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Maternal Satisfaction with Administering Infant Interventions in the NICU

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Abstract

Objective—To examine mothers' satisfaction with administering interventions for their preterm infants and with the helpfulness of the study nurse by comparing the ATVV intervention (massage with auditory, tactile, visual, and vestibular stimulation), kangaroo care, and education about equipment needed at home. Secondly, to explore whether mother and infant characteristics affected maternal satisfaction ratings.

Design—Three-group experimental design.

Setting—Four NICUs (two in North Carolina, two in Illinois).

Participants—208 preterm infants and their mothers.

Methods—When the infant was no longer critically ill, mother-infant dyads were randomly assigned to ATVV, kangaroo care, or the education group, all taught by study nurses. At discharge and 2 months corrected age, mothers completed questionnaires.

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Results—All groups were satisfied with the intervention and with nurse helpfulness, and the degree of satisfaction did not differ among them. Intervention satisfaction, but not nurse helpfulness, was related to recruitment site. Older, married, and minority mothers were less satisfied with the intervention but only at 2 months. Higher anxiety was related to lower intervention satisfaction at discharge and lower ratings of nurse helpfulness at discharge and 2 months. More depressive symptoms were related to lower nurse helpfulness ratings at 2 months.

Conclusions—Mothers were satisfied with providing interventions for their infants regardless of the intervention performed. Maternal satisfaction with the intervention was related to recruitment site, maternal demographic characteristics, and maternal psychological distress, especially at 2 months. Thus, nursing interventions that provide mothers with a role to play in the infant's care during hospitalization are particularly likely to be appreciated by mothers.

Keywords

Preterm infants; mothers; massage; kangaroo care; satisfaction; maternal distress

Providing mothers with a role to play in the neonatal intensive care unit (NICU) has the potential to reduce maternal emotional distress and lead to better parenting. One way to do this is to have mothers provide interventions for their infants. Two interventions that might have this effect are infant massage--particularly, the auditory-tactile-vestibular-visual (ATVV) intervention--and kangaroo care. ATVV is a form of massage that involves moderate stroking, eye contact with, talking to, and rocking the infant (White-Traut, Nelson, et al., 2002; White-Traut et al., 2004); kangaroo care involves skin-to-skin contact and holding and has been shown to promote breastfeeding (Furman, Minich, & Hack, 2002; Hill, Aldag, & Chatterton, 1999). These interventions have been shown to be safe for preterm infants and to have positive immediate effects on infants (Dieter, Field, Hernandez-Reif, Emory, & Redzepi, 2003; Ludington-Hoe, Nguyen, Swinth, & Satyshur, 2000; White-Traut, Nelson, et al., 2002; White-Traut, Studer, et al., 2002). Many mothers continue to provide these interventions after discharge (Neu, 2004; White-Traut et al., 2004).

In addition, both the ATVV intervention and kangaroo care have positive effects on mothers. Mothers taught to provide the ATVV intervention for their infants exhibited more positive interactive behaviors than mothers taught to sing to their infants or control mothers, even though infant behaviors did not differ between the groups (White-Traut & Nelson, 1988). At 3 months corrected age, preterm infants massaged by their mothers or trained interveners had more positive interactions with their mothers than preterm infants who were not massaged (Ferber et al., 2005). Maternal massage of their infants was also found to reduce anxiety and depressive symptoms (de Macedo, Cruvinel, Lukasova, & D'Antino, 2007; Feijo et al., 2006). Moreover, mothers have generally been satisfied with massaging their hospitalized infants and the effects of the massage on their infants (Livingston et al., 2009).

Most studies also have found that mothers had positive experiences with kangaroo care and preferred it to just holding the infant (Gathwala, Singh, & Singh, 2010; Johnson, 2007; Mahmood, Jamal, & Khan, 2011; Neu, 2004). However, a minority of mothers were anxious about the possibility of dislodging tubing or harming the baby during kangaroo care,

especially if the infant was on mechanical ventilation (Gale, Franck, & Lund, 1993; Neu, 2004). Mothers believed that kangaroo care was beneficial for their babies (Nguah et al., 2011) and that it increased their confidence in caring for their infants (Arivabene & Tyrrell, 2010; de Macedo, Cruvinel, Lukasova, & D'Antino, 2007; Johnson, 2007). Through 6 months corrected age, mothers who were not randomly assigned, but rather chose to provide kangaroo care, had fewer depressive symptoms and showed more positive interactions with their infants than mothers not providing kangaroo care (de Alencar, Arraes, de Albuquerque, & Alves, 2009; Feldman, Eidelman, Sirota, & Weller, 2002; Feldman, Weller, Sirota, & Eidelman, 2002, 2003; Tallandini & Scalembra, 2006). In clinical trials, mothers of infants in the NICU and who provided kangaroo care had less anxiety, fewer depressive symptoms, lower cortisol levels, and lower heart rates during and immediately after kangaroo care and more positive interactions with their infants in the first 6 months after discharge than mothers not providing it (de Macedo et al., 2007; Morelius, Theodorsson, & Nelson, 2005; Neu & Robinson, 2010). By contrast, other studies have not found an effect of kangaroo care on maternal depressive symptoms (Ahn, Lee, & Shin, 2010), maternal stress about the NICU experience (Roberts, Paynter, & McEwan, 2000), or mother-infant interactions (Chiu & Anderson, 2009).

ATVV and kangaroo care have never been compared so it is unknown whether mothers prefer one over the other or whether they would be equally satisfied with any intervention that provided them with a role in the care of their infants in the NICU. The primary purpose of this study, therefore, was to examine mothers' satisfaction with administering the auditory-tactile-visual-vestibular intervention and kangaroo care and with the helpfulness of the study nurse who taught them the intervention as compared to receiving an attention control intervention. The secondary purpose was to explore whether mother and infant characteristics (maternal demographic characteristics, infant illness severity, maternal psychological distress at the time of data collection, whether the mother exclusively performed her assigned intervention, and study site) affected maternal satisfaction ratings.

Methods

This longitudinal 3-group experimental study of the satisfaction of mothers of preterm infants with their intervention—ATVV, kangaroo care, and control—was part of a larger study comparing the effects of these interventions on maternal and infant responses (White-Traut, Rinehart, Wink, & Holditch-Davis, 2012).

Setting

The study was conducted at four hospitals: two in North Carolina (NC-1 and NC-2) and two in Illinois (IL-1 and IL-2). These sites served different populations: NC-1 and NC-2 were southern and served urban, suburban, and rural populations of diverse socioeconomic status, whereas IL-1 and IL-2 served northern, urban, and poor populations. NC-1 was a regional children's hospital that received referrals of extremely low birthweight infants and infants requiring surgery. NC-2 was a university medical center that received maternal-fetal and infant referrals from throughout the state. IL-1 and IL-2 were community-based inner city

medical centers. The use of four sites allowed a more rapid accumulation of research subjects.

Sample

The participants were 208 mothers of preterm infants who weighed less than 1750 grams at birth. We excluded mothers of infants with congenital neurological problems (e.g., congenital hydrocephalus, Down Syndrome) or symptoms of substance exposure. Mothers of all other infants, including those with postnatal neurological insults or substance exposure without symptoms, were eligible so that the sample included mothers of infants with varied health status and outcomes. Mothers of multiple birth infants were included, and one infant from each set was selected randomly to be the focus of the study. Mothers were excluded if they did not have custody of the infant, if their situations would affect mothers' ability to administer or respond to the intervention (age less than 15; history of HIV, psychosis, or bipolar disease; current diagnosis of major depression; ongoing critical illness; or non-English speaking), or if follow-up for several months was unlikely (out-of-state visitors as mothers).

A total of 458 mothers met inclusion criteria of the larger study. Two hundred and nine declined participation, and 249 agreed to be enrolled. However, nine withdrew prior to providing enrollment data, either because of infrequent visitation or worsening of the infant's medical condition. The participants were assigned to the three groups using a randomization scheme stratified on recruitment hospital and twin versus singleton birth. The sample for this analysis included all 208 mothers who completed the intervention satisfaction questionnaire at either discharge or 2 months of age corrected for prematurity. Maternal demographic characteristics and infant illness characteristics are summarized in Table 1. The only difference among the intervention groups was that there were more first-time mothers in the ATVV group.

Variables

Satisfaction survey—At hospital discharge and 2 months corrected age, mothers completed a 26-item questionnaire designed by the study team to assess how satisfied they were with the intervention and with the helpfulness of the nurses who taught them the intervention. It also asked about the impact of the intervention and study on them. Items were rated on a 5-point scale with 5 as the highest and assessed three dimensions of satisfaction: efficacy, caring, and technical quality. Two items dealing with activities at home were only included on the 2-month version. The scale has two subscales: satisfaction with the intervention (12 items) and satisfaction with the helpfulness of the study nurse (11 items). Subscale scores and a total score are calculated by the mean of the items. Three other global items asked whether the mother would recommend the study to others and the degree of change in the mother as a person and as a mother as a result of being in the study. Cronbach's alphas for the intervention satisfaction subscale were .85 at discharge and .89 at 2 months corrected age. Alphas for the nurse helpfulness subscale were .91 at discharge and .92 at 2 months. Convergent validity between the subscale score and the three global items was shown by all bivariate correlations at each age being significant: at discharge correlations varied from .16 (satisfaction with nurse helpfulness with the degree to which the

mother changed as a person as a result of being in the study) to .50 (satisfaction with nurse helpfulness with whether the mother would recommend the study to others) and at 2 months, from .19 (satisfaction with nurses helpfulness sub-scale with the degree to which the mother changed as a person as a result of being in the study) to .52 (satisfaction with nurses helpfulness with whether the mother would recommend the study to others).

Use of non-assigned interventions—Mothers were not prevented from engaging in interventions of the other groups (e.g., control group doing kangaroo care or the kangaroo care group doing infant massage). They did not receive education from the study nurse on the other interventions but may have learned about them from the NICU nurses and physicians and other sources before or after they entered the study. Therefore, mothers were asked to complete checklists during each hospital visit on their use of the assigned and non-assigned interventions. These checklists included a number of other activities mothers engage in during visits (e.g., feeding, singing) so that the mothers would not focus exclusively on the study interventions. The ATVV and kangaroo care mothers reported high levels of engaging exclusively in their assigned intervention and low levels of using other intervention, with only 29.6% of the ATVV mothers and 24.4% of the kangaroo care mothers reporting doing the other intervention. On the other hand, 58.1% of the control mothers reported engaging in infant massage, kangaroo care, or both. Thus, the satisfaction scores of mothers doing only their assigned intervention were compared with mothers doing non-assigned interventions as well.

Depressive symptoms—The Center for Epidemiologic Studies Depression Scale (CESD; Radloff, 1977) was used to measure the frequency of 20 depressive symptoms. Items on this instrument are rated on a 4-point Likert scale, from “rarely or none of the time (less than 1 day in the past week)” to “most or all of the time (5–7 days).” Scores range from 0 to 60, with higher scores indicating more depressive symptoms. The CESD is highly correlated with other measures of depression and showed good test-retest reliability (Radloff, 1977; Weissman, Sholomskas, Pottenger, Prusoff, & Locke, 1977). CESD scores of mothers of medically fragile and preterm infants were related to other indicators of psychological well-being, including hospital environmental stress, maternal mastery, satisfaction with family, worry about the child’s health, and post-traumatic stress symptoms (Holditch-Davis et al., 2003; Mew et al., 2003; Miles, Holditch-Davis, Burchinal, & Nelson, 1999; Miles et al., 2007). Cronbach’s alpha for this sample was .89 at discharge and .86 at 2 months corrected age.

Anxiety—Maternal situational anxiety was measured with the state anxiety sub-scale of the State-Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983). The state sub-scale includes 20 items rated on a 4-point scale from “1 not at all” to “4 very much so” and has been found sensitive to changes in anxiety levels. Numerous reliability and validity studies of the STAI have been conducted (Spielberger et al., 1983). The test-retest coefficients of the state sub-scale are low, ranging from .16 to .53, as would be expected since it was designed to be influenced by situational factors. Cronbach’s alpha for this sample was .92 at discharge and .88 at 2 months corrected age.

Post-traumatic stress symptoms—The Perinatal PTSD Questionnaire (PPQ) was used to measure the extent to which mothers experienced post-traumatic stress symptoms in response to the birth of a high-risk infant and the NICU experience (Callahan & Hynan, 2002; Quinnell & Hynan, 1999). The PPQ has 14 yes-no items that measure intrusive thoughts (e.g., bad dreams of giving birth), avoidance or numbing (e.g., inability to remember parts of the hospitalization), and increased arousal (e.g., increased irritability or anger). The “yes” answers are summed. Scores on this tool have been correlated with scores on general PTSD scales (which are not specific to perinatal events) and with the severity of infant perinatal complications (Dieter et al., 2003; Quinnell & Hynan, 1999). Cronbach’s alpha for this sample was .85 at discharge and .81 at 2 months corrected age.

Worry about child health—The Worry Index (Miles & Holditch-Davis, 1995) measured the degree to which mothers worry about their preterm infant in seven areas (e.g., the infant getting enough to eat, medical problems, and rehospitalization). Items are rated on a 5-point scale, from “not at all” to “very much.” Worry scores of mothers of preterm infants were related to depressive symptoms and to parenting (Holditch-Davis et al., 2009; Holditch-Davis, Schwartz, Black, & Scher, 2007; Miles et al., 2007). Cronbach’s alpha for this sample was .87 at discharge and .83 at 2 months.

Demographic information—At enrollment, hospital discharge, and 2 months corrected age, mothers completed a demographic questionnaire that asked for the age, race, ethnicity, education, and occupation of the mother, spouse, and head of household. It also asked for a list of people living in the house with the child, their ages and relationship to the child, and whether or not the family is receiving public assistance. It was repeated over time to identify changes in demographic characteristics, such as changes in marital status.

Infant illness characteristics—The infant’s medical records were reviewed weekly until discharge to obtain data on obstetric history and medical course. To determine the severity of infant medical problems that might result in neurological insults, information from the medical record was scored on the Neurobiologic Risk Scale (NBRS; Brazy, Goldstein, Oehler, Gustafson, & Thompson, 1993), which measures potential insults to the brain through direct injury or inadequate blood flow, nutrients, or oxygenation. Seven neurological insults are scored for severity on a 4-point scale, with higher scores indicating more severe insults. Scores on the NBRS correlate between $-.37$ and $-.65$ with the Bayley Scales of Infant Development at 6–24 months corrected age, and they correlate at $.60$ with neurological examinations at 6 and 15 months (Brazy et al., 1993). Inter-rater reliability in scoring the NBRS is reported to be 97% (Brazy et al., 1993). Cronbach’s alpha in this sample was $.71$.

Procedures

The study was approved by the institutional review board at each study site. Mothers provided informed consent and were enrolled when their infants were no longer critically ill. They were followed until the infant was 2 months of age corrected for prematurity, which was the last time point at which mothers were to perform the interventions. Mothers were randomly assigned using computer-generated random numbers to the multi-sensory ATVV

intervention (White-Traut et al., 1999; White-Traut & Tubeszewski, 1986), kangaroo care using the Ludington-Hoe protocol (Ludington, 1990; Ludington-Hoe et al., 1999), or an attention control group. Study nurses instructed the mother on the intervention for her group and supported the mother in administering the intervention during hospitalization. The mothers were instructed to perform the interventions at least once a day, 3 times a week, and for at least 15 minutes at a time during infant hospitalization and continue at home until the infant was 2 months corrected age. By 2 months, infants' increasing social abilities provided mothers with many other ways to interact with their infants. Mothers were also told that they were free to do the interventions more frequently. The focus of the interventions was on the mother as intervener, and the study nurse as educator and supporter of the mother. All study nurses provided education and support for all three groups. Weekly teleconferences during which the nurses and investigators discussed each active case and reviewed videotapes of mothers doing the intervention insured that the protocols of all interventions were followed. After educating the mother in her assigned intervention, study nurses contacted the mothers at least weekly while the infants were in the hospital and made monthly phone calls after discharge. The NICU nurses were not directly involved with the intervention but continued their usual care of the infant and family. Although the NICU nurses were not informed about the assignment of any particular infant or mother, it was not possible to truly blind them to group assignments. In the control group, mothers spent a similar amount of time each week with the study nurse discussing the equipment needed for preterm infant care at home, e.g., clothes, diapers, formula, as did the intervention mothers.

Baseline data were collected at enrollment prior to group assignment. Research team members who were blinded to group assignment obtained outcome data at hospital discharge and 2 months corrected age to determine immediate effects of the intervention on maternal satisfaction with the intervention. Infant medical records were reviewed. Mothers were paid \$10 each time they complete questionnaires (at enrollment, discharge, and 2 months).

Data Analysis

The three groups of mothers were compared on subscale scores, the three global item scores (that were not part of a subscale), and the individual item scores using general linear models at both discharge and 2 months corrected age. The relationship of intervention satisfaction and satisfaction with nurse helpfulness to maternal demographic characteristics (age, marital status, race/ethnicity, first-time mother; education, public assistance) and infant illness (Apgar scores at 1 and 5 minutes, birthweight, gestational age, number of infections, NBRS scores) at enrollment and maternal psychological distress (anxiety, depressive symptoms, post-traumatic stress, worry about child health) at the time of data collection was examined using Pearson correlations. The effect of the exclusive or non-exclusive use of the assigned intervention on satisfaction was compared using a 2 factor (Group X Exclusivity) analyses of variance (ANOVA) at discharge and 2 months. The four recruitment sites were compared on subscale scores using general linear models.

Results

Comparison of the Groups on Satisfaction with their Intervention

Table 2 presents the comparison of the three groups of mothers on subscale scores and the three global item scores. The mothers in all three groups were satisfied with the intervention (mean scores of 3.3 or higher on a 5-point scale) and the helpfulness of the nurse (mean scores of 4.6 or higher on a 5-point scale). No significant differences occurred between the groups in the subscale or on the three global items: whether the mother would recommend the study to others, the degree to which she changed as a person, and the degree to which she changed as a mother.

Comparison of the Groups on Individual Items on the Satisfaction Questionnaire

Table 3 shows the group differences on the individual items in the subscales at discharge and 2 months corrected age. There were very few differences among the groups and no differences in the nurse helpfulness items. On the intervention satisfaction sub-scale at discharge, ATVV mothers had significantly higher scores on item #8 (learn new ways to stimulate and teach my infant) than did the other two groups. Kangaroo care mothers had higher scores on item #11 (feel I was helping my baby while in the hospital) than did the other two groups. At 2 months, the ATVV and kangaroo care mothers scored significantly higher than the control mothers on item #3 (feel like a mother in the hospital), and the ATVV mothers still had higher scores on item #8 (learn new ways to stimulate and teach my infant) than the other two groups.

Relationship to Maternal Demographic Characteristics and Infant Illness Characteristics

Table 4 shows the relationship of intervention satisfaction and satisfaction with nurse helpfulness to maternal demographic and infant illness characteristics at enrollment. Intervention satisfaction at discharge was not related to any of these maternal or infant variables, but at 2 months, being less satisfied with the intervention was associated with being younger, unmarried, African American, receiving public assistance, having lower education levels, and having infants with lower Apgar scores (at 1 or 5 minutes) or lower gestational ages at birth. Nurse helpfulness ratings at discharge were lower for mothers on public assistance and mothers with lower education levels, but at 2 months, nurse helpfulness scores were not related to any maternal or infant variable. Although statistically significant, these relationships were small, accounting for less than 5% of the variance in satisfaction.

Relationship with Maternal Psychological Distress at the Time of Data Collection

Table 5 shows the relationship of intervention satisfaction and satisfaction with nurse helpfulness to maternal psychological distress (anxiety, depressive symptoms, post-traumatic stress symptoms, worry about infant health) at the time of data collection. Intervention satisfaction was not related to maternal distress at discharge, but at 2 months, it was negatively correlated with state anxiety. Nurse helpfulness was negatively correlated with state anxiety and depressive symptoms at discharge and at 2 months. However, these

significant correlations were small, accounting for less than 10% of the variance in satisfaction.

Relationship with Exclusive Use of the Assigned Intervention

Neither the exclusive use of the intervention or the interaction between exclusivity and group were significant for either subscale at either age (see Table 6). The effect of exclusivity on nurse helpfulness ratings at 2 months did reach $p = 0.051$ ($F[2,112]=3.90$) because mothers who did other interventions tended to rate nurse helpfulness higher than mothers who only did the assigned intervention.

Comparison of the Recruitment Sites

Table 7 shows the subscale scores for the four study sites at discharge and 2 months. The mothers at all sites were satisfied with the intervention and the helpfulness of the study nurse. Intervention satisfaction, but not satisfaction with nurse helpfulness, varied by site: at discharge one NC site had lower scores, and at 2 months both NC sites had lower scores.

Discussion

This study examined mothers' satisfaction with two maternally administered interventions (ATVV and kangaroo care) and an attention control. We found that mothers in all three groups were equally satisfied with the interventions. Thus, the data suggest that regardless of the intervention, involving the mother in infant care while in the NICU is an important strategy to increase maternal satisfaction. We also found that mothers were very satisfied with the helpfulness of the study nurse. However, mothers with more anxiety or depressive symptoms at 2 months rated the nurse helpfulness lower than mothers with lower levels of these symptoms.

Overall, mothers were satisfied with all interventions and the helpfulness of the study nurses. ATVV and kangaroo care groups averaged slightly higher intervention satisfaction ratings than the control group, but these differences were not statistically significant. These data suggest that regardless of the intervention type, mothers feel satisfied when they have a distinct role in the care of their infant and they receive the attention and support of the health care team. Thus, receiving an intervention during infant hospitalization, whether focused on the infant or on education, was a positive experience for mothers. Further research is needed to determine the effects of these interventions on maternal distress and the mother-infant relationship.

A couple of the items on the satisfaction questionnaire differed among the groups at discharge and 2 months corrected age. We found that mothers using the ATVV intervention reported significantly higher ratings for learning new ways to stimulate and teach their babies. The ATVV intervention possibly provided a method by which mothers could explore and become familiar with their infants. Other types of infant massage have been shown to increase mother-infant attachment (Lee, 2006). We also found that at discharge, mothers who provided kangaroo care had stronger perceptions that they were helping the baby while in the hospital than did the other two groups. Kangaroo care has been shown to improve thermal regulation, decrease pain, and promote breastfeeding, and improve infant growth

(Cong et al., 2012; Gathwala et al., 2010; Tuoni, Scaramuzzo, Ghirri, Boldrini, & Bartalena, 2012). Thus, mothers in this study may have been aware of the benefits of kangaroo care for their infants, either because they could see them or had received information from other sources.

We also examined the relationship between intervention satisfaction and maternal and infant characteristics. Intervention satisfaction was not related to maternal demographic or infant illness characteristics at discharge or whether the mothers only provided the infant with their assigned intervention but were related to maternal demographics at 2 months corrected age. The active period of the intervention, when mothers had at least weekly contact with the study nurse, ended at discharge. Mothers still had current contact with the study nurse when they completed the discharge satisfaction questionnaires. The absence of significant correlations at this time point suggests they were reporting on their current experiences. At 2 months, mothers had to rely on their memories of the intervention and study team after discharge so it is not surprising that their own characteristics had very small but significant effects on their satisfaction ratings.

Also, the intervention satisfaction had small but significant correlations with the mother's level of psychological distress at the time the satisfaction questionnaire was completed, especially at 2 months corrected age. This finding may also be attributed to the effects of the mother's emotional state on her recollection of the intervention, as studies have suggested that emotional state can influence the recollection of an event (Pernot-Marino, Danion, & Hedelin, 2004). Finally, ratings of intervention satisfaction were related to recruitment site, which probably reflects the different populations served by each site.

Mothers in all groups were very satisfied with the study nurse's helpfulness. The overall nurse helpfulness subscale rating and all of the item ratings did not differ by intervention group or by recruitment site. The same nurses provided all three interventions at each site so the finding of no differences strongly suggested that the nurses were equally competent with all three interventions. However, mothers with more anxiety or depressive symptoms at the time of data collection rated nurse helpfulness lower, especially at 2 months. This finding suggests that the later ratings may have reflected the mother's emotional state as well as the nurse's helpfulness. Overall, the mothers viewed the study nurses, who were trained to support mothers in administering interventions for their preterm infants in the NICU, quite positively.

This study had a few limitations including the use of the same nurses to perform all three interventions, conducting the study in NICUs rather than a more controlled environment, and the large number of analyses conducted on an investigator-developed instrument. The same study nurses instructed the mothers in all groups, raising the possibility that the nurses' preference for one intervention might have affected the mothers' responses to the interventions. However, the protocols for each intervention were straight forward and specific. Weekly teleconferences between study nurses and investigators insured that the nurses at all sites followed intervention protocols. The similarity of the three groups of mothers' satisfaction with the interventions and the study nurses strongly suggests that the mothers did not detect any differences in the study nurses' behaviors. Also, by using the

same nurses for all intervention groups, we insured that the interventions were not confounded with any differences among the nurses.

Another potential limitation was that the interventions were performed in an NICU environment, where other distractions or health care provider perceptions of the interventions might have affected the mother or the mothers' feelings about their intervention. Conducting the study in a controlled environment such as a laboratory was not feasible since the infants were by definition patients in an NICU. Also, by conducting our study in an NICU, the ecological validity of the study was insured since the NICU is the environment in which these interventions are used clinically. Thus, the study findings could be more easily translated into practice.

The final limitation of this study was the large number of statistical tests conducted on an investigator-developed instrument. No standardized instruments to measure maternal satisfaction with administering interventions for their infants exist. The instrument was derived from theory and tapped three dimensions of satisfaction: efficacy, caring, and technical quality. Evidence of the appropriateness of the instrument is found in the excellent internal consistency of the two sub-scales at both study time points. However, because little was known about maternal satisfaction with administering interventions and nothing was known about the satisfaction instrument's functioning, a number of exploratory analyses were performed including examining individual items on the questionnaire and correlations with a large number of maternal and infant characteristics. Because no correction for multiple statistical tests was made, the possibility of finding a significant difference by chance was increased. Thus, findings of this study need to be replicated.

Implications for Practice

Together these data suggest that mothers of infants in the NICU during hospitalization will be satisfied with nursing interventions whether they are focused on the caring for the infant or on education since ATVV, kangaroo care, and education were viewed equally positively by the mothers in this study. In particular, interventions that provide mothers with a unique role to play in infants' care during hospitalization are likely to be appreciated by mothers. Another important factor was the study nurse's role in supporting the mother and helping her to perform the intervention with her infant. Unlike the study nurses, neonatal nurses have limited time to spend with parents because of the need to care for multiple infants. Nevertheless, this study's findings suggest that it is important that mothers are not made to feel that the infant's nurse is too busy to attend to parental needs. Another recommendation would be to insure that parents have privacy and space to provide interventions for their infants and to engage in social interactions with them. Many NICUs are designed in such a way that there is limited space between patients, which may make parents feel like they are intruding or are "in the way" of nurses trying to care for the infants. Overall, neonatal nurses can encourage mothers to administer ATVV or kangaroo care because these interventions have the potential to improve maternal satisfaction while having the positive effects on the infant found in previous studies (Dieter et al., 2003; Ludington-Hoe et al., 2000; White-Traut, Nelson, et al., 2002).

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References

- Ahn HY, Lee J, Shin HJ. Kangaroo care on premature infant growth and maternal attachment and post-partum depression in South Korea. *Journal of Tropical Pediatrics*. 2010; 56(5):342–344. [PubMed: 20601691]
- Allen EC, Manuel JC, Legault C, Naughton MJ, Pivor C, O’Shea TM. Perception of child vulnerability among mothers of former premature infants. *Pediatrics*. 2004; 113(2):267–273. [PubMed: 14754937]
- Arivabene JC, Tyrrell MA. Kangaroo mother method: mothers’ experiences and contributions to nursing. *Revista Latino-Americana de Enfermagem*. 2010; 18(2):262–268. [PubMed: 20549127]
- Bell PL. Adolescent mothers’ perceptions of the neonatal intensive care unit environment. *Journal of Perinatal Neonatal Nursing*. 1997; 11(1):77–84. [PubMed: 9214953]
- Brooten D, Gennaro S, Brown LP, Butts P, Gibbons AL, Bakewell-Sachs S, Kumar SP. Anxiety, depression, and hostility in mothers of preterm infants. *Nursing Research*. 1988; 37(4):213–216. [PubMed: 3393427]
- Callahan JL, Hynan MT. Identifying mothers at risk for postnatal emotional distress: further evidence for the validity of the perinatal posttraumatic stress disorder questionnaire. *Journal of Perinatology*. 2002; 22(6):448–454. [PubMed: 12168121]
- Chiu SH, Anderson GC. Effect of early skin-to-skin contact on mother-preterm infant interaction through 18 months: randomized controlled trial. *International Journal of Nursing Studies*. 2009; 46(9):1168–1180. [PubMed: 19361802]
- Cong X, Cusson RM, Walsh S, Hussain N, Ludington-Hoe SM, Zhang D. Effects of skin-to-skin contact on autonomic pain responses in preterm infants. *Journal of Pain*. 2012; 13(7):636–645. [PubMed: 22595172]
- Davis L, Edwards H, Mohay H, Wollin J. The impact of very premature birth on the psychological health of mothers. *Early Human Development*. 2003; 73(1–2):61–70. [PubMed: 12932894]
- de Alencar AE, Arraes LC, de Albuquerque EC, Alves JG. Effect of kangaroo mother care on postpartum depression. *Journal of Tropical Pediatrics*. 2009; 55(1):36–38. [PubMed: 19066171]
- de Macedo EC, Cruvinel F, Lukasova K, D’Antino ME. The mood variation in mothers of preterm infants in kangaroo mother care and conventional incubator care. *Journal of Tropical Pediatrics*. 2007; 53(5):344–346. [PubMed: 17881409]
- DeMier RL, Hynan MT, Harris HB, Manniello RL. Perinatal stressors as predictors of symptoms of posttraumatic stress in mothers of infants at high risk. *Journal of Perinatology*. 1996; 16(4):276–280. [PubMed: 8866297]
- Dieter JN, Field T, Hernandez-Reif M, Emory EK, Redzepi M. Stable preterm infants gain more weight and sleep less after five days of massage therapy. *Journal of Pediatric Psychology*. 2003; 28(6):403–411. [PubMed: 12904452]
- Feijo L, Hernandez-Reif M, Field T, Burns W, Valley-Gray S, Simco E. Mothers’ depressed mood and anxiety levels are reduced after massaging their preterm infants. *Infant Behavior and Development*. 2006; 29(3):476–480. [PubMed: 17138300]
- Feldman R, Eidelman AI. Direct and indirect effects of breast milk on the neurobehavioral and cognitive development of premature infants. *Developmental Psychobiology*. 2003; 43(2):109–119.10.1002/dev.10126 [PubMed: 12918090]
- Feldman R, Eidelman AI, Sirota L, Weller A. Comparison of skin-to-skin (kangaroo) and traditional care: parenting outcomes and preterm infant development. *Pediatrics*. 2002; 110(1 Pt 1):16–26. [PubMed: 12093942]
- Feldman R, Weller A, Leckman JF, Kuint J, Eidelman AI. The nature of the mother’s tie to her infant: maternal bonding under conditions of proximity, separation, and potential loss. *Journal of Child Psychology and Psychiatry*. 1999; 40(6):929–939. [PubMed: 10509887]

- Feldman R, Weller A, Sirota L, Eidelman AI. Skin-to-skin contact (kangaroo care) promotes self-regulation in premature infants: Sleep-wake cyclicity, arousal modulation, and sustained exploration. *Developmental Psychology*. 2002; 38(2):194–207. [PubMed: 11881756]
- Feldman R, Weller A, Sirota L, Eidelman AI. Testing a family intervention hypothesis: The contribution of mother-infant skin-to-skin contact (kangaroo care) to family interaction, proximity, and touch. *Journal of Family Psychology*. 2003; 17(1):94–107. [PubMed: 12666466]
- Ferber SG, Feldman R, Kohelet D, Kuint J, Dollberg S, Arbel E, Weller A. Massage therapy facilitates mother-infant interaction in premature infants. *Infant Behavior and Development*. 2005; 28:74–81.
- Furman L, Minich N, Hack M. Correlates of lactation in mothers of very low birth weight infants. *Pediatrics*. 2002; 109(4):e57. [PubMed: 11927730]
- Gale G, Franck L, Lund C. Skin-to-skin (kangaroo) holding of the intubated premature infant. *Neonatal Network*. 1993; 12(6):49–57. [PubMed: 8413138]
- Gathwala G, Singh B, Singh J. Effect of kangaroo mother care on physical growth, breastfeeding and its acceptability. *Tropical Doctors*. 2010; 40(4):199–202.
- Gelfand DM, Teti DM. The effects of maternal depression on children. *Journal of Child Psychology and Psychiatry*. 1990; 40:929–939.
- Gennaro S. Postpartal anxiety and depression in mothers of term and preterm infants. *Nursing Research*. 1988; 37(2):82–85. [PubMed: 3347524]
- Henderson JJ, Evans SF, Straton JA, Priest SR, Hagan R. Impact of postnatal depression on breastfeeding duration. *Birth*. 2003; 30(3):175–180. [PubMed: 12911800]
- Hill PD, Aldag JC, Chatterton RT Jr. Breastfeeding experience and milk weight in lactating mothers pumping for preterm infants. *Birth*. 1999; 26(4):233–238. [PubMed: 10655829]
- Holditch-Davis D, Bartlett TR, Blickman AL, Miles MS. Posttraumatic stress symptoms in mothers of premature infants. *Journal of Obstetric, Gynecologic and Neonatal Nursing*. 2003; 32(2):161–171.
- Holditch-Davis, D.; Miles, M. Parenting the prematurely born child. In: Fitzpatrick, JJ.; Norbeck, J., editors. *Annual Review of Nursing Research*. Vol. 15. New York: Springer; 1997. p. 3-34.
- Holditch-Davis D, Miles MS, Weaver MA, Black B, Beeber L, Thoyre S, Engelke S. Patterns of distress in African-American mothers of preterm infants. *Journal of Developmental and Behavioral Pediatrics*. 2009; 30(3):193–205. [PubMed: 19412125]
- Holditch-Davis D, Schwartz T, Black B, Scher M. Correlates of mother-premature infant interactions. *Research in Nursing & Health*. 2007; 30(3):333–346. [PubMed: 17514707]
- Hughes M, McCollum J, Sheftel D, Sanchez G. How parents cope with the experience of neonatal intensive care. *Child Health Care*. 1994; 23(1):1–14. [PubMed: 10132662]
- Jackson K, Ternstedt BM, Schollin J. From alienation to familiarity: experiences of mothers and fathers of preterm infants. *Journal of Advanced Nursing*. 2003; 43(2):120–129. [PubMed: 12834369]
- Johnson AN. The maternal experience of kangaroo holding. *Journal of Obstetric, Gynecologic, and Neonatal Nursing*. 2007; 36(6):568–573.
- Kaplan PS, Bachorowski JA, Zarleno-Strouse P. Child-directed speech produced by mothers with symptoms of depression fails to promote associative learning in 4-month-old infants. *Child Development*. 1999; 70(3):560–570. [PubMed: 10368910]
- Lee HK. The effects of infant massage on weight, height, and mother-infant interaction. *Taehan Kanho Hakhoe Chi*. 2006; 36(8):1331–1339. [PubMed: 17215606]
- Lefkowitz DS, Baxt C, Evans JR. Prevalence and correlates of posttraumatic stress and postpartum depression in parents of infants in the Neonatal Intensive Care Unit (NICU). *Journal of Clinical Psychology in Medical Settings*. 2010; 7(3):230–237. 10.1007/s10880-010-9202-7 [PubMed: 20632076]
- Livingston K, Beider S, Kant AJ, Gallardo CC, Joseph MH, Gold JI. Touch and massage for medically fragile infants. *Evidence-Based Complementary and Alternative Medicine*. 2009; 6(4):473–482. [PubMed: 18955228]
- Ludington SM. Energy conservation during skin-to-skin contact between premature infants and their mothers. *Heart & Lung*. 1990; 19(5 Pt 1):445–451. [PubMed: 2211150]

- Ludington-Hoe SM, Anderson GC, Simpson S, Hollingsead A, Argote LA, Rey H. Birth-related fatigue in 34–36-week preterm neonates: rapid recovery with very early kangaroo (skin-to-skin) care. *Journal of Obstetric, Gynecologic, and Neonatal Nursing*. 1999; 28(1):94–103.
- Ludington-Hoe SM, Nguyen N, Swinth JY, Satyshur RD. Kangaroo care compared to incubators in maintaining body warmth in preterm infants. *Biological Research Nursing*. 2000; 2(1):60–73.
- Mahmood I, Jamal M, Khan N. Effect of mother-infant early skin-to-skin contact on breastfeeding status: a randomized controlled trial. *Journal of the College of Physicians and Surgeons*. 2011; 21(10):601–605.
- Mew AM, Holditch-Davis D, Belyea M, Miles MS, Fishel A. Correlates of depressive symptoms in mothers of preterm infants. *Neonatal Network*. 2003; 22(5):51–60. [PubMed: 14598980]
- Miles MS, Holditch-Davis D. Compensatory parenting: how mothers describe parenting their 3-year-old, prematurely born children. *Journal of Pediatric Nursing*. 1995; 10(4):243–253. [PubMed: 7562381]
- Miles MS, Holditch-Davis D. Parenting the prematurely born child: pathways of influence. *Seminars in Perinatology*. 1997; 21(3):254–266. [PubMed: 9205979]
- Miles MS, Holditch-Davis D, Burchinal P, Nelson D. Distress and growth outcomes in mothers of medically fragile infants. *Nursing Research*. 1999; 48(3):129–140. [PubMed: 10337844]
- Miles MS, Holditch-Davis D, Schwartz TA, Scher M. Depressive symptoms in mothers of prematurely born infants. *Journal of Developmental and Behavioral Pediatrics*. 2007; 28(1):36–44. [PubMed: 17353730]
- Miles MS, Holditch-Davis D, Shepherd H. Maternal concerns about parenting prematurely born children. *MCN: American Journal of Maternal Child Nursing*. 1998; 23(2):70–75. [PubMed: 9529869]
- Mörelus E, Theodorsson E, Nelson N. Salivary cortisol and mood and pain profiles during skin-to-skin care for an unselected group of mothers and infants in neonatal intensive care. *Pediatrics*. 2005; 116(5):1105–1113. [PubMed: 16263996]
- Muller-Nix C, Forcada-Guex M, Pierrehumbert B, Jaunin L, Borghini A, Ansermet F. Prematurity, maternal stress and mother-child interactions. *Early Human Development*. 2004; 79(2):145–158. [PubMed: 15324994]
- Murray L, Fiori-Cowley A, Hooper R, Cooper P. The impact of postnatal depression and associated adversity on early mother-infant interactions and later infant outcome. *Child Development*. 1996; 67(5):2512–2526. [PubMed: 9022253]
- Neu M. Kangaroo care: is it for everyone? *Neonatal Network*. 2004; 23(5):47–54. [PubMed: 15490915]
- Neu M, Robinson J. Maternal holding of preterm infants during the early weeks after birth and dyad interaction at six months. *Journal of Obstetric, Gynecologic and Neonatal Nursing*. 2010; 39(4):401–414.
- Nguah SB, Wobil PN, Obeng R, Yakubu A, Kerber KJ, Lawn JE, Plange-Rhule G. Perception and practice of kangaroo mother care after discharge from hospital in Kumasi, Ghana: a longitudinal study. *BMC Pregnancy and Childbirth*. 2011; 11:99.10.1186/1471-2393-11-99 [PubMed: 22133462]
- Perrin EC, West PD, Culley BS. Is my child normal yet? Correlates of vulnerability. *Pediatrics*. 1989; 83(3):355–363. [PubMed: 2919140]
- Pernot-Marino E, Danion JM, Hedelin G. Relations between emotion and conscious recollection of true and false autobiographical memories: an investigation using lorazepam as a pharmacological tool. *Psychopharmacology*. 2004; 175(1):60–67. [PubMed: 15007596]
- Quinnell FA, Hynan MT. Convergent and discriminant validity of the perinatal PTSD questionnaire (PPQ): a preliminary study. *Journal of Traumatic Stress*. 1999; 12(1):193–199. [PubMed: 10027153]
- Radloff LS. The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement*. 1977; 1:385–401.
- Ravn IH, Smith L, Smeby NA, Kynoe NM, Sandvik L, Bunch EH, Lindemann R. Effects of early mother-infant intervention on outcomes in mothers and moderately and late preterm infants at age

- 1 year: a randomized controlled trial. *Infant Behavior and Development*. 2012; 35(1):36–47. [PubMed: 22024475]
- Roberts KL, Paynter C, McEwan B. A comparison of kangaroo mother care and conventional cuddling care. *Neonatal Network*. 2000; 19(4):31–35. [PubMed: 11949100]
- Singer LT, Fulton S, Davillier M, Koshy D, Salvator A, Baley JE. Effects of infant risk status and maternal psychological distress on maternal-infant interactions during the first year of life. *Journal of Developmental and Behavioral Pediatrics*. 2003; 24(4):233–241. [PubMed: 12915795]
- Spielberger, CD.; Gorsuch, RL.; Lushene, R.; Vagg, PR.; Jacobs, GA. *Manual for the State-Trait Anxiety Inventory*. Palo Alto, CA: Consulting Psychologists Press; 1983.
- Tallandini MA, Scalembra C. Kangaroo mother care and mother-premature infant dyadic interaction. *Infant Mental Health Journal*. 2006; 27(30):251–275.
- Tronick E, Reck C. Infants of depressed mothers. *Harvard Review of Psychiatry*. 2009; 17(2):147–156. [PubMed: 19373622]
- Tuoni C, Scaramuzzo RT, Ghirri P, Boldrini A, Bartalena L. Kangaroo mother care: four years of experience in very low birth weight and preterm infants. *Minerva Pediatrics*. 2012; 64(4):377–383.
- Weissman MM, Sholomskas D, Pottenger M, Prusoff BA, Locke BZ. Assessing depressive symptoms in five psychiatric populations: a validation study. *American Journal of Epidemiology*. 1977; 106(3):203–214. [PubMed: 900119]
- White-Traut RC, Nelson MN, Silvestri JM, Patel M, Berbaum M, Gu GG, Rey PM. Developmental patterns of physiological response to a multisensory intervention in extremely premature and high-risk infants. *Journal of Obstetric, Gynecologic and Neonatal Nursing*. 2004; 33(2):266–275.
- White-Traut RC, Nelson MN, Silvestri JM, Patel M, Vasani U, Han BK, Bradford L. Developmental intervention for preterm infants diagnosed with periventricular leukomalacia. *Research in Nursing & Health*. 1999; 22(2):131–143. [PubMed: 10094298]
- White-Traut RC, Nelson MN, Silvestri JM, Vasani U, Littau S, Meleedy-Rey P, Patel M. Effect of auditory, tactile, visual, and vestibular intervention on length of stay, alertness, and feeding progression in preterm infants. *Developmental Medicine and Child Neurology*. 2002; 44(2):91–97. [PubMed: 11848115]
- White-Traut R, Rinehart T, Wink T, Holditch-Davis D. Frequency of premature infant engagement and disengagement behaviors during two maternally administered interventions. *Newborn and Infant Nursing Reviews*. 2012; 12(3):124–131. [PubMed: 22984346]
- White-Traut R, Studer T, Meleedy-Rey P, Murray P, Labovsky S, Kahn J. Pulse rate and behavioral state correlates after auditory, tactile, visual, and vestibular intervention in drug-exposed neonates. *Journal of Perinatology*. 2002; 22(4):291–299.10.1038/sj.jp.7210695 [PubMed: 12032792]
- White-Traut RC, Tubeszewski KA. Multimodal stimulation of the premature infant. *Journal of Pediatric Nursing*. 1986; 1(2):90–95. [PubMed: 3634818]

Table 1
 Comparison of Control, Auditory-Tactile-Visual-Vestibular (ATVV) Intervention, and Kangaroo Care Mothers on Maternal Demographic Characteristics and Infant Illness Variables at Enrollment

	Total Sample			Control			ATVV			Kangaroo Care		
	Mean (SD)	N	Mean (SD)	N	Mean (SD)	N	Mean (SD)	N	Mean (SD)	N	Mean (SD)	N
Gestat. Age (Weeks)	27.2 (3.0)	73	27.6 (3.2)	66	27.0 (2.7)	68	27.4 (3.0)	68	27.4 (3.0)	68	27.4 (3.0)	68
Birthweight (Grams)	1025 (373)	73	1031(353)	66	1004 (312)	68	1038 (317)	68	1038 (317)	68	1038 (317)	68
Sex: % Male	45.7%	73	43.8%	67	46.3%	68	47.1%	68	47.1%	68	47.1%	68
Size: % SGA	17.7%	73	18.5%	65	15.4%	68	19.2%	68	19.2%	68	19.2%	68
Apgar Score: 1 Min. 5 Min.	5.2 (2.5) 7.3 (1.6)	73	5.3 (2.4) 7.4 (1.4)	65	5.2 (2.6) 7.2 (1.7)	68	5.2 (2.4) 7.3 (1.6)	68	5.2 (2.4) 7.3 (1.6)	68	5.2 (2.4) 7.3 (1.6)	68
Neurological Insults ^a	3.8 (3.7)	73	3.6 (3.6)	66	4.2 (3.8)	68	4.5 (4.2)	68	4.5 (4.2)	68	4.5 (4.2)	68
Mech. Vent. (Days)	14.2 (17.8)	73	14.3 (18.9)	67	14.6 (18.3)	68	13.7 (16.3)	68	13.7 (16.3)	68	13.7 (16.3)	68
IVH: % None	65.7%	73	65.7%	66	69.7%	68	61.8%	68	61.8%	68	61.8%	68
% Grade I	18.8%		17.8%		16.7%		22.1%		22.1%		22.1%	
% Grade II	6.8%		12.3%		3.0%		4.4%		4.4%		4.4%	
% Grade III	1.0%		0.0%		1.5%		1.5%		1.5%		1.5%	
% Grade IV	7.7%		4.1%		9.0%		10.3%		10.3%		10.3%	
% Having Surgery	36.4%	73	40.0%	66	30.8%	68	38.5%	68	38.5%	68	38.5%	68
% Multiple births	18.8%	73	16.4%	66	21.2%	68	19.1%	68	19.1%	68	19.1%	68
% PDA	41.3%	73	42.5%	67	43.3%	68	38.2%	68	38.2%	68	38.2%	68
% NEC	15.1%	72	16.7%	66	10.6%	68	17.7%	68	17.7%	68	17.7%	68
% Cesarean Section	57.9%	73	58.0%	67	61.7%	68	53.9%	68	53.9%	68	53.9%	68
Maternal Age	27.0 (6.2)	73	26.7 (6.6)	67	26.4 (5.4)	67	28.0 (6.3)	67	28.0 (6.3)	67	28.0 (6.3)	67
Race/Ethn.: White	18.3%	73	16.4%	67	19.4%	68	19.1%	68	19.1%	68	19.1%	68
Black	72.1%		78.1%		70.2%		67.6%		67.6%		67.6%	
Hispanic	7.7%		5.5%		7.5%		10.3%		10.3%		10.3%	
Other	1.9%		0.0%		3.0%		2.9%		2.9%		2.9%	
% Mothers Married	32.2%	73	27.4%	67	36.0%	65	33.8%	65	33.8%	65	33.8%	65
% First-Time Mothers*	54.0%	69	43.5%	65	66.2%	64	53.1%	64	53.1%	64	53.1%	64
Maternal Ed. (Years)	13.4 (2.3)	71	13.1 (2.2)	66	13.6 (2.1)	66	13.5 (2.5)	66	13.5 (2.5)	66	13.5 (2.5)	66

	Total Sample		Control		ATVV		Kangaroo Care	
	Mean (SD)	N	Mean (SD)	N	Mean (SD)	N	Mean (SD)	N
% Public Assistance	20.3%	73	21.9%	67	19.4%	67	19.4%	67

Note: Gestat. = gestational; SGA = small for gestational age; Min. = minute; Mech. Vent. = mechanical ventilation; IVH = intraventricular hemorrhage; PDA = patent ductus arteriosus; NEC = necrotizing enterocolitis; Ed. = education; Ethn. = Ethnicity.

^a Scored on Neurobehavioral Risk Scale.

* Groups were compared using Chi squared test for categorical variables and general linear models for continuous variables, $p < .05$.

Table 2

Comparison of Control, Auditory-Tactile-Visual-Vestibular (ATVV) Intervention, and Kangaroo Care Mothers on Their Satisfaction with Their Intervention at Discharge and 2 Months Corrected Age

Subscale or Item	Control		ATVV		Kangaroo Care		Comparison	
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	F	df	p	
	<u>Discharge</u>							
Intervention Satisfaction	3.31 (0.61)	3.44 (0.53)	3.50 (0.56)	2.00	2,188	.14		
Nurse Helpfulness	4.61 (0.55)	4.58 (0.62)	4.60 (0.64)	0.03	2,188	.97		
Recommend Study	3.78 (0.42)	3.75 (0.44)	3.75 (0.44)	0.12	2,188	.89		
Changed as Person	1.93 (0.77)	2.12 (0.77)	2.05 (0.78)	1.03	2,184	.36		
Changed as Mother	2.08 (0.81)	2.15 (0.72)	2.13 (0.81)	0.16	2,183	.85		
	<u>2 Months</u>							
Intervention Satisfaction	3.41 (0.62)	3.49 (0.43)	3.41 (0.56)	0.44	2,185	.65		
Nurse Helpfulness	4.61 (0.52)	4.68 (0.56)	4.61 (0.69)	0.44	2,185	.78		
Recommend Study	3.84 (0.37)	3.76 (0.43)	3.76 (0.53)	0.57	2,182	.57		
Changed as Person	2.12 (0.75)	2.19 (0.63)	2.27 (0.67)	0.77	2,182	.46		
Changed as Mother	2.06 (0.85)	2.17 (0.67)	2.24 (0.68)	0.92	2,182	.40		

Note: Items were shortened for this table. Items were scored on a 5-point scale with 5 being the best rating, except the items change as a person and change as a mother that were scored on a 3-point scale with 3 being the highest. The groups were compared on subscales and items using general linear models.

Table 3
 Comparison of Control, Auditory-Tactile-Visual-Vestibular (ATVV) Intervention, and Kangaroo Care Mothers on the Helpfulness Survey Items in the two Sub-Scales at Discharge and 2 Months

Subscale/Item	Age	Control		ATVV		Kangaroo Care		Comparison	
		Mean(SD)	Mean(SD)	Mean(SD)	Mean(SD)	F	df	p	
1. Learn new ways to care for baby	DC	3.2(1.0)	3.5(0.8)	3.4(0.9)	2.18	2,188	.12		
	2 M	3.4(0.8)	3.5(0.7)	3.4(0.8)	0.48	2,185	.62		
2. New way care for baby after hospital	2 M	3.3(0.9)	3.4(0.7)	3.3(0.9)	0.29	2,184	.75		
	DC	3.0(1.0)	3.2(0.9)	3.3(1.0)	2.02	2,188	.11		
3. Feel like a mother in hospital	2 M	2.8(1.1)	3.2(0.9)	3.1(1.1)	3.12	2,183	<.05		
	2 M	3.5(0.9)	3.5(0.7)	3.5(0.9)	0.00	2,184	.99		
4. Feel like a mother at home	DC	2.8(1.1)	2.9(0.9)	3.0(1.1)	0.58	2,186	.56		
	2 M	2.8(1.1)	2.9(1.0)	2.8(1.1)	0.16	2,183	.85		
5. Feel less upset in hospital	DC	3.5(0.8)	3.4(0.7)	3.6(0.8)	0.76	2,188	.47		
	2 M	3.5(0.9)	3.5(0.8)	3.4(0.9)	0.31	2,185	.73		
7. Learn new things about baby	DC	3.3(1.0)	3.6(0.7)	3.5(0.8)	2.02	2,188	.14		
	2 M	3.5(0.9)	3.8(0.4)	3.5(0.7)	2.00	2,185	.14		
8. Learn new ways to stimulate baby	DC	3.1(1.0)	3.8(0.5)	3.4(0.9)	9.42	2,188	<.001		
	2 M	3.4(0.9)	3.8(0.4)	3.5(0.8)	5.66	2,185	<.01		
9. Feel baby knew he was loved	DC	3.5(0.9)	3.6(0.7)	3.7(0.7)	1.00	2,188	.37		
	2 M	3.8(0.7)	3.7(0.6)	3.7(0.8)	0.32	2,184	.73		
10. Feel everything done to help baby	DC	3.6(0.8)	3.6(0.7)	3.8(0.7)	0.74	2,187	.48		
	2 M	3.7(0.7)	3.6(0.7)	3.6(0.8)	0.53	2,184	.59		
11. Feel I was helping baby	DC	3.5(0.7)	3.5(0.7)	3.7(0.6)	3.15	2,186	<.05		
	2 M	3.6(0.8)	3.5(0.8)	3.7(0.7)	0.21	2,184	.81		
12. Understood info. about baby needs	DC	3.4(0.9)	3.3(0.9)	3.6(0.8)	2.09	2,185	.13		
	2 M	3.6(0.8)	3.4(0.7)	3.4(0.8)	1.24	2,184	.29		
13. Study nurse cared about you	DC	4.6(0.7)	4.6(0.8)	4.6(0.9)	0.17	2,188	.85		
	2 M	4.6(0.7)	4.7(0.7)	4.7(0.6)	0.21	2,184	.81		
14. Feel welcome to call nurse	DC	4.7(0.7)	4.5(0.8)	4.7(0.8)	0.77	2,188	.46		
	2 M	4.6(0.8)	4.7(0.7)	4.6(1.0)	0.18	2,184	.84		

Subscale/Item	Age	Control		ATVV	Kangaroo Care		Comparison	
		Mean(SD)	Mean(SD)		Mean(SD)	Mean(SD)	F	df
15. Feel nurse explained things	DC	4.8(0.6)	4.7(0.7)	4.7(0.8)	0.16	2,188	.85	
	2 M	4.9(0.4)	4.8(0.6)	4.8(0.7)	0.34	2,184	.71	
16. Feel nurse listened carefully	DC	4.8(0.5)	4.8(0.6)	4.8(0.7)	0.21	2,188	.81	
	2 M	4.9(0.5)	4.8(0.6)	4.8(0.5)	0.17	2,184	.84	
17. Feel nurse knew enough	DC	4.6(0.7)	4.7(0.7)	4.6(0.9)	0.08	2,188	.93	
	2 M	4.8(0.6)	4.7(0.6)	4.6(0.8)	0.73	2,185	.48	
18. Feel nurse knew guidance needed	DC	4.4(1.0)	4.5(0.9)	4.3(1.1)	0.21	2,188	.82	
	2 M	4.2(1.1)	4.4(0.9)	4.3(1.1)	0.30	2,185	.74	
19. Feel nurse as helpful as should	DC	4.7(0.6)	4.7(0.7)	4.6(0.8)	0.44	2,188	.65	
	2 M	4.6(0.8)	4.8(0.6)	4.7(0.8)	0.57	2,185	.57	
20. Feel intervention helped baby	DC	4.3(1.1)	4.4(0.9)	4.5(1.0)	0.41	2,187	.66	
	2 M	4.3(1.0)	4.5(0.8)	4.4(1.0)	0.92	2,185	.40	
21. Feel nurse easy to contact	DC	4.8(0.6)	4.7(0.8)	4.7(0.7)	0.45	2,188	.64	
	2 M	4.7(0.7)	4.7(0.7)	4.6(1.0)	0.35	2,184	.70	
22. Feel nurse was available	DC	4.6(0.9)	4.5(1.0)	4.6(1.0)	0.25	2,188	.78	
	2 M	4.6(0.7)	4.7(0.8)	4.6(0.9)	0.06	2,184	.94	
23. Feel nurse spent enough time	DC	4.4(1.1)	4.4(1.1)	4.4(1.0)	0.04	2,188	.96	
	2 M	4.5(1.0)	4.7(0.8)	4.7(0.8)	1.59	2,183	.21	

Note: Groups were compared on items using general linear models. Items were shortened for this table. Items 1–12 were in the Intervention Satisfaction subscale and Items 13–23 were in the Nurse Helpfulness subscale. Items were scored on a 5-point scale with 5 being the best rating. DC = discharge; 2 M = 2 months; info. = information.

Table 4

Correlations of Subscale Scores with Maternal Demographic and Infant Illness Characteristics

Characteristics	Discharge		2 Months	
	Interv. Satisf.	Nurse Helpf.	Interv. Satisf.	Nurse Helpf.
Maternal Age	-.04	.08	-.22**	-.03
Marital Status ¹	-.14	.07	-.22**	-.02
Race/Ethnicity ²	.12	.03	.21**	.13
First-Time Mother	-.05	.08	-.01	-.10
Maternal Educat.	-.05	.21**	-.16*	.04
Public Assistance	.14	.14*	.16*	.14
Apgar 1	-.04	-.08	.14*	-.06
Apgar 5	.03	.07	.20**	-.00
Birthweight	.04	.03	.09	.06
Gestational Age	.03	-.01	.17*	.03
# of infections	-.02	-.14	.01	-.02
Ventilator Days	.08	.06	-.07	-.00
NBRS	.06	.05	-.06	-.02

Note: Interv. Satisf. = Intervention Satisfaction; Nurse Helpf. = Nurse helpfulness. Educat. = Education. NBRS = Neurobehavioral Risk Scale.

¹ married or not.

² African American or not.

* $p < .05$.

* $p < .01$.

Table 5

Correlations of Subscale Scores with Maternal Psychological Distress Variables at the Time of Data Collection

Maternal Psychological Distress	Discharge		2 Months	
	Interv. Satisf.	Nurse Help.	Interv. Satisf.	Nurse Help.
Anxiety	-.10	-.16*	-.20**	-.30***
Depressive Symptoms	-.01	-.15*	.03	-.17*
Post-traumatic stress	-.04	-.06	-.04	-.08
Worry about child health	.00	-.04	-.04	-.08

Note: Interv. Satisf. = Intervention Satisfaction; Nurse Helpf. = Nurse Helpfulness.

*
 $p < .05$.

**
 $p < .01$.

 $p < .001$.

Table 6

Sub-Scale Scores of Control, Auditory-Tactile-Visual-Vestibular (ATVV) Intervention, and Kangaroo Care Mothers Who Exclusively Did Their Assigned Interventions and Mothers in These Groups Who Also Did Other Interventions

Subscale	ATVV		Kangaroo Care		Control	
	Exclusive Mean (SD)	Other Mean (SD)	Exclusive Mean (SD)	Other Mean (SD)	Exclusive Mean (SD)	Other Mean (SD)
Interv. Satisf.	3.48 (0.42)	3.54 (0.35)	3.56 (0.47)	3.47 (0.55)	3.37 (0.52)	3.37 (0.68)
Nurse Helpf.	4.63 (0.57)	4.95 (0.10)	4.56 (0.66)	4.68 (0.56)	4.56 (0.67)	4.68 (0.58)
			<u>2 Months</u>			
Interv. Satisf.	3.48 (0.47)	3.61 (0.21)	3.34 (0.57)	3.50 (0.65)	3.52 (0.37)	3.32 (0.78)
Nurse Helpf.	4.63 (0.71)	4.95 (0.07)	4.50 (0.74)	4.91 (0.13)	4.56 (0.47)	4.59 (0.61)

Note: None of the main effects for Group or Exclusivity or the interaction of Group X Exclusivity were significant in two factor ANOVAs at discharge and 2 months. Interv. Satisf. = Intervention Satisfaction; Nurse Helpf. = Nurse Helpfulness.

Table 7

Differences Among Recruitment Sites on Subscale Scores

Subscale	NC1		NC2		IL1		IL2		F(2,172) ^a	p
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)		
Discharge										
Intervention Satisfaction	3.60 (0.35)	3.23 (0.70)	3.54 (0.43)	3.40 (0.55)	4.46	<.01				
Nurse Helpfulness	4.68 (0.50)	4.59 (0.61)	4.59 (0.66)	4.58 (0.54)	0.21	ns				
2_Months										
Intervention Satisfaction	3.38 (0.56)	3.29 (0.67)	3.59 (0.40)	3.50 (0.38)	3.68	.05				
Nurse Helpfulness	4.70 (0.44)	4.63 (0.62)	4.64 (0.60)	4.56 (0.64)	0.24	ns				

Note: NC1 = the first hospital in North Carolina; NC2 = the second hospital in North Carolina; IL1 = the first hospital in Illinois; IL2 = the second hospital in Illinois.

^aSites were compared on sub-scale scores using general linear models.