Infants of Depressed Mothers Show "Depressed" Behavior Even with Nondepressed Adults

Tiffany Field, Brian Healy, Sheri Goldstein, Susan Perry, and Debra Bendell

University of Miami Medical School

Saul Schanberg, Eugene A. Zimmerman, and Cynthia Kuhn

Duke University Medical School

FIELD, TIFFANY; HEALY, BRIAN; GOLDSTEIN, SHERI; PERRY, SUSAN; BENDELL, DEBRA; SCHANBERG, SAUL; ZIMMERMAN, EUGENE A.; and KUHN, CYNTHIA. *Infants of Depressed Mothers Show "Depressed" Behavior Even with Nondepressed Adults.* CHILD DEVELOPMENT, 1988, **59**, 1569–1579. To determine whether the "depressed" behavior (e.g., less positive affect and lower activity level) of infants noted during interactions with their "depressed" mothers generalizes to their interactions with nondepressed adults, 74 3–6-month-old infants of "depressed" and nondepressed mothers were videotaped in face-to-face interactions with their mothers and with nondepressed female strangers. "Depressed" mothers and their infants received lower ratings on all behaviors than nondepressed mothers and infants. Although the infants of "depressed" versus nondepressed mothers also received lower ratings with the stranger adult, very few differences were noted between those infants' ratings when interacting with their mother versus the stranger, suggesting that their "depressed" style of interacting is not specific to their interactions with depressed mothers but generalizes to their interactions with nondepressed adults as early as 3 months of age.

Unfavorable affective development has been reported for children reared by depressed mothers as opposed to mothers with other diagnoses or normal mothers (Cytryn, McKnew, Bartko, Lamour, & Hamovitt, 1982; Sameroff & Seifer, 1983). Despite these suggestive data, there are very few studies in the literature on the early interactions of depressed mothers and their infants.

In one such study, "depressed" behavior was simulated by normal mothers (Cohn & Tronick, 1983). Mothers behaved spontaneously and then were asked to "look depressed" during interactions with their infants. The instruction to "look depressed" resulted in flat affect and lower activity on the part of the mother and distressed behavior on the part of the infant. The distressed behavior of the infants continued even after the mothers resumed their normal behavior. While the Cohn and Tronick (1983) study was intended to simulate interactions between depressed mothers and infants, infants of naturally "depressed" mothers may be accustomed to their mothers' behavior and may no longer appear to be distressed by this behavior. This seemed to be the case in more recent studies on infants of naturally depressed mothers.

In a study by Field (1984), infants of naturally "depressed" mothers were compared to infants of nondepressed mothers during spontaneous interactions and an interaction during which the mothers were invited to "look depressed." During the "looking depressed" situation (vs. the spontaneous situation), the infants of nondepressed mothers (vs. those of depressed mothers) were more disturbed. The behavior of naturally depressed mothers and their infants was not affected by the request for the mothers to look depressed. These data are congruent with those of Cohn and Tronick (1983) on infants of nondepressed mothers; infants noticed a change in

This research was supported by NIMH Research Scientist Award to Tiffany Field (MH00331). We also wish to thank the mothers and infants who participated in this study and Bené Alpert, Laura Pavon, and Mary Mazzeo for their research assistance. Correspondence and requests for reprints should be sent to Tiffany Field, University of Miami Medical School, P.O. Box 016820, Miami, FL 33101.

[*Child Development*, 1988, **59**, 1569–1579. 0009-3920/88/5906-0003$01.00]

their mothers' affect and modified their own affective behavior and responsivity to the mothers' "looking depressed" behavior. From the elevated activity levels and corresponding increases in heart rate during the "looking depressed" interaction, we may infer that this may have been an anxiety-provoking situation for both the nondepressed mothers and their infants. The infants of depressed mothers may not have been as distressed by their mothers being invited to "look depressed" because they had become accustomed to their mothers' depressed behavior. By experiencing frequent lack of control during early interactions, these infants may have developed a passive-coping, depressed style of interaction. Their depressed mood persisted across the interactions and may be a well-established defensive posture that would appear in situations regardless of the stimulation provided.

In a more recent study of naturally depressed mothers, Cohn and his colleagues (Cohn, Matias, Tronick, Connell, & Lyons-Ruth, 1986) noted a persistent depressed mood in infants despite the variations in interaction styles of their depressed mothers, including disengaged and intrusive interaction styles. The infants were withdrawn, engaged in frequent "looking away" behavior, and seldom showed positive affect.

The way in which depressed behavior is transmitted from mother to infant is unknown. One possibility is that the depressed affect emerges in very young infants as a function of their early interactions with depressed mothers. This depressed affect may derive from the infants mimicking their mothers' behaviors or simply from the minimal stimulation and arousal modulation provided by the mothers. Although the origins of this behavior remain an empirical question, these data suggest that depressed behavior in the mother can be transmitted to her offspring as early as the first few months of life.

It is also possible that these infants are depressed prior to their early interactions with their mothers. That is, they may have been depressed from birth, suggesting a genetic or temperamental basis for the infant's depressed behavior (Sameroff & Seifer, 1983). In another study of this kind, mothers who were identified during pregnancy ultrasound examinations as being depressed prepartum were filmed interacting with their infants during the postpartum period when the mothers were again identified as being depressed (Field, Sandberg, Garcia, Vega-Lahr, Goldstein, & Guy, 1985a). After their delivery, the newborn infants of these mothers were given a Brazelton Neonatal Behavior Assessment (Brazelton, 1973) and were noted to show depressed activity levels and limited responsivity to social stimulation (Field, Sandberg, Quetel, Garcia, & Rosario, 1985b). At 3 months postdelivery the mothers who had been depressed during pregnancy were still depressed; they showed flat affect and lower activity levels as well as less contingent responsivity during their interactions with their infants. The infants of these depressed mothers, in turn, showed fewer contented expressions, more fussiness, and lower activity levels than the infants of nondepressed mothers. It is not clear from these data whether diminished activity and responsivity during their early interactions was merely a behavioral style that persisted from birth or behavior that resulted from 3 months of exposure to the depressed behavior modeled by their mothers, and/or the infants' repeated failure to experience normal interactions (Tronick, Ricks, & Cohn, 1982).

A question not addressed by any of these studies is whether the depressed behavior of these infants is specific to interactions with their depressed mothers or whether the infants' depressed style of interacting generalizes to their interactions with nondepressed adults, suggesting that they have developed a depressed style of interacting. Thus, in the present study we compared the interactions of infants with their depressed mothers to their interactions with nondepressed adult strangers. Because stranger fear reputedly does not emerge until later in the first year of infancy, we hoped that the unfamiliarity of the adult stranger would not confound the comparison of these interactions.

Hypotheses could be made in both directions based on the existing literature. That is, the literature on mothers' simulated depression (Cohn & Tronick, 1983), still-face behavior (Tronick, Als, Adamson, Wise, & Brazelton, 1977) and imitative behavior (Field, 1977), for example, shows that infants readily change their behavior when the adult's behavior is modified, as if the infant's behavior is very much affected by the "mood state" or type of behavior displayed by the adult. In this context the infant would notice that the stranger's behavior was different and would be expected to behave differently with the adult stranger. However, if the infant's behavior has been "depressed-like" since birth and/or the mother has reportedly been depressed since pregnancy, as in the Field et al. (1985a) study, then it is conceivable that the infant may have developed a depressed style of in-

teracting that might generalize to other adults. Still another possibility is that for infants who typically experience interactions that are depressed in nature (e.g., unanimated, unstimulating interactions), the interaction context could be generally stressful, in which case the infants may appear generally depressed in this context irrespective of their interaction partner.

Physiological measures (heart rate and cortisol) were used to assess the infants' general physiological response to the interaction situation. Elevated heart rate has been reported during stressful interactions such as those in which the mother is asked to remain still-faced (Stoller & Field, 1982) or the mother is overstimulating (Field, 1981). Although cortisol levels have not been used as an index of stress in the early mother-infant interaction situation, elevated cortisol levels have been noted in infants experiencing other forms of stressful interaction, for example, following the Brazelton assessment (Gunnar, Malone, & Fish, 1984). Again, based on the literature, different hypotheses could be formulated about these measures. If the infants had become accustomed to these types of interactions, they would perhaps be less distressed by them, as they appeared to be in the Field et al. (1985a) study. In this case no elevations in heart rate or cortisol would be expected. If, however, the interaction situation is stressful, higher heart rate and cortisol levels might be expected. Unfortunately, because of the limited literature on these types of mother-infant dyads and the limited use of physiological measures in young infants in the early interaction context, no definitive hypotheses could be made.

Method

Sample

The sample comprised 74 mothers (N = 40 depressed mothers, 34 nondepressed mothers) and their 3–6-month-old infants (M = 3.7 months). The mothers were from two ethnic groups (N = 38 blacks, N = 36 Cubans) evenly distributed across the depressed and nondepressed groups, were lower socioeconomic status (M = 4.15 on the Hollingshead two-factor index), and ranged in age from 14 to 47 years (M = 27 years). No differences were noted in infant age or maternal demographic variables as a function of group assignment (depressed/nondepressed) or ethnicity. See Table 1 for background characteristics of this sample.

Procedures

Interview.—The mothers were recruited from a university infant clinic and, following their informed consent, were administered two mood-state inventories, including the Beck Depression Inventory (BDI; Beck, Ward, Mendelson, Mach, & Erbaugh, 1961) and the Profile of Mood States (POMS; McNair, Lorr, & Dropplemen, 1971). The Beck Depression Inventory is a 21-item inventory with each item scored on a four-point scale indicating the absence/presence and the range of severity of depressed feelings/behaviors/symptoms. In accord with other investigators' use of this instrument as a research tool (O'Hara, Rehm, & Campbell, 1983), the mothers who received a score of less than 9 on the BDI were classified as nondepressed and the mothers receiving a score greater than 12 were classified as depressed. Although the below-9 cutoff for no depres-

TABLE 1

BACKGROUND CHARACTERISTICS AND DEPRESSION SCALE SCORES OF SAMPLE

MEASURES	GROUP		EFFECT
	Depressed	Nondepressed	
Age of mother	24.1	29.7	.001
Parity of mother	1.6	1.7	N.S.
Ethnicity	1.5	1.5	N.S.
SES	4.2	4.1	N.S.
Stress interview total	19.4	19.3	N.S.
Support system	5.5	5.4	N.S.
Child rearing	6.0	6.2	N.S.
Own childhood	3.2	2.9	N.S.
Environmental and crowding stress	2.1	2.4	N.S.
Beck Depression Inventory	21.1	3.9	.001
POMS negative mood	15.8	2.6	.001
POMS positive mood	6.5	13.7	.001

sion may seem high inasmuch as some studies define depressed mood as above 9, below 9 is typically considered a nondepressed or at least a low depressed sample (O'Hara et al., 1983). The < 9 group averaged very low scores (M = 3.9) and the > 12 group averaged high scores (M = 21.1) (see Table 1). This scale is among the most commonly employed instruments in research on nonclinically depressed samples, and it has reasonable psychometric properties. However, it should be noted that since the mothers were classified solely on the basis of their elevated BDI scores, it is conceivable that they were not clinically depressed by DSM-III standards (see Coyne & Gottlib, 1983, for debate about the comparability of clinical samples and those selected on the basis of high BDI scores).

The POMS scale was used only to determine the consistency of the mothers' feelings/behaviors as reported on the Beck Depression Inventory. The POMS scale includes 15 negative mood items that significantly load on a depression factor and 15 positive mood items, each of these being scored on a five-point ("not at all" to "extremely") scale. Because the POMS scale yields both negative and positive mood scores, we could also determine whether the mother understood the questions and was reliably reporting her mood state. Understanding the items was an important consideration inasmuch as the BDI normative data were collected on a more educated sample than this one (Field, Widmayer, Stoller, & DeCubas, in press). A related concern was the use of these instruments with ethnic groups that had not been included in the normative samples for the scales. Although the distributions of scores from these samples were similar to those of the standardization samples, the degree to which affective behaviors are interpreted similarly by different ethnic groups is unknown. Thus, this factor may limit the representativeness of these data.

Finally, the mothers were given a stress interview comprised of 42 items designed to determine the mothers' current socioeconomic status and to yield a composite score based on items assessing the amount of social support she was currently receiving, the degree of stress she was experiencing in her child-rearing role, the self-recalled stress from her own childhood, as well as currently stressful home environment features, particularly crowding stress. This interview was used to ensure that the groups were not depressed/nondepressed as a function of potential differences in SES and "environmental stress." A standard stress measure was not used inasmuch as the focus of the typical stress measure is life events, and in low-SES samples of this kind environmental stressors are often reported as more stressful than life events per se (Bendell, Stone, & Field, 1987). In any case, the groups did not differ on environmental stress so that factor apparently did not contribute to their different BDI scores (see Table 1).

Interactions.—The mothers and infants were videotaped in a 3-min, face-to-face interaction. For this interaction the mothers were asked to "pretend you are playing with your infant at home." Following this interaction, the infant was situated face-to-face with the nondepressed stranger of the same ethnicity as the mother. The two strangers were infant nursery school teachers/researchers who were selected based on their experience with infants and demonstration of affectively responsive behaviors in face-to-face interactions with this age infant. They were naive to the classification of the mother-infant dyads. The mother-stranger interaction order was not counterbalanced inasmuch as pilot data on 28 mother-infant and stranger-infant dyads yielded no significant mother-stranger situation order effects.

For the videotaping of the face-to-face interactions, the infants were placed in an infant seat on a table approximately 15 inches (38 cm) from the face of the mother/stranger, who was seated at a table. Two videocameras and a split-screen generator enabled simultaneous monitoring of the mothers' and the infants' facial behaviors. Simultaneous with the videotaping of the interaction situations, the infant's heart rate was recorded to determine whether, as in the Field (1984) study, there were differences in the physiological activity of the infants of depressed versus nondepressed mothers. Heart rate was recorded via Narco telemetry on a vetter stereo tape recorder. Pregelled, disposable EKG electrodes were placed on the base of the sternum and lower left lateral costal margin of the infants and their mothers. The electrodes were connected to a small transmitter battery that transmitted the heart rate signal to receivers located in the adjacent monitoring room. Following the interaction sessions, saliva samples were taken from the mothers and infants by placing a syringe along the gum line and withdrawing 1 cc of saliva. These samples were subsequently assayed for cortisol levels to determine the differential stressful effects of these interactions on the nondepressed and

depressed mother-infant dyads. Because of the close proximity in time of the mother-infant and stranger-infant interactions, separate cortisol assays for the mother and stranger interactions could not be made. Cortisol values are noted to have a 20–30-min lag time, suggesting that only the situational stress effects on cortisol could be assessed.

Behavior ratings.—The videotapes were rated by research assistants who were naive to the classifications of the mother-infant dyads. To provide data comparable to the Field et al. (1985a) study, the videotapes were scored on the Interaction Rating Scale (Field, 1980), a three-point, Likert-type scale (high ratings being optimal) that includes the following behavior ratings: (*a*) infant state, physical activity, head orientation, gaze behavior, facial expressions, vocalizations, and fussiness; and (*b*) mother state, physical activity, head orientation, gaze behavior, facial expressions, vocalizations, silence during infant gaze aversion, imitative behaviors, contingent responsivity, and game playing. Each of these scales yields a summary rating derived from averaging individual behavior ratings. Between-rater reliabilities were assessed on one-third of the videotapes by calculating kappa coefficients (Bartko & Carpenter, 1976). Coefficients ranged from .81 to .95 (M = .86) for the infant ratings and from .81 to .96 (M = .88) for the mother/stranger ratings. Interrater reliabilities of the individual ratings are given in parentheses in Table 2.

Quantification of the heart rate data.—Heart rate was recorded on cassette tape and analyzed off-line using a vagal tone monitor and computer software developed by Porges (1985). The average heart rate (BPM) and vagal tone for each interaction situation were derived from this program. For the measure of vagal tone, the program applies spectral analytic and time-series analyses to the cardiac pattern to isolate that component of the rhythm associated with spontaneous breathing (i.e., respiratory sinus arrhythmia [RSA]). Since the respiratory influence on heart rate is mediated primarily by the vagus (tenth cranial nerve), quantification of the amplitude of RSA has been viewed as an accurate assessment of cardiac vagal tone (i.e., parasympathetic nervous system activity) (Porges, McCabe, & Yongue, 1982; Richards, 1987).

Cortisol assays.—The saliva samples were frozen and subsequently assayed for cortisol levels at the clinical pharmacology lab at Duke University. Cortisol was measured by specific radioimmunoassay (RIA) using high-pressure liquid chromatography (HPLC)—purified titrated tracer, 3M cortisol, antiserum, and standards purchased from Radioassay System Laboratories (Carson City, CA). Antibody bound and free hormone were separated by the dextran-coded charcoal technique. Samples were counted by liquid scintillation spectrometry using toluene-based scintillation fluid. Performance of the assay sensitivity is .0005 ng per tube. The range of the standard curve is .0005–2.0 ng.

Results

The data were analyzed by repeated-measures analyses of covariance with two grouping factors (depressed vs. nondepressed dyads and sex of infant), a repeated measure (the mother vs. stranger interaction), and two covariates (the age of infant and age of mother). Age of mother and infant were entered as covariates because a preliminary t test revealed that the depressed mothers were younger than the nondepressed mothers (see Table 1) and because developmental differences might be expected in infant interaction behavior across this 3-month period. Preliminary t tests yielded no ethnicity effects on the dependent measures, and on this basis ethnicity was not entered as a covariate. Although earlier comparisons of low-income black and Cuban mothers yielded interaction behavior differences (Field & Widmayer, 1981), it is possible that the absence of ethnic differences in this sample relates to the Cuban mothers being native Americans rather than Cuban immigrants. Post hoc comparisons were made by Bonferroni t tests with a significance level set at $p < .05$.

Interaction Behavior of Depressed versus Nondepressed Mother-Infant Dyads

As can be seen in Table 2, a number of main and interaction effects are apparent on the group variable depressed versus nondepressed dyads. The depressed mothers received lower ratings than nondepressed mothers on all of the interaction behaviors as well as the summary rating (cols. 1 vs. 2 in Table 2). Similarly, the infants of depressed versus nondepressed mothers received lower ratings on all of the behaviors as well as the summary rating (cols. 1 vs. 2 in Table 2). No effects were noted for sex of infant.

Comparison of Mother and Stranger Interaction Situations

An absence of repeated-measures effects suggests that as a total sample the mothers' and strangers' behaviors did not differ. Similarly, the infants as a total sample did not differ in their behavior as a function of interacting with their mother or a stranger. However,

TABLE 2

INTERACTION RATINGS OF INFANTS (of Depressed and Nondepressed Mothers), MOTHERS (Depressed and Nondepressed), AND STRANGERS IN MOTHER INTERACTION AND STRANGER INTERACTION SITUATIONS

	MOTHER SITUATION		STRANGER SITUATION		
MOTHERS	Depressed	Nondepressed	Depressed	Nondepressed	EFFECT
Infant interaction behaviors:					
State (.82)	1.66_a	2.66_b	1.97_a	2.52_b	G****
Physical activity (.81)	1.78_a	2.66_b	2.06_a	2.61_b	G****
Head orientation (.92)	1.63_a	2.28_b	2.00_b	2.30_b	I****
Gaze behavior (.83)	1.83_a	2.55_b	2.25_b	2.52_b	I**
Facial expressions (.84)	1.63_a	2.48_b	1.81_a	2.34_b	G****
Vocalizations (.87)	1.46_a	2.07_b	1.66_a	1.83_b	G****
Fussiness (.95)	1.88_a	2.59_b	2.00_a	2.30_b	G****
Summary rating	1.69_a	2.42_b	1.98_a	2.36_b	G****
Mother/stranger interaction behaviors:					
State (.83)	1.51_a	2.72_b	2.59_b	2.96_c	G**I**
Physical activity (.86)	1.32_a	2.55_b	2.13_c	2.65_b	G*I***
Head orientation (.94)	2.70_a	3.00_b	3.00_b	3.00_b	N.S.
Gaze behavior (.92)	2.80_a	3.00_b	2.94_b	3.00_b	N.S.
Facial expressions (.81)	1.46_a	2.55_b	2.22_b	2.48_b	I****
Vocalizations (.95)	1.32_a	2.52_b	1.97_c	2.43_b	G***I****
Silence during infant gaze aversion (.82)	1.46_a	2.20_b	1.97_b	2.09_b	I***
Imitative behaviors (.90)	1.05_a	1.72_b	1.35_b	1.52_b	I***
Contingent responsivity (.83)	1.34_a	2.45_b	1.88_c	2.39_b	G**I****
Game playing (.96)	1.05_a	1.76_b	1.19_a	1.52_b	G*
Summary rating	1.59_a	2.45_b	2.13_c	2.41_b	G*I***

NOTE.—Interobserver reliabilities are in parentheses. Means bearing different subscripts are different at $p < .05$ or less revealed by post hoc comparison of adjacent groups. Higher scores are optimal for all ratings. G = group effect. I = group × mother/stranger interaction effect.

* $p < .05$.

** $p < .01$.

*** $p < .005$.

**** $p < .001$.

a number of group × repeated measures interaction effects are apparent (symbolized by "I" effects in Table 2). Depressed mothers and their infants when interacting with each other received the lowest ratings on several behaviors. The depressed mothers received the lowest ratings on state, physical activity, facial expressions, vocalizations, silence during infant gaze aversion, imitative behaviors, contingent responsivity, and summary ratings. The infants of the depressed mothers received the lowest ratings on head orientation and gaze behavior when interacting with their mothers.

Comparison of Infants of Depressed versus Nondepressed Mothers in Interaction with the Stranger

Again, group × repeated measures interaction effects are apparent in these comparisons. The infants of depressed mothers received lower ratings than infants of nondepressed mothers when interacting with a stranger on all behaviors except head orientation and gaze behavior. On these two behaviors, the stranger received similar ratings with the two groups of infants. However, the stranger received lower ratings when interacting with infants of depressed versus nondepressed mothers on state, physical activity, vocalizations, contingent responsivity, game playing, and the summary rating. Although the infants of depressed mothers received lower ratings than the infants of nondepressed mothers on most of the behaviors when interacting with the stranger, the infants of depressed mothers behaved similarly with their mother and the stranger, except that they received lower head orientation and gaze behavior ratings with their mother.

Physiological Measures: Heart Rate, Vagal Tone, and Cortisol

As can be seen in Table 3, group × repeated measures interaction effects are apparent for the physiological measures. The infants of depressed mothers (vs. infants of nondepressed mothers) showed higher heart rate and lower vagal tone when interacting with their mothers. In addition, the infants of depressed mothers showed higher cortisol values than the infants of nondepressed mothers. The depressed mothers did not differ from the nondepressed mothers on heart rate or cortisol levels.

Discussion

That the depressed mothers and their infants showed less positive interaction behavior than nondepressed mothers and their infants is not surprising given that at least three other studies in the literature have reported less optimal interaction behavior for depressed mother-infant dyads (Cohn et al., 1986; Field, 1984; Field et al., 1985a). Also not surprising was the finding that the depressed mothers received lower ratings than the nondepressed strangers on most of the interaction behaviors. This finding would be expected based on comparisons between depressed and nondepressed mothers since the strangers were also not depressed.

Less predictable were the findings that the infants of depressed mothers performed more poorly than the infants of nondepressed mothers when interacting with the stranger and that in most respects their behavior did not differ as a function of interacting with their mother or the stranger. Apparently the infants' depressed style of interacting generalizes from interactions with their mothers to those of nondepressed adults. The exceptions to this generalization—that infants of depressed mothers showed more head and gaze aversion with their mothers than with the stranger—are probably not surprising since the stranger was novel and might be expected to elicit more looking from the infant. In addition, looking-away behavior is most frequent in infants' interactions with their depressed mothers, suggesting that gaze aversion may be more stimulus-specific, that is, more frequently elicited by depressed maternal behavior than are other infant behaviors (Cohn et al., 1986; Field, 1984). Tronick and Gianino (1986) have suggested that infants of depressed mothers turn to self-regulatory behaviors such as head and gaze aversion in an attempt to reduce the negative affect engendered by unresponsive maternal behavior. This interpretation would suggest that the interactions with the stranger were not as stressful as those with their depressed mothers.

Also less predictable was the apparent negative effect the infants of depressed mothers had on the nondepressed strangers' behaviors. Even though the strangers were naive to the classification of the infants, the strangers performed less optimally with infants of depressed versus infants of nondepressed mothers. Consistent with the suggestion that the infants affected the strangers' behavior were the findings that the infants of depressed mothers were no different than their peers on head orientation and gaze behavior with the stranger, and the stranger, in turn, did not differ on these behaviors with the two groups of infants. Thus, as might be expected in interactions of this kind, there are apparently strong reciprocal influences, a

TABLE 3

HEART RATE, VAGAL TONE, AND CORTISOL MEASURES FOR INFANTS (of Depressed and Nondepressed Mothers) AND CORTISOL MEASURE FOR MOTHERS (Depressed and Nondepressed)

MEASURES	MOTHER SITUATION		STRANGER SITUATION		EFFECT
	Depressed	Nondepressed	Depressed	Nondepressed	
Infant heart rate (BPM)	155.5_a	145.6_b	149.2_b	143.0_b	I*
Infant vagal tone	2.9_a	3.9_b	3.4_b	3.7_b	I*
Infant cortisol (ng/ml)	2.6_a	1.1_b	...	...	G*
Mother cortisol (ng/ml)	1.4_a	1.4_a	...	...	N.S.

NOTE.—G = group effect. I = group × mother/stranger interaction effect. Means bearing different subscripts are different at $p < .05$ or less revealed by post hoc comparison of adjacent groups.

* $p < .05$.

phenomenon that invariably confounds any attempts to determine causality or directionality. However, since there was no a priori reason to expect that a nondepressed adult would differentially behave with infants of depressed versus nondepressed mothers, the negative influence of the infants' behavior seems to be the most parsimonious interpretation of these data. The infants' depressed style of interacting not only generalized to their interactions with nondepressed strangers but also seemed to elicit depressed-like behavior in the nondepressed adult.

Elevated heart rate in the infants of depressed mothers may relate to the infants being sympathetically aroused during their interactions with their mothers (Field, 1984). Similarly, their lower vagal tone suggests lower parasympathetic activity during these interactions (Porges et al., 1982). Higher sympathetic arousal and, conversely, lower parasympathetic activity generally occur in stressful situations (McCabe & Schneiderman, 1984), suggesting that the infants of depressed mothers were stressed during their interactions with their mothers. However, heart rate was not elevated during their interactions with the stranger. This was an unexpected finding since their behavior generalized to their interactions with the stranger. The greater amounts of looking at the stranger, most likely accompanied by heart rate decelerations (Graham & Clifton, 1966), could have attenuated the expected elevation in heart rate. Unfortunately, second-by-second behaviors were not coded. In a future study, time-locked behavior and heart rate could be analyzed to determine the correspondence between looking behavior and cardiac decelerations.

Elevated cortisol levels in the infants of depressed mothers are also indicative of sympathetic arousal, suggesting that the infants were generally stressed during these interaction sessions (Gunnar et al., 1984). Given the delay in the effects of stress on cortisol levels, and given that baseline measures of cortisol in infants are related to the levels of cortisol excreted under stress (Tennes, Downey, & Vernadakis, 1977), it would appear that these infants may be experiencing chronic stress. Curiously, the cortisol values of the depressed mothers were no different than those of the nondepressed mothers. Because cortisol levels are typically not elevated in chronically depressed individuals, this finding raises the possibility that this sample of mothers experienced chronic depression (Elliott & Eisdorfer, 1982). This would not be surprising in view of a very high incidence of chronic depression among low-SES samples of this kind (Brown & Harris, 1975; Lyons-Ruth, Zoll, Connell, & Grunebaum, 1986). Another possibility is that the generally limited attentiveness and blunted sensitivity of the depressed mothers to their infants' behaviors may have resulted in this being a nonstressful situation for them, thus attenuating any expected stress-related cortisol elevations in the depressed mothers.

Unclear from this study is how this behavior develops in the infant. We have speculated elsewhere that the infant may be depressed from birth because of genetic and/or prenatal factors, as in a temperament trait. The infants may exhibit a pattern of depressed behavior that elicits a predictable set of responses from both their mothers and strangers. Neonatal data on the infants, such as those reported in Field et al. (1985a), are essential to determine what role the infant might have in the development of the interaction pattern observed in depressed mothers and their infants. Alternatively, the infant's depressed behavior may derive from the mother modeling depressed behavior and the infant, in turn, mimicking the behavior, as in a social learning process (Field, 1984). It may also derive from limited stimulation and arousal modulation provided by the mother, as in depression related to stimulus deprivation. The infant may develop a learned helplessness or passive coping style in the face of a repeatedly unresponsive mother. Whatever the origins and development of this behavior may be, the persistence of the infants' depressed style of interacting across interaction partners highlights the need for additional developmental and process-oriented research on this problem.

References

Bartko, J. J., & Carpenter, W. T. (1976). On the methods of reliability. *Journal of Nervous and Mental Disease*, **163**, 307–317.

Beck, A. T., Ward, C. H., Mendelson, M., Mach, J. E., & Erbaugh, J. (1961). An inventory for measuring depression. *Archives of General Psychiatry*, **4**, 561–571.

Bendell, D., Stone, W., & Field, T. (1987). *Child and maternal influences on parenting stress during the early grade school years.* Unpublished manuscript, University of Miami Medical School.

Brazelton, T. B. (1973). *Neonatal Behavioral Assessment Scale.* London: Spastics International Medical Publications.

Brown, G., & Harris, T. (1975). *Social origins of depression: A study of psychiatric disorders in women.* New York: Free Press.

Cohn, F., Matias, R., Tronick, E. Z., Connell, D., & Lyons-Ruth, D. (1986). Face-to-face interactions of depressed mothers and their infants. In E. Z. Tronick & T. Field (Eds.), *Maternal depression and infant disturbance* (pp. 31–45). San Francisco: Jossey-Bass.

Cohn, J. F., & Tronick, E. Z. (1983). Three-month-old infants' reaction to simulated maternal depression. *Child Development,* **54,** 185–193.

Coyne, J. C., & Gottlib, I. H. (1983). The role of cognition in depression: A critical appraisal. *Psychological Bulletin,* **94,** 472–505.

Cytryn, L., McKnew, D. H., Bartko, J. J., Lamour, M., & Hamovitt, J. (1982). Offspring of patients with affective disorders. *Journal of American Academy of Child Psychiatry,* **21,** 289–391.

Elliott, G. R., & Eisdorfer, C. (1982). *Stress and human health* (p. 372). New York: Springer.

Field, T. (1977). Effects of early separation, interactive deficits, and experimental manipulations on infant-mother face-to-face interaction. *Child Development,* **48,** 763–771.

Field, T. (1980). Interactions of high-risk infants: Quantitative and qualitative differences. In D. B. Sawin, R. C. Hawkins, L. Walker, & J. Penticuff (Eds.), *Current perspectives on psychosocial risks during pregnancy and early infancy* (pp. 120–143). New York: Brunner/Mazel.

Field, T. (1981). Infant gaze aversion and heart rate during face-to-face interactions. *Infant Behavior and Development,* **4,** 307–315.

Field, T. (1984). Early interactions between infants and their postpartum depressed mothers. *Infant Behavior and Development,* **7,** 527–532.

Field, T., Sandberg, D., Garcia, R., Vega-Lahr, N., Goldstein, S., & Guy, L. (1985a). Prenatal problems, postpartum depression, and early mother-infant interactions. *Developmental Psychology,* **12,** 1152–1156.

Field, T., Sandberg, D., Quetel, T. A., Garcia, R., & Rosario, M. (1985b). Effects of ultrasound feedback on pregnancy anxiety, fetal activity, and neonatal outcome. *Obstetrics and Gynecology,* **66,** 525–528.

Field, T., & Widmayer, S. (1981). Mother-infant interaction among lower SES Black, Cuban, Puerto Rican, and South American immigrants. In T. Field, A. Sostek, P. Vietze, & A. H. Leiderman (Eds.), *Culture and early interactions* (pp. 41–62). Hillsdale, NJ: Erlbaum.

Field, T., Widmayer, S., Stoller, S., & DeCubas, M. (in press). Teenage parenting in different cultures, family constellations, and caregiving environments: Effects on infant development. *Parenting Studies.*

Graham, F., & Clifton, R. (1966). Heart rate changes as a component of the orienting response. *Psychological Bulletin,* **65,** 213–228.

Gunnar, M. R., Malone, S., & Fish, R. D. (1984). Psychobiology of stress and coping in the human neonate: Studies of adrenocorticol activity in response to stress. In T. Field, P. M. McCabe, & N. Schneiderman (Eds.), *Stress and coping* (pp. 179–196). Hillsdale, NJ: Erlbaum.

Lyons-Ruth, K., Zoll, D., Connell, D., & Grunebaum, H. E. (1986). The depressed mother and her one-year-old infant: Environment, interaction, attachment, and infant development. In E. Tronick & T. Field (Eds.), *Maternal depression and infant disturbance* (pp. 61–82). San Francisco: Jossey-Bass.

McCabe, P., & Schneiderman, N. (1984). Psychophysiological reactions to stress. In N. Schneiderman & J. Tapp (Eds.), *Behavioral medicine: The biopsychosocial approach* (pp. 99–131). Hillsdale, NJ: Erlbaum.

McNair, D. M., Lorr, M., & Dropplemen, L. F. (1971). *Profile of mood states.* San Diego: Educational and Industrial Testing Service.

O'Hara, M., Rehm, L. P., & Campbell, S. B. (1983). Postpartum depression: A role for social network and life stress variable. *Journal of Nervous and Mental Disease,* **171,** 336–341.

Porges, S. W. (1985). *Method and apparatus for evaluating rhythmic oscillations in aperiodic response systems.* Patent no. 4510944.

Porges, S. W., McCabe, P. M., & Yongue, B. G. (1982). Respiratory–heart rate interactions: Psychophysiological implications for pathophysiology and behavior. In J. T. Cacippo & R. E. Petty (Eds.), *Perspectives in cardiovascular psychophysiology* (pp. 233–260). New York: Guilford.

Richards, J. E. (1987). Infant visual sustained attention and respiratory sinus arrhythmia. *Child Development,* **58,** 488–496.

Sameroff, A. V., & Seifer, R. (1983). Familial risk and child competence. *Child Development,* **54,** 1254–1268.

Stoller, S., & Field, T. (1982). Alteration of mother and infant behavior and heart rate during a still-face perturbation of face-to-face intervention. In T. Field & A. Fogel (Eds.), *Emotion and early interactions* (pp. 57–82). Hillsdale, NJ: Erlbaum.

Tennes, K., Downey, K., & Vernadakis, A. (1977). Urinary cortisol excretion rates and anxiety in normal 1-year-old infants. *Psychosomatic Medicine,* **39,** 178–187.

Tronick, E. Z., Als, H., Adamson, L., Wise, S., &

Brazelton, T. B. (1977). The infant's response to entrapment between contradictory messages in face-to-face interaction. *Journal of Child Psychiatry,* **17,** 1–13.

Tronick, E. Z., & Gianino, A. F. (1986). The transmission of maternal disturbance to the infant. In E. Z. Tronick & T. Field (Eds.), *Maternal depression and infant disturbance.* San Francisco: Jossey-Bass.

Tronick, E. Z., Ricks, M., & Cohn, J. (1982). Maternal and infant affective exchange: Patterns of adaptation. In T. Field & A. Fogel (Eds.), *Emotion and early interactions* (pp. 83–101). Hillsdale, NJ: Erlbaum.