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SECTION 4. EMOTIONAL CARE OF THE AT-RISK INFANT

Emotional Characteristics of Infants Associated With Maternal Depression and Anxiety

M. Katherine Weinberg, PhD, and Edward Z. Tronick, PhD

ABSTRACT. Infants as young as 3 months are able to detect depression in their mothers. Depressed mothers are sufficiently different from nondepressed mothers in affect and interaction that the social, emotional, and cognitive functioning of their infants are compromised. This article reviews current findings on the effects of maternal depression and psychiatric illness on infants. *Pediatrics* 1998;102:1298–1304; *maternal depression, anxiety, infants, development, emotion, panic disorder, psychiatric illness.*

ABBREVIATIONS. PD, panic disorder; CES–D, Center for Epidemiologic Studies–Depression Scale.

Tronick¹ has argued that even very young infants are exquisitely sensitive to the emotions of their caregivers. This emotional sensitivity is critical to our understanding of normal and abnormal emotional development in children and how maternal depression and anxiety disorders affect children's development. In a paradigmatic study, Cohn and Tronick² asked nondepressed mothers to simulate a depressed interaction with their 3-month-old infants. With only minimal instruction, mothers had little difficulty in acting depressed. They spoke in a monotone, expressed little or no facial affect, hardly touched their infants, and interacted at a greater than usual distance from their infants. The infants reacted dramatically when exposed to just 3 minutes of simulated depression. The infants looked away from the mothers and became distressed and wary. Their affect cycled among states of wariness and disengagement. They made brief solicitations to the mother to resume her normal affective state. Importantly, the infants continued to be distressed and disengaged from the mother even after the mother resumed normal interactive behavior. Clearly, infants as young as 3 months are able to detect maternal affective states. They react with well-organized emotional displays that are related to the affect expressed by their mothers. These experimental find-

ings led us to hypothesize that the affective and interactive states of infants would be disturbed by maternal depression and anxiety.

EFFECTS OF MATERNAL DEPRESSION AND ANXIETY ON INFANT FUNCTIONING

Research on the effects of maternal depression on infant outcome, reviewed by Weinberg and Tronick³ and other investigators,^{4,5} indicates that in each communicative domain—face, voice, and touch—the quantity, quality, and timing of depressed mothers' social and affective behavior is distorted in ways that contrast sharply with the behavior of nondepressed mothers and that these affective characteristics compromise infant social, emotional, and cognitive functioning.^{6,7}

Maternal Subsets

The research also suggests that the behavior of depressed mothers is heterogeneous. Several researchers have found that some depressed mothers' behavior and affect appear quite normal, whereas the behavior and affect of mothers with similar levels of depressive are compromised symptomatology.^{7–11} Cohn and Tronick,¹⁰ for instance, found that some depressed mothers are disengaged and withdrawn when interacting with their infants. These withdrawn mothers engage in little play, talk only rarely to their infants in the "babified" register of motherese, and show flat and sad affect. Other mothers are more intrusive. They express anger to their infants and interfere with their infants' activities. Still another subset of mothers are able to pull themselves together and interact positively with their infants. Campbell and associates¹² have argued that the ability to muster the energy to engage in positive mother–infant interactions and to derive pleasure from these interchanges may be one marker of who will or will not show a chronic course of depression.

Infant Functioning

Maternal depression affects infant functioning.³ Infants of depressed mothers have difficulties engaging in object and social interactions as early as 2 months of age.¹³ These infants, compared with control infants, look at the mother less often, engage with objects less, show less positive and more negative affect, and have lower activity levels and greater physiologic reactivity as indexed by higher heart rate and cortisol levels.⁵ They show compromises in their

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ability to regulate their affective and behavioral states. These regulatory dysfunctions appear as early as during the newborn period,¹⁴ suggesting that there are prenatal effects of maternal depression on the infant's regulatory capacities. Importantly, the infants' affective states are related specifically to their mothers' style of interaction. Thus, Cohn and Tronick¹⁰ found that the infants of withdrawn depressed mothers spent most of their time crying and fussing, whereas the infants of the intrusive depressed mothers avoided looking and interacting with their mother. The infants of the emotionally and socially positive depressed mothers behaved similarly to control infants. This suggests that the social emotional interactive style that the infants are exposed to may be more critical than the mothers' diagnosis per se.

At 1 year of age, many infants of depressed mothers show poorer performance on developmental tests such as the Bayley Scales of Infant Development and Piagetian object tasks, suggesting that even at this age, these children are beginning to be at risk for cognitive compromises.¹⁵⁻¹⁷ Furthermore, there is some indication that these infants have an insecure attachment to the mother, especially if the mother's illness is severe and chronic.¹⁸ Beeghly and co-workers,¹⁹ however, found no differences in infant attachment security. They did find that infants of mothers with a pregravid history of depression were significantly more difficult to classify and more likely to exhibit odd or unexpected patterns of affect, a finding that deserves additional attention. Insecure attachment has been related to a number of difficulties, including conduct disorders and behavior problems during the preschool and later school periods, and has been suggested as an environmental mechanism for the occurrence of familial psychopathology.

Thus, there is evidence that exposure to maternal depressive symptomatology or depression compromises infant social, emotional, and cognitive functioning. These compromises continue to be observed in the older children of depressed mothers. At later ages, these children exhibit a range of problems including difficulties in school, poor modulation of affect, conflict with peers and parents, and increased rates of psychiatric problems including depression.^{4,20,21}

Panic Disorder (PD) and Anxiety

There is a paucity of research on the effects of maternal anxiety disorders on infant functioning, and the literature has focused almost exclusively on the effects of PD. Nonetheless, as with the research on depression, it appears that maternal anxiety has powerful developmental effects. Adult patients with PD rate their parents as having engaged in dysfunctional parenting, particularly overprotectiveness and lack of care.^{22,23} These studies, however, suffer from their exclusive reliance on retrospective self-reports. Patients often are searching for the causes of their problems and may attribute a more negative value to these relationships than they, in fact, warrant.²²

Only a handful of studies have evaluated the children of parents with PD, and none of these studies

have focused on infants younger than 1 year of age. The studies have found higher rates of behavioral inhibition in these children.²⁴⁻²⁶ Furthermore, inhibited older children have been found to be more likely than uninhibited children to evidence higher rates of multiple anxiety disorders than normal controls based on maternal interview data.²⁷ Thus, behavioral inhibition in children may be a precursor to anxiety disorders in later life. The children of mothers with PD also have higher rates of insecure attachment to the mother.^{26,28} An astounding 80% of the preschool children in a study by Manassis and colleagues²⁸ were classified as insecurely attached, with 65% judged disorganized. Furthermore, based on parental interviews, Weissman and researchers²⁹ found that 6- to 7-year-old children with a parent with PD were three times more likely than controls to experience anxiety disorders. Taken together, this research indicates that the children of mothers with PD may be at risk for developing anxiety disorders themselves, particularly in the presence of attachment difficulties and inhibited temperamental characteristics, as has been suggested by Manassis and colleagues.²⁶

Importance of Study Methodology

Several of the studies evaluating the impact of maternal anxiety on child functioning have suffered from methodologic problems including small sample sizes, no comparison groups, and lack of blindness to the mothers' psychiatric status. Several of the studies also have relied on maternal reports of child psychopathology, either parental interviews or parental ratings on measures such as the Child Behavior Checklist. The extent to which these reports are biased by the parental disorder is unknown, because parents with psychopathology may exaggerate symptoms in their children or be less tolerant of child symptomatic behavior and therefore more likely to underestimate problems.²⁹ Studies using direct observations of these children and paying particular attention to methodologic details are needed to evaluate the effects of maternal anxiety on the infants' and children's functioning.

Most of the studies evaluating the effects of depression or anxiety on maternal and infant functioning have not explored the effect of treatment. The studies have used community samples of women who have not typically sought treatment. Although self-reported symptomatology of depressive symptoms, for example, is common during the postpartum period and the prevalence rate of postnatal depression is ~10%, treatment use is low.^{12,30} Women who seek treatment therefore may represent an extreme group at higher risk than women who do not seek treatment. Although untreated women from the community may be more representative than women who seek treatment, focusing on untreated mothers from the community begs the issue of whether treatment has a mitigating effect on maternal and infant functioning. Few studies have included women in treatment, and results from these studies are equivocal and contradictory. For example, Lyons-Ruth and associates¹⁷ found no differences in infant attach-

ment in a high social risk sample of depressed treated mothers and nondepressed control subjects. By contrast, Teti and colleagues¹⁸ found higher rates of insecure attachment in a treated depressed group, particularly in chronically impaired women. Similar results have been reported by Manassis and co-workers,²⁸ who found greater insecure attachment and disturbances in a sample of anxious mothers in treatment and their children. Thus, there is a need for longitudinal observational studies to evaluate the socioemotional functioning of women with a psychiatric illness who are in treatment as well as the functioning of their infants.

Furthermore, very few studies have evaluated the relation between mothers' self-reported functioning, their observed interactive behavior with their infants, and the infants' socioemotional functioning. Teti and colleagues^{31,32} found that the quality of depressed mothers' caretaking behavior was related to their perceptions of their maternal competence. Thus, the poorer the mothers' feelings of self-efficacy in the mothering role, the poorer their interactions with their infants. Frankel and Harmon³³ found in addition that in a depressed group of mothers, those in remission showed improvement in self-reported functioning but continued to show interactional difficulties with their 3-year-old children. These types of data may have significant implications for psychiatry because they suggest that mothers' self-evaluations are not always concordant with their behavior. Thus, there is a need to ask mothers how they are feeling and to observe their interactions with their infants if the goal is to understand maternal and child socioemotional functioning.

ONGOING STUDY OF MATERNAL PSYCHIATRIC ILLNESS AND INFANT FUNCTIONING

At the Child Development Unit at Boston's Children's Hospital, in collaboration with Drs Lee Cohen and Debra Sichel at the Massachusetts General Hospital, we are conducting an ongoing study designed to evaluate the relations between maternal self-reported functioning and direct observations of maternal and infant socioemotional behavior in a group of mothers in treatment.

In this preliminary study, the treated psychiatric group consisted of 30 mothers with a pregravid clinical diagnosis of PD (37% of sample), major depressive disorder (43% of sample), or obsessive-compulsive disorder (20% of sample). Mothers were diagnosed using the Structured Clinical Interview for DSM-III Axis I Disorders³⁴ and were treated at and recruited from the Perinatal Psychiatry Clinical Research Program at the Massachusetts General Hospital.

The majority of the mothers were treated with psychotropic medication. Of the mothers, 68% were maintained on medication during some part of their pregnancy. During the postpartum period, 48% of the mothers were treated with psychotropic medication and an additional 40% with psychotropic medication and therapy. Furthermore, 40% of the sample breastfed while on medication. Thus, a majority of the infants were exposed during pregnancy

and/or the postpartum period to psychotropic medication, the most common of which were clonazepam, tricyclic antidepressants (nortriptyline, desipramine, imipramine), and fluoxetine.

A limitation of this study is that the treated psychiatric group is a mixed group of mothers with different diagnoses. When the study is completed, the major depressive disorder, panic disorder, and obsessive-compulsive disorder groups will be disaggregated to determine whether there is a differential effect of diagnosis on maternal and infant functioning. Disaggregation will permit us to address the issue of whether different maternal psychiatric conditions are associated with specific effects on the infant or with more general effects such as those observed in nonpsychiatric samples (eg, medically ill or maritally dissatisfied mothers and their infants^{35,36}). It is our hypothesis that maternal and infant affective behavior will vary by diagnostic status primarily along the dimensions of withdrawal and vigilance. Although specificity is one of the most important issues in the field of high-risk research,³⁷ few studies have evaluated what outcomes are unique to a specific diagnostic group. When the sample is complete, we also will evaluate the effects of different kinds of treatment and psychotropic medication on maternal and infant functioning. This too is an important issue that remains generally unexplored.

The second group of mothers was a control group drawn from the community. These mothers were recruited from the maternity wards of Boston hospitals. The group consisted of 30 mothers with no documented depressive symptomatology on the Center for Epidemiologic Studies–Depression Scale (CES-D)³⁸ or clinical diagnosis on the Diagnostic Interview Schedule–Version III–Revised.³⁹

Mothers and infants in both groups met a set of low-risk social and medical criteria (eg, age over 21, living with the infant's father, at least a high school education, healthy mother and infant). Many developmental studies have included very-high-risk samples of mothers and infants. Risk factors known to affect maternal and infant functioning (eg, teenage parenthood, poverty, illness) confound and obscure the effects of psychiatric status, making it difficult to disentangle the effects of psychiatric illness from other factors. In this study, given the low-risk sample characteristics, the mothers may be seen as having accumulated protective factors that would mitigate against finding effects of their diagnostic status on their and their infants' functioning. For example, paternal support and involvement are protective of both maternal and infant functioning.⁴⁰ A needed study is one that covers a range of high to low social and medical risk factors. Such a study would permit an evaluation of the relative contribution of maternal psychiatric illness among other factors that are related to compromises in maternal and infant functioning.

MATERNAL SELF-REPORTED FUNCTIONING

To evaluate the mothers' perceptions of their own functioning, mothers completed several measures

designed to assess depressive symptomatology (using the CES-D), current psychiatric symptoms (using the Symptom Checklist-90-Revised),⁴¹ and maternal self-esteem (using the Maternal Self-Report Inventory).⁴² Mothers in the treated psychiatric group reported feeling as well as control mothers on these measures, suggesting that treatment was effective.

When the pattern of responses on these questionnaires was compared with that of a community group of mothers with high levels of depressive symptoms (on the CES-D) who had not sought treatment and who were participants in another research project, an interesting pattern emerged. The untreated community group with high levels of depressive symptoms reported significantly more psychiatric symptoms than did the treated psychiatric group. The untreated community mothers also felt that they were less prepared for taking care of their infant than did the mothers in the treated psychiatric group. Interestingly, the treated psychiatric mothers and untreated community mothers reported equally high levels of anxiety, suggesting that for both groups, the experience of becoming a new mother may have been more stressful than for control mothers.

These data suggest that mothers with a psychiatric illness who are in treatment perceive themselves as functioning well. By contrast, depressed mothers from the community who do not receive treatment reported significant psychological distress and poor functioning. This raises the question of what to do with mothers in the community who are distressed and symptomatic but who typically do not seek help. An effort will need to be made to screen and identify these women. One possible setting might be at well-baby visits, because pediatricians and nurse practitioners routinely come in contact with mothers during the postpartum period. A collaborative effort between the pediatric and psychiatric communities may need to be established to provide pediatric providers with tools for identifying psychiatric illness and with treatment site referrals for the mothers identified.

MOTHER-INFANT INTERACTIONS

To evaluate whether there were differences in maternal and infant interactive socioemotional behavior, mothers and infants were videotaped in the laboratory of the Child Development Unit at Boston's Children's Hospital at 3 months' postpartum. The infants were videotaped in Tronick and associates'⁴³ Face-to-Face Still-Face paradigm, which included a 2-minute face-to-face play interaction with the mother preceding and after a 2-minute still-face episode during which the mother was unresponsive to the infant. In addition, the infants were videotaped during a 2-minute face-to-face play interaction with an unfamiliar female research assistant.

Contrasted to normal face-to-face play (during which mothers are instructed to play with the infant as she would at home), the still-face interaction distorts the mothers' behavior. During the still-face interaction, mothers are asked to look at the infant but not to touch, smile at, or talk to the infant.

The mothers' en face position and eye contact signal the infants that social interaction is forthcoming, whereas their expressionless face and lack of response communicate the opposite. The mothers are saying "hello" and "good-bye" at the same time and remain expressionless even after attempts by the infants to reinstate the interaction.

The still-face interaction has been used extensively to evaluate young infants' communicative abilities, sensitivity to changes in maternal behavior, and capacity to regulate affective states.^{44,45} For example, Gianino and Tronick⁴⁶ found that infants who experienced frequent repairs (corrections) of minor interactive errors (eg, misreading of cues) during mother-infant face-to-face play were likely to solicit their mothers' attention during the still-face interaction. Infants who experienced fewer repairs were more likely to turn away and become distressed. Gianino and Tronick concluded that infants who experience repairs routinely have a representation of themselves as effective in making repairs and of their mother as responsive and sensitive. These data have implications for the infants of depressed mothers who are exposed to periods of maternal unavailability or prolonged interactive errors that are not easily repaired. Infants of depressed mothers would be expected to react with more disengagement to the still-face interaction than would the infants of nondepressed mothers.

The infants also were videotaped interacting with an unfamiliar female research assistant. This episode was included because of work by Field and colleagues⁴⁷ suggesting that negative interactive patterns of infants of depressed mothers generalize to the infants' interactions with an unfamiliar adult. Specifically, these investigators found that infants of depressed mothers showed similar compromises whether they were interacting with their mother or a stranger and that the stranger performed less optimally with these infants than with the infants of control subjects. These data suggest that infant affect and behavior are not simply immediate by-products of the adult partner's interactive style, but possibly reflect broader representations of interactions.

The infants' and mothers' behaviors and facial expressions were coded microanalytically second-by-second from videotapes using Tronick and Weinberg's Infant and Maternal Regulatory Scoring Systems^{48,49} (for a description of these systems, also see Weinberg and Tronick)⁵⁰ and Izard and Dougherty's Affect Expressions system.⁵¹ These systems have been very effective at picking up subtle changes in infant and maternal behavior. For example, few studies using global scoring systems or rating scales have been able to demonstrate gender differences in infant behavior before 1 year of age. Weinberg and co-workers,⁵² using the Infant and Maternal Regulatory Scoring Systems and Affect Expressions systems, found that 6-month-old boys of nondepressed mothers were more emotionally reactive during social interaction with their mother than were girls. The boys' greater emotional reactivity, as indexed by crying and fussing, facial expressions of anger, and attempts to distance themselves from the mother by

arching their backs and turning and twisting in the infant seat, suggested that they had greater difficulty regulating affective states on their own and that they needed to rely more on maternal scaffolding than did girls. Recently, Weinberg⁵³ has found similar gender differences in the infants of depressed mothers. Male infants were more demanding social partners, and depressed mothers had greater difficulties providing their sons with the regulatory help they needed. In this way, a cycle of mutual interactive problems between mothers and sons became established, with the mothers showing more anger and the sons showing less positive affect.

Mothers in the treated psychiatric group evidenced a number of interactional difficulties with their infants, even though they reported feeling well on the questionnaire measures. Compared with control subjects, mothers in the treated psychiatric group talked less to their infants, touched their infants less, and were less likely to share their infants' focus of interest. The mothers in the treated psychiatric group also were more likely to perceive the interaction negatively (as reflected in comments such as "You don't like me," "I bore you," or "You don't want to play with me"); loomed more often into the infant's face, which is often invasive and disruptive; and showed more anger to their infants. These interactional difficulties are consistent with those reported in previous research on depressed typically untreated mothers' interactions with young infants.

Infants of the treated psychiatric mothers reacted differently to the still-face interaction and the stranger than did infants of control mothers. They were less interested, expressed more anger and sadness, and tended to fuss and cry more. During their interaction with the stranger, these infants also were less likely to vocalize to the stranger.

We also evaluated the strangers' reactions to the infants in the treated psychiatric and control groups. The stranger interaction is interesting because the stranger is unbiased. The stranger has never seen the infant before and is blind to the infant and mother's background. Thus, the stranger is influenced only by the infant's ongoing behavior during the interaction. The strangers were more disengaged with the infants of the treated psychiatric mothers than with the infants of the control mothers. Of particular interest was the minimal amount of time they spent touching these infants. They also avoided using touches that are often arousing and somewhat intrusive such as tickles. Furthermore, the strangers maintained a greater physical distance from these infants than from control infants, and when they tried to elicit the attention of these infants, they did so by using distal elicits such as hand-waving. It is likely that the strangers were disengaged because they were picking up cues from the infants that the infants did not want to play with them (ie, these infants were less likely to invite interaction by smiling and vocalizing). It also is possible that the strangers may have perceived these infants as more vulnerable emotionally than control infants and more likely than control infants to become overstimulated and overwhelmed and to start crying or fussing if they played with

them in a more animated manner. Both interpretations suggest that the infants in the treated psychiatric group brought something to the interaction that served to compromise their interactions with the stranger.

CONCLUSIONS

Our work indicates that maternal psychiatric illness has an effect on mothers' and infants' social and emotional functioning, even though the mothers have been in treatment and report feeling well. When asked to complete self-report measures assessing psychiatric symptoms and maternal self-esteem, mothers in the treated psychiatric group consistently perceived themselves as doing well. A notable exception was a higher level of anxiety. However, how well the mothers said they were doing did not always reflect accurately their interactions with their infant. The mothers in the treated psychiatric group demonstrated a number of interactional difficulties similar to those reported in previous research evaluating the interactive behavior of untreated mothers. These findings may have significant implications for treatment because they suggest that mothers' self-evaluations are not always concordant with their behavior. Although the mothers feel better, their behavior with their infants still is compromised. This is consistent with work by Weissman and Paykel⁵⁴ demonstrating that even after an acute psychiatric episode is over, mothers continue to show parenting problems.

The mothers' self-perceptions also did not reflect how their infants were doing. These infants' emotional functioning was disturbed. They were angrier and sadder and more dysregulated by crying and fussiness. During the still-face interaction, they reacted more negatively and, with the unfamiliar adult, they also were more negative. Furthermore, the finding that the strangers were more disengaged when interacting with these infants suggests that these infants brought something to the interaction that served to compromise their interactions with individuals other than their mother. Thus, these infants' emotional disturbance is detectable by our objective coding and by the natural sensitivities of an unfamiliar adult. Moreover, we believe that the infants' emotional reactivity may affect negatively the mothers' behavior and become part of a self-reinforcing cycle.

The interactive history of the mother and infant may be one explanation for the infant findings. However, there are other factors that contribute to infant outcome. Just a partial list includes biological and genetic predisposition and in utero exposure to psychotropic medication. At this point in our understanding, it is difficult to pinpoint the relative contribution of each of these factors.

The data also may reflect the fact that treatment of these mothers did not include an infant component. In many cases, the infant is the "forgotten patient." By excluding the infant in the treatment process, clinicians may not address fully the potential exacerbating effect of the birth of a child on the mother's psychiatric status. Furthermore, by treating mothers

in isolation, clinicians miss the opportunity to address developmental difficulties that may lead to later psychiatric problems in a child who already may be genetically vulnerable to psychiatric illness. The results of this study suggest that clinicians should be aware of mother–infant interactional difficulties and be alert to the fact that these difficulties emerge early in the child’s life. Including the infant in the therapeutic process may help alleviate mothers’ concerns about their infant’s development and feelings of guilt and worry that they are not doing everything they should to foster the child’s development. The infant who does well can become a therapeutic ally and increase mothers’ sense of competence as a parent. Moreover, directly addressing mother–infant interactional difficulties with the mother also will benefit the infant by improving the mother–child relationship.

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