Objective: To assess the effectiveness of a short-term intervention for improving interaction behaviors of newborn infants with their depressed mothers.

Method: Depressed mothers assigned to the experimental group first observed an administration of the Neonatal Behavioral Assessment Scale (NBAS) at delivery. Mothers then used a similar instrument, the Mother's Assessment of the Behavior of her Infant (MABI), to independently conduct NBAS-like infant assessments periodically at home. Depressed mothers in the control group were not present when the NBAS was administered at delivery, and they periodically completed written assessments at home of their parenting attitudes and infants’ development.

Results: One-month NBAS assessments administered by an examiner revealed that experimental group infants performed more optimally than controls on Social Interaction and State Organization.

Conclusions: Findings suggested that an intervention consisting of mothers taking part in NBAS/MABI assessments may be a simple and cost-effective technique for benefiting infants of depressed mothers during the early postpartum period.

Key words: maternal depression; neonates; intervention; Neonatal Behavioral Assessment Scale (NBAS); Mother's Assessment of the Behavior of her Infant (MABI).

The Neonatal Behavioral Assessment Scale (NBAS; Brazelton, 1973; Brazelton & Nugent, 1995) was designed for evaluating behavioral and neurologic functioning in neonates and young infants. The instrument assesses infants’ alertness to auditory and visual stimuli, ability to tune out distraction, responses to stress, soothability, motor functioning, and reflexive behaviors. Since its inception, the NBAS has also been widely used as an intervention device for improving parenting practices. Toward this end, the NBAS has been administered in parents’ presence while examiners highlight a number of impressive, though subtle, features of neonatal development. In particular, the NBAS demonstration includes identification of neonates’ adeptness at responding to stimulation and at engaging in social interaction (Juntti, 1982; Nugent & Brazelton, 1989). Brazelton-based interventions have been used with a broad variety of subject samples (for reviews, see Britt & Myers, 1994; Das Eiden & Reifman, 1996; Worobey, 1985), and recent reviews of the effectiveness of these interventions suggest a small to moderate beneficial effect on parenting quality (Das Eiden & Reifman, 1996).

Again to encourage parental involvement...
through enhanced awareness of infant competencies, the Mother's Assessment of the Behavior of her Infant (MABI; Field, Dempsey, Hallock, & Schuman, 1978) was developed to allow parents access to a simplified version of the NBAS that they themselves could administer to their infants. This modified form of the NBAS assesses most of the competencies tapped by the NBAS, except for reflexive behaviors, but contains fewer items, less detailed scoring criteria, and more simply worded questions. The effectiveness of the MABI coupled with an NBAS intervention was first explored in an intervention study on preterm infants of low socioeconomic status (SES), teenage mothers (Widmayer & Field, 1981). Following an NBAS/MABI intervention at delivery, infants improved across the first year. At one month, the infants performed more optimally on the NBAS social interactive items and showed superior mother-infant interactions during feeding and face-to-face play sequences. At four months, they demonstrated better fine motor/adaptive skills and obtained higher ratings on interaction behaviors. By 12-months they received higher scores on the Bayley Mental Scales. In other research, low-income mothers have shown greater sensitivity in a feeding session if they had received the NBAS/MABI intervention (Poley-Strobel & Beckmann, 1987).

The present study investigated whether a similarly designed, NBAS/MABI intervention would benefit newborns of depressed mothers. That infants of depressed mothers are compromised already at birth (Abrams, Field, Scafidi, & Prodromidis, 1995; Lundy, Field, & Pickens, 1996) and show continued dysregulation by the first month of life (Hart, Field, & Roitfarb, in review; Jones et al., 1997) highlights the importance of instituting interventions as early as possible (Field, 1997).

Method

Participants

Twenty-seven dyads were recruited on a maternity unit of a university hospital that serves a low-income, ethnically diverse community. Representative of this community, the mothers, as shown in Table I, were Hispanic (68%), African American (30%), and white (2%). Using the Hollingshead (1975) index, a 1 to 5 scale with 5 representing the lowest SES, subjects were found ranking low (M = 4.5) in SES (see Table I). In an attempt to target higher risk mothers, younger subjects were selected for recruitment, and ranged in age from 15 to 30 years (M = 21.6). Of the depressed mothers invited to participate in the study, approximately 84% voluntarily agreed. Their infants were healthy, full-term male (n = 14) and female (n = 13), firstborn (62%) and laterborn infants seen at delivery (M = 40.3 hours) and again at one month (M = 32 days).

Measures

The Center for Epidemiologic Studies Depression (CES-D) Scale (Radloff, 1977) was the instrument used to measure symptoms of depressed mood. This self-report inventory is a 20-item questionnaire, with possible responses ranging from 0 (rarely) to 3 (most of the time) to each item describing a depressive symptom, such as, “I felt sad,” and “I had crying spells.” The CES-D Scale was designed to measure depressive symptomatology in the general population and evidence of content, concurrent, and discriminative validity have been demonstrated (Weissman et al., 1977). In accordance with other researchers’ use of the CES-D (Radloff, 1991;
Weissman et al., 1977), a cut-off score of 16 was the criterion for subjects to be considered depressed for purposes of research, and thus eligible to participate in the study, although we recognize that self-report measures of distress are not equivalent to interview-based diagnoses of depression (Fechner-Bates, Coyne, & Schwenk, 1994).

The NBAS, 3rd edition (Brazelton & Nugent, 1995), is an infant assessment tool, administered by trained examiners. Twenty-eight behavioral responses fall into six dimensions: Habituation, evaluates infants’ response decrement to repeated stimulation; Social-Interactive, measures alertness and responsiveness to stimulation; Motor System, assess the quality of motor performance and tone; State Organization, probes irritability and lability of state, from deep sleep to crying; State Regulation, examines infants’ capabilities for controlling state; and Autonomic System, assesses signals of distress. In addition, 18 neurologic reflex items test for the presence of abnormal reflexes.

The MABI (Field et al., 1978) taps into constructs similar to those addressed by the NBAS. As shown in Table II, the MABI consists of 15 items, grouped into four dimensions: Social, Motor, State Organization, and State Regulation. Each of the 15 MABI items is based on an NBAS item (see Table II for correspondences between MABI and NBAS items). For example, the MABI equivalent of the NBAS item assessing the Social-Interactive capability to respond to “animate visual and auditory stimuli” consists of the following:

Try talking to your baby holding your face about one foot away from his/hers. Then, as you continue talking, slowly move your face to one side, then to the other. Then slowly move your face up and down. When you do this, your baby:
1. Doesn’t look at you; 2. Becomes quiet and looks at you; 3. Follows your face to each side; 4. Follows your face with her head and eyes, up and down, and to each side.

An example of the MABI item corresponding to the NBAS item assessing “lability of state,” one of the State Organization items, consists of the following:

How are your baby’s mood swings—how often do they occur and how quickly do they change? 1. S/he sleeps most of the time and hardly ever cries; 2. S/he goes back and forth from being quiet to crying; 3. S/he goes back and forth from being quiet to crying, but is occasionally calm; 4. S/he goes back and forth from quiet to crying, but is often calm.

Designed for use by untrained administrators, items on the MABI are scored on a 4-point scale, with high scores optimal.

**Procedure**

After signing an informed consent, the mothers were given the CES-D Scale to screen for depression. The mothers (M CES-D = 24.1) were then given the MABI to be conducted in their hospital rooms, using instructions included with the scale. To ensure that mothers were able to comply with the instructions, examiners observed 30% of the mothers as they completed the MABI. The mothers were randomly assigned to the experimental (n = 14) or control (n = 13) groups. As shown in Table I, the two groups of participants did not differ on any demographic measures.

If a mother was assigned to the experimental group, an examiner administered the NBAS in the mother’s presence. During this administration, the examiner explained the significance of various infant behaviors, such as turning toward a sound source and tuning out distractions, in helping infants modulate levels of stimulation. Mothers were given feedback pertaining to their infants’ strengths and preferences and the examiner responded to mothers’ questions about their infants’ behaviors. After the NBAS demonstration, the mother inde-
pendently administered the MABI to her infant and was instructed to repeat the administration at home, at 1-week intervals for 1 month. If a mother was assigned to the control group, the NBAS was administered in an adjacent room and the mother was asked to complete a weekly assessment of developmental milestones and childrearing attitudes for 1 month. During the following 1-month period, the mothers were contacted by phone on at least two occasions to schedule return visits and to be reminded of the instructions to either administer the MABI or to complete the assessment of milestones and attitudes on a weekly basis. Approximately 30 days after delivery, the mothers and infants returned to a laboratory, near the hospital, where they completed the MABI and an examiner, “blind” to the mother’s group status, administered the NBAS.

**Results**

A repeated measures MANOVA, with Rater (mother/examiner) and Age (birth/1-month) as within-subjects measures and Group status (experimental/control) as a between-subjects measure, was performed on the four dimensions of infant behavior: Social, Motor, State Organization, and State Regulation. Scores on the four dimensions of infant behavior were derived using items on the MABI and the corresponding items on the NBAS. The significant MANOVA, $F(1, 16) = 3.2, p < .05$, was followed by ANOVAs on each of the four dependent measures and by post hoc Bonferroni tests for interaction effects.

### Table III. Examiners’ NBAS Ratings (Converted to 4-point MABI Scores, With High Scores Optimal) of Experimental and Control Group Infants at Birth and at 1 Month (Standard Deviations)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Experimental Birth</th>
<th>Experimental 1 Month</th>
<th>Control Birth</th>
<th>Control 1 Month</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social</td>
<td>2.1</td>
<td>2.9</td>
<td>2.4</td>
<td>3.0</td>
<td>A**</td>
</tr>
<tr>
<td></td>
<td>(5)</td>
<td>(4)</td>
<td>(6)</td>
<td>(5)</td>
<td></td>
</tr>
<tr>
<td>Motor</td>
<td>2.6</td>
<td>3.0</td>
<td>2.6</td>
<td>2.7</td>
<td>A*</td>
</tr>
<tr>
<td></td>
<td>(6)</td>
<td>(5)</td>
<td>(5)</td>
<td>(4)</td>
<td></td>
</tr>
<tr>
<td>State Organization</td>
<td>2.0</td>
<td>2.2</td>
<td>2.0</td>
<td>2.5</td>
<td>A*</td>
</tr>
<tr>
<td></td>
<td>(4)</td>
<td>(4)</td>
<td>(6)</td>
<td>(6)</td>
<td></td>
</tr>
<tr>
<td>State Regulation</td>
<td>2.9</td>
<td>3.0</td>
<td>2.7</td>
<td>3.1</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>(4)</td>
<td>(5)</td>
<td>(6)</td>
<td>(5)</td>
<td></td>
</tr>
</tbody>
</table>

$G =$ group (treatment/control) effect, $A =$ age (birth/1-month) effect, $I =$ group by age interaction.

*p < .05.

**p < .01.

Means bearing subscripts differ at $p < .05$ or less revealed by post hoc comparison of adjacent group means.

As shown in Table III, ratings of infants by examiners revealed no differences in NBAS scores between infants in the experimental and control groups at delivery. At 1 month, however, interaction effects revealed that infants in the experimental group were performing more optimally than infants in the control group on Social Interaction, $F(1, 25) = 5.76, p < .05$, and State Organization, $F(1, 25) = 3.97, p < .05$. As shown in Table IV, ratings of infants by their mothers on the MABI revealed significant main effects for Age on Social, $F(1, 25) = 29.9, p < .001$, Motor, $F(1, 25) = 5.7, p < .05$, and State Organization, $F(1, 25) = 4.4, p < .05$, suggesting that mothers in both groups recognized similar improvements in their infants over the course of 1 month (see Table IV).

### Discussion

The 1-month-old infants of depressed mothers who received this brief intervention program showed greater improvements in social interaction behaviors and state organization at 1 month. As in previous research with high-risk infants (Poley-Strobel & Beckman, 1987; Widmayer & Field, 1981), these data suggest the efficacy of a simple and cost-effective procedure for attenuating risks associated with maternal depression. Additionally, these findings add weight to the growing consensus regarding the effectiveness of Brazelton-based interventions (Das Eiden & Reifman, 1996). Whether these positive effects can be maintained over time and how they offset dysregulation evident at birth must be addressed in further studies. It is possible that the observed improvements represent only transitory
changes. Alternatively, it is possible that by showing heightened alertness, enhanced responsiveness to social stimulation, and decreased irritability, infants receiving this intervention are able to contribute favorably to mother-infant interactions, thus eliciting more positive responses from their depressed mothers and setting in motion improved patterns of social interchange, leading to lasting positive outcomes (Lewis & Rosenblum, 1974). Certainly, long-term studies are needed to verify whether infants receiving this intervention continue to show improvements over the first year, as has been noted in earlier research (Widmayer & Field, 1981).

Both groups of depressed mothers recognized that their infants had progressed over the 1-month interval. However, perceptions of infants by mothers in the experimental group did not reflect their infants' greater progress. The significance of negative maternal attitudes has been documented in the literature on maternal depression. A recent study (Hart, Field, & Roitfarb, in review) found that depressed mothers, as compared with examiners, rated their neonates more negatively on the MABI. In particular, depressed mothers perceived their newborns as less cuddly and more difficult to console. This finding is consistent with previous literature reporting more negative evaluations of older infants by depressed mothers versus independent examiners (Field, Morrow, & Adelstein, 1993; Panaccione & Wahler, 1986). The Hart et al. study also found that 1 month after the neonatal assessments, mothers and examiners concurred in their ratings of the infants. On 1-month NBAS reassessments, examiners were as negative as depressed mothers in rating infants' social interaction, state organization, and state regulation, suggesting that, as in a self-fulfilling prophesy, infants' lesser responsiveness at 1 month had been predicted by depressed mothers' negative perceptions at delivery.

That infants in the present study showed enhanced performance despite their mothers' unimproved perceptions is perplexing, but not unprecedented. A comparable pattern of findings was documented by Poley-Strobel and Beckman (1987). Their study on a similar intervention technique for low-income mothers reported improvements in mothers' behaviors, including greater maternal sensitivity and responsiveness, but not in mothers' perceptions of their infants. Enhancements in infants' performance but not in depressed mothers' perceptions of their infants' performance may simply reflect the fact that the success of the intervention was achieved by modifying maternal behaviors rather than attitudes. Indeed, maternal depression was not alleviated in mothers in the experimental group of the present study, nor was maternal self-confidence improved in similar earlier research (Poley-Strobel & Beckman, 1987). Using the MABI to stimulate mothers to take an active role in becoming acquainted with their infants' abilities and to encourage mothers to interact with their infants on a regular basis at home may have contributed greatly to the infants' superior performance. As noted already, such superiority might help shape subsequent interactions by triggering a positive chain of events, thus contributing to long-term positive outcomes. This notwithstanding, a more comprehensive intervention would be required in order to have a broader impact on mothers. That depressed mothers in the experimental group failed to recognize their infants' more optimal behaviors suggests the need for interventions targeting maternal attitudes as well as behaviors and studies to assess infant outcomes as a function of these different approaches.

Received September 16, 1997; accepted March 3, 1998

References


