

Specificity of Infants' Response to Mothers' Affective Behavior

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Abstract. Mother-infant face-to-face interaction is central to infant socioemotional development. Little has been known about the mechanisms that mediate the mother's influence. Findings are reviewed from a series of laboratory studies that suggest the major functional components of a mother's behavior are its affective quality and its contingent relationship to her baby's behavior. Quality of mother's affective expression accounted for individual differences in the behavior of thirteen 7-month-old infants living in multiproblem families. Infants' response was specific to the type of affective expression mothers displayed. Flat, withdrawn maternal affective expression was associated with infant distress. Intrusive maternal expression was associated with increased gaze aversion. Lack of contingent responsiveness was common to all but four mothers. Findings suggest that withdrawn or intrusive maternal affective expression, together with lack of contingent responsiveness, may in part be responsible for the risk-status of infants in multiproblem families. *J. Am. Acad. Child Adolesc. Psychiatry*, 1989, 28, 2:242-248. **Key Words:** mother-infant, social interaction, behavioral organization, risk factors.

Face-to-face interaction with parents (or other primary caregivers) is centrally important to infants' development. Face-to-face interaction is a context for early socialization experience (Brazelton et al., 1974; Kaye, 1982; Malatesta and Haviland, 1982) and is particularly important for the baby's developing sense of identity (Escalona, 1968; Winnicott, 1967). Individual differences in patterns of mother-infant adaptation are believed to influence profoundly the security of the baby's attachment to his/her mother and other aspects of the baby's socioemotional development (Ainsworth et al., 1978; Belsky et al., 1984; Kaye, 1982; Schaffer, 1984). Until recently, however, little has been known about the mechanisms that mediate the mother's influence. In particular, what aspects of the mother's behavior impact on the baby's behavior, and how closely do mother's and baby's behavior correspond?

In this study the authors review findings from a series of laboratory studies that suggest that the major functional components of the mother's behavior are its affective quality and its contingent relationship to the baby's behavior. They then show that these functional components accounted for individual differences in the behavior of 7-month-old babies living in multiproblem families. The families were characterized by high rates of factors related to childhood behavior disorder and psychopathology, including low SES, single-parent family, depressive symptoms or history of psychopathology in the mother, and child abuse or neglect (Robins, 1974; Rutter,

Yule et al., 1974). In this group, face-to-face interactions in the families' homes were observed and close correspondences between individual differences in mothers' affect and (lack of) contingent responsiveness and infants' behavior were found.

Previous Laboratory Studies of Mother-Infant Dyads

To evaluate whether babies have specific responses to the quality of their mother's affect and its relationship to their own, Cohn and Tronick (1987) used a cross-sectional design to study mother-infant face-to-face interactions at 3, 6, and 9 months of age. Mothers were asked to play with their babies as they normally would. At each age, mothers used positive affective expressions about half the time and almost never looked away from their infants. The percentage of mothers' gaze away from the baby was consistently less than one percent. Depending on the age, between 12 and 25% of the infant's expressions were positive. Babies also had high proportions of interest in objects (*object attend*), especially at 6 months.

Within mother-infant pairs, the affective behaviors of each partner were highly related for 52 of the 54 dyads. In particular, babies were almost never positive in affective expression when their mothers were not also.

When Cohn and Tronick (1987) looked at how babies became positive, they found further support for the functional importance of both the affective quality and the organization of the mother's behavior. Babies at each age were far more likely to become positive *after* their mother did so. At 3 and 6 months, the probability of the baby becoming positive following the mother was 0.33; the probability of the infant becoming positive *before* the mother was only 0.03. Not until 9 months did babies begin to initiate joint positive engagement, but even then the mother was more likely to do so. Thus, the normal pattern is for the mother's positive expressions to provide a frame within which the infant cycles between neutral and positive expression (Cohn and Tronick, 1987; Kaye and Fogel, 1980). These findings suggest that the mother's positive affective expressions are essential to the quality and organization of the infant's behavior.

This idea was tested in a more rigorous way in an earlier study by Cohn and Tronick (1983) by asking how infants would respond were their mother to act depressed. Thirty

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mothers were instructed either to simulate depression or behave normally while interacting with their babies. Infants responded dramatically to simulated depression.

Figure 1 shows the difference in the infant's behavior between the simulated depressed and a normal control-condition. The size of the circles represents the proportion of time spent in each state. The arrows represent the probability of transitions among states. The thickness of the arrows represents the size of the transition probability. For clarity, only transition probabilities greater than 0.20 are shown.

In the depressed condition, the proportion of *play* was far less than in a normal, control condition. Extreme reductions in the mother's positive affect resulted in extreme reductions in the positive affect of the baby. Indeed, if infants in the simulated depressed condition became positive it was only briefly (*brief positive*).

When mothers simulated depression, the organization as well as the distribution of the infant's behavior was affected. Not only were the infants less positive and more negative, they organized their behavior in a totally different way. They no longer cycled between *monitor* (neutral expression and gaze directed at the mother) and *play*. Instead, they cycled between negative affective states and *look away*.

To rigorously test whether the timing as well as the quality of the mother's affect influences infant's behavior, Cohn and Elmore (in press) modified Tronick et al.'s (1978) still-face

procedure. In the original study, Tronick et al. asked mothers to hold a still-face and remain unresponsive while seated *en face* with their babies. They found that babies tried to elicit their mother's normal behavior; when they failed, their affect became negative and they turned to self-directed regulatory behaviors.

Despite these dramatic effects, because the still-face is continuous one cannot assess whether changes in babies' behavior is contingent on the mothers'. To do so, Cohn and Elmore asked mothers of 3-month-old babies to become still-faced for 5 seconds contingent on their infant becoming positive. This perturbation of the usual relation between mothers' and infants' affect provided a test of how closely infants monitor changes in the mothers' behavior. If infants are sensitive to the mothers' signals, they should show less positive affect following the mothers' becoming still-faced. Specifically, they should show an increased frequency of transitions from positive to neutral expression.

Consistent with earlier research, mothers were always in a positive state when their infants became positive. But when mothers became briefly still-faced contingent on infants' positive expression, the infants became less likely to cycle between positive and neutral expression and more likely to turn away. This study demonstrated that babies have an exquisite sensitivity to the quality and reciprocity of mothers' emotional response.

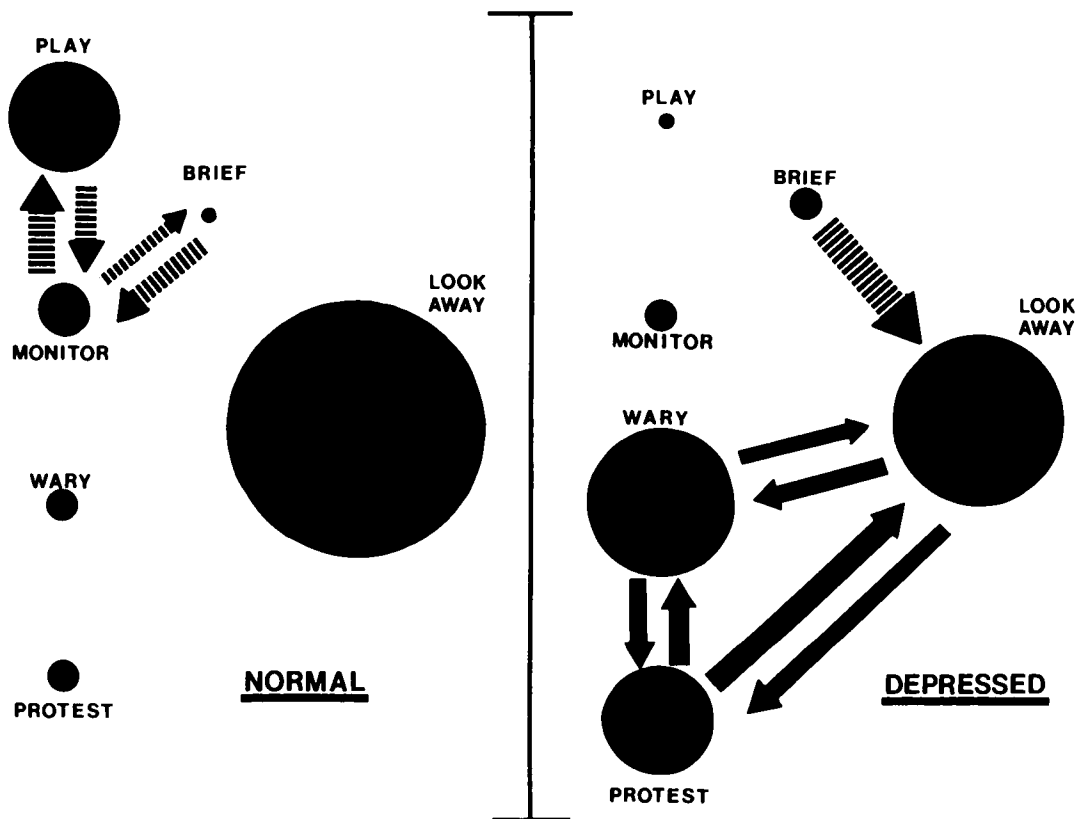


FIG. 1. State transition diagram for the normal and depressed conditions. The relative proportion of time spent in each state is indicated by the size of the circle representing that state. Arrows represent transition probabilities among states. The thickness of arrows represents the size of transition probabilities. Striped arrows indicate those transition probabilities for which conditional and unconditional probabilities significantly differ, $p < 0.05$. Only transition probabilities greater than 0.20 are shown.

Clinical Study

The studies reviewed in the preceding section all involved mother-infant pairs from working- or middle-class, well-functioning families. In those studies, distortions of maternal affect and responsiveness, such as simulated depression, were achieved through experimental instructions. The mothers did not ordinarily distort the quality of their affect or its contingent relationship to the baby's behavior. To determine whether these characteristics could account for individual differences in naturally occurring environments, we studied 13 mother-infant pairs from multiproblem families.

Method

Subjects

The mothers and infants were all participants in a large intervention project conducted in Cambridge, Massachusetts; they were referred to the project by health-service providers because of concerns about the mothers' caregiving ability. All the mothers were of low SES; only two had had more than a high school education; seven were single parents; four were under the supervision of the Department of Social Services because of documented child abuse or neglect; and three had had a prior psychiatric hospitalization. They had high rates of self-reported depressive symptoms, as assessed at intake with the Center for Epidemiologic Studies Depression-Scale (CES-D) (Radloff, 1977). The mean CES-D score was 27 (SD = 11), which was well within the range for outpatient depressed patients (Myers and Weissman, 1980). Thus, these mothers were identified as needing intervention; they had high rates of factors associated with risk of childhood behavior disorder (Robins, 1974; Rutter et al., 1974; Rutter and Garmez, 1983). For these reasons, the authors believed that these mothers would show the wide variability in interactive behavior we were seeking.

Procedure

Two staff members, at least one of whom was known to the families, videotaped the mothers and their babies at home when the babies were 6 to 7 months old. The staff explained what was wanted to the mothers, 3 minutes of face-to-face play preceded by a typical, 40-minute segment when they were free to relate to their baby as they wished (naturalistic observation).

During the face-to-face interaction, the babies sat in an infant seat placed on a table, and their mothers sat on a facing chair. The distance between mothers and babies was similar to that found in the studies reviewed before, about 1 to 2 feet. A mirror placed to the side of the baby enabled us to videotape frontal views of both partners with a single camera.

For the naturalistic interaction, mothers were asked to behave as they normally would and interact with their babies as they wished. The naturalistic interaction allowed the mothers to become comfortable with the videotaping and provided us with the opportunity to assess the generalizability of the behavior and emotions observed in the face-to-face play session.

Coding

Mother's and baby's behavior during the face-to-face interactions was coded using behavioral descriptors and a 1-second

scoring interval. Coded for the mother were *anger/poke*, *disengage*, *elicit*, and *play*. *Anger/poke* refers to facial or vocal expressions of anger or irritation or rough, intrusive handling, such as forcing the baby's face into alignment with the mother's. *Elicit* refers to attempts to elicit the baby's attention, such as repeatedly calling his name or making repetitive noises, combined with neutral affective expressions. *Play* referred to positive facial expressions with or without vocalizations.

Coded for the baby were *protest*, *avert*, *attend*, *object*, and *play*. *Protest* refers to strong negative expressions (fuss/cry or grimace); *avert* refers to neutral to slightly negative facial expressions with gaze directed away from the mother. *Object* refers to gaze directed at an object; *attend* refers to gaze directed at the mother and neutral facial expression (*attend* corresponds to Cohn and Tronick's [1983] *monitor*). *Play* was coded as for the mothers. Interobserver agreement across descriptors was assessed with Cohen's kappa, which corrects for chance levels of agreement. Kappa coefficients were 0.62 for mothers' codes and 0.66 for babies'.

Mothers' and babies' behavior during the naturalistic observation was later described with 5-point rating scales and one timed-variable. The rating scales included maternal Warmth, Sensitivity, and Flatness of Affect, and baby's Positive and Negative Affect. The timed variable was the amount of time that mothers spent in another room away from their baby. Interobserver agreement within one scaled point averaged 0.77 to 0.98 across scales for the mothers' ratings (Tinsley-Weiss coefficients, which correct for chance agreement, averaged from 0.60 to 0.98) and 0.84 to 0.99 for the babies' ratings (Tinsley-Weiss coefficients across scales averaged from 0.75 to 0.96).

Results

Face-to-Face Interactions

Taken as group, during the face-to-face interactions, the mothers' behavior was unlike that of mothers from families without multiple problems. Mothers in well-functioning families typically display positive affect about half the time and do not show expressions of angry or rough behavior. The mothers in this clinical group were withdrawn or interacted in an aggressive, intrusive way with few positive affective expressions (Table 1). Nevertheless, variation in their interactive style was pronounced ($\chi^2 = 491, p < 0.001$), requiring that the group be broken down into subgroups based on the quality of their affective expression and degree of intrusiveness (Fig. 2). At the extreme of disengagement, two mothers (M-Disengaged) showed a pattern similar to some clinical descriptions of depressed mothers (Weissman and Paykel, 1974) and what Cohn and Tronick (1983) had modeled in the simulated depression study. These mothers were disengaged more than 75% of the time. They slouched back in their chairs, often turned away, and spoke in an expressionless voice. They were responsive only to active infant distress.

At the other extreme was the largest group (M-Intrusive): six mothers with high proportions of angry or intrusive behaviors, such as rough handling, poking at their babies, and speaking in an angry tone. Two others (M-Mixed) also showed *anger/poke*, although less so, together with some *play*, and much *elicit*. A small group of three mothers (M-Positive)

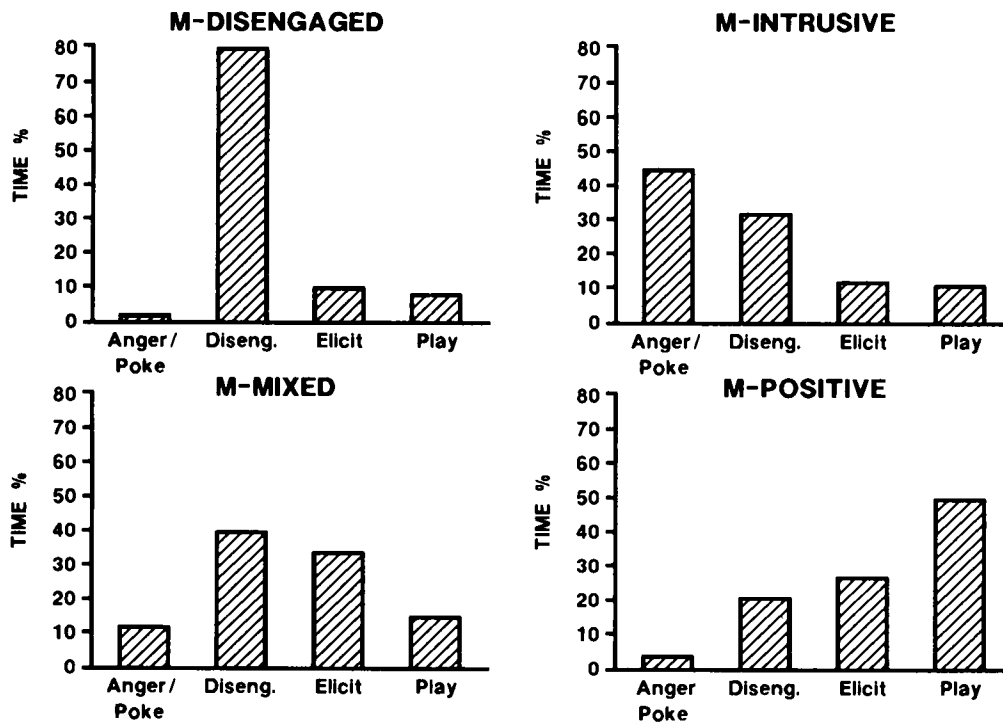


FIG. 2. Individual differences among mothers in the percentage of time spent in behavioral states during face-to-face interaction with their babies.

showed high rates of positive expression, comparable to that found in laboratory studies of normal development (Cohn and Tronick, 1987; Kaye and Fogel, 1980).

With the exception of the small M-Positive group, these patterns were unlike those in studies of mothers without risk factors (e.g., Cohn and Tronick, 1987; Kaye and Fogel, 1980). The mothers showed a wider range of variation in behavior and affect than has been previously reported, from extremes of withdrawal to negativity. The majority were not disengaged, but highly engaged, albeit intrusively.

The babies were consistent in showing little positive expression (*play*), but otherwise their behavior, too, was highly variable ($\chi^2 = 1507, p < 0.001$). Whereas the means for babies' positive expressions in prior research with low-risk

families ranged from 15 to over 25% (Cohn and Tronick, 1987; Kaye and Fogel, 1980), only one infant in this clinical study had a proportion within this range. A significant reduction was also found in the proportion of *object attend*, which suggested that they were compromised not only in the affective domain but in the domain of objects (things), as well.

When we analyzed the babies' data by grouping them into their maternal subgroups (Fig. 3), we found differences corresponding to those among the mothers. Babies of disengaged mothers had the highest proportions of *protest*, which suggests that the most distressing behavior for infants may be the pattern of maternal disengagement (see below). Infants of intrusive mothers had the highest proportions of *look away*, which was consistent with previous work indicating that increases in maternal intensity are unsuccessful in reestablishing mutual interaction when infants are looking away (Cohn and Tronick, 1987; Hirshfeld and Beebe, 1987; Kaye and Fogel, 1980). The infants in the M-Mixed group showed higher rates of *look away* but little *protest*. The infants of the more positive mothers showed the most positive expression but also a greater proportion of *look away* than found among infants of mothers from low-risk families. These findings indicate that infants' behavior is specifically related to the mothers' behavior.

In the interactions of mothers and infants from families without multiple problems, the matching of positive expressions is a highly consistent finding. Mothers and infants tend to be in positive states simultaneously (Beebe and Kronen, 1986, unpublished manuscript; Cohn and Tronick, 1987). To evaluate whether this matching occurred, the percentage of mutual positive expression in each group was computed first. The percentages were low: 0 to only 3%, which is far less than that reported in comparable studies of mothers and babies from families without multiple problems (Cohn and Tronick

TABLE 1. Means and SD for the Percentage of Mothers' and Babies' Times in Each Behavioral State

	Percentage of Time ^a	
	\bar{X}	SD
Mothers		
Anger/poke	23	24
Disengage	39	24
Elicit	18	14
Play	21	21
Babies		
Protest	7	11
Avert	57	17
Object attend	12	11
Social attend	19	14
Play	6	6

^a Because of rounding error, percentages do not sum to 100.

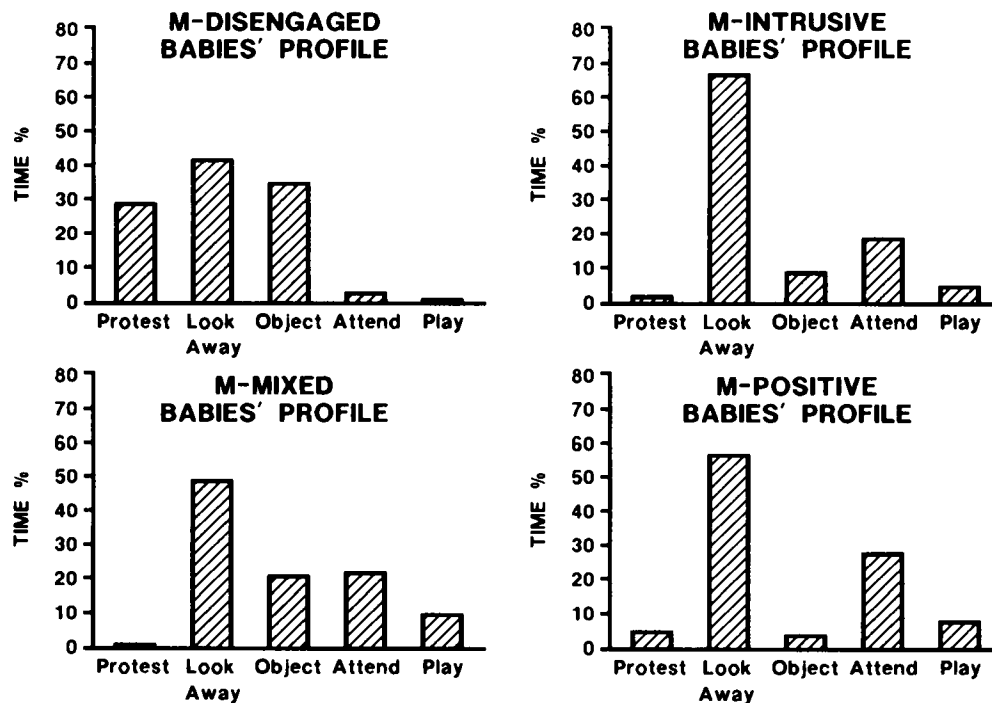


FIG. 3. Individual differences among babies in the percentage of time spent in behavioral states during face-to-face interaction with their mothers.

[1987], e.g., found mutual positive engagement occurring 12 to 25%). The low percentage of mutual positive expressions suggests that these dyads were seldom able to coordinate their behavior to achieve mutually positive engagement.

The relative absence of matching positive states was part of a more general pattern of nonresponsiveness. While watching the videotapes, we were continually struck with the lack of contingent turn-taking, or reciprocity, in these interactions. Reciprocity is a characteristic feature of normal interactions (Brazelton et al., 1974): Contingent responsiveness is found in one half to two thirds of mothers and one third or more of babies (Cohn and Tronick, 1988). To evaluate the impression of its absence in this study, time-series analysis was used (see Cohn and Tronick, 1988, for details of this methodology) to test whether or not either partner was responsive to the other. Only four mothers and two babies showed evidence of contingent responding. This low percentage was consistent with the analysis of mutual positive expression in indicating little coordination of affective expression.

To see whether these individual differences in mothers' and infants' behavior were related to variability in risk factors, the distribution of each within each of the four groups was examined. Mean CES-D scores appeared unrelated to mother-infant functioning. CES-D scores were higher in the M-Disengaged group ($\bar{X} = 40$) than in the M-Positive group ($\bar{X} = 26$), but the latter were comparable to the M-Intrusive group ($\bar{X} = 23$). Abuse or neglect was documented in all but the M-Disengaged group. Prior psychiatric hospitalization was documented in all but the M-Mixed group. Absence of the father from the home was equally likely in each group. The only factor possibly related to better outcome was mother's education. The two mothers with a college degree showed no

intrusive behavior: one was in M-Disengaged; the other was in M-Positive. With the possible exception of mothers' education, then, variability in the quality of face-to-face interaction appeared to be unrelated to any particular risk factor. Of course, since all the mothers were of low SES, we were unable to investigate its influence.

Overall, these interactions differed dramatically from what has been found in studies of families without multiple problems. Most of the mothers in this study either failed to express positive affect or else combined it with negative or intrusive behavior. Most were unable to respond contingently to their babies. Their babies showed high percentages of disengagement. When they did become positive, they did so only briefly. Even their engagement with objects was attenuated.

Naturalistic Observations

Maternal affective expression during the face-to-face interactions was consistent with that observed during the naturalistic interactions. *Anger/poke* during the face-to-face interactions was inversely correlated with Sensitivity ($r = -0.42, p < 0.10$) and with Warmth ($r = -0.56, p < 0.05$) and positively correlated with Flatness of Affect ($r = 0.54$). *Play* was positively correlated with Warmth ($r = 0.45, p < 0.10$) and inversely correlated with Flatness of Affect ($r = -0.50, p < 0.05$). The correlation with Sensitivity was positive but not significant. This continuity across situations suggests that the individual differences we found were not limited to the face-to-face interaction.

Mothers, especially those who seem most irritable and negative, may have ways of coping that buffer their babies. The naturalistic observations, as contrasted to the face-to-face

interactions, did not require that mothers interact with their infants. Thus, it presented them with the opportunity to minimize contact, which they did. Mothers who had high scores for *anger/poke* during the face-to-face interaction spent more time out of the room during the 40 minutes of naturalistic interaction.

No continuity was found between babies' behavior in the two contexts. The low proportions of positive expression in both contexts may have attenuated any associations.

Discussion

The results of this study converge with those from studies of mothers and infants from families without multiple problems to suggest the following model: Infants respond to the affective quality of their mother's behavior in a way that is specific to that affect. In particular, infants' cycles of neutral to positive affect occur primarily within the mothers' periods of positive expression. When mothers are unable to provide such periods, infants' affective expression is limited to neutral to negative displays and they become less involved with both persons and objects. In an experimental situation these effects are short-lived whereas in a clinical group the effect is chronic, carries over between situations, and has a more profound effect.

Consistent with the present authors' clinical experience, the mothers in this study were not uniformly withdrawn and sad or lacking in affective expression. The largest proportion was rough, insensitive, intrusive, and, on occasion, angry.

These individual differences among mothers had striking effects on their babies: infants of disengaged mothers were distressed and unsuccessfully sought engagement; infants of intrusive mothers looked away; whereas infants of mixed- and positive mothers had a greater breadth of behavior and affect. These individual differences were unrelated to variability in risk factors. Depressive symptoms and other risk-factors did not predict maladaptive interaction patterns in a simple one-to-one fashion. These findings make it clear that infants' affective behavior and experience are specific to the affective quality and reciprocity of mothers' behavior.

The findings of this study have important implications for both developmental psychopathology and clinical practice. Mothers with similar combinations of risk factors may behave dissimilarly with their babies. Risk factors may be predictive only weakly of interactive behavior. To adequately assess an infant's risk status, behavioral assessment of mother-infant interaction is necessary.

Mother-infant interaction assessment can provide the clinician with valuable information about how symptomatology is related to caregiving behavior and infants' response. Although treatment efforts typically focus on the individual patient, a broader focus may be warranted when the patient is a woman with an infant or young child. The present data suggest that depressive symptoms in combination with other risk factors have dramatic effects on infants. Medication or other treatment may successfully eliminate symptomatology, but it is unknown whether successful treatment also remedies the kinds of maternal behaviors studied here. Maladaptive patterns of interaction may continue even after symptoms remit. In this regard, the experimental data suggest that infants

may continue to be withdrawn and negative even after mothers resume normal behavior. Thus, clinicians should be alert to the possible need to direct intervention efforts to the mother-infant dyad, as well as the mother herself.

It is interesting to speculate on the psychological processes underlying the different patterns of infants' behavior. The infants of the withdrawn mothers were the most distressed. Their mothers may have failed to provide them with the necessary regulatory support to control the negative affect generated in response to the mothers' withdrawn behavior. The infants thus were forced to self-regulate their own negative affect. Unsuccessful, they become even more distressed. The infants of the intrusive mothers, by contrast, may have experienced less distress because they were able to regulate their experience by turning away from their mothers and disengaging.

If this perspective is accurate, one might hypothesize that infants of the withdrawn mothers are at greater risk than those of the intrusive mothers because the former never experience success at regulating either themselves or the interaction (Tronick et al., 1982). Infants of the more positive mothers are likely to experience a wider range of affect and some successful periods of self-regulation, although on an inconsistent basis, which suggests that they might be developmentally at less risk. Normal interactions have been characterized as ones in which the infant regularly experiences affective disruptions that are quickly resolved, experiences that may have positive developmental effects (Tronick and Cohn, in press).

Engagement with objects was reduced for all the infants. We propose that a common experience was the need to devote excessive resources to regulating the negative affect occasioned by their interactive experience, which resulted in fewer resources available for regulating exchanges with the inanimate environment. Thus the experience of relating to a mother whose affect and responsiveness are atypical disrupts both social and object engagement. In this regard, Sameroff et al. (1982) found cognitive deficits at 4 and 18 months.

To summarize the present findings: In families characterized by multiple risk factors, mothers disrupted the normal interaction in one of several ways, all of which forced the infants both to self-regulate their own negative affect and to try to reduce the effects of their mothers' inappropriate behavior. The infants' response was specific to the type of affective expression mothers displayed, but in each case positive affective experience was compromised. It is expected that the accumulation of such interactive experience has a structuring effect on infants such that a self-directed regulatory style comes to dominate all interpersonal exchanges. Thus, the increased rate of affective disturbance seen in at-risk infants may result from the infants' normal capacities for internal and external regulation becoming increasingly narrowly deployed in the service of self-regulation.

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