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A Preliminary Study of Depressive Symptoms in Mothers of 3-Year-Old Prematurely Born Children

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Abstract

This exploratory study examined the effects of maternal depressive symptoms on mothers' perceptions of their 3-year-old prematurely born children, interactive behaviors, and child outcomes. Mother and child interactive behaviors were coded from naturalistic observations in their homes. Education and marital status were found to be significantly related to maternal depressive symptoms. Factor analyses were conducted to determine the most prominent behaviors related to maternal depressive symptoms. In a small sample of mothers, the quality of the maternal-child relationship was negatively affected by elevated depressive symptoms. Mothers of prematurely born children may report depressive symptoms that continue into early childhood.

The birth of a premature infant is distressing for mothers (Holditch-Davis et al., 2009). Worry over the infant's survival and medical complications can lead to elevated depressive symptoms (Mew, Holditch-Davis, Belyea, Miles, & Fishel, 2003; Miles, Holditch-Davis, Schwartz, & Scher, 2007). Prior research has shown depressive symptoms in mothers of premature infants are related to prolonged hospitalization in the neonatal intensive care unit (NICU), the need for technological support, and medical complications (Mew et al., 2003). The most stressful aspects of the birth of a premature infant are alterations in the parental role, appearance and behavior of their infant, and sights and sounds of the NICU (Docherty, Miles, & Holditch-Davis, 2002; Doering, Moser, & Dracup, 2000).

Maternal stress and anxiety do not end with NICU discharge. Many mothers feel overwhelmed by the responsibility of assuming total care for their infant and have stressful memories of the NICU (Miles et al., 2007; Horowitz et al., 2007). Also, the potential for developmental problems remains a concern (Miles et al., 2007; van Doesum, Hosman, Risken-Walraven, & Hoefnagels, 2007). The purpose of this study was to identify symptoms of depression in mothers whose premature infants are now three years of age.

Only a few studies have examined depression or depressive symptoms in mothers of premature infants after NICU discharge. Maternal depressive symptoms at 6 months

corrected age are correlated with infant health problems (Doering et al., 2000; Mew et al., 2003). At one year, maternal depressive symptoms are related to perception of self control, maternal education level, and child illness-related issues (Horowitz, 2007; Miles et al., 2007; Singer et al., 2003). Infant medical risk and decreased maternal coping ability persist as factors related to maternal depressive symptoms for at least 2 years (Miles et al., 2007; van Doesum et al., 2007).

Thus, depressive symptoms may continue indefinitely for some mothers of premature infants. This prolonged distress has implications for family dynamics, the home environment, and the type of cognitive enrichment the child receives. Maternal depression has been shown to have negative effects on child cognitive, emotional and behavioral development (Jones et al., 2009; Sohr-Preston & Scarmelia, 2006). Mothers who are depressed have difficulty providing adequate stimulation and contingent responses to their children and display more negative affect (van Doesum, 2007; Field et al., 2005). It has also been reported that prolonged depression affects mothers' feelings of attachment (Mason, Briggs & Silver, 2012).

The emotional unavailability of depressed mothers often results in less infant responsiveness to environmental stimuli (Jones, Field, & Almeida, 2009). The problem is compounded by prematurity because premature infants tend to be less alert and attentive to stimulation. One area that is negatively affected is mother-infant interactions because mothers with depressive symptoms show less emotion, less interest, and fewer responses to infant cues (Singer et al., 2003; van Doesum et al., 2007).

Another area of development that has been shown to be affected by maternal depressive symptoms is language acquisition (Godoy, Jansen, Matos, Tarveo Pinheiro, & Pinheiro, 2011). There is a greater chance that infants will not receive adequate verbal stimulation in the home the longer and more severe the depression.

This secondary analysis of a large study of prematurely born children (Holditch-Davis et al., 2000) examined the relationship of depressive symptoms to maternal perceptions of their child and to mother-child interactions at 3 years. Also investigated was the relationship of depressive symptoms to maternal characteristics and child outcomes. Specifically, we compared mothers with and without elevated depressive symptoms on perception of their child, interactive behaviors, and maternal personal characteristics and determined whether their children differed on IQ, language skills and interactive behaviors.

This study was guided by the Preterm Parental Distress Model of Miles and Holditch-Davis (1997). Maternal emotional distress associated with premature birth and subsequent parenting is affected by personal and family factors, illness-related stress, severity of the infant's illness, and environmental stressors. This model has been used in other studies showing relationships between depressive symptoms and re-hospitalization (Miles et al., 2007) and increased worry about medical complications (Docherty et al., 2002). The concepts of the model that will be addressed include severity of the child's initial illness, worry about the child, and the impact of the home environment. Personal factors include

maternal ages, marital status and education level. The dyadic relationships were explored through direct observation of mother-child interactions.

Methods

Design

This study used a comparative design. The sample was a subgroup of infants and mothers from a large longitudinal study of premature infants that was conducted in southeastern United States (Holditch-Davis et al., 2000). The original study examined maternal perceptions of their child, interactive behaviors, and followed the cognitive and motor development of the children.

Sample

The inclusion criteria for this study were infants born prior to 37 weeks gestation and weighing less than 1500 grams at birth. Infants had to be off mechanical ventilation by 36 weeks post conceptual age. Infants were excluded if they had congenital neurological problems at birth. The depression measure was not part of the original study, but was added during the investigation because as mothers were interviewed, the members of the research team noticed that several of them appeared to be depressed. Because the longitudinal investigation did not focus on depressive symptoms, this variable was only obtained on the final 38 mothers.

The current study included all 38 mothers and their children. The average age of the mothers was 31.5 years ($SD=5.86$). They averaged 14.1 years of education ($SD=5.96$) and 48% were married. There were 18 Caucasian, 18 African American, and 2 Hispanic mothers. The infants had a mean gestational age of 28.3 weeks ($SD=2.2$) with a birth weight of 1131 grams ($SD=342$). There were 19 boys and 19 girls.

Measures

Measures were obtained when children reached 3 years of age corrected for prematurity.

Maternal self-report—Maternal depressive symptoms were measured using the Center for Epidemiology Studies Depression Scale (CES-D) (Radloff, 1977). The CES-D is a 20-item scale that assesses the frequency of depressive symptoms over the last week using a 4-point scale ranging from “rarely” to “most of the time.” Items included feelings of guilt, loss of sleep and difficulty concentrating. The scores range from 0 to 60. A score of 16 or greater indicated risk for depression. The CES-D is correlated with other measures of depression, and test-retest reliability was established in multiple studies (Jones et al., 2009; Miles et al., 2007; Wang, Wu, Anderson, & Florence, 2011). Internal consistency for this sample was 0.88.

The Child Health Worry Scale (Miles & Holditch-Davis, 1995), a 5-item scale, measures the degree of concern about infant health. Mothers rated the degree of worry from 1=not worried to 5=extremely worried. This tool correlated with post traumatic stress and depressive symptoms in mothers (Holditch-Davis, Bartlett, Blickman, & Miles, 2003;

Holditch-Davis, Schwartz, Black, & Scher, 2007; Miles et al., 2007). Internal consistency in this study was 0.73.

The Vulnerable Child Scale measured the mother's perception of her child's vulnerability to health problems (Docherty et al., 2002). The tool consists of 16 items rated on a 4-point scale from 1 "definitely true" to 4 "definitely false." Item scores are summed, with lower scores indicating a greater sense of vulnerability. Cronbach's alpha of 0.75 was reported for this scale (Miles et al., 2007). In the current study, the alpha was 0.71.

Child's Environment—The Home Observation for Measurement of the Environment (HOME) (Caldwell & Bradley, 1980), which measured the quality of the home environment, contains 45 binary items organized into 6 subscales: emotional and verbal responsiveness of mother, acceptance of the child's behaviors, organization of the environment, provision of appropriate play materials, maternal involvement with child, and opportunities for variety in daily stimulation. The HOME is administered through observation, semi-structured interview, and an assessment of play materials. Interrater reliability was 90%. Internal consistency in this study was 0.88.

Child health and development—The children in this study were assessed for the degree of illness and complications in the neonatal period using the Infant Morbidity Scale (Minde, Whitelaw, Brown, & Fitzhardinge, 1983). Based on daily reviews of the medical record, each of the 20 most common diseases or complications in the NICU is given a score of 0 if absent, 1 if well controlled, 2 if still requiring specific treatment, or 3 if life-threatening. Daily scores are summed to a total score. The Infant Morbidity Scale was validated against neurological and motor outcomes (Minde et al., 1983; Minde, Carter, Goldberg, & Jeffers, 1990).

At 3 years corrected age, children were assessed for language skills and IQ. The Pediatric Extended Examination at Three (PEET) (Blackman, Levine, Markowitz, & Aufseeser, 1983) is designed to detect learning, attention and behavioral problems of preschool children. The PEET uses observation and aspects of the physical examination to assess five domains: gross motor, language, visual-fine motor memory and intra-sensory integration abilities. PEET scores are correlated to corresponding areas of the McCarthy (1971) scales of children's abilities. Since many prematurely born children have language deficits, the language domain score was used in these analyses. The language score (converted into a 3-point scale in which 0 = definite concern, 1 = possible concern, and 2 = no concern) correlated .88 with the PEET expressive language score and 0.87 with the PEET reception score ($n = 52$, $p < .001$). Correlations with the McCarthy scales were 0.87 for the PEET language scores. It also correlated 0.70 ($n = 55$, $p < .001$) with the verbal reasoning score on the Stanford-Binet, -0.42 with the nurse examiner's clinical judgment of language concerns, and -0.57 with the psychologist's clinical judgment ($n = 52$, $p < .01$).

The Stanford-Binet Intelligence Scale: 4th Edition (Riverside Publishing Co, Rolling Meadows, IL) is a standardized test that measures cognitive abilities from age two through adulthood (Thorndike, Hagan, & Sattler, 1986). Internal consistency for the composite scales is well established (Caruso, 2001). It is the most widely used test for the mental

abilities of children and is revised periodically. The mean score on the Stanford-Binet is a 100 with $SD=16$. An IQ below 84 indicates low cognitive ability.

Mother-child relationship—To determine the type and frequency of interactive behaviors, three trained master's prepared nurses conducted 2-hour live observations of interactions between each mother and child on two occasions. Interrater reliability was a Cohen's kappa of 0.73. During the observations, the observers sat several feet away from the mother-child dyad, and no conversation occurred with the family. The occurrences of mother and child behaviors were recorded in real time using a behavioral scoring system. The end of each 10-second epoch was signaled audibly through an ear phone from a small electronic timer. The observer recorded the behaviors that occurred during each epoch.

Maternal behaviors included were no adult present, mother negative, mother positive, mother plays with child, another adult plays with child, mother talk, mother gesture, mother touch, interact, passive observation, uninvolved, mother teach, and mother look, and eye-to-eye contact. Child behaviors were activities competing with play, child uninvolved with play, child positive, child negative, child talk, child gesture, child touch, sedentary activity, moderate activity, very active, child play with other child, child play an with object, child plays with self, and child look. (For definitions of each, see Holditch-Davis et al., 2000).

Procedure

This study was approved by the Institutional Review Board for human subjects' protection, and mothers provided informed consent. During home visits, observations were conducted during free play. The observer brought a suitcase of toys and the mother was instructed to play with the toys with her child until the child was comfortable. Then, the mother was instructed to do what she would normally do when she was home alone with her child, and the child could play with the new toys or his or her own toys. At the conclusion of one of the observations, the HOME Inventory was scored. Although maternal interaction elements are included on the HOME, only 8 of the 45 items overlapped with the behavior coding system.

One month after the home visits, the family visited a developmental evaluation center for developmental assessments of the child. The Stanford-Binet Intelligence Test and the PEET were administered by two examiners who had no prior contact with the family and were not aware of the child's history. During this evaluation, the mothers completed questionnaires about their parenting experiences including the CES-D, the Child Health Worry Scale, and the Vulnerable Child Scale.

Data Analysis

The survey scales were analyzed by comparing the scores of mothers with elevated CES-D scores of 16 or more (mothers with depressive symptoms) with those of mothers with normal CES-D scores (mothers without depressive symptoms). Variables were converted to standardized scores for analysis. An alpha of 0.05 for two-tailed tests was used. A conservative approach was taken to compare the two groups using both parametric and non-parametric statistics. Since the results from these tests were similar, the parametric statistics are reported. SAS statistical software (Carey, NC) was used in analyses.

Mothers were compared based on the presence or absence of depressive symptoms with student's *t*-tests on all maternal scales and interactive behaviors. The individual behaviors that were coded during the maternal-child interactions were each analyzed separately. Correlations between the interactive behaviors were determined, and an exploratory factor analysis was performed and used to determine the behaviors that were most related to maternal depressive symptoms.

Results

Six of the 38 mothers had elevated depressive symptoms. The mean score on the CES-D for the mothers with depressive symptoms was 23 ($SD=3.16$), but only 7 ($SD=4.76$) for the mothers with no depressive symptoms. The mothers without depressive symptoms had more education $t(32) = 2.00$, $p < 0.05$ with a mean of 14.6 years ($SD=6.48$) versus 12 years ($SD=1.09$) for mothers with depressive symptoms. The mothers did not differ on age. Mothers without depressive symptoms had a mean age of 31.68 ($SD=6.35$) years, versus 30.66 ($SD=2.35$) years for those with depressive symptoms. No significant racial differences were found although five of the six mothers with depressive symptoms were African American. The other significant difference between the groups was that mothers with depressive symptoms were less likely to be married $t(4) = 4.07$, $p < 0.002$; 50% of these mothers were unmarried versus 19% of the mothers without depressive symptoms. There were no significant differences between mothers with depressive symptoms and those without on the Child Health Worry Scale or Child Vulnerability Scale (see Table 1).

Infant Health Problems

The infants of mothers with no depressive symptoms had higher Infant Morbidity Scale scores ($M=155.84$, $SD=120.68$) than the group of mothers with depressive symptoms ($M=144.16$, $SD=146.62$), although this difference was not significant. The children of mothers with depressive symptoms had lower IQ levels at 85.5, versus 87.1 for children of mothers without depressive symptoms. Language delay was found in 83% of children of mothers with depressive symptoms compared to 46% of children of mothers without depressive symptoms.

Mother-Child Relationship

There were no significant differences in the scores of mothers on the HOME Inventory although HOME scores averaged 4 points lower for the mothers with depressive symptoms (see Table 1).

There were significant differences for several interactive behaviors (Table 2). Mothers with depressive symptoms touched their children less than mothers without depressive symptoms $t(29.50) = 3.01$, $p < 0.01$ and achieved less eye-to-eye contact with them $t(7.94) = 2.35$, $p < 0.05$. Mothers with depressive symptoms were also more negative and more passive during interactions although these differences were not significant. Children of mothers with depressive symptoms were less active $t(11.60) = 2.54$, $p < 0.05$ and looked less at their mothers $t(32) = 2.18$, $p < 0.05$ (Table 3).

Factor Analysis

Finally, a factor analysis was performed to group the interactive behaviors. For these analyses, negative mother and child items were reverse scored to be consistent with the directional interpretation of the score. Factor analyses were conducted separately for the mother and child with a minimum Eigen value of 1 and Varimax rotation. The analysis of maternal items yielded a two-factor solution (Table 4). Factor 1 ($n=8$), *mother involvement*, accounted for 5.88% of the variance and had loadings ranging from 0.80 to 0.91. The Cronbach's alpha was 0.94. The second factor was a single item representing *mother's touch* and accounted for 1.48% of the variance.

The factor analysis of child behaviors yielded a four-factor solution (Table 4). Factor 1, *child cues*, included the items child look, gesture, and talk. It accounted for 2.05% of the variance and had loadings ranging from 0.75 – 0.84. The original Cronbach's alpha was 0.75, which improved to 0.83 by removing child talk. Factor 2, *child activity*, included moderate activity, very active, and negative behavior, accounted for 1.78% of the variance, and had loadings ranging from 0.68 – 0.79. The Cronbach's alpha was 0.58. Factor 3, *child play*, included percent of time in play and activities competing with play, accounted for 1.76% of the variance, and had loadings of 0.91–0.92. The Cronbach's alpha was 0.83. A single item, *positive mood*, comprised Factor 4 and accounted for 1.32% of the variance.

Prior to creating factor scores, all items were standardized to a mean=100 and $SD=10$. The scale was created as the average of the non-missing items. Scores for the mother involvement scale ranged from 7.12 to 57.37, and mother's touch from -0.99 to 3.91. Scores for the child cues ranged from 7.64 to 40.17; for child activity from 0.05 to 26.55; for child play from 21.99 to 69.43; and for positive mood from 1.06 to 18.47 (Table 4). Mothers who had depressive symptoms and mothers who did not, differed significantly on maternal touch and child play, suggesting that mothers with depressive symptoms were less affectionate, and their children were less playful.

Discussion

We found that 16% of mothers had elevated depressive symptoms when their children were 3 years corrected age. In other reports, between 13% and 50% of the mothers in the immediate postpartum period had elevated depressive symptoms; however by 6 months postpartum, the number reporting depressive symptoms had decreased to 20% and remained at this level for at least 2 ½ years (Bergstrom, Wallin, Thomson, & Flacking, 2012; Mew et al., 2003; Miles et al., 2007). Our findings suggest that this rate of elevated depressive symptoms continues through at least 3 years.

We also found that maternal worry about their children's health, maternal perceptions of vulnerability, and quality of the home environment did not differ between these two groups of mothers. Child health worry had been found to relate to depressive symptoms by other investigators (Miles et al., 2007). Most of the children in this sample did not have major health issues or significant delays, which may have explained this difference.

As has been found in other studies (Holditch-Davis et al., 2003; Poehlmann et al., 2009), higher maternal educational attainment was protective against depressive symptoms in this study. Mothers with higher education levels may seek more information about prematurity and infant health and have more active coping mechanisms than mothers of lower educational achievement (Singer et al., 2007). Mothers who are less educated also may have more financial burdens and feel more role strain. Lack of resources and instrumental support that accompanies low income has been related to poor maternal adjustment and lower child cognitive skills (Singer et al., 2007; Sohr-Preston & Scarmelia, 2006).

Another protective factor was having a spouse. The unmarried women in this study were more likely to have elevated depressive symptoms possibly because of the need for support and help with caring for a prematurely born child, particularly due to the uncertainty of outcomes and unpredictable day-to-day occurrences. Several other studies have also found that marital or relationship status was related to depressive symptoms (Miles et al., 2007; Singer et al., 2007; Wang et al., 2011).

In other studies, the severity of infant illness in the NICU was not found to be correlated with depressive symptoms (Mew et al., 2003; Miles et al., 2007; Poehlmann, et al., 2011), similar to the findings of our study. However, long-term developmental issues are more likely to be related to maternal depressive symptoms (Singer et al., 2003; Singer et al., 2007). Although we did not find a significant relationship between depressive symptoms and child IQ or language skills, these areas of child development were lower when mothers reported elevated depressive symptoms. We may not have had enough power to detect a difference.

Examining the relationship between maternal depressive symptoms and mother and child interactive behaviors was our major focus. Less sensitivity and communicative behavior have been reported in mothers with depressive symptoms (Sohr-Preston & Scarmelia, 2006; Hwa-Froelick, Cook, & Flick, 2008). We found that several maternal and child behaviors differed between mothers with depressive symptoms and other mothers. Factor analysis identified the major dimensions of mother and child interactive behaviors. Two of these dimensions—maternal touch and child play—differed between dyads with mothers who had elevated depressive symptoms. Interactive issues identified by others including less engagement, less touch, less proximity and less co-regulation are similar to ours (Field et al., 2005).

Maternal depressive symptoms may continue indefinitely after premature birth. This prolonged distress has implications for family dynamics. Mothers who are depressed typically have difficulty providing adequate stimulation and contingent responses to their children and display more negative affect (Field et al, 2005). Prematurity may also affect the child's ability to understand emotional expression and lead to social withdrawal and behavioral problems (Wocadlo & Rieger, 2006). These issues may be compounded by limited role modeling for learning provided by mothers with elevated depressive symptoms.

Our findings also help with understanding the Preterm Parental Distress Model. We found that the child's prematurity-related medical complications and current development were not

strongly related to maternal depressive symptoms. However, personal factors including education level and marital status were related. Maternal adjustment and interactive ability seem to be areas where distress is still evident 3 years after preterm birth. Coping ability may have been a factor in the low number of mothers in this study with elevated depressive symptoms. Some mothers may accept the potential delays and frequent illness of their prematurely born children due to better coping skills.

Limitations

This study was limited due to the small number of mother with depressive symptoms. Thus, its findings must be interpreted with caution. Other limitations included the convenience sample. Poverty is a major predictor of depression and this variable was not examined in our study (Poehlmann et al. 2009; Vanderbilt, Bushley, Young & Frank, 2009). A greater focus on maternal adjustment after preterm birth is needed in future studies. In particular, re-hospitalization, maternal resources, and coping style need to be examined.

Implications for Research

The importance of the mother's sensitivity and availability to a child's growth and development is well established. Investigations examining prematurely born children's developmental progress should include measures that evaluate the quality of the mother-child relationship. A larger sample and longitudinal design is needed to evaluate depressive symptoms in mothers who have experienced a premature delivery so that appropriate interventions can be developed. Longitudinal studies on prematurity should consider including the emotional state of the mother and the impact of maternal depressive symptoms on developmental outcomes.

Implications for Practice

These preliminary results show along with other investigations that screening for depression only in the postpartum period is not adequate to identify depressive symptoms, and mothers of premature infants need to be followed over time and referred for appropriate counseling services (Bergstrom et al., 2012; Mason et al., 2011). Increased awareness of maternal mood and behavior by the nursing staff of the NICU along with more frequent communication may help to relieve some stress and anxiety during hospitalization.

This exploratory study adds to the body of literature showing distress in mothers for prolonged periods after premature birth. A major contribution was finding that interactive behaviors of mothers and their 3-year-old prematurely born children were related to elevated maternal depressive symptoms. Maternal interactive behaviors affect child cognitive outcomes and language acquisition. Also, the early social environment is crucial to social and emotional development (Wocadlo & Rieger 2006). Mothers with depressive symptoms may not be sensitive to child cues, and provide inconsistent stimulation (Sohr-Preston & Scarmelia, 2006), and show less engagement with the child (Hwa-Froelich et al., 2008). The severity and duration of depressive symptoms may not be identified if only evaluated in the immediate postpartum period (Horowitz, Briggs-Gowan, Storfer-Isser, & Carter, 2007).

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Table 1

Differences in Mothers' and Children's Scale Scores Based on Mothers' Presence or Absence of Depressive Symptoms¹

Scale	No depressive symptoms Mean(SD)	Depressive symptoms Mean(SD)	<i>t</i> -statistic ²
Worry	8.89 (4.04)	8.60 (3.85)	0.15 (5.76)
Vulnerable child	45.66 (5.55)	45.17 (3.54)	0.21 (10.3)
Stanford-Binet	87.13 (18.64)	85.50 (5.32)	0.41 (29.4)
Language delay	0.46 (0.41)	0.83 (0.51)	-1.66 (8.6)
Severity of illness	155.84 (120.64)	144.00 (146.63)	0.21 (6.33)
Low IQ	0.32 (0.48)	0.50 (0.55)	-0.81 (6.71)
HOME Inventory	36.54 (7.34)	32.50 (8.29)	1.20 (6.78)

Note:

¹ Values represent Z scores.

² No significant differences were found.

Table 2

Differences in Z Scores for Mother Interactive Behaviors Based on Mothers' Presence or Absence Depressive Symptoms

Behaviors	Depressive symptoms Mean (SD)	No depressive symptoms Mean (SD)	<i>t</i> statistic (df)
Interaction	−0.57 (0.31)	−0.26 (0.78)	0.59 (9.02)
Passive observation	0.18 (0.63)	−0.59 (1.16)	−1.51 (8.67)
Mother uninvolved	0.12 (0.94)	0.31 (1.20)	0.98 (7.74)
Mother negative affect	−0.28 (0.88)	0.63 (1.23)	1.72 (6.13)
Mother positive affect	−0.28 (0.27)	−0.09 (1.27)	0.10 (6.88)
Mother talks	−0.28 (0.79)	−0.20 (1.01)	0.20 (8.89)
Mother gesture	−0.22 (1.00)	−0.02 (0.16)	0.44 (7.90)
Eye to eye contact ^I	−0.25 (0.99)	0.71 (0.89)	−2.35 (7.94)*
Mother looks at child	−0.24 (1.02)	0.32 (1.00)	−1.22 (7.40)
Mother teach	−0.30 (0.55)	−0.23 (0.93)	0.24 (32.00)
Mother touch ^I	−0.57 (0.31)	0.18 (1.13)	3.01 (29.50)**
Percent no adult present	0.13 (1.11)	0.14 (1.08)	0.01 (7.17)
Mother play	−0.09 (0.65)	−0.05 (1.19)	0.13 (13.50)
Adult play with child	−0.08 (0.59)	−0.10 (1.22)	0.01 (7.17)

Note:

^I Mothers with depressive symptoms had fewer incidences of eye-to-eye contact and used less touch than their peers without depressive symptoms.

* $p < 0.05$;

** $p < 0.01$.

Table 3

Differences in Z Scores for Child Interactive Behaviors Based on Mothers With or Without Depressive Symptoms

Behaviors	Depressive Symptoms Mean (SD)	No Depressive Symptoms Mean (SD)	<i>t</i> statistic (df)
Play with other child	0.06 (0.83)	0.24 (0.59)	−0.84 (6.04)
Play with object	0.23 (0.59)	0.15 (1.16)	−1.17 (14.60)
Plays alone	−0.07 (0.89)	0.13 (1.10)	0.15 (8.72)
Child looks at mother ¹	−0.33 (0.77)	0.77 (0.92)	−2.18 (32.00)*
Activities competing with play	−0.28 (0.27)	−0.24 (1.27)	−1.67 (22.40)
Uninvolved with play	−0.64 (0.53)	−0.21 (1.18)	0.94 (17.70)
Child positive affect	−0.25 (1.07)	0.29 (1.06)	0.75 (7.28)
Child negative affect	−0.23 (0.81)	−0.03 (1.19)	0.49 (10.40)
Child talk	−0.11 (0.90)	0.03 (1.07)	−0.44 (8.36)
Child gesture	−0.08 (0.73)	0.09 (1.09)	−0.04 (10.50)
Child touch	−0.21 (0.75)	0.03 (0.95)	−0.68 (9.89)
Little activity	0.62 (0.78)	0.04 (1.08)	1.44 (32.00)
Moderate activity	−0.59 (0.82)	0.02 (1.09)	−1.86 (32.00)
Very active ²	−0.47 (0.49)	0.16 (0.79)	2.54 (11.60)*

Note:

¹ Children of mothers with depressive symptoms look at their mothers less than do children of mothers who do not have depressive symptoms.

² Children of mothers without depressive symptoms are more active than children of mothers with depressive symptoms.

* $p < 0.05$.

Table 4
Factor Analysis for Mother and Child Interactive Behaviors; Mothers With and Without Depressive Symptoms¹

Factor/Construct	Factor loading	Variance explained	Cronbach's alpha coefficient	Depressive symptoms Mean (SD)	No depressive symptoms Mean (SD)	t statistic
Mother involvement		5.88	.94	26.12 (13.13)	29.62 (10.76)	-0.61
Interaction	.91	-	-	-	-	-
Talk	.89	-	-	-	-	-
Gesture	.89	-	-	-	-	-
Look	.86	-	-	-	-	-
Involvement	.85	-	-	-	-	-
Vis-à-vis	.83	-	-	-	-	-
Play w/child	.81	-	-	-	-	-
Teach	.80	-	-	-	-	-
Mother touch	.95	1.48	-	-0.57 (0.31)	0.18 (0.13)	3.01**
Child cues		2.05	.83	-2.23 (1.00)	0.39 (1.14)	-1.59
Look	.84	-	-	-	-	-
Gesture	.75	-	-	-	-	-
Child activity		1.78	.58	9.81 (6.06)	13.38 (4.58)	-1.36
Moderate activity	.79	-	-	-	-	-
Very active	.70	-	-	-	-	-
Child negative	.68	-	-	-	-	-
Child play		1.76	.83	55.91 (11.46)	61.25 (3.85)	-2.00*
% play	.91	-	-	-	-	-
Activities competing w/play	.92	-	-	-	-	-
Child positive mood	.91	1.32	-	6.92 (4.30)	8.37 (4.27)	0.76

Note:

¹Values represent Z-scores.

* $p < 0.05$;

** $p < 0.01$