The Effect of Maternal Depressive Symptoms and Early Maternal Feeding Behavior on Later Infant Feeding Behavior

Lisa F. Brown, PhD, RN and **Karen Pridham, PhD, RN**

Virginia Commonwealth University, School of Nursing, Richmond, VA; and University of Wisconsin-Madison School of Nursing, Madison, WI.

Abstract

Adaptive maternal feeding behaviors are sensitive and responsive to the infant and support the infant's participation in feeding. Adaptive infant behaviors help the infant to participate in the feeding within developmental capacities and to interact in a positive manner with the mother. Therefore, the purpose of this study was to explore the contribution of the adaptiveness of early maternal feeding behavior to the adaptiveness of later infant feeding behavior, accounting for maternal depressive symptoms and neonatal health. Thirty-seven premature infants and their mothers were assessed in the special care nursery just before discharge and in their homes at 4 months postterm age. The adaptive quality of maternal and infant behavior was assessed using the Parent-Child Early Relational Assessment. Maternal depressive symptoms were assessed using the Center for Epidemiological Study–Depression Scale. Infant health was assessed using the Neonatal Health Index. Linear regression analyses revealed that the adaptiveness of maternal feeding behavior before special care nursery discharge contributed significantly to the adaptiveness of infant feeding behavior at 4 months postterm age, accounting for neonatal health and maternal depressive symptoms. Although further study of the relationship is needed, findings support development of interventions to enhance the adaptiveness of mothers' early feeding behaviors.

Keywords

Feeding is one of the primary settings of interaction for mothers and their very young premature infants and of the infant's formation of an attachment relationship. During feeding, infants begin to construct internal working models of the self, mother, and the mother-infant relationship. When infants' signals for protection, nurturance, or comfort are recognized and responded to appropriately and consistently, they develop positive expectations about their mothers' present and subsequent availability and responsiveness.[1,2] These expectations support the infant in feeding adaptively and interacting more effectively with their mothers. However, the individual mother's psychological condition, in particular,

Address correspondences to Lisa F. Brown, PhD, RN, Virginia Commonwealth University, School of Nursing, P.O. Box 980567, Richmond, VA 23298-0567..

symptoms of depression, may affect her ability to consistently read and respond sensitively and responsively to her infant's signals.[3] Furthermore, the immature neuromotor system of premature infants makes it difficult for them to process stimuli and manage the stimulation of feeding and interaction appropriately.[4,5] The preterm infant's health in the neonatal period, including respiratory problems and the residuals of intraventricular bleeds, may interfere with sensory-motor functions that are important for feeding and interaction.

Transition to home from a special care nursery (SCN) is difficult for both mothers and infants. Feeding interactions before this transition can often set the stage for how competent and adaptive a mother believes she can be in caring for her preterm infant after discharge. Little study of the relationship of early maternal feeding behavior with later infant feeding behavior has been done. The purpose of this study was to explore the contribution of the adaptiveness of a premature infant's feeding behavior at 4 months postterm age (PTA) to the adaptiveness of very early maternal feeding behavior, accounting for maternal depressive symptoms and the premature infant's health.

Background

Adaptive Feeding Behavior

Adaptive maternal feeding behavior is characterized by warmth in the mother's tone of voice; positive affect; gentleness and warmth in her physical contact; her sensitivity to infant signals for protection, nurturance, and comfort; her responsiveness to infant behaviors; the mirroring she does of the infant's feelings; and her ability to structure and mediate the infant's feeding environment. The mother's adaptive feeding behavior is also evident in avoidance of anger, hostility, or displeasure; her lack of harsh or abrupt physical contact; and the absence of maternal rigidity, intrusiveness, inconsistency, or unpredictability.[6-10]

The adaptiveness of maternal feeding behaviors that an infant experiences may influence the adaptiveness of an infant's later feeding behavior through the expectations of the mother's feeding behavior that the infant develops. Through repeated interactions with the mother, the infant begins to develop a "process-oriented map" of how feeding exchanges are expected to operate.[11] More simply, the infant comes to know the behaviors of the mother during feeding and, over time, the responses to these behaviors because of the previous experiences and mutually developed expectations.

Adaptive infant feeding behavior is organized and regulated in a manner that supports participation in the feeding within the limits of developmental capacities, pleasurable interaction with mother, and intake of adequate nutrients. Specifically, for the infant, adaptive social-emotional and task-related feeding behavior is characterized by organization of the motoric system, state of arousal, and regulated emotional and motoric responses. Infants whose feeding behavior is adaptive have good muscle tone throughout the feeding. They are alert and seek eye contact with their mothers. If upset, these infants are easily soothed; and they give clear cues during the feeding.[10,12,13]

Infant and Maternal Conditions That Contribute to Adaptive Feeding Behavior

Maternal Depressive Symptoms—A mother's symptoms of depression can negatively influence her interactive behaviors with her infant.[3,14-16] These symptoms may include a depressed mood, sleep and appetite disturbances, a sense of guilt, and feelings of worthlessness and hopelessness. The risk for depression of mothers of premature infants is likely to be high, both at the time of the infant's discharge from hospital and through the first postterm year. Researchers found that at the time of hospital discharge of technology-dependent or medically fragile infants, 45% of the mothers had scores on the Center for Epidemiological Study–Depression (CES-D) Scale that indicated risk for depression. Twelve months later, 36% of these mothers had CES-D scores indicating high risk for depression.[17] Poehlmann and Fiese[15] found that even subclinical depressive symptoms in the mother at 12 months PTA of the infant may have an effect on mother-infant interaction regardless of whether the infant was preterm or full-term.

Research has shown links between a mother's depressive symptoms and infant feeding behavior.[18] Clinically depressed mothers, when compared with nondepressed mothers, were less sensitive to their infants during feeding. Nondepressed mothers were found to be more available, accepting, responsive, and affectionate toward their infants. These mothers also had infants who were more adequately nourished and more competent in social interactions than the infants of mothers who were depressed and demonstrated decreased sensitivity.[18]

Infant Health—The premature infant's health at birth and in the neonatal period puts them at risk for less adaptive social-emotional and task-related feeding behavior.[6] These conditions include both immaturity- and prematurityrelated medical problems that are likely to interfere with the organization and regulation of infant behavior as well as advancement to being fed by the mother. Infants must be able to master internal regulation of physiological systems before a dyadic quality is possible in their interactions. Singer and her colleagues[19] found full-term infants to be more responsive and give clearer cues than premature infants during the first year of life. Premature infants who experience more health complications at birth typically exhibit more interactional difficulty through the first postterm year than infants with fewer medical complications such as periventricular leukomalacia, bronchopulmonary dysplasia, and acute respiratory disease.[19-21]

Methods

This short-term longitudinal study examined the contribution of maternal feeding behavior with their premature infants from the time of transfer of caregiving responsibility to infant feeding behavior through the first 4 postterm months. Both infant health and maternal depressive symptoms were controlled for in the analysis of the interactions. Human subject approval was received from the academic center and participating hospital institutional review boards for the study protocol and consent form before initiation of the study.

Participants

Mothers were recruited from three SCNs in the Midwest. Registered nurses obtained permission from eligible mothers for the investigator to contact them. The inclusion criteria

for the mothers were 17 years or older and the ability to speak and read English. Inclusion criteria for the infants were 35 weeks gestation or less, appropriate weight for gestational age, no major congenital malformations, and no known drug exposure. Infants with an intraventricular bleed of greater than grade II were not included.[22,23] Both breastfeeding and bottlefeeding mothers were included. Although one mother attempted to exclusively breastfeed, she, as well as other mothers who breastfed, also bottlefed the infant at times with either formula or breast milk.

Procedure

Staff nurses approached the mothers to find out if they were interested in learning about the study. After the mothers indicated an interest in learning more about the study, the investigator contacted the mothers in person and explained the study. Twenty-four to 48 hours later, the investigator contacted the mothers again to obtain informed consent. The first visit took place in the hospital; and the next visit, at approximately 4 months, took place in the home. During the first visit, the mothers were asked to fill out the demographic questionnaire; and then mother and infant were videotaped during a feeding interaction. After the feeding, the mother was asked to fill out the CES-D Scale; and arrangements were made for the next visit. The second visit took place in the home. The mothers were contacted by phone about a week before the 4-month home visit, and arrangements were made for the investigator to visit. The procedure for data collection was the same for both visits. Mothers were instructed to feed their infants as usual, and the entire feeding interaction was videotaped.

Measures

Adaptiveness of Maternal and Infant Feeding Behaviors—The adaptiveness of maternal and infant feeding behaviors were measured from video recordings using the Parent-Child Early Relational Assessment (PCERA).[10,24] The PCERA is a 65-item observational rating scale that was designed to assess the amount, duration, and intensity of feeding behavior, assessed comprehensively in terms of social-emotional and task-related qualities. These qualities capture the major features of mother-infant interaction identified in the literature.[8,25] Each item is rated on a five-point ordinal scale, with "5" indicating behavior that is adaptive in quality and "1" indicating behavior that is maladaptive; "3" indicates behavior of some clinical concern.

Clark identified six scales (two maternal, two infant, and two dyadic) consisting of PCERA items on theoretical grounds and factor analysis of data obtained from mothers and healthy infants during feeding at 4 months of infant age.[7,8] Clark demonstrated discriminate validity of the PCERA scales by comparing healthy and high-risk dyads.[8,24,25] The α coefficients for a sample of 54 premature infants and their mothers were reported to range from .92 to .94 for the maternal scales and .85 to .91 for the infant scales across the first postterm year, at 1, 4, 8, and 12 months.[26]

Four of the PCERA scales identified by Clark were used in this study. Two of these scales assess the mother's adaptive feeding behavior, and two scales assess the infant's adaptive feeding behavior. The first of the two scales for mothers' interactive behavior includes 16

items and is labeled Positive Affective Involvement and Sensitivity/Responsiveness (PAISR). Items in this scale include sensitivity and responsiveness to the infant's cues, warmth and kindness of tone of voice, expression of positive affect and enjoyment, competence in structuring and mediating of the environment to support nutrient intake and a positive feeding experience, visual regard, and mirroring of the infant's feelings. The second scale includes 14 items and concerns the mother's Regulation of Affect and Behavior (RAB). Items included in this scale describe how competently a mother structures a feeding, mediates the infant's feeding environment, and provides a positive and well-regulated social-emotional experience for her infant. Items in the RAB scale also describe a mother's sensitivity and responsiveness to her infant and her curtailment of such behaviors as talking with an angry tone of voice, expressing a negative attitude toward the baby, behaving intrusively, handling the infant roughly or abruptly, and responding inflexibly.

Two PCERA scales were used in this study to describe infant adaptive feeding behavior. The first scale, Infant Positive Affect, Communication, and Social Skills (IPACS), includes 12 items to rate the quality of attention, motoric and communicative skills, social initiative, and responsiveness. The second scale, Infant Regulation of Affect and Behavior (IRAB), includes 11 items for describing the infant's expression of negative affect, fearfulness or tension, irritability, soberness, avoiding or averting behavior, attention to feeding, and interest in the environment.

A trained coder who was blind to the study hypotheses and who did not know the families coded 100% of the videotapes. To determine intercoder reliability, the first investigator, who was trained to 80% reliability in coding PCERA items, independently coded a random sample of 20% of the videotapes. After intercoder agreement had been assessed, discrepancies in coding were discussed; and a consensus coding was obtained. Interrater reliability, assessed on a three-point scale (1 or 2 = area of concern; 3 = some concern; 4 or 5 = area of strength), was 84% for PAISR, 82% for RAB, 79% for IPACS, and 80% for IRAB. Pearson r, for exact agreement in coding of items, averaged 0.89, with a range of 0.74 to 1.0 for PAISR; 0.86, with a range of 0.72 to 1.0 for RAB; 0.66, with a range of 0.20 to 1.0 for IPACS; and 0.70, with a range of 0.5 to 1.0 for IRAB. κ was 0.72, with a range of 0.27 to 1.0 for PAISR; 0.70, with a range of 0.25 to 1.0 for RAB; 0.56 with a range of 0.13 to 1.0 for IPACS; and 0.60, with a range of 0.15 to 1.0 for IRAB. The α coefficients for the four scales, each assessed twice, were as follows: (*a*) PAISR, .96 and. 97; (*b*) RAB, .93 and . 95; (*c*) IPACS, .85 and .89; and (*d*) IRAB, .88 and .89.

Symptoms of Depression—A mother's symptoms of depression were measured using the CES-D Scale.[27] The CES-D Scale is widely used in epidemiological studies and has been validated against psychiatric interviews standardized with research diagnostic criteria.[28] This scale includes 20 items designed to measure current levels of depressive symptoms. The items include depressive mood, feelings of guilt and worthlessness, feelings of helplessness and hopelessness, loss of energy, and disturbances of sleep and appetite.[28,29] Using a four-point scale, respondents rate the frequency, over the past week, of symptoms ranging from "rarely or none of the time" to "most or all of the time." A total score is calculated by summing the score for all items and ranges from 0 to 60. A higher score

indicates more depressive symptoms. A score of 16 or higher is indicative of clinical depression.[28]

Acceptable reliability and concurrent and predictive validity of the CES-D Scale have been demonstrated for populations with a wide variety of demographic characteristics, including age, education, geographic area, racial, ethnic, and language groups.[28] Test-retest reliability, internal consistency, and concurrent validity have been supported in several studies with a community-based sample.[27,30-32] The CES-D Scale has also been used in clinical and epidemiological research with mothers of infants and young children[33-36] and has been shown to be valid and reliable during the postpartum period.[37,38] The α coefficients for the CES-D Scale administered to a community sample have been reported as .80 or higher. The α coefficients for this study were .85 and .84 for the two administrations.

Infant Health—The Neonatal Health Index (NHI) was used to assess the infant's health.[15,39] The NHI is designed to summarize birth status and the prior medical course of high-risk infants at the time of hospital discharge. One point is given for each of the following neonatal conditions identified from audit of the infant's medical record: (*a*) birth weight of less than 1000 grams; (*b*) 5-minute Apgar score of less than 8; (*c*) hospitalization of more than 1 month; (*d*) tracheal intubation; (*e*) grade I intraventricular hemorrhage at birth or greater; and (*f*) experience of apnea, bradycardia, or bronchopulmonary dysplasia. In a study by Poehlmann and Fiese,[15] 90% of full-term infants obtained health scores of 0 or 1; and 68% of premature infants received a score of 4 or 5. In this study, 44% of premature infants had a score of 4 or greater. Descriptive statistics for all study variables are shown in Table 1.

Analysis

The Statistical Package for the Social Sciences 14 (SPSS Inc, Chicago, IL) was used for all analyses. Linear regression analyses were used to examine the effect mother's early feeding behavior (PAISR and RAB) had on later infant feeding behavior (IPACS and IRAB), accounting for CES-D scores, averaged across the two administrations, and neonatal health. Two regression models were used, one for each of the dependent variables, IPACS and IRAB, each assessed at 4 months. For both models, the covariates CES-D and NHI were entered into the analysis first. Afterward, the independent variables (PAISR and RAB) were regressed on the infant feeding variables, accounting for the contribution of the covariates. Whether one or both maternal feeding variables (PAISR and RAB) were entered into the model would depend on the collinearity between these two variables. One model for each of the dependent variables was designed for examination of the contribution of the maternal feeding variables at SCN discharge ($PAISR_{predischarge}$ and $RAB_{predischarge}$).

Results

Sample Characteristics

Of the 43 mothers recruited to the study, 37 mother-infant dyads completed all data collection sessions. This sample was relatively homogenous in race/ethnicity and income. Seventy-two percent of the sample was European American, and 49% had a family income

of $55000 or more a year. The average age of mothers at entry to the study was 29 years (SD = 6.9), the average age at birth for infants was 30 weeks (SD = 3.1), and the average weight for the infant was 1591 grams at birth (SD = 604). Demographic characteristics and attributes of mothers and infants are shown in Tables 2 and 3, respectively.

Regression Analyses

The correlation of the two independent variables, PAISR and RAB, was examined to determine the structure of the regression model for each of the two dependent variables, IPACS and IRAB. Because the correlation of PAISR and RAB was high at SCN discharge ($r = 0.77$, $P < .001$), only one of the two maternal variables was selected for each regression model. Because a mother's positive affect could be expected to support an infant's development of communicative and social skills, PAISR was included in the regression models for IPACS. A mother's regulation of affect and behavior and structuring of the feeding could be expected to support an infant's development of a regulated pattern of feeding; and therefore, RAB was included in the regression models for IRAB.

Maternal Behavior at Predischarge in Relation to Infant Behavior at 4 Months

—Mother's adaptive feeding behavior (PAISR) just before discharge was significantly related to infant adaptive feeding behavior (IPACS) at 4 months PTA, accounting for NHI and CES-D, F(3,36) = 6.87, $P < .05$, $R^2 = 0.38$. However, the β coefficients for the covariates did not contribute to the variance when added to the model ($\beta = -.13$ for infant health and $\beta = -.09$ for maternal depressive symptoms averaged over the two assessment periods).

Mother's adaptive feeding behavior (RAB) just before discharge was significantly related to infant adaptive feeding behavior at 4 months PTA, accounting for NHI and CES-D, F(3,36) = 4.53, $P < .05$, $R^2 = 0.29$. However, the β coefficients for the covariates did not contribute to the variance when added to the model ($\beta = -.39$ for infant health and $\beta = .19$ for maternal depressive symptoms averaged over the two assessment periods). Complete results from the regression analysis are shown in Table 4.

Discussion

In this study, a model of the association of maternal adaptive feeding behavior at earlier feedings with infant adaptive feeding behavior at later feedings during the first 4 postterm months, controlling maternal depressive symptoms and infant health, was examined. Findings were consistent with those of previous researchers who reported that maternal behavior during play at 3 months was associated with infant behavior at 12 months.[40] This study gives further support to the idea that early maternal behaviors are related to later infant behaviors. Specifically, this study demonstrated that the quality of maternal feeding behavior as early as prehospital discharge was related to the quality of infant feeding behavior at 4 months. This finding was demonstrated for both IPACS and IRAB. Both types of maternal feeding behaviors examined, PAISR and RAB, were associated with the adaptiveness of maternal feeding behavior.

The finding of a contribution of maternal feeding behavior as early as just before SCN discharge to infant feeding behavior at 4 months adds new knowledge concerning longitudinal relationships to the literature of feeding interaction for mothers and their premature infants. Theorists have suggested that early patterns of mother-infant interaction may be particularly critical, either for the patterns of infant behavior that are engendered or for the pattern of maternal behavior that establishes the pattern of infant behavior or both.[1,2,11,41] The contribution found in this study of maternal adaptive feeding behaviors assessed at SCN discharge to infant adaptive feeding behaviors at 4 months provides support for very early assessment of maternal feeding behaviors. Future studies could examine how early infant feeding behavior contributes to later maternal feeding behavior. This study would extend knowledge of the contribution of infant behavior to maternal behavior over time and provide additional information for the identification of dyads at risk for interactional difficulties. The findings of this study indicate directions for refinement and development of the theoretical model as well as refinement and development of measures. This study did not show a relationship between the study dependent variables and either infant health or maternal depressive symptoms. The measure of infant health may need to be more specific and allow for scoring of items on an ordinal scale rather than for dichotomous scoring, which is the case with the NHI used in this study.

Maternal depressive symptoms were relatively low for this sample, and the relationship with the infant feeding variables may not have been adequately tested. Maternal depressive symptoms may not be the most useful concept to include as a maternal condition that potentially contributes to the adaptiveness of infant feeding behavior. Mothers may compensate for symptoms of depression in their feeding affect and behavior, especially when caring for a premature infant who they understand to be vulnerable and in need of their attentiveness to feeding and nutrient intake. Researchers have found both maternal depressive symptoms and anxiety were related to decreased maternal sensitivity for mothers of healthy newborns.[42] Research is needed to assess the relationship between anxiety and the adaptiveness of infant feeding behavior as well as between depressive symptoms and the adaptiveness of infant feeding behavior with a more heterogeneous sample.

Several limitations in the study design need to be addressed in future studies. The results are limited because they may be generalized only to mother-infant dyads with the same characteristics as the sample of this study. Use of another instrument in addition to the PCERA to describe the adaptiveness of infant behavior would strengthen the study of the relationship of the mother's behavior with the infant's behavior. Despite study limitations in sample size and in measures used, this study fills a gap in the literature and generates questions for future research. Study findings indicate that early assessment of the adaptiveness or maladaptiveness of maternal feeding behavior could help nurse researchers and clinicians to design and target intervention specifically to mother-infant dyads who are at risk for less adaptive feeding behavior.

References

1. Bowlby, J. A secure base: parent-child attachment and healthy human development. Basic Books; New York (NY): 1988.

2. Bowlby, J. Attachment and loss. 2nd ed. Basic Books; New York: 1982.

3. Coyl D, Roggman L, Newland L. Stress, maternal depression, and negative mother-infant interaction in relation to infant attachment. Infant Ment Health J. 2002; 23:145–163.

4. Als H, Gilkerson L. Developmentally supportive care in the NICU. Zero Three. 1995; 15:2–10.

5. Als, H. Reading the premature infant. In: Goldson, E., editor. Developmental intervention in the neonatal intensive care nursery. Oxford University Press; New York (NY): 1999. p. 18-85.

6. Barnard K, Bee H, Hammond M. Developmental changes in maternal interactions with term and preterm infants. Infant Behav Dev. 1984; 7:101–113.

7. Clark R. The parent-child early relational assessment. A factorial validity study. Educ Psychol Meas. 1999; 59:821–846.

8. Clark R, Hyde JS, Essex MJ, Klein MH. Length of maternity leave and quality of mother-infant interactions. Child Dev. 1997; 68:364–383. [PubMed: 9180007]

9. Tomlinson M, Cooper P, Murray L. The mother-infant relationship and infant attachment in a South African peri-urban settlement. Child Dev. 2005; 76:1044–1054. [PubMed: 16150001]

10. Clark, R. Early parent-child relationship assessment. University of Wisconsin-Madison; Madison (WI): 1985.

11. Schore AN. Attachment and the regulation of the right brain. Attach Hum Dev. 2000; 2:23–47. [PubMed: 11707891]

12. Thoyre S. Living with illness. Techniques for feeding preterm infants. Am J Nurs. 2003; 103:69, 71, 73.

13. Thoyre SM, Carlson JR. Preterm infants' behavioural indicators of oxygen decline during bottle feeding. J Adv Nurs. 2003; 43:631–641. [PubMed: 12950569]

14. Field T. Maternal depression effects on infants and early interventions. Prev Med. 1998; 27:200–203. [PubMed: 9578995]

15. Poehlmann J, Fiese BH. The interaction of maternal and infant vulnerabilities on developing attachment relationships. Dev Psychopathol. 2001; 13:1–11. [PubMed: 11346045]

16. Field T. Early interactions between infants and their postpartum depressed mothers. Dev Psychopathol. 2002; 7:517–522.

17. Miles MS, Holditch-Davis D, Burchinal P, Nelson D. Distress and growth outcomes in mothers of medically fragile infants. Nurs Res. 1999; 48:129–140. [PubMed: 10337844]

18. Valenzuela M. Maternal sensitivity in a developing society: the context of urban poverty and infant chronic undernutrition. Dev Psychol. 1997; 33:845–855. [PubMed: 9300217]

19. Singer LT, Fulton S, Davillier M, et al. Effects of infant risk status and maternal psychological distress on maternal-infant interactions during the first year of life. J Dev Behav Pediatr. 2003; 24:233–241. [PubMed: 12915795]

20. DeWitt SJ, Sparks JW, Swank PB, et al. Physical growth of low birthweight infants in the first year of life: impact of maternal behaviors. Early Hum Dev. 1997; 47:19–34. [PubMed: 9118826]

21. Buka, A.; Lipsitt, L.; Tsuang, M. Emotional and behavioral development of low-birthweight infants. In: Friedman, SL.; Sigman, MD., editors. The psychological development of low-birth weight children. Ablex Publishing; Norwood (NJ): 1992. p. 187-214.

22. Sherlock RL, Anderson PJ, Doyle LW. Neurodevelop-mental sequelae of intraventricular haemorrhage at 8 years of age in a regional cohort of ELBW/very preterm infants. Early Hum Dev. 2005; 81:909. [PubMed: 16126353]

23. Bendersky M, Lewis M. Effects of intraventricular hemorrhage and other medical and environmental risks on multiple outcomes at age three years. J Dev Behav Pediatr. 1995; 16:89. [PubMed: 7790520]

24. Clark, R.; Paulson, A.; Colin, S. Assessment of developmental status and parent-infant relationships. In: Zeanah, CH., editor. Handbook of infant mental health. The Guilford Press; New York (NY): 1993. p. 191-209.

25. Grych JH, Clark R. Maternal employment and development of the father-infant relationship in the first year. Dev Psychol. 1999; 35:893–903. [PubMed: 10442859]

26. Pridham K, Lin CY, Brown R. Mothers' evaluation of their caregiving for premature and full-term infants through the first year: contributing factors. Res Nurs Health. 2001; 24:157–169. [PubMed: 11526615]

27. Radloff L. The CES-D Scale. Appl Psychol Meas. 1977; 1:385–401.

28. Radloff L, Teri L. Use of the CES-D with older adults. Clin Gerontol. 1986; 5:119–136.

29. Spitzer RL, Endicott J, Robins E. Research diagnostic criteria: rationale and reliability. Arch Gen Psychiatry. 1978; 35:773–782. [PubMed: 655775]

30. Myers JK, Weissman MM. Use of a self-report symptom scale to detect depression in a community sample. Am J Psychiatry. 1980; 137:1081–1084. [PubMed: 7425160]

31. Roberts RE, Vernon SW, Rhoades HM. Effects of language and ethnic status on reliability and validity of the Center for Epidemiologic Studies–Depression Scale with psychiatric patients. J Nerv Ment Dis. 1989; 177:581–592. [PubMed: 2677237]

32. Weissman MM, Myers JK. Affective disorders in a US urban community: the use of research diagnostic criteria in an epidemiological survey. Arch Gen Psychiatry. 1978; 35:1304–1311. [PubMed: 708194]

33. Heart S, Field T, Roitfarb M. Depressed mothers' assessment of their neonates' behavior. Infant Ment Health J. 1999; 20:200–210.

34. Hart S, Field T, Nearing G. Depressed mothers' neonates improve following the MABI and a Brazelton demonstration. J Pediatr Psychol. 1998; 23:351–356. [PubMed: 9824923]

35. Lundy B, Field T, Cigales M, Cuadra A. Vocal and facial expression matching in infants of mothers with depressive symptoms. Infant Ment Health J. 1997; 18:265–273.

36. Lyons-Ruth K, Zoll D, Connell D, Grunebaum HU. The depressed mother and her one-year-old infant: environment, interaction, attachment, and infant development. New Dir Child Dev. 1986; 34:61–82. [PubMed: 3822211]

37. Turner RJ, Grindstaff CF, Phillips N. Social support and outcome in teenage pregnancy. J Health Soc Behav. 1990; 31:43–57. [PubMed: 2313076]

38. Zuckerman B, Amaro H, Bauchner H, Cabral H. Depressive symptoms during pregnancy: relationship to poor health behaviors. Am J Obstet Gynecol. 1989; 160:1107–1111. [PubMed: 2729387]

39. Sameroff AJ, Seifer R, Zax M. Early development of children at risk for emotional disorder. Monogr Soc Res Child Dev. 1982; 47:1–82. [PubMed: 7167155]

40. Kivijarvi M, Voeten M, Niemela P, et al. Maternal sensitivity behavior and infant behavior in early interaction. Infant Ment Health J. 2001; 22:627–640.

41. Main, M.; Kaplan, N.; Cassidy, J. Security in infancy, childhood, and adulthood. A move to the level of representation. In: Bretherton, I.; Waters, E., editors. Growing points of attachment theory and research. 1985. p. 66-104.

42. Mertesacker B, Bade U, Haverkock A, Pauli-Pott U. Predicting maternal reactivity/sensitivity: the role of infant emotionality, maternal depressiveness/anxiety, and social support. Infant Ment Health J. 2004; 25:47–61.

Table 1

Descriptive Statistics for Study Variables

Variable	Predischarge			4-Month PTA		
	Mean	SD	n	Mean	SD	n
PAISR	3.58	0.81	43	3.42	0.98	38
RAB	4.48	0.44	43	4.37	0.58	38
IPACS	2.91	0.77	43	3.59	0.68	38
IRAB	4.10	0.60	43	4.23	0.53	38
CES-D	12.38	8.84	43	9.30	7.23	38
NHI	2.95	1.54				

n = 37.

Table 2

Family Demographic Data (N = 43)

	Mother		Partner	
	Mean	**SD**	**Mean**	**SD**
Age	29.4	6.47	33.7	15.8
Education	n	%	n	%
<High school*	4	9.3	3	7.0
High school	17	39.5	15	34.9
Some college	2	4.7	1	2.3
Associate/Bachelor degree	8	18.6	12	27.9
Graduate degree†	11	25.6	7	16.3
Missing	1	2.3	5	11.6
Ethnicity	n	%		
Asian American	2	4.7		
European American	31	72.0		
African American	6	13.9		
Latino	2	4.7		
Mixed	2	4.7		
Marital status	n	%		
Married	29	67.4		
Not married	14	32.6		
Income	n	%		
<$10000	4	9.3		
10000-19999	4	9.3		
20000-34999	4	9.3		
35000-49000	6	14		
>$55000	21	48.8		
Missing	4	9.3		

*In high school, n = 2; less than high school, n = 2.

†Masters, n = 5; PhD, n = 6.

Table 3

Infant Demographic Data (N = 43)

	n	%
Infant birth weight in grams		
<1000	9	21
1000-1500	11	26
1501-2000	10	23
2001-2500	11	26
>2500	2	4
Gestational age in weeks		
<26	7	16
27-28	11	26
29-30	3	7
31-32	12	28
33-34	10	23
Days hospitalized		
<1 week	5	12
1-2 weeks	7	16
3-5 weeks	7	16
6-8 weeks	8	19
9-12 weeks	13	30
>13 weeks	3	7
Sex		
Male	22	51
Female	21	49
5-minute Apgar <8	15	35
Hospitalization <1 month	23	54
Intubation	18	42
IVH, apnea, bradycardia, or BPD	28	65

IVH indicates intraventricular hemorrhage (1 or 2 only); BPD, bronchopulmonary dysplasia.

Table 4

Results of Stepwise Regression Analyses for the Contribution of Maternal Variables (PAISR and RAB) to Infant Variables (IPACS and IRAB) in the Context of NHI and CES-D Contributions

	Coefficient B	SE	β	F	P	R^2
IPACS at 4 months PTA						
Constant	2.06	0.49			.00	
Covariates						
NHI	−0.06	0.06	−.13		.35	
CES-D	−0.01	0.01	−.09		.52	
PAISR$_{predischarge}$	0.49	0.12	.59	6.87	.00	0.38
IRAB at 4 months PTA						
Constant	1.52	0.79				
Covariates						
NHI	0.01	0.05	−.04			
CES-D	0.01	0.01	.01			
PAISR$_{predischarge}$	0.61	0.17	.55	4.52	.01	0.29

n = 37.