

Family-Based Intervention to Enhance Infant–Parent Relationships in the Neonatal Intensive Care Unit

Joy V. Browne, PhD, RN, and Ayelet Talmi, PhD

University of Colorado, Health Sciences Center and Center for Family and Infant Interaction

Objective To examine how family-based interventions in the neonatal intensive care unit (NICU) may change parental knowledge and behaviors and decrease stress. **Methods** Eighty-four high-risk mother–infant dyads were randomly assigned to two intervention and one control groups. Group 1 ($n = 28$) participated in a demonstration of infant reflexes, attention, motor skills, and sleep-wake states. Group 2 ($n = 31$) viewed educational materials. Group 3 ($n = 25$), controls, participated in an informal discussion. Parent–infant interactions (Nursing Child Assessment Feeding Scale) were videotaped. Mothers completed measures of stress (Parenting Stress Index) and knowledge of infant cues (Knowledge of Preterm Infant Behavior Scale). **Results** Mothers in both intervention groups evidenced greater knowledge and more contingent and sensitive interactions with their infants than did the control group. Stress also differed across groups, and all mothers reported scores above norms. **Conclusions** In a high-risk sample, short-term, family-based NICU interventions may enhance mothers' knowledge, sensitivity, contingency, and stress.

Key words NICU intervention; parent–infant interaction; parenting behaviors; preterm infants.

Infants' relationships with their parents provide the foundation for the development of self-confidence and security, emotional stability, readiness to learn, and social competence. The provision of sensitive, nurturing, stimulating and nonrestrictive actions fosters optimal development (Berlin, Brooks-Gunn, McCarton, & McCormick, 1998). When well-timed interactions with familiar caregivers are contingent upon infant cues, they help regulate infants' physiological responses (e.g., heart rate, breathing rate, and body temperature), behavioral, social and emotional responses (e.g., distress), and nutritional needs (Hofer, 1994). These relationships also provide the foundation for the development of self-regulation capacities (Sameroff & Fiese, 2000) in addition to fostering infant mental health.

The birth of a premature infant and hospitalization in the neonatal intensive care unit (NICU) disrupts the expected development of interactive skills for both the parent and the infant (Talmi & Harmon, 2003). Factors

contributing to this disruption include situational and environmental circumstances associated with the birth and the NICU (Allen, Lewinsohn, & Seeley, 1998), physical and psychological effects of early birth for the family (Shields-Poe & Pinelli, 1997; Singer et al., 1999), as well as physical fragility and immaturity of the infant (Allen et al., 1998; Als, 1982). Thus, preterm infants are often exposed to many of the risk factors associated with poor long-term outcomes (Sameroff & Chandler, 1975). Although the relationships with parents provide the focal context in which infants develop, they are embedded in other influential contexts including the family, the community, and broad socio-cultural, historical, and political contexts (Bronfenbrenner, 1979). As such, socio-demographic characteristics (Taylor, Klein, Minich, & Hack, 2001) and infant medical risk may compound the effects of a preterm birth on maternal and infant functioning and on the quality of mother–infant interaction. In light of the cumulative effects of these factors, it is not

All correspondence concerning this article should be addressed to Ayelet Talmi, Center for Family and Infant Interaction, The Children's Hospital, 1056 East 19th Avenue B310, Denver, Colorado 80218. E-mail: ayelet.talmi@uchsc.edu.

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surprising that preterm infants' interactions with their parents are related to later infant development and functioning (Beckwith & Cohen, 1989; Feldman, Eidelman, Sirota, & Weller, 2002; Moore, Saylor, & Boyce, 1998; Poehlmann & Fiese, 2001).

Although most studies find similarities in the attachment relationship of preterm infants and their parents and those of low-risk infants and their parents in the first 2 years of life (Goldberg & DiVitto, 1995), others find that mothers of preterm infants tend to be more active than mothers of term infants when examining specific interactional components (Greenberg & Crnic, 1988). Mothers attempt to initiate and maintain an interaction with the infant, regardless of whether the infant is receptive to their approaches. These mothers also typically smile and engage in physical contact less with their preterm infants than do mothers of term babies. In their attempts to engage the infant in interaction, mothers may overwhelm their infant's capacity for social interaction with the infant showing subsequent distress. Distress may include motor flaccidity, autonomic distress, or state change (Als, 1982). These episodes constitute a negative feedback loop, where both the infant and the parent engage in noncontingent and nonrewarding behaviors. This pattern may ultimately result in feelings of helplessness and hopelessness on the part of caregivers (Goldberg, 1979). Moreover, it is not conducive to optimal parent–infant interaction.

Effective interactions between infants and their parents require that infants and parents provide a range of clear cues, respond to each other, and experience environmental support for the interaction (Kelly & Barnard, 2000). For preterm infants, supportive interactions with parents involve availability to the infant, ability to focus on the infant's cues, recognition of organized and disorganized behaviors and of the impact of the environment on the infant, and anticipation and prevention of the infant becoming overwhelmed (Browne, MacLeod, & Smith-Sharp, 1996). Such caregiving increases infant neurobehavioral organization and improves long-term outcomes (Als et al., 2003; Symington & Pinelli, 2000). However, optimal interactions between mothers and fragile infants may be particularly challenging in families with multiple risk factors (e.g., financial challenges, parental mental health issues, and complicated infant medical course). Such factors may adversely affect infant mental health and the infant-caregiver relationship as a result of continuous negative interactions and responses among the child, his or her family, and their social context (Sameroff & Fiese, 2000).

Intervention to Enhance Parent–Infant Interaction

Prevention of adverse developmental outcomes for preterm infants has focused on providing developmentally supportive environments for these infants and their families (Als et al., 1994; Lawhon, 2002; Raugh, Achenbach, Nurcombe, Howell, & Teti, 1988). A central tenet of these interventions is that the mother's behavior with the infant is the most significant environmental modification that can be provided for high-risk infants (Browne et al., 1996).

To heighten the parents' awareness of their infant's individuality, complexity and sociability, and to enhance parent–infant reciprocity and empower the parent in their role, researchers have used the Brazelton Neonatal Behavioral Assessment Scale (BNBAS; Brazelton, 1973) (Barnard & Sumner, 2002; Parker, Zahr, Cole, & Brecht, 1992). Using these interventions, researchers guided parents in eliciting the behaviors of their preterm infants, while simultaneously observing and discussing their own perceptions of the newborn (Cardone & Gilkerson, 1990). Such interventions have been found to increase performance on measures of cognitive development (Achenbach, Howell, Aoki, & Rauh, 1993; Moore et al., 1998; Parker et al., 1992). Regarding effects on parents, such programs have also enhanced parents' knowledge regarding their infant (Myers, 1982), increased parents' involvement in caretaking (Belsky & Benn, 1982; Myers, 1982), and improved the mothers' satisfaction and self-confidence in their role (Ramey et al., 1992; Raugh et al., 1988).

Developmentally supportive interventions, including those that focus on parents of preterm infants, often begin near or after the time of discharge from the NICU and continue in the home (Raugh et al., 1988). Although fewer interventions focusing on parent–infant interaction begin early in the course of an infant's hospitalization, findings suggest that interventions occurring during hospitalization impact cognitive development and parental perceptions of stress (Feldman et al., 2002; Melnyk et al., 2001; Parker et al., 1992). However, high-risk families may be difficult to engage because of family responsibilities, economic and transportation issues which make availability to their infant less consistent, and mistrust of the service delivery system.

The present investigation was designed not only to evaluate the effects of guided interaction versus educational interventions with mothers of preterm infants but also to determine potential outcomes of providing such intervention with a high-risk population of preterm infants born to economically disadvantaged women

(Parker, Greer, & Zuckerman, 1988). We hypothesized that both interventions would produce an increase in knowledge and contingent mother infant interaction, and a decrease in parental stress in comparison with the control group. The type of intervention provided was expected to moderately affect outcomes, with a group provided guided interaction scoring higher than either a group provided didactic education regarding preterm infant behavior or a group provided no treatment.

Method

Participants

Participant Selection

Application and consent for participation of human subjects in this research study was approved by the University of Oklahoma Health Sciences Center Institutional Review Board. All mother-infant dyads admitted to the University Hospital were eligible candidates for the study. Infant characteristics determined inclusion of mothers in the study. Mothers whose infants were born at or before 36 weeks post-conceptional age and expected to be hospitalized 2 weeks or more, had no documented congenital anomalies, nor did their condition necessitate surgery, were approached for consent. Additional maternal criteria included the mother's age over 17 years, documented presence with their infant prior to discharge, no major medical complications associated with delivery, English speaking, and reading ability at least at a fifth grade level, as assessed by administration of the reading subscale of the Wide Range Achievement Test Reading Scale (WRAT).

One hundred and twelve infants met criteria for the study. Thirteen parents declined participation. One mother could not read at a fifth grade level. The resulting 99 mothers signed informed consent for the study.

Of the 99 dyads that consented and were randomly assigned to treatment groups, 16 were subsequently withdrawn from the study. Eight mothers withdrew before data could be collected; two mothers never returned to the hospital except to pick up their infant, one did not wish to answer the questionnaires, one was unable to read at a fifth grade level, one declined because of a divorce, one mother's husband withdrew her from the study, and one infant died. Late attrition resulted in seven mothers being withdrawn because of unexpected early discharge or loss to follow-up for five dyads, one maternal incarceration, and one infant requiring surgery late in hospitalization. These withdrawals resulted in a subject pool of 84 mother-infant dyads, assigned to three treatment groups. Racial composition

was as follows: 75% white ($n = 63$), 15% African American ($n = 13$), and the remaining 9% comprised of Latina ($n = 2$), American Indian ($n = 5$), and Asian American ($n = 1$) women. Nine of the couples were racially mixed. Mothers reported that in most homes, the father was present regardless of marital status. Income and source of payment for the mothers' medical services were consistent with the referral pattern to the University Hospital, which was reported to be approximately 85–90% indigent. Eighty-seven percent of the study mothers had an income of less than \$19,999, and 77% reported receiving public assistance for medical payment. The majority of mothers were unemployed (85%) and reported a high-school education or less. These data indicate that the participants studied were almost entirely from a low socioeconomic, low education background, and thus were a high-risk population. Table I provides additional maternal demographic characteristics. After establishing parity, participating mothers were randomly divided into one of three treatment groups by card draw to assure even distribution of parity in each group. No statistical differences between groups were found for mothers' age ($M = 24.02$, $SD = 5.51$), education, $\chi^2(10, N = 83) = 9.83$, $p = .501$, or marital status, $\chi^2(6, N = 84) = 8.42$, $p = .209$. The three groups did not differ by racial composition.

Infants

Demographic information about the infants is included in Table I. Because inclusion criteria required the infants' hospital stay to be of at least 2 weeks duration, the number of hospital days ranged from a minimum of 14 days to a maximum of 80 days, with a mean of 33.16 days ($SD = 16.98$). A severity score was assigned based on review of medical record data reflecting length of stay, severity of illness, and complicating factors. The mean severity score for the infants was 54.64 ($SD = 45.12$) at discharge. Infant distribution to the three treatment groups was not statistically different for weight, Apgar score, gender, or severity of illness score.

Measures

Knowledge of Preterm Infant Behavior Scale

The Knowledge of Preterm Infant Behavior (KPIB) scale elicited the mother's knowledge regarding her preterm infant across two broad domains of infant behavior (see Browne, 1990 for measure construction and validation) using a multiple choice question format (Browne, 1990). The first area assessed knowledge of infant reflexes (e.g., "when you push your finger against the inside of your baby's hand he will?"), physical responses to stimuli (e.g., "Hiccoughs, spitting up, gagging and grunting are all signs that?"), motor activity (e.g., "When your baby

Table I. Additional Demographic Characteristics of Participating Mothers and Infants

Variable	Group 1	Group 2	Group 3
<i>Mothers</i>			
Marital status (n)			
Married	15	23	16
Single	12	6	7
Divorced	1	0	1
Separated	0	2	1
Parity (n)			
One child	17	17	12
Two children	4	7	7
More than two children	7	7	6
<i>Infants</i>			
Gestational age (weeks) (M ± SD)	32.0 ± 2.5	31.2 ± 2.3	31 ± 2.7
Birth weight (g) (M ± SD)	1617.4 ± 389.7	1509.3 ± 367.8	1518.0 ± 374.4
Birth weight at discharge (g) (M ± SD)	2272.4 ± 376.8	2162.4 ± 312.1	2160.8 ± 283.7
Severity of illness scores (M ± SD)	61.8 ± 52.7	55.9 ± 43.8	52.7 ± 45.1
Apgar scores (M ± SD)	7.2 ± 1.7	7.1 ± 1.7	7.8 ± 6.8

extends her arm as if she is saluting this means?”), sleep-wake states, and social interaction capacities (e.g., “Your baby is telling you that she’s alert and ready to play when she?”). The second assessed knowledge regarding optimal times for interaction (e.g., “The best distance for your baby to be able to see your face is?”), as well as how to help her infant develop self-regulatory mechanisms (e.g., “A common thing preemies do to get themselves under control is to?”). Split-half reliability using the Spearman Brown formula was .88, with odd and even items correlating at .79.

Nursing Child Assessment Feeding Scale

The Nursing Child Assessment Feeding Scale (NCAFS) (Barnard, 1978) assesses the contributions and characteristics unique to the feeding interaction of both parent and infant during the first year. Characteristics in six key areas that contribute to the interaction or adaptation process between parent and child are assessed. The NCAFS consists of 76 observable behaviors (26 child and 50 parent items) noted by the examiner during feeding. The characteristics observed in the mother include (a) sensitivity to the infant’s cues, (b) ability to alleviate the infant’s distress, (c) provision of cognition fostering situations, and (d) provision of social growth fostering situations. The observable characteristics on the part of the infant are (a) clarity of cues to the mother and (b) the infant’s responsiveness to the mother. Previous research suggests that preterm-infant-parent interactions tend to yield lower scores than do full term infant-parent interactions with adequate reliability and validity for both populations (Barnard, 1994).

Parenting Stress Index

The Parenting Stress Index (PSI) (Abidin, 1986) evaluates stress related to child rearing, and which may be related to dysfunctional parenting. Three main domains of stressors are identified and evaluated by the PSI. The child domain includes the factors adaptability, acceptability, demandingness, mood, distractibility or hyperactivity, and parent reinforcement. Parent domain factors include depression, attachment, restriction of role, sense of competence, social isolation, relationship to spouse, and health. Life stress includes those events in the past 12 months that are thought to be particularly stressful, such as death of a family member, divorce, pregnancy, and move to a new home. The PSI is used extensively for clinical purposes and is both valid and reliable as a research instrument (Abidin, 1986).

Severity of Illness score

The Severity of Illness score (SOI) was adapted from the *Manual for Postnatal Complications Scale* (Littman & Parmalee, 1974). Total days of hospitalization, dependence on medical equipment upon discharge, and some of the more severe diagnoses were included. The SOI is the sum of points for hospital days and days on oxygen (1 day equals one point). Because the infants were hospitalized at least 2 weeks, indicating that they were potentially at risk for increased interactional difficulties as hospitalization lengthened, one point per day was included in the severity of illness scoring method. An additional point was assigned for each of the following diagnoses: small or large for gestational age; intracranial hemorrhage; retinopathy of prematurity; neurological abnormalities; anemia; apnea; bronchopulmonary

dysplasia; hyaline membrane disease; hyperbilirubine-mia; hypocalcemia; infant of diabetic mother; meconium aspiration; patent ductus arteriosus; perinatal asphyxia; persistent fetal circulation; pneumothorax; polycythemia; respiratory distress syndrome; seizures; sepsis; tachypnea; and other diagnoses. An additional point was given for being sent home on either apnea monitors or oxygen support.

Procedure

Group Assignment

Prior to participant selection, a list of consecutive subject numbers for first time mothers, second time mothers and more than second time mothers was developed. Assignment to groups was made by drawing one of three cards. Cards were drawn randomly in rounds of three with assignment to consecutive numbers with respect to parity. This method was chosen to reduce the possibility of extreme differences in group size and yet retain random assignment with respect to parity. Descriptions of the intervention groups and the control group follow.

Intervention and exposure to the control interaction were provided upon admission to the study, and at least 1 week prior to discharge. All groups were exposed to approximately 45 min of one-on-one contact with the experimenter, as described below.

Group 1: Demonstration and Interaction

Mothers in Group 1 received a demonstration of their infant's reflexes, attention-interaction, motor capabilities and sleep-wake states, according to the systematic administration of the Assessment of Preterm Infant Behavior (APIB) (Als, 1983). The APIB is an extension and refinement of the Brazelton Neonatal Behavioral Assessment Scale (BNBAS), and provides a framework for the systematic observation of the premature infant's behavioral response to increasing levels of environmental stimuli, examiner manipulation, and social interaction. It provides a system of quantifying behaviors for each of the following systems: (a) physiologic, (b) motor, (c) regulatory, (d) attention-interaction, (e) sleep and wake states, and (f) amount of examiner facilitation.

Each maneuver was described to the mother, and the infant's individual responses were discussed both during and after the examination. The examiner emphasized the infant's individual repertoire and what techniques could be used to both elicit optimal responses and to help the infant to utilize self-regulatory behaviors. The mother was encouraged to participate in the exam by attempting to elicit several behavioral reactions, including response by the infant to her voice. At the end

of the APIB demonstration the mothers were given the Mother's Assessment of the Behavior of her Infant (MABI), another modification of the BNBAS (Field, Dempsey, Hallock, & Shuman, 1978) to be used as a guideline to make more critical observations of her own infant. The MABI requires mothers to observe and elicit specific behaviors (except reflexes) in their own infants and answer the items associated with those behaviors. Mothers were given the instrument and told that it would help them to become more familiar with their own infant. Mothers were instructed to try to see how their infant performed according to the questions.

Group 2: Education

Mothers in Group 2 only received education. They viewed the slides and tapes *Prematurely Yours* (Thompson-Linton & Als, 1983) and *To Have and Not to Hold* (Gibes, Lawhon, Kelliher, & Dorner, 1984). The educational slides and tape presentations focus on the strengths and skills of premature infants, describing signs of over-stress, consoling an unhappy baby, bringing a baby to an alert state, and understanding the importance of sleep and self-comforting skills. Additionally, the slides and tape presentation describes typical thoughts and feelings of parents during pregnancy, early delivery, the intensive care experience, and coping with stressful interpersonal relationships. The mothers were also given copies of *The Premature Baby Book* (Harrison, 1983) and *Developmental Steps* (Flushman & VandenBerg, 1984), which was on a fifth grade reading level. These were provided for reading during the remainder of the infant's hospitalization.

Group 3: Control

Group 3 mothers were scheduled for a 30 to 45 min discussion regarding follow-up care for preterm infants. This informal discussion included information on clothing, infants' names, bathing the baby, and the importance of immunizations. No specific information was given regarding infant behavior, social interaction, sleep states, or medical intervention.

Post-Treatment Evaluation

The follow-up evaluation included filming of a feeding, administration of the KPIB test, and an interview to elicit family demographic data immediately prior to discharge from the hospital. Video recordings were transcribed and made available to scorers so that they would be able to interpret soft-spoken words or utterances.

Follow-Up After Discharge

The Parenting Stress Index (PSI) was mailed to the mother at 1 month after discharge from the nursery with instructions for completion and return. Ninety-four percent of

PSI's were returned within approximately 2 weeks of the questionnaire being mailed to the mothers.

Data Collection, Tabulation, and Preliminary Analyses

Scoring and recording of instruments were done after discharge of the infant from the hospital. Cross-checks for accuracy in scoring were done on every third questionnaire. All videotapes were scored by two reliable NCAFS observers who were blind to treatment group assignment. Twenty of the 80 feeding videos were reviewed by both scorers who achieved at least 85% inter-rater reliability.

Results

Owing to attrition, there were unequal numbers of subjects in each treatment group (Group 1 = 28, Group 2 = 31, and Group 3 = 25). Demographic and birth characteristics were similar in all three groups with the exception of delivery type. There were more vaginal deliveries than cesarean section deliveries in Groups 1 and 3 than in Group 2, $\chi^2(2, N = 84) = 6.64, p = 0.036$.

A one-way analysis of covariance (ANCOVA) was performed using maternal marital status, income, race, parity, and age, as well as for the infants' severity of illness and place of hospitalization as covariates. Only two of these factors (maternal age and severity of illness) were related to the outcome variables. Infant–mother dyads where mothers were older received higher NCAFS scores: $F(1, 80) = 6.81, p < .01$ and KPIB scores: $F(1, 79) = 11.90, p < .001$. Infant severity of illness (SOI) scores also evidenced a linear relationship with the child domain scores of the PSI. That is, the higher the SOI scores, the higher the reported child related stress scores at 1 month of age.

Analysis of Outcome Measures

Total scores for two of the dependent variables (NCAFS and KPIB) were analyzed using one-way analysis of variance (ANOVA). The Student Newman Keuls multiple comparison procedure was used in all group comparisons when overall differences were significant. KPIB scores for knowledge were significantly lower for the control group (Group 3) than for Groups 1 and 2, $F(3,$

79) = 9.04, $p < .001$. Treatment group main effects were also found for the NCAFS, $F(2, 80) = 3.25, p < .05$, with scores for the control group significantly higher, indicating lower relationship quality, than scores for the intervention groups. Table II presents the mean scores and standard deviations for these outcome variables by treatment group.

A multivariate analysis of variance (MANOVA) with group as the between-subject factor was used to analyze the PSI, with severity of illness as a covariate. The MANOVA revealed a significant effect for group, multivariate $F(2, 76) = 1.71, p < .05$. Planned contrasts, using the Student Newman Keuls correction, indicated a marginally significant difference between groups in the child acceptability subscale, $F(2, 76) = 2.86, p = .056$, with control group mothers scoring higher, which indicated more perceived stress with parenting their infant at 1 month after discharge, than mothers in Groups 1 and 2.

A large proportion (38%) of mothers in this high-risk population scored outside the published high and low normative ranges on the PSI regardless of group assignment. High and low scores are based on the 80th and 15th percentile ranks, respectively. Twenty-eight percent of the mothers scored higher than 250, whereas 10% scored lower than 180.

Discussion

This study confirms previous work which shows that short-term hospital based intervention with low-socioeconomic-status mothers of preterm infants affects the mother's knowledge of infant behavior, interaction with the infant, and parental stress (Cardone & Gilkerson, 1990; Myers, 1982; Pridham, 1998; Raugh et al., 1988). Previous literature has emphasized that optimal parenting effects are obtained with more active maternal involvement (Heinicke, Beckwith, & Thompson, 1988). Additionally, short-term approaches, involving only hospital-based intervention in the newborn period, have been found less efficacious than have longer-term hospital plus home-based interventions (Achenbach et al., 1993; Beckwith & Cohen, 1989; Raugh et al., 1988). Although high-risk populations may benefit more from long-term, home intervention, the high economic and personnel expenditures involved in offering such programs may be

Table II. Mean Scores \pm Standard Deviations of Outcome Measures by Experimental Group

Measure	Total	Group 1	Group 2	Group 3	F
Knowledge of Preterm Infant Behavior	23.16 \pm 5.94	23.32 \pm 5.88*	25.90 \pm 5.30*	19.58 \pm 5.01*	9.04
Nursing Child Assessment Feeding Scale	47.31 \pm 7.06	45.65 \pm 6.20**	47.43 \pm 7.36**	48.88 \pm 7.41**	3.25

*Differ at $p < .0001$.

**Differ at $p < .05$.

prohibitive. This study confirms that even short-term interventions may provide some benefits for this high-risk population.

Knowledge Effects

Mothers' knowledge of preterm–infant behavior was higher in the treatment groups than that in the control group, a finding that is consistent with that of other studies (Myers, 1982; Parker-Lowen & Lytton, 1987). These findings indicate that parents do benefit from provision of information through either a content-specific or active-participation mode of learning about their preterm infant.

Behavioral Effects

Similar to the knowledge findings, maternal behaviors during feeding interactions also evidenced treatment effects, with both intervention groups receiving lower scores than the control group. Higher scores on the NCAFS indicated more behavioral and verbal stimulation of the infant during a feeding. Preterm infants are characteristically less competent in their ability to suck, swallow, breathe, and simultaneously take in complex tactile visual and verbal environmental stimuli (Thoyre, 2003). Both interventions sought to help mothers identify those behavioral signs that indicated disorganization on the part of infants and to reduce external input in response to those signals. Mothers' noncontingent attempts at interactive behavior would, therefore, result in higher scores on the NCAFS. Accordingly, the finding that control mothers scored higher is consistent with the prediction that intervention would promote behavior that was based on more contingent maternal–infant interaction, which would produce a lower score.

Parental Stress Effects

A multivariate analysis of variance revealed that Parenting Stress Index (PSI) scores differed across treatment groups. Subscale analyses revealed that mothers in the control group perceived more stress pertaining to child acceptability than did mothers in either intervention group. These results are similar to those of Bendell, Goldberg, Urbano, Urbano, and Bauer (1987) who found the child adaptability PSI scores of mothers of extremely low birth weight infants to be significantly elevated at 6 months of age. Since high scores for child acceptability indicate that the child is perceived to have physical, intellectual, or emotional characteristics which do not match the mother's expectations of the hoped for infant, these characteristics may be issues in

poor attachment or regulation in the parent–child relationship (Abidin, 1997).

Because the present study population was selected for its high-risk status both medically and socioeconomically, it is not surprising approximately 40% of mothers in the present study scored outside the published high and low normative scores on the PSI. These findings confirm that parenting the preterm infant is highly stressful to almost all mothers (Halpern, Brand, & Malone, 2001; Singer et al., 1999), regardless of the treatment they receive. Mothers scoring above published norms may be significantly stressed and at increased risk of developing dysfunctional parenting behaviors or experiencing child-behavior problems (Abidin, 1986).

Mothers responding with an increase in reported parenting stress regarding child acceptability at 1 month post discharge may be reflecting their perception of an infant who is not developmentally mature enough to respond with social reinforcement cues. On the other hand, infants who are ill or who have had long courses in the hospital may truly exhibit either increased irritability (Goldberg, 1978) or an appearance of flattened affect (Als et al., 1994). Regardless of intervention, the stress of parenting for this economically disadvantaged population may be significantly greater than that for most typical parents who have an infant hospitalized at birth. These findings underscore the importance of designing and implementing appropriate interventions for preterm infants and their families.

The literature is replete with reports of a high incidence of neglect and abuse in those infants hospitalized in the newborn period (Strathearn, Gray, O'Callaghan, & Wood, 2001; Sullivan & Knutson, 2000). The link between stressful parenting and the increased occurrence of child abuse and neglect in the preterm infant population has been hypothesized. No long-term follow-up was done for this sample of subjects so that documentation of abuse or neglect is not possible. However, anecdotal information obtained after data collection was complete indicated that at least two children who were recruited for the study died with a suspicion of abuse, and seven were reported for suspected abuse or neglect.

Taken together, these scores on the PSI provide documentation of individual differences in mothers' perceptions with regard to parenting a high-risk preterm infant. Regardless of cause, a large proportion of mothers of preterm infants perceive their infants and their parenting role to be very stressful and consequently, may benefit from intervention efforts aimed at improving the parent–infant relationship.

As the current study was performed entirely within a lower socioeconomic status sample, generalization to other populations is limited. In previous research, some studies found no differences in intervention effects with a middle-class sample of mothers of term infants (Belsky, 1986), some found only knowledge differences (Myers, 1982), and others found improved quality of interaction (Worobey & Belsky, 1982).

The timing of the data acquisition was as consistent as possible given the high-risk population and the unexpected changes in infant readiness for discharge. Although the investigator followed the infants on a daily basis for weight gain and medical stability, some infants were discharged unexpectedly, making the timing of data collection somewhat variable. Additionally, this study focused on short-term, hospital-based intervention for high-risk infants, so no longitudinal follow-up was performed. Parker et al. (1992) and Achenbach et al. (1993) found delayed positive developmental outcomes based on relatively short-term, hospital- and home-based intervention. Had this study been designed to follow the infants long-term, it would have enabled further interpretation of knowledge, infant–parent interaction and parenting stress for high-risk populations. It would be beneficial to document long-term maternal–infant interactions including reported parenting dysfunction as related to those mothers with high PSI scores.

Engaging mothers in this high-risk population was challenging. Significant accommodation for their lack of transportation and financial resources to be with their infants in the hospital, care in providing culturally appropriate educational approaches, and patience in their lack of trust in the hospital system was warranted. However, all parents responded to the focus of interest on their infant's behavior and to the examiner's offer of a copy of their videotape, yielding a high-response rate. Future research could benefit from determining the importance of parent's investment in their own baby's behavior and the resulting engagement in offers of support and education.

Other challenges to engaging mothers in the intervention included the lack of individualization of treatment to the mother's particular learning or coping style. These factors may have affected the extent to which mothers were able to engage in the intervention, and thus influenced outcomes. Future intervention and research should attend to the individualization of appropriate approaches for parents of high-risk infants. Additionally, physical, emotional and economic support should be readily available so that the mother's availability to her premature or ill infant is insured, particularly during the initial hospitalization.

Preterm infants born to low socioeconomic mothers are at higher risk for later impaired development than are preterm infants who are born to middle-class mothers (Escalona, 1982). Studies that identify parents as coming from low socioeconomic status are not necessarily intervention studies (Beckwith & Cohen, 1989). To date few short-term, hospital-only intervention studies have been conducted (Feldman et al., 2002). The long-term studies, which included not only an in-hospital but also in-home intervention over 1 to 12 months, were all done with low-income and otherwise high-risk populations. These latter studies report significant effects in enhancing mother–infant interaction, satisfaction, and positive cognitive outcome for the infants (Achenbach et al., 1993; Raugh et al., 1988).

Participants in the current study were at increased risk for poor outcome as the infants were medically fragile preterms with extended hospitalization, and the mothers were from a lower socioeconomic group. This study provides evidence that even short-term intervention may have positive outcomes with a high-risk, low socioeconomic sample of mothers and infants. This population is reportedly at highest risk for parenting dysfunction, and yet appears to benefit most from both long-term or, as now documented, short-term intervention. These data demonstrate that an intervention that utilizes easy to administer educational materials may be as effective as a more time consuming and labor intensive intervention such as demonstration of the infant's behavior.

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