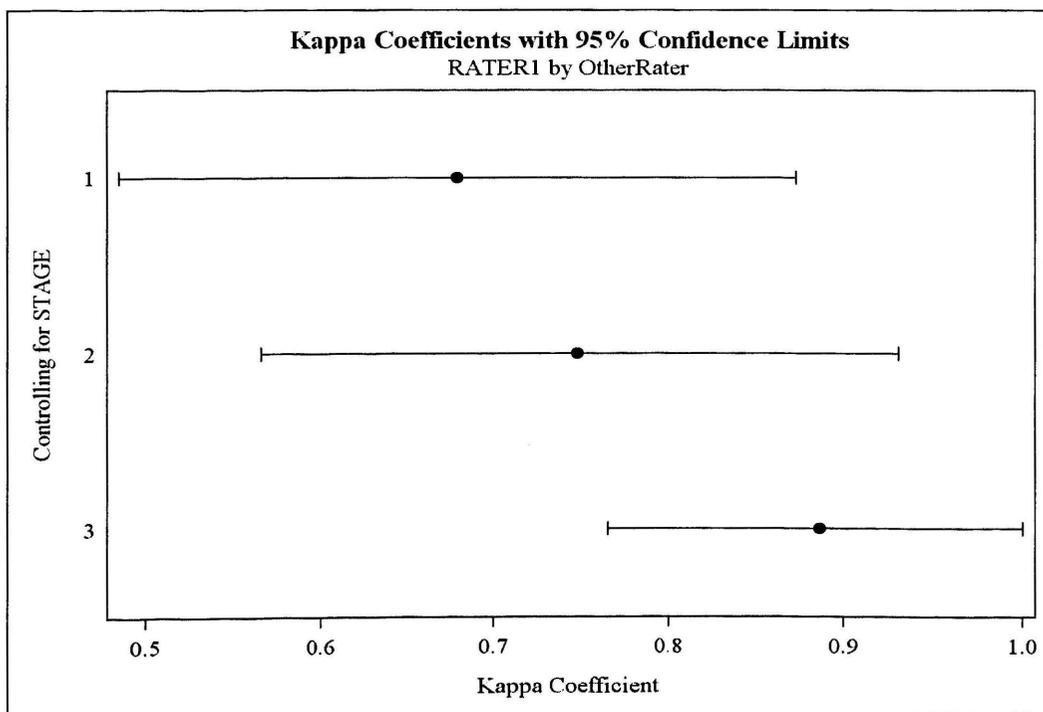
Kappa for Stages Pooled Using the PIPE

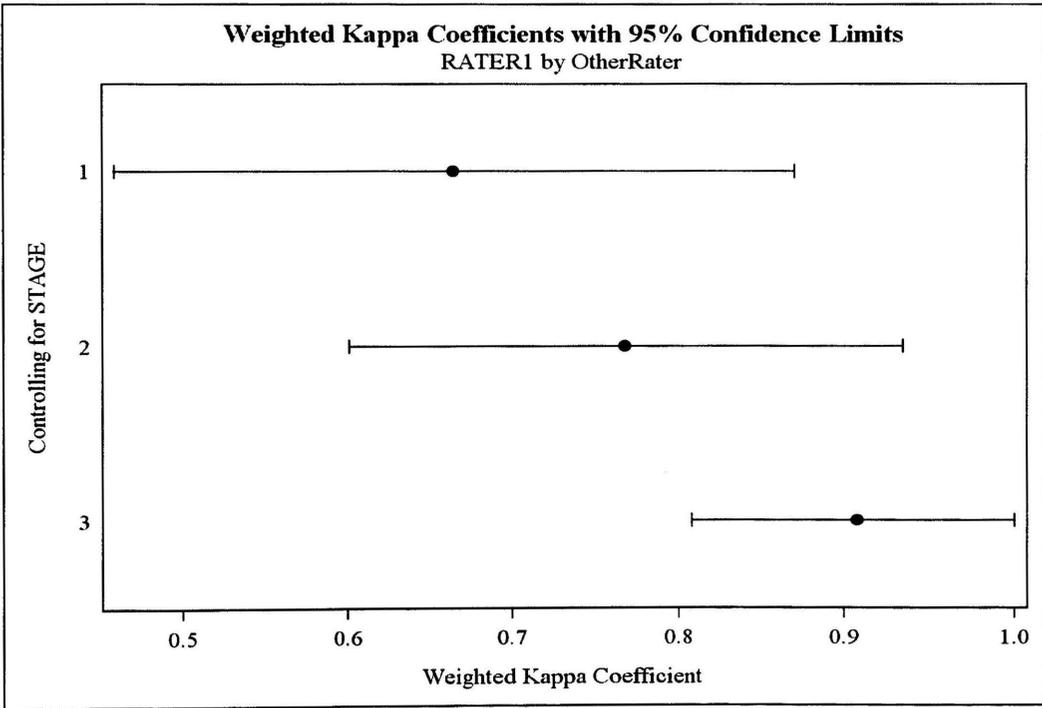
Kappa for Stages Pooled Using the PIPE

N=44		Secondary Rating (Nursing Staff)																													
		Beginning the Game					Continuing the Game					Ending the Game																			
Frequency	Percent	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5												
		Primary Rating (Investigator)	0	19.4318	1	0	0	0	0	20.455	2	0	0	0	0	21.73	0	0	0	0	0										
1	11.36		1.5349	1	0	1	0	2.455	1.73864	1	0	0	0	1.227	1.5349	0	0	0	0												
2	0.00		0.00	2.455	0	0	0	0.00	2.227	2.00	0	0	0	0.00	2.455	1.136	0	0	0												
3	0.00		0.00	0.00	0	0	0	0.00	0.00	0.00	0	0	0	0.00	0.00	0.00	0	0	0												
4	0.00		0.00	0.00	0	0	0	0.00	0.00	0.00	0	0	0	0.00	0.00	0.00	0	0	0												
5	0.00		0.00	0.00	0	0	0	0.00	0.00	0.00	0	0	0	0.00	0.00	0.00	0	0	0												
Agreement		Agree = 81.82%					Disagree = 18.18%					Agree = 86.36%					Disagree = 13.64%					Agree = 93.18%					Disagree = 6.82%				

Cohen's Kappa			
	Beginning the Game	Continuing the Game	Ending the Game
Simple kappa	$k = 0.679, 95\% \text{ Conf. Int: } (0.486, 0.873)$	$k = 0.748, 95\% \text{ Conf. Int: } (0.566, 0.930)$	$k = 0.887, 95\% \text{ Conf. Int: } (0.766, 1)$

Weighted kappa	$k = 0.665$, 95% Conf. Int: (0.459,0.870)	$k = 0.768$, 95% Conf. Int: (0.601,0.934)	$k = 0.907$, 95% Conf. Int: (0.051,1)
Cumulative	Simple $k = 0.809$, 95% Conf. Int: (0.720,0.899)*		Weighted $k = 0.840$, 95% Conf. Int: (0.761,0.919)*





APPENDIX E

University Approval Letters to Conduct Study



INSTITUTIONAL REVIEW BOARD FOR THE PROTECTION OF HUMAN SUBJECTS
FWA # 00006767 LUBBOCK/ODESSA IRB #00000096

ADDITIONAL INFORMATION REQUESTED

April 21, 2011

IRB #: L11-115

STUDY #: Interrater reliability of the Pediatric Infant Parent Exam Instrument for screening interactional synchrony during a well-baby visit (1111)

PRINCIPAL INVESTIGATOR: Kathryn Sridaromont

SUBMISSION REFERENCE #: 037275

TYPE OF REVIEW: EXPEDITED

Recommendation: This project was reviewed in accordance with 45 CFR 46 Subpart D (Children in Research). The study meets the criteria for 46.404 - research not involving greater than minimal risk. The study also meets the criteria for expedited review under category 45 CFR 46.110(7); however, there are a few points that need to be addressed prior to approval.

Stipulations:

1. The protocol discusses three PCN's and a Nursing Research Assistant who will be assisting with the consent process and data collection. As you have stated in the protocol, all of these assistants will require CITI training. In addition, all must be specifically named and added as study personnel.
2. Application 7.1 & 16.1 and Consent #13 state that a book will be given. The protocol states a \$10 voucher will be given. Please correct the wrong document.
3. Application 10.2 – There are two subject groups (mothers and babies). Please correct.
4. Application 14.2 and Consent #6 – The risks of the study need to be the same in both documents. Please correct.
5. Consent #6 Risks – Please delete the following from both consent forms. This material is covered in Consent #15, 16, & 17: **Another risk that you might feel is coercion. Your participation is on a voluntary basis and no penalty or loss of usual benefits you are entitled to will be affected. At any time you may freely choose to not continue participation in the study. You will be given the child's book for your interest in the study regardless of your decision to continue in the study. Texas Tech University Health Sciences Center (TTUHSC) nor Texas Woman's University (TWU) provide medical service or financial assistance for injuries that might happen because you are taking part in this research.**
6. Will adolescent mothers also sign the mother consent form or will you have a separate assent form for them? Please clarify.
7. Please provide a copy of TWU's IRB Approval letter for this project when it has been obtained.

Please address the stipulations within 30 days. For ease in reviewing, the IRB would prefer that you **highlight** any changes to existing documents.

Please retain this letter with your research records. Research records include all Institutional Review Board submissions and responses and must be kept in the principal investigator's file for a minimum of three (3) years after completion of the study.

The Texas Tech University Health Sciences Center (TTUHSC) IRB Policies and Procedures are available for reference on the TTUHSC Human Research Protection Program Website (<http://www.ttuhscc.edu/research/hrpo/irb/>).

TTUHSC Lubbock/Odessa Institutional Review Board
3601 4th Street STOP 8146
Lubbock, TX 79430
806-743-4753

