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Furthering the Understanding of Parent–Child Relationships: A Nursing Scholarship Review Series. Part 3: Interaction and the Parent–Child Relationship—Assessment and Intervention Studies

Karen A. Pridham, PhD, RN, FAAN, Kristin F. Lutz, PhD, RN, Lori S. Anderson, PhD, RN, Susan K. Riesch, PhD, RN, FAAN, and Patricia T. Becker, PhD, RN, FAAN

Karen A. Pridham, PhD, RN, FAAN, is Professor Emeritus; Lori S. Anderson, PhD, RN, is Assistant Professor; Susan K. Riesch, PhD, RN, FAAN, is Professor; and Patricia T. Becker, PhD, RN, FAAN, is Professor Emeritus, all at the University of Wisconsin-Madison School of Nursing, Madison, Wisconsin, USA; Kristin F. Lutz, PhD, RN, is Assistant Professor, Oregon Health & Science University School of Nursing, Portland, Oregon, USA

Abstract

PURPOSE—This integrative review concerns nursing research on parent–child interaction and relationships published from 1980 through 2008 and includes assessment and intervention studies in clinically important settings (e.g., feeding, teaching, play).

CONCLUSIONS—Directions for research include development of theoretical frameworks, valid observational systems, and multivariate and longitudinal data analytic strategies.

PRACTICE IMPLICATIONS—Observation of social–emotional as well as task-related interaction qualities in the context of assessing parent–child relationships could generate new questions for nursing research and for family-centered nursing practice.

Search terms

Nursing; parents; parent-child interaction; parent-child relations; parenting

A relationship is developed and changed through interaction (Hinde, 1976; Hinde & Stevenson-Hinde, 1988). A relationship is distinguishable from interaction by specific motivation (e.g., security regulation) and its qualities. A relationship has endurance over time and is described by qualities of mutuality, reciprocity, responsiveness, and synchrony, and patterns of connection and separation (Hinde, 1976). Interaction, on the other hand, is the activity of the parent–child dyad, including bids for the other’s attention and responses to the bids (Greenspan & Greenspan, 1989). The moment-to-moment interaction between a child and parent and the challenges and opportunities it presents is the fundamental mechanism through which the child develops (Bronfenbrenner, 1996; Bronfenbrenner & Ceci, 1994; Sroufe, Egeland, Carlson, & Collins, 2005). Although nursing research studies of parent–child interaction and relationships are numerous, interaction and relationship are conceptually not well defined. This article is the third in a series of five articles examining the contribution of nursing research to knowledge development about the parent–child relationship (Anderson, Riesch, Pridham, Lutz, & Becker,

in press; Lutz, Anderson, Pridham, Riesch, & Becker, 2009; Lutz, Anderson, Riesch, Pridham, & Becker, 2009; Riesch, Pridham, Lutz, Anderson, & Becker, in press).

The purpose of this article is to use Hinde's relationship theory as a context in which to integrate the nursing literature published during the years 1980–2008. The intent is to identify emerging foci and the future goals they suggest for parent–child interaction and relationship studies.

Parent–child interaction and relationships are important to nursing science and practice for reasons fundamental to the discipline (Blake, 1954). Of specific interest to nursing is the development of the parent–child relationship through activities central to parent–child functions, for example, care-giving, guiding, playing, socializing, and restoring security. Interaction that occurs during these activities involves goal-directed behavior that increases in complexity as the relationship develops and the child matures (Zeanah, Larrieu, Heller, & Valliere, 2000). A parent's goal-directed behavior may be supported by nursing practice or deliberately influenced by nursing intervention (Blake, 1954). Qualities of the parent–child relationship are displayed in interactive behaviors, which make the relationship accessible to observation. An understanding of these relationship qualities and interactive behaviors must take into account the knowledge that they are embedded within contextual factors, including personal characteristics and environmental facilitators and barriers. Blake's scholarly and clinical investigations and those of her students (see Waechter, 1977, for example) supported the analysis of parent–child interaction and relationship in terms of developmental tasks engaged in or accomplished, strengths revealed, or competencies demonstrated. Although most nursing studies of parent–child interaction or relationship involve infants, the young child also has been a subject of nursing research.

The review is organized by two research design categories derived from Diers' (1979) work: *Assessment Model* and *Intervention Model*. Discover Model studies were not identified for nursing studies of parent–child interaction and relationships. Assessment and intervention studies reviewed in Part 3 of this series used categories of observable events, conditions, interaction features, or relationship qualities identified a priori of a study. The Assessment Model focuses on child, parent, family, or environmental indicators, correlates, or predictors of parent–child interaction or the parent–child relationship. The Intervention Model involves strategies to support, improve, or otherwise have an effect on parent–child interaction or the parent–child relationship. For each of the two models in this review article, there is a table to summarize the articles reviewed.

Prior to 1980, the primary vehicle nurses used to build knowledge relevant to clinical practice with parents and children was in the discovery mode. Concepts of interaction and relationship were explained and developed through case studies, exemplified by Blake's (1965) study of a young child's regaining autonomy after surgery to repair a congenital heart defect. The published parent–child interaction and relationship studies identified within the time span of this review, 1980–2008, were either assessment or intervention in type.

Method

The method used for this integrative review was derived from Whittemore and Knafl's (2005) guidelines. The terms of the computerized search for nurse designed or implemented research studies in the English language included parents OR mother OR father OR parent–child relations OR parenting OR child rearing OR object attachment AND nursing. The concept of parent–child interaction was included under the parent–child relations term. The construct of *attachment* within the broader conceptual framework of relationships refers to the motivational–behavioral system in which the goal that guides and corrects behavior is closeness, proximity, or security (Bowlby, 1969, 1988). In this type of relationship activity,

the caregiver or parental role is to provide safety, protection, soothing, comfort, and help or safety (Bowlby, 1988; Bretherton, 1994). Research concerning parental relationships with a fetus or adult child was excluded from the review. Theoretical, methodological, and review papers were also excluded.

The search began with identification of articles in the electronic databases MEDLINE, CINAHL, PsychINFO, and Web of Science, and was followed by a PubMed ancestral and electronic search for the work of known researchers in parent–child nursing. Because our review strategy was intentionally broad and inclusive for the purpose of displaying the scope of extant research, all 56 identified studies published between January 1980 and December 2008 that were peer reviewed and presented as reports of completed research were included in this review. The details of studies categorized as assessment or intervention research are summarized in Tables 1 and 2, respectively.

Results

Assessment Studies

Purpose—Nurse investigator studies that have had assessment or understanding of parent–child interaction as their overarching purpose are summarized in Table 1. For the most part, these studies stemmed from clinical concerns for risk of delays or deviant patterns of development as a result of prematurity, disability, or chronic health problems. Most of these studies associated interaction characteristics with environmental conditions. The implicit assumption is that mal-adaptive characteristics of the relationship between parent and child mediate developmental or health risks, and that preventive or supportive action to strengthen the quality of the relationship can reduce those risks.

The research question in assessment studies generally concerns either the degree to which the interactive behavior of the parent, child, or dyad is adaptive or maladaptive in light of child characteristics or environmental conditions, or the degree to which the character or quality of the interaction is related to positive development, particularly in social and emotional domains. We have organized our review of assessment studies by the following categories: (a) parent–child interaction when children are biologically and/or environmentally at risk; (b) environmental and cultural influences on interaction; (c) social or caregiving contexts of interaction; (d) multivariate studies of parent–child interaction involving child characteristics, parental experience or mental health conditions, and/or family contexts; and (e) the effect of interaction on outcomes. For the third category, we have subdivided the review by method of observation, including microanalytic recording of behaviors and rating scales that globally characterize the quality of the interaction. All together, 34 studies were reviewed in the assessment category (Table 1).

Approaches to observation of interaction—Systematic observation of parent–infant interactions by nurse researchers was advanced with the development of methods for assessment of the interaction of at-risk children with their parents. Barnard, Eyres, Lobo, and Snyder (1983) developed a widely used observational system for children up to 3 years of age, based on an ecological model. This system, formerly referred to as NCAST and currently as Parent–Child Interaction (PCI), was designed to be applied during feeding or teaching activities, and addresses interaction behaviors identified with responsiveness, clarity of communication, and socio-emotional and cognitive growth fostering. 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 post-term year (Barnard, 1980; Kelly & Barnard, 2000). For some of the many off-shoot studies, PCI scale scores have been compared with the PCI reference population of mother–child dyads

who participated in screenings across North America by public health nurses who were trained in this observational rating method.

Although the PCI system has been the predominant observational method used in nursing research, microanalytic observation also has been used in developmentally or ecologically based studies to explore correlates of parent–infant interaction in caregiving, teaching, or unstructured play settings. Microanalytic observation involves scoring the occurrence of discrete categories of behavior within time-based frames. A third approach to observation of parent–child interaction characterizes social–emotional and task qualities of the relationship through application of global rating scales. This approach uses judgment of the degree of adaptiveness of the relationship quality rather than microanalytic coding or checklists of events that occurred or did not occur. These three observation approaches are illustrated in the studies reviewed in this section.

Parent-child interaction when children are biologically or environmentally at risk—The Nursing Child Assessment Project (NCAP) was a ground-breaking longitudinal study with 200 families to determine the difference prematurity made in parent–child interaction and in developmental outcomes through the child’s eighth year (Barnard et al., 1985). Examination of mother–infant interaction showed more positive scores for mothers of healthy children born at term than for mothers of premature children through 24 months of age (Barnard, Bee, & Hammond, 1984).

In an elaboration of the model of biological risk for interaction competence, Holditch-Davis, Bartlett, and Belyea (2000) studied the difference specific types of developmental problems (i.e., low IQ, language, or attention problems) made for the interaction of 3-year-old premature children with mothers or grandmothers during a teaching task. Mothers of children with language problems interacted less positively and had lower scores on the PCI teaching scales than other mothers, demonstrating that specific characteristics of the child that make a difference in interaction need to be identified and planned for in an interaction study.

Several studies applied the ecological framework of the NCAP study using the PCI feeding and teaching scales with culturally diverse populations of parents and children. MacDonald-Clark and Boffman (1995) examined the feeding interaction of Yup’ik Eskimo mothers and their infants living in harsh environmental and remote conditions. Maternal and infant scores were low relative to the reference population, but the investigators attributed this to Eskimo child-rearing practices rather than to either child biologic or developmental conditions or to maladaptive parenting. They noted that comparison to the reference population may be difficult to interpret for cultural reasons and also raised concerns about a White, middle-class bias in the PCI scales. How remoteness and harsh climate become structured into culturally shared feeding and teaching interactions for a community of parents and children, and the consequences of interaction characteristics for the parent–child relationship, are questions of continuing interest for nursing and for developmental science (Black, Holditch-Davis, & Miles, 2009; Bronfenbrenner, 1996) and have implications for community health and health policy.

Letourneau, Hungler, and Fisher (2005) studied parent–child interactions of low-income Canadian Aboriginal (i.e., indigenous) parents using the PCI. Low scores were consistent with the patterns observed by other researchers in low-income, ethnically diverse samples, and were attributed to both Aboriginal culture and low socioeconomic status. Schiffman, Omar, and McKelvey (2003) also found evidence that the PCI teaching scales differentiated 156 low-income U.S. mother–infant pairs from the PCI reference population of similarly aged but better educated women, a finding consistent with the conclusions of Letourneau and her colleagues (2005) that ethnicity may be less of an influence on interaction than income as an attribute of diverse cultures.

An earlier study of the impact of culture by Choi and Hamilton (1986) used Walker and Thompson's (1982) adaptation of Price's (1983) Assessment of Mother–Infant Sensitivity (AMIS) Scale, a global rating system, to explore the differences in two relationship qualities, reciprocity during feeding and sensitivity during play, in two ethnic groups of west coast U.S. mothers and their healthy full-term newborns. A Caucasian group studied in the hospital was compared with a Korean American group studied at home. No differences were found between ethnic groups. The investigators attributed this finding to the very young age of the infants and the newness of the mother–infant relationships, and appropriately suggested the need for longitudinal study. Although these early observational studies with rating scales were laudable for taking on the question of the effect of culture, ethnicity, and social–economic status on interaction, they could only raise rather than answer questions because of small, heterogeneous samples. The effect of only a few cultures on parent–child interaction and relationship has been studied, and, for the most part, cultural practices theoretically making a difference have been assumed rather than specified. Many questions of the difference culture or ethnicity, examined from a broad perspective, makes in parent–child interaction remain to be addressed for clear and definitive findings useful to nursing research and practice.

Parent gender and parent–child interaction—Within the last 15 years, nurse investigators taking ecological and developmental perspectives have extended the variables included in assessment of parent–child interaction. An interdisciplinary Canadian team of researchers included parent gender as a central variable, as well as family psychosocial variables. Harrison and Magill-Evans (1996) examined the effect of child age and parent gender on interaction in a longitudinal investigation of PCI teaching scores post-hospital discharge of prematurely- and term-born infants. Parenting stress, marital support, and amount of contact the parent had with the infant did not account for the lower teaching scores observed for premature infants compared with full-term infants. Fathers' scores were lower than mothers' scores for both groups. The scores for both parents decreased over time, whereas infant responsiveness and clarity of cue scores increased. In a subsequent study of father–child interaction, Harrison, Magill-Evans, and Sadoway (2001) reported that fathers' PCI teaching scores with healthy toddlers were lower than those for reference mothers. Children, however, were more responsive with their fathers than mothers. The investigators questioned both the application of mothers' scores as reference values for fathers' scores and the validity of the teaching items for fathers, whose skills may vary with the extent to which they participate in caregiving. Boechler, Harrison, and Magill-Evans (2003) indeed found that fathers of toddlers who were more involved in caregiving were higher in cognitive-growth fostering on the PCI teaching scale, although they did not differ in sensitivity and responsiveness from fathers with lower caregiving involvement. Interactive behaviors and their meanings may vary depending on parental gender, caregiving functions, and roles. In-depth, theoretically based analysis of the effects of the quality of interaction on the child's health and development is needed.

The social or caregiving context of interaction—Interest in the environment in which parent–infant interaction occurs is evident in early nurse–researcher observation studies. In a naturalistic study, Dunn and White (1981) used microanalytic categories to explore the interactive behaviors of British mothers with their newborn infants and the effect on these behaviors of the presence of hospital staff and fathers. When fathers were absent, mothers' time interacting actively with their infants was significantly lower than when fathers were present, leading to the conclusion that the presence of fathers facilitated mother–newborn interactions. In contrast, the presence of the midwife who had delivered the infant may have had an inhibiting effect on interaction, an association that needs more study in light of goals for family-centered care. This study, done over a quarter of a century ago, is singular in its inclusion of a third person and the relationship of that person to the mother as a context of mother–infant interaction, and has implications for hospital practice and policy.

A naturalistic study of the social or task-related functions of interaction involving the caregiving context, feeding or nonfeeding, found that context made a difference in the amount of interactive behavior observed for mothers and their very low-birth-weight (VLBW), 6-month-old infants (Holditch-Davis, Miles, & Belyea, 2000). Interpreting descriptive interaction data requires taking ongoing parent and child functions into account. What feeding interaction contributes to parent-child relationship qualities in contrast to interaction in other social or caregiving contexts (e.g., playing, soothing), the types of interactive variables that are operative in each type of interaction, and the interactive function or effect of variables such as touch or gaze, are questions for further study.

A team of Canadian investigators (Onyskiw, Harrison, & Magill-Evans, 1997) examined interaction in an expanded generational and psychosocial context. Maternal and paternal PCI teaching interaction scores were assessed in relation to the warmth and acceptance the parents experienced in their families of origin and amount of support within the marriage. For mothers there was no relationship; however, fathers who reported less childhood acceptance as well as greater marital support were more responsive with their term or preterm infants 12 months post-hospital discharge. The findings suggest that the effect of marital support on interaction is more complex than just a function of parent gender, and involves childhood experience in the family of origin. These findings are intriguing and warrant follow-up with larger samples and multivariate, hierarchical designs.

Combining naturalistic study of parent-infant interaction with examination of family environmental characteristics using structured, self-response instruments, Becker, Engelhardt, Steinmann, and Kane (1997) compared mothers of children with mental delay with mothers of children without delay on PCI teaching and feeding scale interaction scores at 8, 12, 18, and 24 months, child-adjusted age. Using an ecological theoretical framework, infant age, calculated as both mental and chronological age, and family system variables, including family stress, life events, coping, and maternal education, were examined as predictors of interaction quality. Differences in maternal interaction scores were more pronounced when groups were matched on infant chronological age than mental age, suggesting that mothers adapted their behaviors to the infants' mental rather than chronological age. The social-emotional growth fostering subscale was found to be the least discriminating, leading the investigators to question its sensitivity. This study expanded the nursing literature to include longitudinal study of maternal interaction with children having special healthcare needs in the context of individual and family-systems influences on interaction.

Davis, Mohay, and Edwards (2003) also studied the contribution of maternal psychosocial variables (depression, coping, and perception of family support and stress) and infant perinatal attributes to the feeding interaction, assessed with the PCI feeding scales, in a cross-sectional study of Australian mothers of premature infants 1 month after nursery discharge. Feeding interaction scores were higher for mothers who coped using family integration, cooperation, and an optimistic definition of the situation. As in many studies of the contribution of family psychosocial variables, they reflect the perceptions of only the mother. The usefulness of these findings could be increased by further study of the theoretical mechanisms of the relationships identified, and replication of findings with both fathers and mothers and larger samples.

Social-emotional and task-related aspects of interaction—Social-emotional and task-related aspects of the interaction have been studied through application of global rating scales, as opposed to microanalytic or checklists of events that occurred or did not occur. In a recent longitudinal study, Brown and Pridham (2007) illustrated how parent and child attributes may be examined longitudinally as risks to or facilitators of interaction characterized by the concept of adaptiveness. They globally rated each member of the dyad, in this case mothers and their prematurely born infants, using the Parent-Child Early Relational Assessment (Clark,

1999) scales for mothers and for infants. The scales were applied to videotapes of feeding interactions just prior to the infants' discharge from the neonatal intensive care unit (NICU) and again in the home at 4 months post-term age. Adaptiveness was structured for mothers as positive affective involvement, sensitivity, and responsiveness, versus negative affect and behavior, and for infants as positive affect, communication, and social skills versus dysregulation and irritability. Accounting for maternal depressive symptoms and for infant neonatal health, the adaptiveness of maternal interaction behavior before the infant's NICU discharge contributed significantly to the adaptiveness of infant behavior at 4 months of age. A drawback of this approach is that maternal and infant qualities of behavior are to some extent dependent because of use of the same method to assess each member of the dyad, as is true also for the PCI. The use of videotapes facilitated maintaining reliability of coding, but as with much of this body of research, what is available to be rated depends on what each member of the dyad makes available to the observation.

Another study using global rating scales of social-emotional interactive behavior extended the study of environmental context to include the variable of maternal control (i.e., prohibition or limit setting). LeCuyer-Maus (2000) used Ainsworth's Maternal Care Scales (Ainsworth, Bell, & Stayton, 1974) to examine the sensitivity and responsiveness of mothers and their 12-month-old infants in situations varying in salience for maternal control. Mothers, on the whole, were less sensitive in their interactions when control was an issue (i.e., a teaching task, putting toys away, and a session in which the infant was prohibited from touching a desirable object) than when control was less salient (i.e., playing with toys, eating a snack). However, mothers who were more sensitive in situations in which control was less of an issue were also more sensitive in situations requiring control. In addition, maternal sensitivity and responsiveness varied with maternal style of control, confirming that the association of specific characteristics of interactive behavior with qualities of the parent-child relationship is complex. This complexity calls for more theoretical development in the study of these relationships, so that findings from one study can build on previous studies.

Multivariate studies of parent-child interaction involving child characteristics, parental experience or mental health conditions, and family contexts—In more recent observational studies, several teams of nurse researchers have studied a broader spectrum of variables using a multi-system contextual approach and multivariate analysis in which variables are theoretically selected for simultaneous analysis in a regression model. Feeley, Gottlieb, and Zelkowitz (2005) drew extensively on theoretical and empirical literature to structure a prospective study of VLBW infant, maternal, and social support factors that contribute to the teaching interaction of mothers at 9 months. Infant birth weight and perinatal illness severity, maternal anxiety, education, and report of perceived and received support as well as its helpfulness were included in hierarchical regression analysis to estimate the contribution of contextual factors to PCI teaching scores at 9 months. Maternal anxiety at 3 months was a significant predictor, along with maternal education and received support. Teaching interaction was assessed only at 9 months; thus, neither the effect of time, development from 3 to 9 months, nor the lack of relationship between maternal variables and interaction at 9 months could be explored. In a second study, these authors (Feeley, Gottlieb, & Zelkowitz, 2007) compared Canadian-born and immigrant mothers and fathers on psychosocial adjustment assessed as self-efficacy and anxiety, support, and the quality of teaching interaction with their VLBW infants, again at two time points during the infants' first year. Mothers and fathers did not differ in interactive sensitivity and responsiveness in either ethnic group. Fathers reported lower self-efficacy on average than mothers, but level of received support was higher. The level of anxiety and helpfulness of support received was similar for fathers and mothers. The association of the psychosocial variables with PCI teaching scores was not examined. Results of these studies both add to knowledge of psychosocial and social risks for sensitive and responsive teaching interactions and challenge some of the earlier

findings in the field. For both studies, identification of theoretical mechanisms either explaining findings or in need of elaboration, particularly for other parental functions such as feeding, would advance nursing knowledge beyond the findings of the studies. Whether or not findings for mothers in the first study have been replicated for fathers is not clear.

In the same vein, Holditch-Davis, Cox, Miles, and Belyea (2003) added maternal characteristics (symptoms of depression) and infant characteristics (gender) as well as types of biological conditions (prematurity, chronic illness, and HIV seropositivity) to their assessment model research. In observing that mothers of the chronically ill infants spent more time interacting with them than did mothers with nonchronically ill premature infants, and that the nonchronically ill infants had more mature play and motor behaviors than the chronically ill infants, the researchers conjectured that mothers of the latter group compensated for the infants' vulnerability, in a way somewhat comparable with the earlier findings of Becker et al. (1997).

Further developing the theoretical, microanalytical, and data analytical strategies for the study of mother–infant interaction, Holditch-Davis, Schwartz, Black, and Scher (2007) examined the extent to which child characteristics (age, singleton or multiple gestation, illness severity), maternal characteristics (parity, education, income; depression), and family characteristics (ethnicity, paternal support) either facilitated or acted as barriers to adaptive mother–infant interaction. The discrete microanalytic interactive behaviors were combined and grouped into maternal and child interactive dimensions. For mothers, the dimensions included two subscales of the observational self-report instrument, Home Observation for Measurement of the Environment (HOME; Caldwell & Bradley, 1984) and were labeled maternal positive involvement, developmental stimulation, and negative control. For children, dimensions included social behavior, developmental maturity, and irritability. General linear mixed models were used to analyze the contribution of child, maternal, and family characteristics to each of the maternal and infant interactional dimensions. Mothers with infants who had more illness stress had more positive involvement with their infants. More negative control was shown by mothers of infants with less illness stress, less education, or less participation in caregiving by fathers. There were no effects of depression. The results clearly demonstrated that the association of maternal, child, and family characteristics with mother–child interaction depends on the dimension of interaction assessed, and that effects of the family environment, represented in this study by paternal support, merit more detailed study.

Secondary analyses of the Holditch-Davis et al. (2000) study have extended knowledge of the association of infant, parental, and family variables with parent–infant interaction (Cho, Holditch-Davis, & Belyea, 2004; Cho, Holditch-Davis, & Miles, 2008). Elevated maternal depressive symptoms were associated with diminished maternal attention and increased restrictiveness in interaction with medically fragile (e.g., chronically ill) infants and with diminished attention for HIV-positive infants. Infant gender did not moderate these relationships.

Taking the studies of the Feeley and the Holditch-Davis research teams together (Feeley et al., 2005; Holditch-Davis et al., 2007), the contribution of maternal education and parental psychological well-being, whether anxiety or depressive symptoms, to several different qualities of maternal interaction behavior generally affirms the importance of the maternal contextual variables examined. However, results for infant and social contexts are less concordant across the studies, making it difficult to claim either correspondent or conflicting findings. Possibly differences in the infant populations, including illness characteristics, account for the differences in findings. The next studies in a program of research would most usefully include a theoretical framework with infant and social context concepts precisely

selected to provide well-formulated explanatory mechanisms for specific interaction or relationship outcomes.

Interaction as a predictor of child or parent outcome—Several investigators examined interaction behavior as a predictor of child outcomes or parenting style. McGrath, Sullivan, and Seifer (1996) assessed the effect of maternal interactive compensatory behavior, a relationship quality, on cognitive, linguistic, and problem-solving competencies of preschool children identified as being at medical risk in the perinatal period. Interactive compensatory variables included responsiveness, involvement, and control style, referring to the mother's assistance with the child's problem-solving. Supporting the hypothesis that compensatory behavior would be observed with the most vulnerable children, mothers of children in the sickest birth group had the highest involvement scores, and mothers of the children who were healthiest at birth had the lowest involvement scores. The three compensatory variables made significant contributions to child cognitive, linguistic, and problem-solving competencies beyond that of perinatal risk and maternal education.

As previously described, Holditch-Davis et al. (2000) examined the association of specific types of interaction behaviors with specific types of developmental problems. In another one of the few studies in the nursing research literature to explore the direct association of interaction qualities with child development variables, Magill-Evans, Harrison, and Burke (1999) assessed the prediction of preterm and full-term infant cognitive and language developmental outcomes by maternal and paternal PCI teaching scores, along with child gender, parenting stress, and family socioeconomic status. Both mothers' and fathers' teaching scores, assessed at 3 and 12 months, were related to receptive language at 18 months of age, and mothers' scores were related to mental development. Although only a small amount of variance in developmental outcomes was explained by the set of predictors, the contribution of teaching interaction to these outcomes suggests that intervention to support interaction skills might be beneficial. This study also confirmed earlier findings that the contributions made to developmental outcomes by the interactive behavior of mothers and fathers need to be separately examined.

In an investigation of preschool behavior problems of 4-year-old children born either prematurely or full term as a developmental outcome, Benzies, Harrison, and Magill-Evans (1998) found that the quality of teaching interaction of mothers and fathers at 12 months was not predictive. However, parents who reported lower marital quality in the first year also reported more behavior problems when their child was 4 years old, regardless of the child's birth status or gender. How marital quality and the quality of the teaching interaction were associated was not examined, but the findings suggested that a high level of marital quality enables a parent to provide a consistently high quality of teaching interaction that may result in perception of fewer and lower-impact behavior problems.

Recent study of infant variables has included physiological regulation. Brown (2007) studied the longitudinal association of maternal interaction behavior, theoretically treated as a predictor variable, with heart-rate variability (HRV) as an outcome variable. Adaptiveness of maternal feeding interaction, measured by the Parent–Child Early Relational Assessment (PCERA) factor scores for positive affective involvement, sensitivity, and responsiveness (Clark, 1999), was examined in relationship to HRV just prior to infant NICU discharge and at 1 and 4 months post-term age. In contrast to the literature on maternal social–emotional contribution to infant physiologic regulation (Porges, 2007), the maternal interaction variable was not associated with HRV at any of the infant ages. Whether the infant's interaction behavior mediates the effect of maternal interaction behavior on HRV is a question needing examination.

In a study of parental interaction behavior as an outcome, Gaffney, Barnett-Maglio, Myers, and Kollar (2002) examined associations between maternal self-reported intentions for discipline assessed prenatally and risk for nonsupportive-parenting at 8 months in a sample of low-income mothers. Mothers who scored higher prenatally on intentions to use harsh, non-nurturing discipline showed more maternal role insufficiency behavior at 8 months, as observed with PCI teaching and HOME scores. The association between interaction competency and the parent's style of guiding or regulating behavior, a relationship function, also was examined by Sullivan and McGrath (1999), who compared the support mothers gave their young children in completing a task with their self-reported style of controlling or supporting (i.e., regulating) the child's autonomy. The investigators used questionnaires to determine control style (i.e., redirective, authoritative, authoritarian, or inconsistent) and in-home observations to examine the extent to which mothers supported the children's autonomy. Maternal control style was better predicted by observed or reported characteristics of interaction, that is, maternal responsiveness, measured by the total HOME score (Caldwell & Bradley, 1984); involvement with the child, rated with the Parent/Caregiver Involvement Scale (Farran et al., 1987); and a personal quality, maternal self-esteem, than by personal attributes (e.g., maternal age, education, and occupation).

The studies that have examined parent-child relationship qualities as predictors or outcomes of interaction illustrate how social and developmental psychology concepts applicable to relationship qualities (e.g., control style) can be theoretically linked with concepts of parent-child interaction, thereby increasing understanding of the dynamics of the parent-child relationship in nursing-relevant contexts. Study samples may have been too small to detect alternative hypotheses; designs were not always longitudinal; and strategies of analysis have not always adequately accounted for multiple variables. Nevertheless, these studies, through the questions they raise, make a substantial contribution to knowledge of parent-child relationships in contexts relevant to health care.

Relationship-forming studies—A number of nurse investigators and colleagues from other disciplines drew either on Rubin's (1963, 1977) concepts of acquaintance and binding-in processes during the postpartum period or on Klaus and Kennel's (1976) concept of bonding. "Bonding" refers to a parent's emotional attraction to the infant in the earliest phase of relationship formation. These studies, whether descriptive of processes of acquaintance, binding-in or bonding, or of the association of early parent-infant contact with outcomes such as feeding, were naturalistic and, in some cases, involved fathers or cross-cultural settings. Huckabay (1987) gave 40 mothers a photograph of their 2-day-old preterm infants early in the infants' NICU stays and assessed it with an observational checklist of bonding behavior (Huckabay, 1987). Four weeks later, these mothers showed more attachment behavior than mothers who had not received a photograph. Kussano and Maehara (1998) used Huckabay's Bonding Observation Check List to compare the behavior of Japanese and Brazilian mothers at the time of their first visits with their prematurely born infants in home-country NICUs and concluded that bonding behavior has a cultural basis and is potentially related to a mother's affective perception of the infant.

In a later study with mothers of premature infants in a Thai NICU, Tilokskulchai, Phatthanasiriwethin, Vichitsukon, and Serisathien (2002) observed that during their first visits, all mothers demonstrated most of the verbal and nonverbal attachment behaviors assessed with a checklist except holding, even though some mothers did not stay long in the nursery. In an early study, Taubenheim (1981) observed that the 3 of 10 fathers with the highest number of bonding behaviors fed their newborns when brought into the mothers' rooms for feeding, whereas the 3 fathers with the lowest number of bonding behaviors did not. Because bonding behaviors included touching and holding, bonding behavior would have been confounded with feeding. The effect beyond the first few weeks of early parent-infant contacts, postulated by

Klaus and Kennel (1976) to be critical to relationship formation, has been found to be weaker than expected. This finding, as well as disputation of the validity of the idea that relationship formation can be deliberately promoted and permanently sealed by clinicians, may be a reason for the low number of nursing studies of early parental “bonding” behavior in recent years.

Despite limitations in theoretical underpinnings and research designs, these studies, taken together, point to the need for examination of characteristics of early relationship-forming interactions and how a relationship with a preterm infant advances through interaction. The studies also indicate need for sensitivity to cultural issues and appreciation of culturally based parenting practices when assessing parent–child interaction for what it reveals about the formation of the parent–child relationship. Further cross-cultural studies with more clearly defined and differentiated population groups and specification of within-group as well as between-group differences are warranted. Study of father–infant interaction in the context of either culture or beginning a relationship, on the whole, has been very limited to date and is a promising area for further study.

Assessment studies based in attachment—Bowlby’s (1969) theory of the attachment behavioral system has provided concepts and propositions for studies of parent–child interaction and patterns of attachment relationships that emerge from interactions (Ainsworth, Blehar, Waters, & Wall, 1978). The behavioral system involves motivation, expectations, intentions, and behavior organized by an internal working model of the self, other, and environment or task that dynamically operates to accomplish a set goal (e.g., proximity seeking or maintaining for the child and caregiving for the parent; Bowlby, 1988; Bretherton & Munholland, 2008; George & Solomon, 2008).

Using this theoretical framework, Coffman, Levitt, and Guacci-Franco (1995) studied the contribution of child temperament, assessed with parental report (Bates, Freeland, & Lounsbury, 1979) and maternal responsiveness to the attachment relationship of forty-nine 12- to 15-month-old children with their mothers (Ainsworth & Wittig, 1969). Maternal responsiveness was observed in teaching interaction and scores constructed with ratings of positive and negative feedback, supportiveness, intrusiveness, and positive affect, attributed to an unpublished paper by Belsky and Rovine (1989). Discriminant analysis revealed a larger contribution of temperament than responsiveness to attachment; however, the probability of this contribution was .09, suggesting the possibility of a temperament-maternal responsiveness interaction or the operation of additional variables. Study of maternal responsiveness in relation to characteristics of child attachment classification, taking into account ecological and developmental factors, adequately powered, and with hierarchical mixed-model analysis, could potentially add to clinically useful knowledge.

Using the internal working model as a concept to characterize interaction, Pridham, Schroeder, Brown, and Clark (2001) included several maternal and infant attribute variables as risks or facilitators of mother–infant feeding interaction across the first post-term year of premature and full-term infants. Maternal depressive symptoms and infant weight, as well as the attunement to the infant of the mother’s internal working model, accounted for significant variance in mothers’ social-emotional and task-related feeding behaviors rated on the PCERA items (Clark, 1999). These items are rated from the perspective of how the other member of the dyad experiences the behavior. The relative contribution to interaction variables of specific maternal and child attributes changed across the infant’s first year, while the mother’s internal working model had the most influence on feeding interaction at 8 months. Although the results were complex, the richness of this framework has promise for increasingly sophisticated analysis of parent–infant relationships.

Intervention Studies

Nursing interventions with parent–child interaction as the target of intervention or the indicator of efficacy or effectiveness, summarized in Table 2, have been designed primarily to reduce risk for maladaptive parenting or to support adaptive or competent parenting. Studies have varied in population of concern, theoretical orientation, and methods used to study interaction. The review of studies, 22 in all, is organized by population.

Intervention studies with mothers of healthy infants—Several intervention studies with a population of healthy infants born at term were quasi-experiments. Carson and Virden (1984), in a post-test-only study, examined effects of a prenatal intervention to support the maternal attachment bond as defined by Klaus and Kennel (1976). Fetal palpation and massage were administered by public health nurses to low-income primiparous and multiparous women, some with high-risk pregnancies. In contrast to what Carter-Jessop (1981) had observed in their earlier post-test-only study of the intervention, Carson and Virden (1984) neither found significant differences on relationship indicators (e.g., “bonding” behaviors of touching, talking, holding, gazing), nor did relationship indicators differ by parity. The conflicting results of these studies may have been because of nonequivalent groups.

In another post-test-only study of newborns, Norr, Roberts, and Freese (1989) investigated the effects of rooming-in on maternal attachment behavior and reported higher scores during feeding for mothers who had received rooming-in compared with mothers who delivered before rooming-in was available and mothers who had requested rooming-in but had not received it. In an examination of the effectiveness of massage, an intervention that has been of interest to nurses, Lee (2006) studied Korean mother–infant interaction using a quasi-experimental study with a nonequivalent control group. Although the intervention did not make a difference for measures of growth, responsiveness of mothers, infants, and the dyad, assessed with Walker and Thompson’s (1982) Mother Infant Play Interaction Scale, increased significantly from pre- to post-test for the treatment group. Issues of internal validity and competing explanations need to be addressed for all of the quasi-experimental studies. The modest treatment effects found in these studies of normal full-term newborns and their mothers could be more useful and applied with more confidence if supported by replication with a broader population base. Furthermore, the theoretical underpinnings of the interventions’ effects on interaction need specification for development of programs of research (Becker, 2005).

Several small-sample experimental studies showed a positive intervention effect. Breastfeeding primiparous mothers who received information about and observed their infants’ responses to Neonatal Behavior Assessment Scale items (Brazelton, 1973) increased in reciprocity or responsiveness on Price’s (1983) AMIS scale from the first assessment during feeding at 2 days to the second assessment at 10–12 days after birth (Anderson, 1981). Using a video-taped, prenatally delivered intervention for first-time mothers focused on infant behaviors, behavioral states, communication cues, and social–emotional growth fostering, based on the PCI, Leitch (1999) found that mothers who received the intervention compared with a control group were higher at 24 hours after the infant’s birth on the total teaching scores and scores indicating contingency on the infant’s behavior of the mother’s sensitivity to cues and social–emotional growth-fostering behaviors. These studies suggested that maternal interactive competence could be enhanced very early in an infant’s life. The generalizability and replicability of findings are important issues to pursue for development of knowledge of intervention effects concerning communication of information about the infant as an intervention.

In the Newborn Nursing Models Project, designed for high medical or social risk families through 24 months after birth, Barnard and her colleagues examined effects of three nursing interventions on mother–child feeding and teaching interaction. These interventions,

summarized in Barnard, Booth, Mitchell, and Telzrow (1988), varied in scope and degree of tailored, individualized support. The Nursing, Parent and Child Environments Model, an individualized intervention, is based on assessment of the environment and of child and family needs. The Nursing Support, Infant Bio-Behavior Model taught parents about early infancy behaviors, including sleeping and crying patterns as well as need for stimulation. The traditional Public Health Model focused on preventive health care and the family's stated concerns or problems. Contrary to expectations, no differences were found by intervention group at 3, 10, or 24 months in either PCI maternal or infant feeding or teaching interaction scores or on the HOME Inventory (Caldwell & Bradley, 1984), and mothers' scores for both feeding and teaching declined between 3 and 10 months. The investigators examined intervention effects for subgroups of the samples studied in an effort to explain their results. Another direction for making constructive use of study findings would be to specify the theoretically most likely and powerful effects of the various interventions on interaction.

Kang and her colleagues (1995) found more encouraging results with a modified Newborn Nursing Models intervention designed for hospital and in-home application with mothers who had high or low education. In-hospital instruction in modulating the infants' behavioral states and in-home informational support resulted in infants of low-education mothers showing greater responsiveness to caregiving during feeding on the PCI at 1.5 months corrected age and in greater maternal sensitivity to cues and growth-fostering behavior during teaching at 5 months corrected age. The difference in results between this and the study reported by Barnard et al. (1988) was attributed to both accounting for maternal education in the analyses and a strengthened intervention for mothers who indicated a need for more informational support.

The PCI teaching scale was used by Horodyski and Gibbons (2004) to examine effects of a rural Early Head Start Program (EHSP) for low-income mothers and their young children. Although entry and exit ratings for overall interaction did not differ significantly, more than half of the mothers maintained or improved their sensitivity to cues and response to distress. Comparisons with normative data, however, showed that more than 40% of the mothers were at risk for poor interaction at program exit. The extent to which the EHSP was designed to assist mothers in behaviors assessed by the PCI is not clear, but despite this and the lack of a control group, the low interaction ratings for a population with few resources is an important demonstration of need.

Interventions for mothers of healthy infants in interaction-complicating conditions—Interaction has been treated as an index of the effectiveness of treatment of infant pain or stress and as an index of the interaction competencies mothers are capable of demonstrating despite clinical depression. In a pretest-posttest study, Macke (2001) examined the effects of a pain-reducing intervention (acetaminophen) for circumcision on parent–infant feeding interaction. Contrary to expectation, PCI feeding scores for infants in both groups were lower after the circumcision. However, infants in the analgesia group showed less decrease in clarity of cues and responsiveness from pre- to posttest and were higher on clarity of cues and responsiveness than infants in the placebo group. Mothers in the analgesia group showed increased social–emotional–growth fostering behaviors in contrast to reduced scores for mothers in the placebo group. Macke concluded that, although acetaminophen did not effectively control pain during the intraoperative period, it provided some comfort postoperatively, allowing infants to provide clearer feedback and to be more responsive at a time when the mothers were learning their infants' cues and care activity.

The intervention goal of a study that viewed infant colic as jeopardizing parent–infant interaction and parental positive feelings toward the infant and the self was to educate parents about sensitivity and responses to infant cues (Dihigo, 1998). A 72-hour diary of crying and daily activities and the PCI ratings of a typical feeding were used to design individualized

counseling and education about colic and reading infant cues. Infant crying decreased in the group receiving this treatment whereas it did not in either a group of parents receiving empathy and supportive contact or a control group receiving no treatment. PCI ratings for only one feeding are reported, making it unclear whether or not interaction changed toward greater parental responsiveness to child distress. As with several of the intervention studies, the sample was small, thus use of parametric statistics can be questioned. The study, however, serves as a pilot for subsequent hypothesis-testing research.

In two studies, the intervention goal was to help depressed mothers understand and respond to the infants' interactive behaviors. Horowitz and her colleagues (2001) rated videotapes of face-to-face play without toys using the Dyadic Mutuality Code (Censullo, Bowler, Lester, & Brazelton, 1987) in a randomized clinical trial of a coaching intervention. Mothers receiving the intervention were higher in responsiveness despite no intervention effect on depression. Over time (1–4 months), in both treatment and control groups, responsiveness increased and depression decreased. In an intervention with moderately depressed Canadian mothers and their infants, Jung, Short, Letourneau, and Andrews (2007) used the still-face paradigm (Tronick, Als, Adamson, Wise, & Brazelton, 1978) to increase infant positive affective expression, assessed with measures developed by Izard, Dougherty, and Hembree (1989), and the PCI Keys to Caregiving program delivered in group sessions to increase maternal understanding and responsiveness to infant behavior. Both studies demonstrated that, through a coaching intervention and a structured program, mothers can learn to better understand and respond more sensitively to their infants during interaction despite no change in depressed mood.

Interventions with parents of prematurely born infants—Several nursing intervention studies showed effects on parent–infant interaction of a scripted or circumscribed intervention targeted to parents of premature infants. The effect of in-hospital instruction and demonstration concerning characteristics and behaviors of preterm infants was examined with PCI feeding scales 6–8 weeks postdischarge (Harrison, Sherrod, Dunn, & Olivet, 1991). Feeding scores were highest for the mothers who received both instruction and demonstration, and their infants were significantly clearer in cues than infants of mothers who received no instruction. A question for further research raised by this study and others using the PCI is how such instruction translates into maternal behavior that increases the infant's clarity of cues. In another study in the NICU, White-Traut and Nelson (1988) found that low income mothers of premature infants randomly assigned to learn a tactile-vestibular technique incorporating talking and eye-to-eye contact demonstrated greater sensitivity to infant cues and cognitive-growth fostering behavior during feeding than mothers assigned either to routine care or instructed to talk or sing to their infants. Despite the small sample, their findings, together with those of Kang et al. (1995) previously described, suggested that mothers who are low in personal and social resources can be supported by a structured intervention to engage in more adaptive interactive behavior with their hospitalized preterm infants during feeding.

A nurse-designed intervention, the Parent Baby Interaction Programme (PBIP), was tested in the initial part of a long-term developmental project using a randomized trial by a psychiatrist-led team in English NICUs with VLBW infants (Glazebrook et al., 2007). The PBIP aims were to enhance parents' observations of and sensitivity to infant cues through caregiving activities, including tactile contact, discussion with staff concerning the infant, verbal interaction, and observation. Contrary to expectations, neither PCI teaching scores nor HOME responsivity scores differed between the intervention and control groups. Although parents were not socially or economically disadvantaged, more mothers than expected had high levels of parenting stress, and their PCI scores, HOME communication, and emotional reinforcement subscale scores were low. Although the authors suggested that the impact of the intervention may become apparent when cognitive function is assessed at 2 years adjusted age, they did not question the

validity of using the PCI teaching scales with mothers and their preterm infants in the week prior to hospital discharge.

In an intervention not based on the PCI, Melnyk and her colleagues (2006) conducted a randomized clinical trial to assess family relationship quality as a coping outcome of a self-regulated educational and behavioral intervention, Creating Opportunities for Parent Empowerment (COPE). The COPE program consisted of audio-taped and printed infant-behavior and parent-role information delivered to parents in four phases beginning 2–4 days after NICU admission and continuing to 1 week after discharge. The content focused in respective phases on infant characteristics, cues of readiness for interaction, the best times for interaction with the infant, and developing a positive parent–infant relationship. The quality of the parent’s interaction with the infant was assessed before infant discharge by blinded observers with a 15-item Index of Parental Behavior in the NICU (Melnik, Feinstein, Fairbanks, & Small, 1998). In contrast to the comparison group, both mothers and fathers in the COPE program were rated as having more positive parenting interactions with their infants but were not rated higher on altering the environment and interaction with a stressed infant. In addition, COPE parents, both mothers and fathers, scored higher on an observer-rated 1-item scale for involvement in the infants’ physical care, and mothers scored higher on overall appropriateness of parent interactive behavior and on sensitivity to the infants’ needs.

The COPE efficacy study makes a substantial contribution to the nursing intervention literature of parent–infant relationships through use of self-regulation and control theory to examine parent interaction behavior specific to preterm infants for both mothers and fathers. The study included condition variables (e.g., parent gender, state anxiety, symptoms of depression) and process variables (i.e., parent beliefs about infant characteristics and the parenting role) that could be moderating or mediating variables in an explanatory model of the intervention effect on outcomes. In a secondary analysis to explore such explanatory pathways, Melnyk, Crean, Feinstein, and Fairbanks (2008) examined the mediation effect of maternal beliefs, stress, depression, and anxiety on the relationship between the intervention and mother–infant interaction, as well as the relationship between NICU stress and mental health outcomes posthospitalization. However, the hypothesis that for mothers participating in COPE more positive beliefs about infant appearance and behavior and higher levels of confidence about the parental role, and less NICU stress, depression, or anxiety would be associated with better mother–infant interaction in the NICU was not supported. The only effect on interaction was the direct one of COPE, with socio-economic status as a covariate. Mothers who participated in COPE and who had higher annual income had higher interaction scores. Mother–infant interaction did not affect posthospitalization depression and anxiety, leaving as a question for future research whether mother–infant interaction might act as a mediator between the parental variables and infant development. Although the investigators suggested a need for more attention to parenting beliefs, emotions, and behaviors, they did not critically examine the content and structure of the instruments used to measure these variables as a factor in low or no association with the interaction measures.

Two studies based on an internal working model framework (Bretherton & Munholland, 2008) examined the effect of guided participation on relationship qualities expressed in the feeding behaviors of mothers and premature infants in randomized clinical trials. The goal of guided participation was the development of caregiving competencies much as an apprentice becomes an expert practitioner (Pridham, Limbo, Schroeder, Thoyre, & Van Riper, 1998; Rogoff, 1990). Pridham et al. (2005) provided guided participation to mothers of premature infants through the first postterm year and examined the effect on feeding interaction, evaluated with the PCERA (Clark, 1999). The guided participation group infants showed higher adaptiveness on the factor for negative affect and behavior at 1 and 8 months and mothers

showed higher adaptiveness at 4 months. Although the design was rigorous, the small sample size may have limited power to detect other guided participation effects.

In another randomized clinical trial, Schroeder and Pridham (2006) used an observation checklist to examine the effect of guided participation on relationship competencies of mothers of premature infants during their NICU stays. The measure of relationship competency was formulated from the literature and previous studies as being with the baby (committing self to and investing self in the baby) and knowing and relating to the baby as a person (referring to the baby as a person, taking steps to get to know the baby, and figuring out the baby's agendas, preferences, and needs). Over the 6-week study, relationship competencies for mothers in the guided participation group increased to a higher level and at a greater rate than the scores for mothers in the standard teaching group. While results must be interpreted with caution because of the small sample, they are supported by the consistency of findings across the 6 weeks.

Intervention for fathers' interaction skills—One published nurse–researcher intervention study addressing fathers' interactions with their infants and young children was identified. This randomized clinical trial, constructed on a model of active participation, used videotaped self-modeling and feedback on sensitivity and responsiveness during teaching interaction with Canadian fathers of healthy infants at 5–6 months of age, followed by outcome assessment with PCI teaching scales at 8 months (Magill-Evans, Harrison, Benzies, Gierl, & Kimak, 2007). Fathers who received the intervention maintained sensitivity and were more skilled in fostering cognitive growth than control group fathers. A secondary analysis of this program to determine which fathers improved compared with those who did not showed that demographic variables (father's age, education, marital status, or sex of child) did not differentiate the fathers who had and had not received the intervention (Benzies, Magill-Evans, Harrison, MacPhail, & Kimak, 2008), suggesting the need to identify additional variables of importance to the intervention's success.

Taken together, nursing intervention studies concerning parent–child relationships, despite being small in number relative to assessment studies, include five studies identified as randomized clinical trials (RCTs), producing Level II evidence for clinical decision-making (Melnik, 2004). Additionally, recent RCTs demonstrate an increase in the application of theoretical frameworks with concepts drawn from developmental science, in sophistication of the intervention, and in complexity of research design and data analytic strategies, including hierarchical, multivariate models. However, the unevenness of results suggest many issues remain to be studied, including differential effects of intervention on mothers and fathers; the most effective timing of intervention, including prenatal application; the evolution of an intervention administered over time; optimal intervention dose; and mechanisms through which specific interventions produce effects.

Discussion

Among the disciplines involved with parents and children, nursing gives particular importance to the study of parent–child relationships. The limitations of this review were detailed in Part 1 (Lutz et al., 2009) of this review series. Although the search method may have missed studies relevant to this topic, the studies reviewed, taken together, provide both an overview of what has been accomplished as well as directions for further examination of what is at the heart of the nursing of children, the parent–child relationship. Although the studies to date in the assessment category are impressive in number, their contribution to knowledge of the parent–child relationship is diminished by the fragmented character of the research and limited number of programmatic efforts to develop a body of systematically accumulated knowledge. Studies in the intervention category give some indication that nursing processes may enhance interaction and qualities of the parent–child relationship (e.g., sensitivity, responsiveness,

mutuality). However, whether these effects would be replicated with larger or different populations or whether different effects would prevail with adequately powered studies needs investigation.

Nursing studies of parent–child interaction are, for the most part, oriented to adaptive behavior that enables a parent or child to function effectively and, consequently, to develop optimally or as expected. The theory underlying the studies suggests that risks for maladaptive outcomes may be because of either child, parental, or environmental conditions. Parental mental well-being and cultural practices may alter interaction in ways that may be difficult to specify. The theoretical underpinnings of the adaptation/development paradigm need elaboration and specification to provide guidance for continued collection and interpretation of observational data and for identifying conditions that influence interaction and relationship variables, and thereby child and parent outcomes.

No matter what observational approach was used, studies in the assessment category clearly and consistently indicated that prematurity or medical vulnerabilities influence interaction. Characteristics of interaction were most often assessed during feeding or teaching activities, with teaching predominating, due, in large part, to the development and structure of the PCI measures. Teaching interaction is likely to be easier to structure in a standardized manner for assessment. However, cultural issues may influence the assessment to the extent that parental attempts to elicit a social type of interaction may or may not be practiced (Bretherton, 1985). Feeding interaction may be clinically more important to assess for very young infants, particularly those who are preterm. Much remains to be learned from feeding interaction that may be important for understanding parent–child interaction.

What mothers and fathers contribute to interaction with infants and young children generally has been assessed using the same instruments, thus more fully understanding gender differences may require methods that capture behavior and relationship qualities distinctive to each gender. Nursing has created a track record for study of the influence of culture on interaction and relationships, but well-developed research is needed. Programs of research attending to cultural aspects of interaction and relationships require refined definition of culture and theoretically specified qualities of culture that may matter to interaction. The social context of parent–infant interaction, whether expressed by the presence of the other parent or in the perceptions of the interacting parent, has been sparsely studied to date; thus, this is a promising area of future research.

The ecological/developmental model of assessment applied by nurse researchers has the possibility of becoming increasingly complex and capable of addressing clinically important questions, a direction supported by the expanding body of child development research on which nurse researchers draw. This broad area of research supports the development of theoretically derived categories for coding relational qualities, multivariate data analytic strategies, and access to computerized approaches to observational research (Hansen, Pridham, Stephenson, & Tsui, 1987; Pridham, 1985; Stephenson, Pridham, & Mlynarczyk, 1996; Wu, 1996; Wu, Clopper, & Wooldridge, 1999).

Although knowledge has been advanced to some extent about the content and qualitative aspects that Hinde (1976) included in his dimensions of relationships, little has been done to fully describe parent–child relationships from a perspective important to nursing. Many questions of interest to nursing remain to be asked, including the following:

- Under what conditions do parents compensate for the developmental deficiencies of their infants or young children and when do they not?

- What psychosocial attributes of the parent make a difference in interaction and could help define risk for maladaptive interaction or the promise of adaptive or attuned interaction?
- How can parental sensitivity and responsiveness to the child during interaction be more clearly operationalized, particularly for medically fragile children?
- How do qualities of the child's temperament or physiological regulation make a difference in the child's interactive behavior?
- How do parents support the emotional regulation of their children during feeding, teaching, or play interaction, a function that may have implications for a child's health as well as development and growth?
- What do the family and community contribute to parent-child interaction and relationships?

Addressing interaction and relationship assessment questions such as these will advance specification of theoretical models for nursing research and practice, and for policy regarding the care of children or the education and counseling of parents in the various settings in which health care is delivered. In particular, the practice of nursing will be advanced by a fuller understanding of both the processes of parent-child interaction that shape a child's definition of self and relationships with parents and others (Fonagy, Gergely, & Target, 2007) and of nursing functions that contribute to or guide these processes.

The review of assessment studies identified a number of methodological issues for nursing research on parent-child relationships as suggested by Hinde's (1976, 1989) theory of relationships. Additional valid measures need to be developed for examination of the direction and character that properties of interaction (e.g., frequency of specific behaviors) give to relationship qualities (e.g., responsiveness), and the effect of interactive behaviors and relationship qualities on health and developmental outcomes. The validity of parent-child relationship measures such as parental responsiveness requires new and concerted attention in light of recent conceptual analysis and empirical study. Recently, Bornstein, Tamis-LeMonda, Hahn, and Haynes (2008) published findings that supported the predictive validity of responsiveness treated as a multidimensional construct. Observational measures of parent-child interaction and relational qualities are needed that more finely capture the essence of variables such as context, emotion, contingency, appropriateness, attunement, adaptiveness, and competency, and that can be articulated with parent-child relationship theories. Analytic strategies suited to longitudinal examination of multiple variables, including parent and infant variables nested within family variables, will become standard fare for observational studies, requiring rigorous design with larger sample sizes. The studies reviewed suggest that longitudinal, multilevel examination of multidimensional qualities of the parent-child relationship will bring substantial gain for nursing knowledge (Wu, 1996; Wu et al., 1999).

How Do I Apply This Evidence to Nursing Practice?

Observation is foundational to evidence-based practice that concerns the parent-child relationship. Because this relationship and the interactions that develop and maintain it are critical to a child's well-being and, hence, to nursing practice (Blake, 1954, 1965), development of observational knowledge and skills is highly important to nurses. Since their introduction, PCI feeding and teaching assessment scales have given community and in-patient nurses tools with which to observe and evaluate parent-child interaction. With the use of these scales in descriptive, correlational research, the risk of nonadaptive interaction has been identified for specific parent-child populations, and the importance of

considering parental characteristics such as gender and the functional context of the interaction in nursing assessment and care has been made clear.

Observational studies that focus on relationships support nurse clinicians in incorporating new categories into their assessment of parent–child interaction. These categories go beyond specific behaviors and their occurrence/nonoccurrence to emotional qualities of behavior and types of social and task-related behavior. Observable behavior and relationship qualities include reciprocity, responsiveness, and engagement; the pleasure a parent and child experience during a feeding, teaching, or play activity; the support a parent's behavior and affect gives the child in gaining and maintaining regulation of his or her own affect and behavior for both task accomplishment and pleasurable and satisfying experience; and contexts in which regulated versus dysregulated infant or child affect or behavior occurs. Evidence for the contribution of interaction to health and developmental outcomes in the context of personal (e.g., parental mental health), family (e.g., support), and environmental (e.g., stress) variables, based on the extant descriptive observational research in nursing, in complement with that from related scientific disciplines, can guide both assessment and intervention.

Practitioners can use observed behavior to engage parents in a discussion about the meaning of behavior—their own or their child's—in respect to their parenting goals (Letourneau et al., 2005). Skill in describing interaction and relationship qualities in terms meaningful to parents will require training supported by institutional administration. Optimal training would involve review of observations with peer nurses, and reflection on interaction and relationship qualities over time. From this reflection, clinically and theoretically important questions about interaction and relationship qualities are likely to emerge, a compelling argument for nurse researchers to form partnerships with nurse clinicians.

References

- Abidin, RR. Parenting stress index. 3. Odessa, FL: Psychological Assessment Resources; 1995.
- Ainsworth, MS.; Bell, SM.; Stayton, DJ. Infant-mother development and social development: "Socialization" as a product of reciprocal responsiveness to signals. In: Richards, MPM., editor. The integration of a child into a social world. London: Cambridge University Press; 1974. p. 99-135.
- Ainsworth, MS.; Blehar, MC.; Waters, E.; Wall, S. Patterns of attachment. Hillsdale, NJ: Lawrence Erlbaum; 1978.
- Ainsworth, MDS.; Wittig, B. Attachment and exploratory behavior of one-year-olds in a strange situation. In: Foss, BM., editor. Determinants of infant behavior. Vol. 4. London: Methuen; 1969. p. 111-136.
- Anderson CJ. Enhancing reciprocity between mother and neonate. *Nursing Research* 1981;30:89-93. [PubMed: 6907868]
- Anderson LS, Riesch SK, Pridham K, Lutz KF, Becker PT. Furthering the understanding of parent-child relationships: A nursing scholarship review series. Part 4: Parent-child relationships at risk. *Journal for Specialists in Pediatric Nursing*. (in press).
- Barnard, KE. Nursing child assessment training/learning resource manual. Seattle, WA: NCAST Project; 1980.
- Barnard KE, Bee HL, Hammond MA. Developmental changes in maternal interactions with term and preterm infants. *Infant Behavior and Development* 1984;7:101-113.
- Barnard, KE.; Booth, CL.; Mitchell, S.; Telzow, RW. Newborn nursing models: A test of early intervention to high-risk infants and families. In: Hibbs, ED., editor. Children and families: Studies in prevention and intervention. Madison, CT: International Universities Press; 1988. p. 63-81.
- Barnard, KE.; Eyres, SJ. Child health assessment, Part 2: The first year of life. Hyattsville, MD: U.S. Department of Health, Education, and Welfare, PHS, HRA, Bureau of Health Manpower, Division of Nursing, DHEW; 1979.

- Barnard, K.; Eyres, S.; Lobo, M.; Snyder, CI. An ecological paradigm for assessment and intervention. In: Brazelton, TB.; Lester, BM., editors. *New approaches to developmental screening of infants*. New York: Elsevier; 1983. p. 199-218.
- Barnard, KE.; Hammond, M.; Mitchell, SK.; Booth, KL.; Spietz, A.; Snyder, CI.; Elsas, T. Caring for high-risk infants and their families. In: Green, M., editor. *The psychosocial aspects of the family*. Lexington, MA: Heath; 1985. p. 245-266.
- Bates J, Freeland C, Lounsbury M. Measurement of infant difficultness. *Child Development* 1979;50:794–803.10.1111/1467-8624.ep7250994 [PubMed: 498854]
- Bayley, N. *Manual for the Bayley Scales of Infant Development*. New York: Psychological Corporation; 1969.
- Becker PT. Conceptual frameworks: Issues for manuscript review and the dissemination of research findings [Editorial]. *Research in Nursing & Health* 2005;28:363–364.10.1002/nur.20091 [PubMed: 16163681]
- Becker PT, Engelhardt KF, Steinmann MF, Kane J. Infant age, context, and family system influences on the interactive behavior of mothers of infants with mental delay. *Research in Nursing & Health* 1997;20:39–50.10.1002/(SICI)1098-240X(199702)20:1<39::AID-NUR5>3.0.CO;2-V [PubMed: 9024476]
- Belsky, J.; Rovine, M. Patterns of marital change and parent-child relationships. Presented at the meeting of the Society for Research in Child Development; Kansas City, MO. 1989.
- Benzies KM, Harrison MJ, Magill-Evans J. Impact of marital quality and parent-infant interaction on preschool behavior problems. *Public Health Nursing* 1998;15(1):35–43. [PubMed: 9503952]
- Benzies K, Magill-Evans J, Harrison MJ, MacPhail S, Kimak C. Strengthening new fathers' skills in interaction with their 5-month-old infants: Who benefits from a brief intervention? *Public Health Nursing* 2008;25:431–439. [PubMed: 18816360]
- Black BP, Holditch-Davis D, Miles MS. Life course theory as a framework to examine becoming a mother of a medically fragile preterm infant. [Electronic Version]. *Research in Nursing & Health* 2009;32(1):38–49.10.1002/nur.20298 [PubMed: 18726937]
- Blake, FG. *The child, his parents and the nurse*. Philadelphia: J.B. Lippincott; 1954.
- Blake FG. A search for Kathy's problem. *International Journal of Nursing Studies* 1965;2:125. [PubMed: 5174759]
- Boechler V, Harrison MJ, Magill-Evans J. Father-child teaching interactions: The relationship to father involvement in caregiving. *Journal of Pediatric Nursing* 2003;18(1):46–51. [PubMed: 12610787]
- Bornstein MH, Tamis-LeMonda CS, Hahn CS, Haynes OM. Maternal responsiveness to young children at three ages: Longitudinal analysis of a multidimensional, modular, and specific parenting construct. *Developmental Psychology* 2008;44(3):867–874.10.1037/0012-1649.44.3.867 [PubMed: 18473650]
- Bowlby, J. *Attachment and loss*. Vol. 1. New York: Basic Books; 1969. Attachment
- Bowlby, J. *A secure base*. New York: Basic Books; 1988.
- Brazelton TB. Assessment of the infant at risk. *Clinical Obstetrics and Gynecology* 1973;16(1):361–375. [PubMed: 4575534]
- Bretherton, I. Attachment theory: Retrospect and prospect. In: Bretherton, I.; Waters, E., editors. *Growing points of attachment theory and research: Monographs of the Society for Research in Child Development*. Vol. 50. 1985. p. 3-35.
- Bretherton, I. The origins of attachment theory: John Bowlby and Mary Ainsworth. In: Parke, POR.; Reiser, J.; Zahn-Waxler, C., editors. *A century of developmental psychology*. Washington, DC: American Psychological Association; 1994. p. 431-471.#128
- Bretherton, I.; Munholland, KA. Internal working models in attachment relationships: Elaborating a central construct in attachment theory. In: Cassidy, J.; Shaver, PR., editors. *Handbook of attachment: Theory, research, and clinical applications*. 2. New York: Guilford Press; 2008. p. 102-127.
- Bronfenbrenner, U. Foreword. In: Cairns, RB.; Elder, GH.; Costello, EJ., editors. *Developmental science*. Cambridge, UK: Cambridge University Press; 1996. p. ix-xvii.
- Bronfenbrenner U, Ceci SJ. Nature-nurture reconceptualized in developmental perspective: A bioecological model. *Psychological Review* 1994;101:568–586. [PubMed: 7984707]

- Brown L. Heart rate variability in premature infants during feeding. *Biological Research for Nursing* 2007;8(4):283–293. [PubMed: 17456589]
- Brown LF, Pridham K. The effect of maternal depressive symptoms and early maternal feeding behavior on later infant feeding behavior. *Newborn & Infant Nursing Reviews* 2007;7(1):56–63.10.1053/j.nainr.2006.12.007
- Caldwell, B.; Bradley, BH. Home observation for measurement of the environment. Little Rock: University of Arkansas at Little Rock; 1984. Unpublished manuscript
- Carson K, Virden S. Can prenatal teaching promote maternal attachment? Practicing nurses test Carter-Jessop's pre-natal attachment intervention. *Health Care for Women International* 1984;5:355–369. [PubMed: 6571006]
- Carter-Jessop L. Promoting maternal attachment through prenatal intervention. *MCN: American Journal of Maternal Child Nursing* 1981;6:107–112.
- Censullo M, Bowler R, Lester B, Brazelton TB. An instrument for the measurement of infant-adult synchrony. Dyadic Mini Code (DMC). *Nursing Research* 1987;36(4):244–248. [PubMed: 3648699]
- Cho J, Holditch-Davis D, Belyea M. Gender, ethnicity, and the interactions of prematurely born children and their mothers. *Journal of Pediatric Nursing* 2004;19(3):163–175. [PubMed: 15185245]
- Cho J, Holditch-Davis D, Miles MS. Effects of maternal depressive symptoms and infant gender on the interactions between mothers and their medically at-risk infants. *JOGNN: Journal of Obstetric, Gynecologic, & Neonatal Nursing* 2008;37(1):58–70.10.1111/j.1552-6909.2007.00206.x
- Choi ES, Hamilton RK. The effects of culture on mother-infant interaction. *JOGNN: Journal of Obstetric, Gynecologic, & Neonatal Nursing* 1986;15(3):256–261.10.1111/j.1552-6909.1986.tb01394.x
- Clark R. The Parent-Child Early Relational Assessment: A factorial validity study. *Educational and Psychological Measurement* 1999;59(5):821–846.
- Coffman S, Levitt MJ, Guacci-Franco N. Infant-mother attachment: Relationships to maternal responsiveness and infant temperament. *Journal of Pediatric Nursing* 1995;10(1):9–18. [PubMed: 7891267]
- Davis L, Mohay H, Edwards H. Mothers' involvement in caring for their premature infants: An historical overview. *Journal of Advanced Nursing* 2003;42(6):578–586.10.1046/j.1365-2648.2003.02661.x [PubMed: 12787231]
- Diers, D. Research in nursing practice. Philadelphia: J. B. Lippincott; 1979.
- Dihigo SK. New strategies for the treatment of colic: Modifying the parent/infant interaction. *Journal of Pediatric Healthcare* 1998;12(5):256–262.
- Dunn DM, White DG. Interactions of mothers with their newborns in the first half-hour of life. *Journal of Advanced Nursing* 1981;6(4):271–275.10.1111/j.1365-2648.1981.tb03222.x [PubMed: 6911140]
- Farran, D.; Kasari, C.; Yoder, P.; Harber, L.; Huntington, G.; Comfort-Smith, M. Rating mother-child interactions in handicapped and at-risk infants. In: Tamir, D., editor. *Stimulation and intervention in infant development: Perinatal risk and newborn behavior*. Norwood, NJ: Ablex; 1987. p. 153-163.
- Feeley N, Gottlieb L, Zerkowitz P. Infant, mother, and contextual predictors of mother-very low birth weight infant interaction at 9 months of age. *Journal of Developmental & Behavioral Pediatrics* 2005;26(1):24–33. [PubMed: 15718880]
- Feeley N, Gottlieb L, Zerkowitz P. Mothers and fathers of very low-birthweight infants: Similarities and differences in the first year after birth. *JOGNN: Journal of Obstetric, Gynecologic, & Neonatal Nursing* 2007;36(6):558–567.10.1111/j.1552-6909.2007.00186.x
- Field T, Hallock N, Dempsey JR, Shuman HH. Mothers' assessments of term and pre-term infants with respiratory distress syndrome: Reliability and predictive validity. *Child Psychiatry and Human Development* 1978;9(2):75–85. [PubMed: 581566]
- Fonagy P, Gergely G, Target M. The parent-infant dyad and the construction of the subjective self. *Journal of Child Psychology and Psychiatry* 2007;48(3–4):288–328.10.1111/j.1469-7610.2007.01727.x [PubMed: 17355400]
- Gaffney KF, Barnett-Maglio B, Myers S, Kollar SJ. Early clinical assessment for harsh child discipline strategies. *MCN: American Journal of Maternal Child Nursing* 2002;27(1):34–40.
- George, C.; Solomon, J. The caregiving system: A behavioral systems approach to parenting. In: Cassidy, J.; Shaver, PR., editors. *Handbook of attachment*. 2. New York: Guilford Press; 2008. p. 833-856.

- Glazebrook C, et al. Randomised trial of a parenting intervention during neonatal intensive care. *Archives of Disease in Childhood. Fetal Neonatal Edition* 2007;92(6):F427–F428.10.1136/adc.2006.1003135
- Greenspan, SI.; Greenspan, NT. *The essential partnership: How parents and children can meet the emotional challenges of infancy and childhood*. New York: Viking Press; 1989.
- Hansen MF, Pridham KF, Stephenson GR, Tsui P. The clinically focused descriptive study: A method of graphic summary of complex observational data. *Computers in Nursing* 1987;5:50–57. [PubMed: 3646909]
- Harrison L, Sherrod RA, Dunn L, Olivet L. Effects of hospital-based instruction on interactions between parents and preterm infants. *Neonatal Network* 1991;9(7):27–33. [PubMed: 2062285]
- Harrison MJ, Magill-Evans J. Mother and father interactions over the first year with term and preterm infants. *Research in Nursing & Health* 1996;19:451–459.10.1002/(SICI)1098-240X(199612)19:6<451::AID-NUR1>3.0.CO;2-N [PubMed: 8948399]
- Harrison MJ, Magill-Evans J, Sadoway D. Scores on the Nursing Child Assessment Teaching Scale for father-toddler dyads. *Public Health Nursing* 2001;18:94–100. [PubMed: 11285103]
- Hinde RA. On describing relationships. *Journal of Child Psychology and Psychiatry* 1976;17:1–19.10.1111/j.1469-7610.1976.tb00370.x [PubMed: 1249137]
- Hinde RA. Ethological and relationships approaches. *Annals of Child Development* 1989;6:251–285.
- Hinde, RA.; Stevenson-Hinde, J. *Relationships within families: Mutual influences*. Oxford, UK: Clarendon Press; 1988.
- Holditch-Davis D, Bartlett R, Belyea M. Developmental problems and interactions between mothers and prematurely born children. *Journal of Pediatric Nursing* 2000;15:157–167. [PubMed: 10897553]
- Holditch-Davis D, Cox MF, Miles MS, Belyea M. Mother-infant interactions of medically fragile infants and non-chronically ill premature infants. *Research in Nursing & Health* 2003;26:300–311.10.1002/nur.10095 [PubMed: 12884418]
- Holditch-Davis D, Miles MS, Belyea M. Feeding and nonfeeding interactions of mothers and prematures. *Western Journal of Nursing Research* 2000;22:320–334.10.1177/0193945002204449 [PubMed: 10804895]
- Holditch-Davis D, Schwartz T, Black B, Scher M. Correlates of mother-premature infant interactions. *Research in Nursing & Health* 2007;30:333–346.10.1002/nur.20190 [PubMed: 17514707]
- Horodyski MA, Gibbons C. Rural low-income mothers' interactions with their young children. *Pediatric Nursing* 2004;30(4):299–306. [PubMed: 15511046]
- Horowitz JA, et al. Promoting responsiveness between mothers with depressive symptoms and their infants. *Journal of Nursing Scholarship* 2001;33:323–329.10.1111/j.1547-5069.2001.00323.x [PubMed: 11775301]
- Huckabay LMD. The effect on bonding behavior of giving a mother her premature baby's picture. *Scholarly Inquiry for Nursing Practice* 1987;1:115–129. [PubMed: 3648868]
- Izard, CE.; Dougherty, LM.; Hembree, EA. *A system for identifying affect expressions by holistic judgments (AFFEX)*. Newark, DE: University Media Services; 1989.
- Johnson C, Mash EJ. A measure of parenting satisfaction and efficacy. *Journal of Clinical and Child Psychology* 1989;18:167–175.
- Jung V, Short R, Letourneau N, Andrews D. Interventions with depressed mothers and their infants: Modifying interactive behaviours. *Journal of Affective Disorders* 2007;98:199–205.10.1016/j.jad.2006.07.014 [PubMed: 16962666]
- Kang R, Barnard K, Hammond M, Oshio S, Spencer C, Thibodeaux B, Williams J. Preterm infant follow-up project: A multi-site field experiment of hospital and home intervention programs for mothers and preterm infants. *Public Health Nursing* 1995;12:171–180. [PubMed: 7596966]
- Kelly, JF.; Barnard, KE. Assessment of parent-child interaction: Implications for early intervention. In: Shonkoff, JP.; Meisels, SJ., editors. *Handbook of early childhood intervention*. 2. Cambridge UK: Cambridge University Press; 2000. p. 258-289.
- Klaus, MH.; Kennel, JH. *Maternal-infant bonding: The impact of early separation or loss on family development*. St. Louis, MO: C. V. Mosby; 1976.
- Kussano CA, Maehara S. Japanese and Brazilian maternal bonding behaviour towards preterm infants: A comparative study. *Journal of Neonatal Nursing* 1998;4(1):23–28.

- LeCuyer-Maus EA. Maternal sensitivity and responsiveness, limit-setting style, and relationship history in the transition to toddlerhood. *Issues in Comprehensive Pediatric Nursing* 2000;23(2):117–139. [PubMed: 11111501]
- Lee HK. The effects of infant massage on weight, height, and mother-infant interaction. *Taehan Kanho Hakhoe Chi* 2006;36:1331–1339. [PubMed: 17215606]
- Leitch DB. Mother-infant interaction: Achieving synchrony. *Nursing Research* 1999;48:55–58. [PubMed: 10029403]
- Letourneau NL, Hungler KM, Fisher K. Low-income Canadian Aboriginal and non-Aboriginal parent-child interactions. *Child: Care, Health & Development* 2005;31:545–554.10.1111/j.1365-2214.2005.00549.x
- Lutz KF, Anderson LS, Pridham K, Riesch SK, Becker PT. Furthering the understanding of parent-child relationships: A nursing scholarship review series. Part One: Introduction. *Journal for Specialists in Pediatric Nursing* 2009;14:256–261. [PubMed: 19796325]
- Lutz KF, Anderson LS, Riesch SK, Pridham K, Becker PT. Furthering the understanding of parent-child relationships: A nursing scholarship review series. Part Two: Grasping the early parenting experience—The insider view. *Journal for Specialists in Pediatric Nursing* 2009;14:262–283. [PubMed: 19796326]
- MacDonald-Clark NJ, Boffman JL. Mother-child interaction among the Alaskan Eskimos. *JOGNN: Journal of Obstetric, Gynecologic, and Neonatal Nursing* 1995;24:450–457.10.1111/j.1552-6909.1995.tb02502.x
- Macke JK. Analgesia for circumcision: Effects on newborn behavior and mother/infant interaction. *JOGNN: Journal of Obstetric, Gynecologic, & Neonatal Nursing* 2001;30:507–514.10.1111/j.1552-6909.2001.tb01570.x
- Magill-Evans J, Harrison MJ, Benzies K, Gierl M, Kimak C. Effects of parenting education on first-time fathers' skills in interactions with their infants. *Fathering* 2007;5(1):42–57.10.3149/fth.0501.42
- Magill-Evans J, Harrison MJ, Burke SO. Parent-child interactions and development of toddlers born preterm. *Western Journal of Nursing Research* 1999;21:292–307.10.1177/01939459922043893 [PubMed: 11512200]
- McGrath MM, Sullivan MC, Seifer R. Maternal interaction patterns and preschool competence in high-risk children. *Nursing Research* 1996;47(6):309–317. [PubMed: 9835486]
- Melnik BM. Integrating levels of evidence into clinical decision making. *Pediatric Nursing* 2004;30:323–325. [PubMed: 15511051]
- Melnik B, Crean HF, Feinstein NR, Fairbanks E. Maternal anxiety and depression after a premature infant's discharge from the neonatal intensive care unit. *Nursing Research* 2008;57:383–394.10.1097/NNR.0b013e3181906f59 [PubMed: 19018213]
- Melnik B, Feinstein NF, Alpert-Billis L, Fairbanks E, Crean HF, Sinkin RA, Gross SJ. Reducing premature infants' length of stay and improving parents' mental health outcomes with the Creating Opportunities for Parent Empowerment (COPE) Neonatal Intensive Care Unit Program: A randomized, controlled trial. *Pediatrics* 2006;118:e1414–e1427.10.1542/peds.2005-2580 [PubMed: 17043133]
- Melnik, BM.; Feinstein, NF.; Fairbanks, E.; Small, L. The index of parental behavior in the NICU. Rochester, NY: 1998. Unpublished manuscript
- Norr KF, Roberts JE, Freese U. Early postpartum rooming-in and maternal attachment behaviors in a group of medically indigent primiparas. *Journal of Nurse-Midwifery* 1989;34(2):85–91. [PubMed: 2703910]
- Onyskiw JE, Harrison JJ, Magill-Evans JE. Past childhood experiences and current parent-infant interactions. *Western Journal of Nursing Research* 1997;19:501–518.10.1177/019394599701900406 [PubMed: 9260528]
- Porges SW. The polyvagal perspective. *Biological Psychology* 2007;74:116–143. [PubMed: 17049418]
- Price GM. Sensitivity in mother-infant interactions: The AMIS scale. *Infant Behavior & Development* 1983;6(3):353–360.
- Pridham KF. The clinically focused descriptive study: Methods of obtaining a complete and accurate coding of observational data. *Computers in Nursing* 1985;3(6):253–261. [PubMed: 3851677]

- Pridham K, Brown R, Clark R, Limbo RK, Schroeder M, Henriques J, Bohne E. Effect of guided participation on feeding competencies of mothers and their premature infants. *Research in Nursing & Health* 2005;28:252–267.10.1002/nur.2007 [PubMed: 15884024]
- Pridham KF, Limbo R, Schroeder M, Thoyre S, Van Riper M. Guided participation and development of care-giving competencies for families of low birth-weight infants. *Journal of Advanced Nursing* 1998;28:948–958.10.1046/j.1365-2648.1998.00814.x [PubMed: 9840866]
- Pridham KF, Schroeder M, Brown R, Clark R. The relationship of a mother's working model of feeding to her feeding behaviour. *Journal of Advanced Nursing* 2001;35:741–750.10.1046/j.1365-2648.2001.01906.x [PubMed: 11529976]
- Radloff LS. The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement* 1977;1:385–401.
- Riesch SK, Pridham K, Lutz KF, Anderson LS, Becker PT. Furthering the understanding of parent-child relationships: A nursing scholarship review series. Part 5: Parent-adolescent relationships and the teen parent-child relationship. *Journal for Specialists in Pediatric Nursing*. (in press).
- Rogoff, B. *Apprenticeship in thinking: Cognitive development in social context*. New York: Oxford University Press; 1990.
- Rohner, RP. *The warmth dimension: Foundation of parental acceptance-rejection*. Beverly Hills, CA: Sage; 1986.
- Rubin R. Maternal touch. *Nursing Outlook* 1963;11:828–831. [PubMed: 14053581]
- Rubin R. Binding in the postpartum period. *Maternal-Child Nursing Journal* 1977;6(2):67–75. [PubMed: 585783]
- Schiffman RF, Omar MA, McKelvey L. Mother-infant interaction in low-income families. *MCN: Maternal Child Nursing* 2003;28(4):247–251.
- Schroeder M, Pridham K. Development of relationship competencies through guided participation for mothers of preterm infants. *JOGNN: Journal of Obstetric, Gynecologic, & Neonatal Nursing* 2006;35(3):358–368.10.1111/j.1552-6909.2006.00049.x
- Spanier GB. Measuring dyadic adjustment: New scales for assessing the quality of marriage and similar dyads. *Journal of Marriage and the Family* 1976;38:15–28.
- Spielberger, CD.; Gorsuch, RL.; Lushene, R.; Vagg, PR.; Jacobs, GA. *State-Trait Anxiety Inventory for Adults*. Palo Alto, CA: Consulting Psychologists Press; 1983.
- Spietz, A.; Johnson-Crowley, N.; Sumner, G.; Barnard, K. *Keys to caregiving manual*. Seattle, WA: NCAST Publications; 1990.
- Sroufe, LA.; Egeland, B.; Carlson, EA.; Collins, WA. *The development of the person: The Minnesota study of risk and adaptation from birth to adulthood*. New York: Guilford Press; 2005.
- Stephenson GR, Pridham KF, Mlynarczyk S. A computerized method of describing phase-related interactive events: Infant feeding as an example. *Computers in Nursing* 1996;14(2):89–98. [PubMed: 8904362]
- Sullivan MC, McGrath MM. Proximal and distal correlates of maternal control style. *Western Journal of Nursing Research* 1999;21(3):313–334.10.1177/01939459922043901 [PubMed: 11512201]
- Taubenheim AM. Paternal-infant bonding in the first-time father. *JOGNN: Journal of Obstetric, Gynecologic, and Neonatal Nursing* 1981;10:261–264.10.1111/j.1552-6909.1981.tb00856.x
- Tilokskulchai F, Phatthanasiriwethin S, Vichitsukon K, Serisathien Y. Attachment behaviors in mothers of premature infants: A descriptive study in Thai mothers. *Journal of Perinatal & Neonatal Nursing* 2002;16(3):69–83. [PubMed: 12472190]
- Tronick EZ, Als H, Adamson L, Wise S, Brazelton TB. The infant's response to entrapment between contradictory messages in face-to-face interaction. *Journal of the American Academy of Child Psychiatry* 1978;17:1–13. [PubMed: 632477]
- Waechter EH. Bonding problems of infants with congenital anomalies. *Nursing Forum* 1977;16:298–317. [PubMed: 245647]
- Walker, LO.; Thompson, ET. Mother-infant play interaction scale. In: Humenick, SS., editor. *Analysis of current assessment strategies in the health care of young children and childbearing families*. Norwalk, CT: Appleton-Century-Crofts; 1982. p. 191-201.

- White-Traut RC, Nelson MN. Maternally administered tactile, auditory, visual, and vestibular stimulation: Relationship to later interactions between mothers and premature infants. *Research in Nursing & Health* 1988;11:31–39.10.1002/nur.4770110106 [PubMed: 3347763]
- Whittemore R, Knafl K. The integrative review: Updated methodology. *Journal of Advanced Nursing* 2005;52:546–553.10.1111/j.1365-2648.2005.03621.x [PubMed: 16268861]
- Wu Y-WB. An application of hierarchical linear models to longitudinal studies. *Research in Nursing & Health* 1996;19:75–82.10.1002/(SICI)1098-240X(199602)19:1<75::AID-NUR8>3.0.CO;2-I [PubMed: 8552805]
- Wu Y-WB, Clopper RR, Wooldridge PJ. A comparison of traditional approaches to hierarchical linear modeling when analyzing longitudinal data. *Research in Nursing & Health* 1999;22:421–432.10.1002/(SICI)1098-240X(199910)22:5<421::AID-NUR8>3.0.CO;2-Q [PubMed: 10520194]
- Zeanah, CH., Jr; Larrieu, JA.; Heller, SS.; Valliere, J. Infant-parent relationship assessment. In: Zeanah, CH., Jr, editor. *Handbook of infant mental health*. Vol. 2. New York: The Guilford Press; 2000. p. 222-235.

Table 1

Assessment Model Studies

Source	Design	Focus/Dependent variable	Sample description	Results
Barnard, Bee, and Hammond (1984)	Descriptive: Two-group longitudinal observation; comparison on three occasions	Change in maternal and child feeding and teaching interaction behavior was rated on scales reported by Barnard and Eyres (1979). The home environment was rated with the HOME (Caldwell & Bradley, 1984).	Mother–infant dyads/88 premature infants < 34 weeks gestation at birth (average age 31.1 weeks, $SD = 1.45$); 166 term infants mean gestational age 39.4 weeks ($SD = 1.1$) Infants were 4, 8, and 24 months post-term age when observed. United States	Premature infants increased in responsiveness between 4 and 8 months. However, the mothers of premature infants were less sensitive and responsive to their infants at 8 months than were mothers of full-term infants.
Becker, Engelhardt, Steinmann, and Kane (1997)	Descriptive, correlational	The relationship of the child's developmental level, immediate context, and family and social system characteristics to the interactive behavior of mothers and infants with and without mental delay.	Thirty mother–infant dyads in each group (study and comparison) Infants in their first and second years were matched at 9 and 19 months mental age (8 and 18 months chronological age). 59 Caucasian, 1 Native American United States	Interactive behavior of infants with special needs was rated as less clear in communicative signals and less responsive than that of typically developing infants of similar mental age; behavior of mothers was rated less optimal in support for social-emotional and cognitive development —differences appeared in the demanding teaching but not in the more casual feeding situations.
Benzie, Harrison, and Magill-Evans (1998)	Descriptive, correlational	The relationships between 4-year-old, preschool behavior problems and parent (mother, father) teaching interactions with healthy term and premature infants, marital quality, and family socioeconomic status, all assessed at 12 months after the child was discharged from the hospital.	80 mothers and 74 fathers (74 families) Mothers' average age was approximately 29 years; fathers' average age was approximately 32 years. All children, except one, were Caucasian. Canada	The parent and infant PCI teaching interaction scores were not associated with preschool behavior problems for either mothers or fathers or for term or premature children. Maternal perceptions of marital quality were associated with both the frequency and impact of the child's behavior problems, whereas, for fathers, marital quality and family socioeconomic status were associated with the

Source	Design	Focus/Dependent variable	Sample description	Results
Boechler, Harrison, and Magill-Evans (2003)	Descriptive, correlational	The relationship of the amount of paternal caregiving to the quality of the teaching interaction behavior of fathers and their healthy infants and toddlers.	110 father-child dyads Fathers were English-speaking, over 20 years of age, living in a stable relationship with the child's mother (the primary caregiver). All but 6 fathers were Euro-Canadian. Children (51 girls, 59 boys) were between 2 and 24 months of age. Canada	impact of behavior problems for fathers. Fathers in higher and lower caregiving involvement groups did not differ on sensitivity to the child's cues and responsiveness to the child's distress. However, fathers who were more involved in caregiving in the previous week had higher scores on cognitive growth fostering of the PCI teaching interaction scale.
Brown (2007)	Correlational, longitudinal	Development of premature infant physiologic regulation, assessed with heart rate variability, in relation to maternal feeding behavior beginning with the time caregiving responsibility was transferred to the mother at special care nursery discharge through the infant's 4th post-term month.	Forty-three mother-premature dyads observed at time of discharge and at 1 and 4 months infant post-term age. Race/ethnicity: 31 European American; 6 African American; 2 Asian American, 2 Latino, and 2 mixed race/ethnicity United States	Maternal feeding behavior (positive affective involvement and sensitivity/responsivity) was not associated with infant either low frequency or high frequency heart-rate variability at any of the three observations.
Brown and Pridham (2007)	Multivariate correlational and longitudinal study	The contribution of the adaptiveness of early maternal feeding behavior to the adaptiveness of later infant feeding behavior, accounting for maternal depressive symptoms and the degree of infant neonatal health.	The sample is described above for Brown (2007).	The adaptiveness of maternal feeding behavior (measured as positive affective involvement and sensitivity/responsivity and as regulation of affect and behavior) contributed to the adaptiveness of infant feeding behavior at 4 months post-term age, accounting for neonatal health and maternal depressive symptoms.
Cho, Holditch-Davis, and Belyea (2004)	Correlational study of child and family system factors contributing to mother-infant interaction; secondary analysis	Effect of child gender and maternal ethnicity on maternal and child positive and negative affect and discrete interactive behaviors as well as on HOME scale scores.	Three-year-old male and female prematurely born children ($n = 53$) and their primary caretakers, either their mothers ($n = 44$) or their grandmothers ($n = 4$). Mothers of female infants, mean years of age = 29.2 ($SD = 5.1$) Race/ethnicity: 21 of the primary caretakers were White; 27 were non-White, including 24 African Americans, and 3 Native Americans United States	Although some maternal interactive behaviors were associated with the child's gender and with ethnicity, child behaviors were not. Gender and ethnic group differences were influenced by the

Source	Design	Focus/Dependent variable	Sample description	Results
Cho, Holditch-Davis, & Miles (2008)	Longitudinal, descriptive (correlational) study; secondary analysis with samples from three studies; in-home observation between 6 and 24 months	Effects of maternal depressive symptoms and infant gender on mother–infant interactions and their prematurely born infants, their medically fragile infants, or their HIV-positive infants. Four global interactive dimensions (mother attention, mother restrictiveness, infant social behaviors, and infant negativism) were constructed from naturalistic observation of discrete interactive behaviors. HOME inventory subscale scores were also used.	One hundred eight prematurely born infants and their mothers; 67 medically fragile infants and their mothers; and 83 infants seropositive for HIV and their mothers. Mothers' mean years of age: premature infants, 28.5 ($SD = 6.5$); medically fragile infants, 27 ($SD = 5.9$); HIV seropositive, 26.2 ($SD = 5.7$). Race/ethnicity: Percent African American—premature infants, 44.4%; medically fragile infants, 34.3%; HIV-seropositive infants, 85.9%	mother's education and illness severity. Maternal depressive symptoms were associated with somewhat lessened attentiveness for mothers of medically fragile infants and for mothers of HIV-positive infants. Mothers of medically fragile infants with higher levels of depressive symptoms were also more restrictive. Maternal depressive symptoms did not moderate the effects of gender on mother–infant interaction.
Choi and Hamilton (1986)	Descriptive: Two-group observation; comparison on one occasion	Influence of culture on maternal views of the infant and maternal reciprocity during feeding, measured with the Maternal–Infant Adaptation Scale, and sensitivity during play interaction, measured with the Mother–Infant Play Interaction Scale (both scales are adaptations of Price's [1983] AMIS Scale).	Thirty-nine mother–infant dyads observed 2–3 days after delivery: (a) 21 Native-born American Caucasian mothers and their infants; (b) 18 Korean-born mothers living in the United States and their infants. United States	The two groups of mothers did not differ in reciprocity or in sensitivity. Korean mothers viewed their infants as more passive than American mothers viewed their infants.
Coffman, Levitt, and Guacci-Franco (1995)	Comparative; one observation	Relationship between infant temperament and attachment Measures: Ainsworth's Strange Situation (Ainsworth & Wittig, 1969), maternal responsiveness tool developed for the study, and the Infant Characteristics Questionnaire (ICQ; Bates, Freeland, & Lounsbury, 1979)	Forty-nine mother–infant dyads Infants: All healthy; age 13 months on average, range 12–15 months Mothers' age average: 31 years, range 22–40; Marital status—90% married Race/ethnicity—48 White, 1 African American United States	Infant temperament was more strongly related to attachment than maternal responsiveness. Mothers perceived infants rated as Anxious-Avoidant in attachment as significantly easier in temperament.
Davis, Mohay, and Edwards (2003)	Descriptive, correlational study; two self-reports of maternal psychosocial variables and infant perinatal variables and one observation of feeding interaction	Bivariate correlation of feeding interaction of mothers and their premature infants with maternal coping, depression, educational level, family support and stress, and infant birth attributes.	Fifty mother–infant dyads Infants: For coping assessment, 1 month after nursery discharge; for interaction assessment, 3 months after nursery discharge Australia	Mothers whose coping at 1 month after nursery discharge included family integration, cooperation, and an optimistic definition of the situation had higher scores on the PCI feeding scales at 3 months after discharge. Feeding scores were not associated, on bivariate

Source	Design	Focus/Dependent variable	Sample description	Results
Dunn and White (1981)	Descriptive, one observation	Influence of fathers and staff on the interaction of first- and second-time mothers with healthy newborns after the delivery in the labor ward.	Eight first-time families; 8 second-time families London, UK	tests, with infant gestational age, birth weight, or Apgar scores, with maternal education level or history of depression at 1 month after discharge, or with nursing or family support or stress. Mothers' interactions with first- and second-born infants did not differ. Maternal interaction was passive, with little vocalization, smiling, or intimate touching; looking was moderate in amount. Maternal interaction with the newborn was reduced with both paternal and midwife presence.
Feeley, Gottlieb, and Zelkowitz (2005)	Prospective study; two data collections, one observation	Examination of the contribution to PCI teaching interaction scores of infants (birth weight, perceived illness severity), mothers (anxiety and level of education), and social context (maternal received and perceived support and its helpfulness).	Seventy-two mother-infant dyads Infants: Very low-birth-weight at 3 and 9 months, age corrected for prematurity Mothers: on average approximately 32 years old; almost 14 years of education; 69% were married and 57% were first-time mothers Race-ethnicity: some immigrants, not specified Canada	Infant, mother, and social contextual factors were assessed at 3 and 9 months of infant age. Mother-infant teaching interaction was observed at 9 months of age. Dyads with more sensitive and responsive interaction had mothers with more years of education and less anxiety on the State-Trait Anxiety Inventory (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983) and who perceived more support at 3 months.
Feeley, Gottlieb, and Zelkowitz (2007)	Comparative study; one observation	Comparison of the quality of teaching interaction of mothers and fathers of very low-birth- weight infants.	Mothers and fathers of 9-month-old infants weighing < 1,500 g at birth; majority were first-time parents, married, and, on average, in their early 30s and with 14 years of education/61 couples/Canada; some recent immigrants.	Mothers and fathers were not significantly different on the quality of teaching interaction assessed with the PCI (total score, parent score).
Gaffney, Barnett-Maglio, Myers, and Kollar (2002)	Descriptive; correlational; one observation	Relationships among prenatally reported experience of discipline as a child and intentions for disciplining the expected baby, and, at 8 months postbirth, reported	One hundred twenty-six mother-infant dyads Infants: 8 months postbirth Mothers: Average age, 23 years ($SD = 4.81$); average education, 12 th grade ($SD = 1.59$); 37% were living with their partners.	Mothers who were clinically at risk for nonsupportive parenting, determined

Source	Design	Focus/Dependent variable	Sample description	Results
Harrison and Magill-Evans (1996)	Descriptive, correlational, longitudinal (two observations)	intentions for discipline and observed maternal role sufficiency behaviors, assessed with the HOME and PCI teaching score.	Race/ethnicity: 64% White; 36% African American United States	by either their PCI teaching scores or by HOME scores at 8 months, scored higher prenatally on a measure of intentions to use harsh, non-nurturing discipline strategies than mothers who were not at risk. Neither parenting stress, marital support, nor amount of parent contact with the infant, examined in bivariate analysis, accounted for the lower PCI teaching scores given parents of premature infants compared with ratings given to parents of term infants. Although, in both term and premature groups, fathers had lower interaction scores than mothers, scores decreased for both parents over time. Infant scores on Responsiveness to Caregiving and Clarity of cues increased.
Harrison, Magill-Evans, and Sadoway (2001)	Descriptive; one observation	Comparison of father-healthy toddler teaching interaction to reference sample of mothers.	Forty-nine father-toddler dyads Toddlers: 13-24 months recruited from public health centers or community organizations Fathers: All but 3 were White; matched with mothers in the PCI database Canada	Compared with the PCI reference sample of 164 mothers of similar ethnicity and marital status with children of similar ages, the fathers had significantly lower PCI total parent scores as well as lower scores for contingency of response to child behavior. Toddlers had higher clarity of cue scores, total scores, and contingency scores than reference sample toddlers. Fathers' age and education were not associated with teaching scores.

Source	Design	Focus/Dependent variable	Sample description	Results
Holditch-Davis, Bartlett, and Belyea (2000)	Descriptive; two 2-hour observations	Relationship of developmental problems (cognitive, language, and/or attention) of prematurely born children to teaching interactions and to the home environment.	Forty-one mothers, 3 grandmothers; 49 children (5 sets of twins)/ Children: 3 years, post-term age Race—ethnicity was not described. United States	Children with low IQs spent less time playing and scored lower on the PCI teaching scale than children with higher IQs. Children with language problems had mothers who interacted less, talked less, were more negative, and scored lower on the HOME and PCI teaching scales than mothers of children without language problems. Children with attention problems were more active than children without attention problems.
Holditch-Davis, Miles, and Belyea, (2000)	Descriptive; one observation	Similarities and differences in interaction of caregivers (mothers or grandmothers) and premature infants during feeding and nonfeeding periods.	Twenty-nine caregiver–infant dyads Infants: 6 months post-term age Caregivers: race—ethnicity—White: 62.1%; African American: 34.5%; Asian: 3.4% United States	Mothers engaged in more interaction during feeding than during nonfeeding periods. During feeding, they were more likely to have body contact and look at, hold, and rock their infants. During nonfeeding periods, maternal behaviors were more likely to be distal, such as gesturing, touching, and playing with the infant. During nonfeeding periods, infants were more likely to be alert, vocalize, play with objects, express negative affect, and move. During feeding, infants were more likely to be drowsy or asleep.
Holditch-Davis, Cox, Miles, and Belyea (2003)	Descriptive; one observation	Comparison of the interactions of mothers and their medically fragile infants (premature, full term) with those of mothers and premature infants without chronic illness.	69 Mother–infant dyads Infants: 20 medically fragile full-term infants; 41 medically fragile premature infants; 28 non-chronically ill premature infants: 6 months, post-term age Race/ethnicity: White., 60%; African American, 30%; Hispanic, 5%; Asian, 5% USA	Mothers of the medically fragile infants, both full term and premature, spent more time interacting with them than did mothers with nonchronically ill premature infants. The nonchronically ill

Source	Design	Focus/Dependent variable	Sample description	Results
Holdrich-Davis, Schwartz, Black, and Scher (2007)	Descriptive, longitudinal, correlational study	The contribution of child characteristics, child illness severity, maternal characteristics and psychological well-being, and paternal support to dimensions of maternal and premature infant interaction.	108 mother-premature infant dyads Infants: 6 or 18 months old, post-term age; Race/ethnicity: Euro-American, 56%; African American, 43% Asian, 1% USA	<p>infants had more mature play and motor behaviors than the medically fragile infants.</p> <p>Age did not significantly interact with any of the child, maternal, or paternal characteristics to affect maternal or child interactive dimensions. Mothers with singletons or more infant illness stress had more positive involvement with their infants. Mothers with less infant illness stress, less education, or less paternal participation in caregiving showed more negative control. Mothers of first babies and of singletons gave greater developmental stimulation. Children of younger and of Euro-American mothers demonstrated more social behavior, and children who received shorter periods of mechanical ventilation and who had mothers with less education had greater developmental maturity. Maternal depressive symptoms did not have a significant effect on any of the maternal or child interactive dimensions.</p>
Horodyski and Gibbons (2004)	Descriptive, longitudinal one group study, before and after a program	Comparison of mother-child interaction at entry to and exit from a rural Early Head Start Program and with a national sample, using the PCI teaching assessment.	Thirty mother-child dyads Children: averaged 16 months, range 1-30 months Race-ethnicity predominantly Caucasian United States	<p>Mother-child interaction scores did not change significantly from entry to exit from the program, 14 months on average. However, more than half of the mothers maintained or improved their sensitivity to cues and response to distress. Mothers' scores were</p>

Source	Design	Focus/Dependent variable	Sample description	Results
Kussano and Maehara (1998)	Descriptive, comparison of two groups on one occasion	The difference in bonding behavior of Brazilian and Japanese mothers on their first visit to their preterm infants in the neonatal intensive care unit (NICU).	Thirty-five mothers (19 Japanese, 16 Brazilian) and their newborn preterm infants Mothers: mean years of age 27.8 ($SD = 3.7$), 23.5 ($SD = 7.8$) Japanese and Brazilian, respectively Japan	similar to the national sample scores, and the total PCI teaching score at exit was closer to the national sample score than at entry. Forty percent of the mothers continued to be at risk for poor interaction. Brazilian mothers exhibited significantly more bonding behavior per unit time than Japanese mothers. Although bonding behaviors differed between the two groups, maternal affective perceptions of the infant and motherhood did not.
LeCuyer-Maus (2000)	Descriptive, correlational; observation (laboratory) on one occasion	The relationship of maternal sensitivity and responsiveness in interactions with more and less control saliency.	Sixty-one mother-child dyads Infants: Healthy; 12 months of age Race/ethnicity: 70% Caucasian; 16% African American; 2% Native American; 8% multi-ethnic United States	On the whole, mothers were less sensitive in their interactions in situations requiring control. Mothers who were more sensitive in situations in which control was relatively less important were also more sensitive in situations in which control was important to the child's compliance or participation. Maternal sensitivity and responsiveness in interaction with the child varied with maternal style of control. Multivariate logistic regression revealed that mother's income or age did not explain a significant amount of the variance in style of control after accounting for maternal sensitivity and responsiveness and the mother's history of overprotection or control with her own parents.

Source	Design	Focus/Dependent variable	Sample description	Results
Letourneau, Hungler, and Fisher (2005)	Comparison of two low-income groups (nonprobability sample) on one occasion; secondary analysis	The relationship between PCI teaching interaction and ethnicity (Canadian Aboriginal, non-Aboriginal compared with each other and with the PCI reference population).	Twelve Aboriginal parent-child pairs (11 mothers, 1 father); 48 non-Aboriginal parent-child pairs (47 mothers, 1 father). Children: Mean age = 17 months, range 5-35 months Race/ethnicity: Non-Aboriginal families were mostly Caucasian Australia	Although Aboriginal parents were less verbal with their children and had lower cognitive-growth fostering scores than non-Aboriginal parents, the overall teaching interaction quality did not differ from that of other low-income parents. In both Aboriginal and Non-Aboriginal groups, parent and child interaction scores were lower than the PCI 10th percentile score.
MacDonald-Clark and Boffman (1995)	Descriptive; observation/interview on one occasion; comparison with normative sample	Influence of culture (Alaskan Yup'ik Eskimo) and environment on maternal-term infant interaction (feeding, teaching) and home environment, assessed with the HOME scales.	Sixty-eight mother-infant dyads, 30 for feeding, 63 for teaching Infants: < 12 months of age	The normative PCI reference population was similar in marital status and age of the child. However, education of the Eskimo mothers was lower than the normative sample. Mothers' scores on the PCI subscales Sensitivity to Cues and Response to Distress for both feeding and teaching interactions were higher than the scores of the PCI reference population. However, mothers' feeding scores on cognitive growth fostering were lower than the feeding scores for the PCI reference population. Infants were lower than the PCI reference population on Responsiveness to Parent, Eskimo HOME subscale scores for emotional and verbal responsivity to the mother and maternal involvement with the child as well as several other subscale scores were significantly lower

Source	Design	Focus/Dependent variable	Sample description	Results
Magill-Evans, Harrison, and Burke (1999)	Descriptive, correlational; part of a longitudinal study of children from birth until 4 years of age	The teaching interaction of mothers and fathers of healthy premature and full-term infants, assessed with the PCI scale at 3 and 12 months, in relationship with child mental and communicative development at 18 months adjusted age. In addition, the relationship of teaching interaction scores with parenting stress, assessed with the Parenting Stress Index (Abidin, 1995), was examined.	One hundred three two-parent families; fathers and mothers of 49 healthy preterm and 54 full-term infants Race/ethnicity: All except four children were White; English was spoken to the child in the home. No parents were recent immigrants Canada	than for the reference population. Fathers and mothers were independently observed in teaching interactions with the child. The Bayley Mental score (Bayley, 1969) was predicted by the mother's teaching score at 12 months as well as by family socioeconomic status and infant gender. The interactions of mothers and fathers with the child (mothers at 3 and 12 months, fathers at 3 months) and infant gender contributed to receptive communication skills, but not to expressive language skills. The birth maturity status of the group (preterm, full-term) was a predictor for words produced but not for mental development or receptive language skills. Although for mothers parenting stress pertaining to child characteristics was negatively related to the quality of teaching interaction, it was not for fathers. Perception of parenting stress by either the mother or father was not associated with any of the developmental variables. A maximum of 22% of the variance in developmental outcome was explained in any of the analyses.
McGrath, Sullivan, and Seifer (1996)	Descriptive, correlational; one observation (laboratory); part of an ongoing longitudinal study	Relationship of maternal compensatory interactive behavior (responsiveness, involvement, and control style) with child problem-solving, cognitive, and language competencies assessed in a laboratory	One hundred eighty-four mother- preschool-aged child dyads Children: 39 full term, 32 healthy premature; 28 small for gestational age; 53 sick premature; 32 premature with neurologic or medical problems Race/ethnicity: Caucasian 89%	Mothers of children in the sickest birth group had the highest involvement score. Mothers of the

Source	Design	Focus/Dependent variable	Sample description	Results
Onyskiw, Harrison, and Magill-Evans (1997)	Descriptive, correlational; one observation (home) at 12 months after the infant's discharge from the hospital; component of a longitudinal study	Relationship between parents' childhood experiences in their family of origin, current level of perceived marital support, and quality of parent teaching interaction, independently assessed for fathers and for mothers with the PCI scale. Marital support was assessed with the Dyadic Adjustment Scale (Spanier, 1976) and childhood experiences in the family of origin were assessed with the Parental Acceptance-Rejection Questionnaire (Rohner, 1986).	Sixty-six families—mother, father, and infant Singleton infants were healthy, premature infants (average gestational age 34.3 weeks at birth) or full-term infants. All but one family was White; none were recent immigrants Canada	healthiest children at birth had the lowest involvement. Maternal responsiveness involvement and control style (supportive presence and problem-solving assistance) significantly contributed to linguistic, cognitive, and problem-solving competencies, accounting for perinatal risk and maternal education. These findings support the compensatory hypothesis of maternal interactive behavior. For mothers, no relationship between childhood experiences (acceptance and warmth) and the quality of teaching interaction was identified on regression analysis. For fathers, the relationship depended on marital support. Fathers who reported less positive childhood experiences but who had a more optimal level of marital support had higher teaching interaction scores on responsiveness. Socioeconomic status was the only predictor of the quality of maternal teaching interaction.
Pridham, Schroeder, Brown, and Clark (2001)	Descriptive, correlational, longitudinal; observation on four occasions; component of a larger study	The contribution of infant birth maturity status, current weight, maternal symptoms of depression, assessed with the CES-D scale (Radloff, 1977), and the attunement of the maternal working model of feeding to maternal interaction, examined with ratings on eight dimension of responses to a focused interview and behavior, assessed with the Parent-Child Early Relational Assessment (Clark, 1999).	Ninety-nine mother-infant dyads Infants: 47 healthy full-term, 52 prematurely born; observations at 1, 4, 8, and 12 months post-term age Race/ethnicity: 93% of mothers of full-term infants were White, 92.3% of mothers of premature infants were White with the remaining mothers African American. United States	Maternal symptoms of depression, infant weight, and the attunement of the mother's internal working model of infant feeding to the infant's agendas and needs contributed significantly to maternal sensitivity and

Source	Design	Focus/Dependent variable	Sample description	Results
Schiffman, Omar, & McKelvey (2003)	Factor searching, comparison	Describe the interaction of low-income mothers and infants on a teaching task; determine differences on scores by the mother's marital status, race/ethnicity, and an age/educational level variable; and compare study mother-infant scores with the PCI national database of mothers and very young children.	156 mother-infant pairs Infant age averaged 4.6 months ($SD = 3.07$) Race/ethnicity: Approximately 75% of the mothers were Caucasian; 16.8% were African American United States	responsiveness during feeding. Mean teaching scales for mothers or infants did not differ by mother's marital status, race/ethnicity, or the age/educational level variable. The sample was most like the PCI sample of low-education adolescents and least like the PCI sample of high-education adults. The investigators note that the study infants were younger than the PCI reference sample infants and that approximately 30% of the reference sample mothers had at least 16 years of education compared to less than 1% of the study sample.
Sullivan & McGrath (1999)	Descriptive, correlational; observation on one occasion in both laboratory and home settings, a component of a longitudinal study	The relationship to maternal control style for healthy children of distal maternal characteristics (maternal education, age, occupation) and proximal characteristics (maternal responsiveness and involvement).	184 mother-child dyads Child: mean age 4 years Race/ethnicity: 89% Caucasian United States	Maternal control style (i.e., redictive, authoritative, or inconsistent) was better predicted by observed or reported characteristics of interaction (maternal responsiveness, involvement with the child, and self-esteem) than by personal attributes (e.g., maternal age, education, and occupation).
Taubenheim (1981)	Descriptive; observation on three occasions	The bonding behavior and attitudes of first-time fathers the first, second, and third days after the birth of a healthy term infant.	10 fathers and their newborn infants Race/ethnicity: Caucasian United States	The three fathers with the highest number of bonding behaviors fed their newborns when brought into the mother's room for feeding in the postpartum period, whereas the three fathers with the lowest

Source	Design	Focus/Dependent variable	Sample description	Results
Tilokkulchai, Phathanasirirwet-hin, Vichitsukon, & Serisathien (2002)	Descriptive; one observation	Attachment behaviors by mothers during first neonatal intensive care unit (NICU) visit with their low-birth-weight premature infants.	30 mother-premature newborn infant dyads Thailand	<p>number of bonding behaviors did not.</p> <p>During their first visit with infants in the NICU, all mothers demonstrated most attachment behaviors assessed with investigator-developed Maternal Behaviors Observation Guidelines. Guidelines were used for verbal and nonverbal behaviors.</p>

HOME, Home Observation for Measurement of the Environment; PCI, Parent–Child Interaction; SD, standard deviation.

Intervention Model Studies

Table 2

Source	Design	Focus/Dependent variable	Sample description	Results
Anderson (1981)	Experimental/ pre-/post-test design; three groups	Effect on maternal reciprocity of an intervention for familiarizing mothers with infant capabilities and characteristics. Reciprocity measured with the AMIS attachment scale (Price, 1983) at 1 and 10–12 days postpartum. Group 1 observed administration of the Brazelton Neonatal Behavior Assessment Scale and were told their infants' responses; Group 2 was given explanations of Scale items and their infants' responses but did not observe them; Group 3 (control) received instruction on infant furnishings.	Thirty mother–newborn dyads, 10 in each group Infants: healthy, term, 1–12 days old Mothers: all Caucasian United States	Mothers in Group 1 who were both shown and told about their infants' capabilities and individual characteristics scored higher on reciprocity from pre- to post-test than the control group. Similar results were obtained for infant responsiveness.
Bamard, Booth, Mitchell, and Telzrow (1988)	Quasi-experimental, longitudinal; three intervention approaches	Effect on infant development, maternal and infant feeding, and teaching interaction (Parent-Child Interaction [PCI] scales), and Home Observation for Measurement of the Environment (HOME; Caldwell & Bradley, 1984) of the three interventions provided during the infant's first 3 months (Nursing Parent and Child Environments, Nursing Support of Infants' Biobehavior, and Nursing Standard Approach to Care).	One hundred eighty-five mother–infant dyads (169 in newborn period, 153 at 3 months, 118 at 10 months, 58 at 24 months) United States	No maternal or infant differences were found by intervention group for feeding or teaching interaction at either 3, 10, or 24 months. Mothers' scores for both teaching and feeding declined between 3 and 10 months. Teaching scores improved by 24 months, HOME score did not differ by intervention group but improved between 10 and 24 months. Across groups, feeding scores were higher for mothers without family problems, suggesting a moderating effect of family conditions on maternal feeding behavior. Effects of sample attrition not discussed.
Benzies, Magill-Evans, Harrison, MacPhail, and Kimak (2008)	Secondary analysis of pre-/ post-test data from a randomized clinical trial (RCT, Magill-Evans, Harrison, Benzies, Gierl, and Kimak, 2007) of a parenting education program for fathers	Exploration of demographic predictors of improvement in fathers' teaching interaction skills from 5 to 10 months, shown by the PCI teaching scale, administered twice.	Eighty-one father–infant dyads Infants: 5 and 8 months Fathers: primarily European Canadian	Controlling for baseline (5-month) PCI teaching scores, demographic variables (father's age, education, marital status) did not predict interactions at 8 months. The authors concluded that further research is needed to identify fathers who will benefit from the program.
Carson and Virden (1984)	Quasi-experimental, post-test only; control and two experimental groups.	Effect of the Carter-Jessop (1981) prenatal attachment intervention administered by public health nurses, compared with relaxation techniques and to usual care on attachment behaviors 2–16 days postpartum.	Sixty-nine mother–newborn dyads Mothers: 42% Caucasian; 44% Black; 14% other ethnicity United States	Unlike the earlier Carter-Jessop study, treatment groups did not differ either on attachment indicators or by parity. Investigators suggest differing results reflect the influence of ethnicity/culture on a mother's style of interaction.

Source	Design	Focus/Dependent variable	Sample description	Results
Carter-Jessop (1981)	Replication of Carter-Jessop (1981) Quasi-experimental, post-test only; two groups	Effect of a prenatal attachment intervention received 1 to 3 times during the third trimester at 1- to 2-week intervals (feeling for baby's parts and checking position daily, increasing awareness of fetal activity, and massaging the mother's abdomen), compared with usual care, on early postpartum attachment behaviors assessed with an investigator-developed instrument.	Ten mother-newborn dyads (5 per group) Mothers: Caucasian United States	Mothers who received the prenatal attachment intervention had a higher frequency of attachment behaviors on the postnatal attachment test than controls.
Dhigo (1998)	Quasi-experimental, pre-/post-test; two treatment groups and one control group	Effect on infant crying (colic) of an individualized counseling and educational intervention designed to increase sensitivity to cues and responsiveness to distress. The intervention was formulated from one pretreatment administration of PCI feeding scales and a diary of crying and daily activities. Group 1 received empathy and supportive follow-up; Group 2 received education and counseling; Group 3—control. Randomization to group not clear. Mean time between pre/post-test was defined by length of time diary was kept: Group 1, 6.0 days; Group 2, 4.3 days; Group 3, 6.4 days.	Twenty-three parent-infant dyads (8 Group 1, 6 Group 2, 9 control) Infants: healthy, full term, less than 3 months Mostly Caucasian United States	Feeding scores were lower on parent responsiveness to the child's distress and on the child's responsiveness to the parent for treatment Group 2 (individualized education and counseling). The crying times of the infants in Group 2 decreased, whereas crying time did not for Group 1. Change in PCI feeding scores was not examined. The investigator suggested parent-infant interaction is a locus of both cause and treatment for infant colic.
Glazebrook et al. (2007)	Cluster RCT, with crossover design and 3-month washout; two groups (intervention and control)	Effects of a NICU parenting intervention (Parent Baby Interaction Programme [PBIP]), designed to enhance parents' observations of the infant and sensitivity to infant cues through progressive involvement in infant care. PBIP included tactile contact, discussion of infant characteristics, verbal interaction, and observation. Outcomes were parenting stress, maternal responsiveness on the Home, PCI teaching scores, and infant neurobehavioral development, assessed at 3 months post discharge.	Two hundred four mother-infant dyads (95 intervention, 109 control) Infants: very low-birth-weight Mothers: predominantly White United Kingdom	No differences were found between groups in parental stress, HOME maternal responsivity, PCI teaching scores, or infant neurobehavioral outcomes at either pre-discharge or 3 months post-discharge. Although parents were not socially or economically disadvantaged, more mothers than expected had high levels of parenting stress, and PCI and HOME scores were low, suggesting that mothers were ineffectively engaged with their infants. The investigators did not question the validity of using the PCI teaching scales to assess mother-infant interaction with preterm infants. Multivariate analysis was not used to examine the effect of parenting stress on parent-infant interaction.
Harrison, Sherrrod, Dunn, and Olivet (1991)	Quasi-experimental, post-test only; three groups	Effect of NICU teaching about infant characteristics and observation of behavior (Group 1) compared with only explanation of an assessment of infant behavior, Mother's Assessment of the Behavior of her Infant (Field, Hallock, Dempsey, & Shuman, 1978; Group 2) or routine support (Group 3—control) on mother-preterm infant	Thirty-two mother-infant dyads (10 Group 1; 10 Group 2; 12 control) Infants: healthy preterm Mothers: 66% Black United States	Total feeding score and the maternal subscale scores were highest for the mothers who received both instruction in rating behavior and

Source	Design	Focus/Dependent variable	Sample description	Results
Horowitz et al. (2001)	Longitudinal RCT; two groups (intervention, control)	Test of a coaching intervention to aid depressed mothers in being responsive to their infants through the first 18 postpartum weeks (4–8, 10–14, and 14–18). Interaction rated in the home from 5 minutes of live or video-taped observation of structured face-to-face play without toys using the Dyadic Mutuality Coding system (Censullo, Bowler, Lester, & Brazelton, 1987).	One hundred seventeen mother–infant dyads Mothers: 69% Euro-American, 7.4% each African American and Latina, 3.3% Asian or Pacific Islander, 1.6% Native American, and 4% designated as “other” United States	demonstration of infant behaviors (Group 1). These results, although not significant, suggested that the intervention had beneficial effects. Group 1 infants were clearer in cues than infants of mothers who received no instruction (control). The investigators conjectured that significant effects might have been identified if the sample had included only high-risk families, who are known to have the greatest need for support. Repeated measures analysis showed that the intervention group was higher in responsiveness than the control group. Depression was not affected by the treatment. Responsiveness increased and depression decreased over time for both groups. Group and time did not significantly interact.
Huckabay (1987)	Quasi-experimental; (pre-/post-test), two groups (intervention, control)	Effect of giving mothers a photograph of their premature infants in the NICU compared with no photograph on attachment behavior assessed with the investigator-developed Bonding Observation Check List. Pretest on Infant’s 2nd day of life; post-test end of the 4th week.	Forty mother–preterm infant dyads (20 in each group) Mothers: 47.5% Black; 32.5% Hispanic; 20% White United States	Mothers who had received a photograph of their premature infant showed more attachment behavior at 4 weeks than mothers who had not received a photograph.
Jung, Short, Letourneau, and Andrews (2007)	Quasi-experimental; (pre-/post-test); one group (intervention)	Enhancement of depressed mothers’ understanding of and response to infant behaviors using the PCI-based Keys to Caring intervention (Spietz, Johnson-Crowley, Sumner, & Barnard, 1990). Outcome assessed as change in infant’s expression of positive affect during play interaction. Mother–infant dyads videotaped prior to and after 5 weekly intervention sessions using the Still-Face paradigm (Tronick, Als, Adamson, Wise, & Brazelton, 1978). Maternal depression assessed with the Edinburgh Postnatal Depression Scale and Beck Depression Inventory.	Seventeen mother–infant dyads Infants: average age at enrollment 3.5 months. Mothers: Race–ethnicity not given Canada	Although mothers’ scores on the depression screening instruments did not change, infants showed a marked increase in interest and joy in face-to-face interaction with their mothers. The investigators concluded that intervention focused on maternal behavior during interaction with the infant instead of on how the mother feels may be an effective component of treatment for mothers who are depressed.
Kang et al. (1995)	Quasi-experimental, longitudinal. Mothers were assigned to groups based on their education: high education (HE), education (HE), education 13 years	Effect on PCI feeding and teaching interaction scores at 40 weeks postmenstrual age and at 1.5 and 5 months of age adjusted for prematurity. In hospital, mothers were randomly assigned by education (HE or LE) to either the State Modulation (SM) program concerning reading infant behavioral cues and modulating states of consciousness during feedings or to a car seat (CS) program. After hospital discharge, LE mothers in each of the two groups, SM and CS, were randomly assigned to either a home visit intervention, Nursing Systems for Effective Parenting (NSTEP-P), to improve	Three hundred twenty-seven mother–preterm infant dyads Mothers: 56% White non-Hispanic; 21% Hispanic; 16% African American; 3% Asian/Pacific Islander; 2% other United States	Although HE SM and CS groups did not differ on feeding interaction at 40 weeks postmenstrual age, the SM and CS groups differed on feeding interaction at 1.5 months. SM infants had higher scores on clarity of cues and total infant score. At 5 months, SM mothers

Source	Design	Focus/Dependent variable	Sample description	Results
	or greater) or low education (LE, education 12 years or less).	interactive competence, caregiving skills, and use of coping resources or to standard public health nurse (PHN) visits.		had higher scores on social-emotional-growth fostering, cognitive-growth fostering, responsiveness to parent, mother total, infant total, and total score. LE groups did not differ on feeding interaction scores at 40 weeks. At 1.5 months, infants in the SM/ NSTEP-P and in the SM/PHN groups had higher clarity of cues scores on feeding interaction than infants in the CS/PHN group. Total infant feeding interaction scores for SM/PHN and SM/NSTEP-P groups were higher than infants in the CS/PHN group. SM/PHN infants had higher responsiveness to parent scores during feeding than CS/PHN infants. Total infant feeding interaction scores for SM/PHN and SM/NSTEP-P infants were higher than scores of CS/PHN infants. At 5 months, SM/NSTEP-P mothers had higher sensitivity to cues and cognitive-growth fostering teaching interaction scores than mothers in the SM/PHN group. These scores as well as social-emotional-growth fostering were higher for SM/NSTEP-P mothers than for CS/PHN mothers. Mothers' average total teaching score was higher for the SM/NSTEP-P group than the SM/PHN group. In sum, effect of state modulation instruction by intervention group (NSTEP-P or PHN) depended on the interaction context (feeding, teaching) and infant age (1.5, 5 months). Infants of LE mothers who received the NICU state modulation instruction and in-home NSTEP-P instruction showed more responsive behavior during feeding at 1.5 months and more sensitivity to infant cues and developmental stimulation during teaching at 5 months.

Source	Design	Focus/Dependent variable	Sample description	Results
Lee (2006)	Quasi-experimental without randomization; nonequivalent control group pre-/post-test design; two groups; two observations; mothers in the intervention group had completed the program prior to selection of the control group	Effects of multisensory stimulation (infant massage, auditory via mother's voice, tactile/kinesesthetic via massage, and visual via eye-to-eye contact) on infant growth (weight and height) and on mother-infant interaction during play, assessed with the Mother-Infant Play Interaction (MIP) Scale (Walker & Thompson, 1982). The intervention was delivered weekly for 4 weeks. Mothers agreed to provide infant massage more than 4 days/week for 4 weeks at home. Outcomes assessed after completion of program.	Fifty-two mother-infant dyads; 26 in each group Infants: Healthy, full-term 2-6 months Mothers: Korean	Differences not found in either infant gain in weight or increase in height, but maternal interaction scores on the MIP scale were higher for the intervention group than for controls. Gain from pre- to post-test for dyadic and infant response was also greater for the intervention group.
Leitch (1999)	Experimental with random assignment; two groups; one observation	Effect on mother-infant interaction of prenatal videotaped education on infant state and communication cues and maternal alleviation of distress and growth-fostering behavior in the first 24 hours after birth, assessed with the PCI.	Twenty-nine mother-newborn dyads (14 intervention; 15 control) Infants: full term/within 24 hours of birth Mothers: race-ethnicity not described Alberta, Canada	Mothers who had viewed the video tape scored higher than control group mothers on the PCI maternal total teaching score, particularly on sensitivity to cues and social-emotional growth-fostering behaviors and on contingency of response. Infants in the experimental group scored higher on the child total teaching score.
Macke (2001)	Quasi-experimental; pre-/post-test; two groups (analgesia and placebo)	Effect of a pain-reducing intervention during and after circumcision on mother-infant feeding interaction assessed with the PCI. Infant pain assessed by investigator observation (percent of time crying and heart rate) during and following the circumcision.	Sixty mother-infant dyads (29 analgesia, 31 placebo) Infants: Male, full term Mothers: 90% White United States	Pain distress increased for all infants during circumcision. Feeding scores for infants in both groups were lower after circumcision. However, infants in the analgesia group decreased less in clarity of cues and responsiveness, and overall their scores were higher. Analgesia group mothers increased in social-emotional-growth fostering behaviors.
Magill-Evans et al. (2007)	RCT with two groups (intervention and control)	Effect of video-taped self-modeling and feedback, using the Keys to Caregiving program on father-infant interaction (PCI) and father self-efficacy. Intervention administered at 5 and 6 months by a home visitor. PCI assessed at 8 months; self-efficacy at 5 and 8 months. Self-efficacy was assessed with the Parenting Sense of Competence Scale (Johnson & Mash, 1989).	One hundred sixty-two father-infant dyads, 81 in each group Infants: Healthy, full term Fathers: most European Canadian Canada	Fathers in both groups reported increased competence in parenting over time. Fathers in the intervention group increased their skill in fostering the infants' cognitive growth and maintained their sensitivity to infant cues from 5-8 months. Control group fathers' scores on the same scales, on average, declined. The groups did not differ on fostering infant social-emotional-growth or on self-efficacy.

Source	Design	Focus/Dependent variable	Sample description	Results
Melnyk et al. (2006)	RCT two groups (intervention and comparison)	Evaluation of the efficacy of an educational-behavioral intervention (Creating Opportunities for Parent Empowerment [COPE]) designed to enhance parent-infant interactions and parent mental health. Audio-taped and printed infant-behavior and parent-role information delivered to parents in four phases. Phase I, 2-4 days after NICU admission, characteristics of the infant. Phase II, 4-8 days after admission, infant cues of readiness for interaction. Phase III, 1-4 days before discharge, best times for interaction, developing positive parent-infant relationship. Phase IV, at home 1 week after discharge, positive parent-infant relationship. Beliefs about the infant were rated on the Parental Belief Scale: NICU, developed by the investigators. The Melnyk Index of Parental Behavior in the NICU (IPBN) used to assess quality of interaction.	Two hundred sixty families; mothers: 147 COPE, 113 comparison/fathers: 81 COPE, 73 comparison Infants: Preterm no handicapping conditions Mothers and fathers: race-ethnicity: 67.4% White, not Hispanic; 22.5% Black, not Hispanic; 10.1% other (Hispanic, American Indian, other) United States	IPBN factors measured: (a) positive interaction with the infant in a quiet alert state; and (b) altering the environment and interaction with a stressed infant. Before discharge, relative to the comparison group, COPE parents were rated by blinded observers as having more positive interactions with their infants and scored higher on observer-rated 1-item scales concerning overall appropriateness of parent interaction, involvement in physical care, and sensitivity to the needs of the infant, and reported more positive beliefs about their infants and their parental roles. In addition, COPE fathers were more involved in infant care and more sensitive to infant needs than comparison group fathers. COPE mothers were lower in state anxiety and depressive symptoms than comparison mothers at 2 months infant age corrected for prematurity.
Melnyk, Crean, Feinstein, and Fairbanks (2008)	Secondary data analysis of an RCT with a treatment and placebo control	Test of a theoretical model of the influence of an educational-behavioral intervention program, COPE on the anxiety and depression of mothers 2 months after discharge of their premature infants from the NICU. The IPBN was used to rate interaction in the NICU (see Melnyk et al., 2006).	Two hundred forty-six mothers of low-birth-weight preterm infants Infants: observed in interaction in NICU Mothers: race-ethnicity: Percent for COPE and Control mothers, respectively—White not Hispanic 90.1, 64.2; Black not Hispanic 22.6, 22.9; Hispanic 3.6, 3.7; other 3.6, 9.2	Mothers who had participated in the COPE program had higher mother-infant interaction scores and fewer symptoms of postpartum depression and anxiety scores. COPE had a direct effect on interaction; socioeconomic status was a covariate. Interaction did not have a relationship with mothers' posthospital symptoms of depression and anxiety. The COPE effect on these symptoms operated through the mediation of mothers' beliefs about what to expect in their infants and their ability to care for their infants.
Norr, Roberts, and Freese (1989)	Quasi-experimental, three-group comparison; one observation	Comparison of maternal attachment behaviors during infant feeding 2-3 days after delivery for: (a) mothers receiving rooming-in, (b) mothers requesting rooming-in but not receiving it, and (c) mothers not having an opportunity for rooming in.	One hundred ninety mother-infant dyads (80 Group 1; 72 Group 2; 35 Group 3) Infants: Healthy, full term Mothers: 83-86% African American USA	Rooming-in group mothers had higher attachment scores than the other two groups, accounting for maternal age, perinatal conditions (episiotomy or lacerations, epidural anesthesia), infant contact at

Source	Design	Focus/Dependent variable	Sample description	Results
Pridham et al. (2005)	Quasi-experimental, longitudinal; pre- and post-test; two groups	Effect of guided participation (GP) compared with standard care (SC) on premature infant and maternal social-emotional and task-related feeding competencies assessed with the Parent-Child Early Relational Assessment at 1, 4, 8, and 12 months post-term age. GP focused on expectations and intentions for the relationship with the infant. The infant's health status, estimated by bronchopulmonary dysplasia diagnosis, family poverty status, and mother's depressive symptoms were treated as covariates in the fixed effects model.	Forty-two mother-infant dyads (24 GP, 18 SC) Infants: premature, extremely-low-birth-weight (<1,000 g). Mothers: 55% African American; 38% Euro-American; 7% Asian or Latina United States	delivery, and time of feeding observation. Younger mothers gained more in attachment behaviors from rooming-in than older mothers. Benefit of GP for mothers and infants was shown by greater competency in regulating negative affect and behavior during feeding at one or more times in the first year, age adjusted for prematurity. Specifically, infants in the GP group were higher on regulation of negative affect and behavior than SC infants at 1 and 8 months. Mothers in the GP group were higher on regulation of negative affect and behavior at 4 months. A moderating relationship of depressive symptoms with maternal competencies in regulating negative affect and behavior during feedings was demonstrated at 8 months.
Schroeder and Pridham (2006)	Quasi-experimental, longitudinal; two groups (intervention, comparison).	Effect of guided participation (referred to as guided learning, GL) compared with standard care teaching (SCT) on mothers' competencies in relating to their premature infants in the NICU. GL delivered weekly for 6 weeks beginning at 30 weeks gestational age. Relationship competencies were assessed with a 27-item observational checklist, the Relationship Competencies Assessment, to describe being with the baby and knowing and relating to the infant as a person. Mothers were interviewed at 29 weeks postmenstrual age (study baseline) and at each of the 6 study weeks with a video-assisted interview for attunement and adaptiveness of their internal working model of parenting.	Sixteen mother-infant dyads (8 GP; 8 SC) Infants: Premature, very low birth weight (<1,500 g) Mothers: 75% White; 1 each African American, Asian, Latina, and Native American United States	Relationship competencies increased to a higher level and at a greater rate for GP mothers than for mothers receiving SC. The internal working models of parenting observed in GL mothers were more attuned and adaptive to their infants' needs. Although GL mothers did not make greater gains in attunement and adaptiveness than SCT mothers, GL mothers made a consistent gain with time and demonstrated almost all of the 27 relationship competencies, compared with about two-thirds of the relationship competencies for the SCT mothers. Furthermore, GL mothers' relationship competency scores increased to a higher level and at a greater rate than scores for SCT mothers.
White-Traut & Nelson (1988)	Quasi-experimental; two treatment groups,	Effect on feeding interaction of (a) massage (maternal tactile-vestibular stimulation) compared with (b) maternal talking or singing, and (c) routine care. Groups 2 and 3 received instruction on	Thirty-three mother-infant dyads (11 per group) Infants: Premature Mothers: 94% African American United States	Mothers in the massage group showed more sensitivity to infant cues and cognitive-growth fostering behavior than

Source	Design	Focus/Dependent variable	Sample description	Results
	one control group; one observation	infant clothing. Mother-infant interaction assessed with the PCI prior to NICU discharge.		mothers in the other two groups. Infant clarity of cues and responsiveness did not differ by group.

NICU, neonatal intensive care unit.