
MOTHERS' INTERACTIONS WITH TEMPERAMENTALLY FRUSTRATED INFANTS

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ABSTRACT: A sample of 162 six-month-old infants was selected from a larger sample of 346 infants on the basis of mothers' report of their infants' temperament and a laboratory assessment of temperament. Infants were classified as easily frustrated or less frustrated and observed in several types of interactions with their mothers in the laboratory. Mothers completed several measures that indicated their level of parenting stress, psychological functioning, and marital adjustment. Maternal behavior with infants was coded along the dimensions of sensitivity, intrusiveness, and physical stimulation. Results indicated that maternal intrusiveness was related to infant temperament and that maternal physical stimulation was predicted by an interaction of infant temperament and mothers' perceived parenting stress. Implications of these findings for mother–infant interaction and subsequent child adjustment are discussed.

RESUMEN: Un grupo muestra de 162 infantes de seis meses de nacidos fue seleccionado de una muestra aun mayor de 346 infantes, sobre la base de lo que las madres reportaron acerca del temperamento de sus infantes y una evaluación de laboratorio del temperamento. A los infantes se les dividió entre los que se frustraban fácilmente y los menos frustrados, y se les observó en varios tipos de interacciones con sus madres en el laboratorio. Las madres completaron varias encuestas que indicaron su nivel de tensión en cuanto al proceso de crianza, el funcionamiento psicológico, así como la adaptación marital. La conducta materna con los infantes fue codificada a lo largo de las dimensiones de susceptibilidad, entremetimiento, y estimulación física. Los resultados indicaron que el entremetimiento materno estaba relacionado con el temperamento del infante; además, que una interacción entre el temperamento del infante y la tensión acerca de la crianza, tal como era percibida por la madre, predecían el nivel de estimulación física de la madre. Se discuten las implicaciones de estos resultados en cuanto a la interacción entre madre e infante y las subsecuentes adaptaciones del niño.

RÉSUMÉ: Un échantillon de 162 bébés de six mois fut sélectionné à partir d'un échantillon plus grand de 346 bébés, sur la base des rapports fait par les mères du tempérament de leur bébé et d'une évaluation laboratoire du tempérament. Les bébés ont été classifiés comme étant facilement frustrés ou moins frustrés et observés dans plusieurs types d'interactions avec leurs mères dans le laboratoire. Les mères complétèrent plusieurs mesures qui indiquèrent leur niveau de stress de parentage, le fonctionnement psychol-

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ogique et l'ajustement marital. Le comportement maternel avec les bébés fut codé selon les dimensions de sensibilité, d'intrusion et de stimulation physique. Les résultats indiquèrent que l'intrusion maternelle était liée au tempérament du bébé et que la stimulation physique maternelle était prédite par une interaction du tempérament du bébé et du stress perçu de parentage des mères. Des implications de ces résultats pour l'interaction mère-bébé et l'ajustement de l'enfant subséquent sont discutées.

ZUSAMMENFASSUNG: Eine Untersuchungsgruppe bestehend aus 162 sechsmonatigen Säuglingen wurde aus einer größeren Gruppe von 346 Kleinkindern auf Grund der mütterlichen Einschätzungen und einer Laboruntersuchung des Temperaments des Kleinkinds ausgewählt. Die Kleinkinder wurden in eine frustrierte, oder weniger frustrierte Gruppe klassifiziert und bei verschiedenen Arten der Interaktion mit ihren Müttern im Labor beobachtet. Die Mütter füllten einige Bögen aus, die das Ausmaß des elterlichen Stress, der psychologischen Fähigkeiten und der Anpassung an das Elternsein maßen. Das mütterliche Verhalten mit ihren Kleinkindern wurde nach den Dimensionen der Einfühlsamkeit, der Einmischung und der körperlichen Stimulation kodiert. Die Ergebnisse weisen darauf hin, dass die mütterliche Einmischung in einer Korrelation zum Temperament des Kindes stand, und dass die körperliche Stimulierung vorausagbar war durch das Zusammenspiel zwischen dem Temperament des Kindes und der mütterlichen Wahrnehmung ihres elterlichen Stress. Die Bedeutung dieser Ergebnisse für die Mutter-Kind Interaktion und die darauf folgende Anpassung des Kindes werden diskutiert.

抄録：母親が報告する乳児の気質と、気質についての研究室での評価に基づいて、346人の乳児という大きなサンプルの中から、162人の6カ月児というサンプルが選ばれた。乳児は、欲求不満になりやすい、あるいは欲求不満になりにくいと分類され、研究室で数種類の母親との相互作用を観察された。母親は、養育ストレスの水準、心理的な機能、および結婚生活への適応を示す、いくつかの質問紙に記入した。乳児といえる時の母親の行動は、感受性、侵入性、および身体的な刺激の次元に沿って、コード化された。結果から、母親の侵入性は、乳児の気質と関係すること、そして母親の身体的な刺激は、乳児の気質と母親が知覚している養育ストレスとの相互作用から予測されることが、示された。これらの所見が、乳児と母親の相互作用とその後の子どもの適応に対して持つ意味について、議論される。

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Despite many years of research on the topic of early parent-child relationships and the implications for child adjustment, questions remain about the predictors and consequences of these early interactions. One broad question often asked about early relationships concerns the relative contribution of parent factors and child factors to these relationships. This question often is addressed empirically by looking at the relations between parenting behavior and attachment security and by examining relations between infant temperament and attachment security. Although parent-child relationships are usually operationalized in terms of the security of attachment (Ainsworth, Blehar, Waters, & Wall, 1978), interactions between parents and infants, and the discrete behaviors that make up such interactions, are clearly important as well (Seifer & Schiller, 1995; Thompson, 1998). Although parenting factors often are conceptualized as parenting behaviors, other characteristics of the parent such as personality or psychological adjustment also may influence the parent-child relationship (Belsky, 1984). Thus, specific questions remain to be addressed concerning the factors that may predict the nature and quality of parent-child relationships early in development, and whether these factors may influence broader relationship dimensions such as attachment security and behavioral adjustment later in development. The purpose of the present study was to examine associations

between a specific infant temperament characteristic (frustration) and maternal behavior. In addition, interactions between maternal functioning and infant temperament were examined as potential predictors of parenting quality.

In studies of maternal interaction during infancy, much attention has been focused on the role of maternal sensitivity versus intrusiveness during early infancy. Several studies indicate that sensitivity to an infant's signals contributes to mutual regulation, which in turn assists the child in gaining mastery over his own behavior (Gianino & Tronick, 1988; Shaw, Keenan, & Vondra, 1994). Alternatively, intrusive parenting during the first few months of life may disrupt the process of mutual regulation and interfere with the development of self-regulatory skills. For example, Egeland, Pianta, and O'Brien (1993) found that intrusive caregiving in infancy was related to behavior problems in preschool and, in a follow-up assessment, observed the same relation with behavior problems in early elementary school. The assumption of this and other attachment research is that a child who is exposed to sensitive and responsive caregiving early in life develops a sense of the caregiver as available in times of stress. Thus, children who have established secure attachment relationships with their caregivers develop ways of understanding and organizing their emotional responses and experiences that enable them to cope effectively (Bretherton, 1985; Cassidy, 1994; Egeland et al., 1993; Lewis, Feiring, McGuffog, & Jaskir, 1984).

Another relevant dimension of maternal behavior in infancy is physical contact and stimulation. Because few studies have examined physical contact separately from measures of sensitivity or intrusiveness, its relation to the quality of mother–infant interaction and child functioning is less clear. However, van den Boom and Hoeksma (1994) found that mothers of highly irritable infants provided less physical contact and provided lower levels of “effective stimulation,” which included effective physical stimulation, than did mothers of less irritable infants. In addition, an intervention study involving low-income women and their infants experimentally manipulated physical contact by providing the experimental group with soft baby carriers and the control group with infant seats (Anisfeld, Casper, Nozyce, & Cunningham, 1990). Mothers in the intervention group initiated more vocalizations and showed more contingent responses to their infants' vocalizations at 3½ months relative to mothers in the control group. Infants in the experimental group were more likely to be securely attached at 13 months than infants in the control group, even after controlling for differences in maternal responsiveness in the two groups.

There is a substantial theoretical and empirical literature supporting the notion that sensitive caregiving and subsequent attachment security play an important role in childhood social and emotional adjustment. However, the questions of whether characteristics of the infant influence the nature of these early interactions, the likelihood that an infant will receive sensitive caregiving, and the development of a secure attachment relationship have been debated vigorously for the last several years (for a review, see Thompson, 1998). Characteristics of the infant that are most often explored are temperamental dimensions such as proneness-to-distress (Calkins & Fox, 1992; Mangelsdorf, Gunnar, Kestenbaum, Lang, & Andreas, 1990; Seifer, Schiller, Sameroff, Resnick, & Riordan, 1996). Because temperament is viewed as a relatively stable, biologically based individual difference in the infant's behavioral style or emotional tendencies (Goldsmith et al., 1987), the assumption is that any relation between child temperament and parenting behavior or attachment relationship is caused, at least in part, by these early appearing child behaviors (Mangelsdorf et al., 1990; Seifer et al., 1996). Presumably, infant temperament that is characterized by frequent or intense bids for maternal intervention might lead to decreased maternal sensitivity and, consequently, less secure attachment over time (Calkins & Fox, 1992; Mangelsdorf et al., 1990).

Crockenberg's (1986) review of the work examining relations between infant temperament

and maternal behavior found no consensus, though, on whether difficult temperament was related to less sensitive maternal responding. Indeed, some studies indicated the opposite relation. Crockenberg concluded that this inconsistency could be attributed to, among other things, the distribution of the temperament trait in a given sample and suggested that decreased sensitivity might be reliably observed in a sample with more extreme temperaments. Or, she argued, the negative relation might be observable only when other circumstances, such as low social support or stress, are present (e.g., Crockenberg, 1981). Studies conducted since Crockenberg's review continue to vary on a number of dimensions including demographic characteristics, whether the sample is selected on the basis of extreme temperament, and whether potential moderators such as social support, stress, marital satisfaction, or maternal depression are assessed. This research also indicated inconsistent relations between maternal behavior and infant temperament (Mangelsdorf et al., 1990; Owens, Shaw, & Vondra, 1998; Pauli-Pott, Mertesacker, Bade, Bauer, & Beckmann, 2000; Seifer et al., 1996; van den Boom, 1994; van den Boom & Hoeksma, 1994). Thompson (1998) noted that more research is needed to understand the complex transactional relations that likely exist between infant and parent characteristics.

In addition to infant characteristics, maternal adjustment and functioning also have been associated with individual differences in maternal behavior. Psychosocial factors that interfere with parents' awareness of or willingness to respond to infant signals are likely to be related to less sensitive behavior (Belsky, 1984; Donovan, Leavitt, & Walsh, 1998; Fish, Stifter, & Belsky, 1993). For example, higher levels of stress may make it more difficult to engage in effective parenting behaviors (Campbell, Pierce, March, & Ewing, 1991; Pianta & Egeland, 1990; Pianta, Sroufe, & Egeland, 1989).

Another cluster of parent factors that has been associated with early emerging family-interaction difficulties is the psychological functioning of parents (Alpern & Lyons-Ruth, 1993; Cummings, 1995; Donovan et al., 1998; Seifer et al., 1996). The link between parent psychopathology and child adjustment is believed to be mediated through either the attachment relationship or parenting behavior (Cummings & Davies, 1994; Downey & Coyne, 1990). For example, Alpern and Lyons-Ruth (1993) specifically looked at the timing of depression and found that chronic depression, across the infant and preschool period in particular, affected the likelihood that the child would develop aggressive behavior problems. These researchers point to the interpersonal component of depression and suggest that negative parent mood increases the child's level of negativity, an affective response that feeds a cycle of parent-child hostility. A related factor that may influence both the mother's psychological state and her capacity to interact sensitively with her infant is the kind of marital relationship she is experiencing. Relationships characterized by a lack of affection and cohesion can create stress or hostility that may diminish sensitivity to the infant's signals (Fish et al., 1993).

This overview of factors that might affect maternal behavior leads to several conclusions. First, the emphasis in the infancy work has focused largely on predicting attachment, even though attachment theory explicitly states that sensitive caregiving leads to secure attachment and thus could plausibly be a mediator of a variety of factors, including infant temperament, which might affect attachment security. Second, relatively few studies have examined the relation between infant temperament and maternal behavior in the months prior to the formation of the attachment bond. Third, in studies that do examine infant temperament, there is a lack of specificity concerning which temperament dimensions might affect maternal behavior and why. Fourth, limited data exist that examine both parent factors and infant temperament together as predictors of maternal behavior.

Of particular interest in the present investigation was the role of a temperament dimension that might be especially challenging for caregivers—infant frustration. Frustration has been

observed in early infancy (Calkins & Fox, 1992; Stifter & Fox, 1990), and by 6 months of age, anger displays are consistently observed. Infants who are easily frustrated likely display frequent bouts of negativity and bids for parental intervention, making it more challenging for caregivers to respond sensitively. In addition, they also may be constrained in the development of appropriate regulatory behaviors that could serve to alleviate their distress (Calkins, 1994; Calkins & Fox, 1992; Calkins & Johnson, 1998), potentially leading to later difficulties with impulsivity, aggression, and other types of externalizing behavior problems. Calkins reported that among a sample of toddlers, mothers of easily frustrated children tended to do things for their children rather than allow the children to become frustrated (Calkins & Johnson, 1998). It is possible that intrusive caregiving in infancy precedes this kind of “preemptive interference” in toddlerhood.

Other studies have examined the dimension of frustration via maternal report of “distress to limitations” (Mangelsdorf et al., 1990; Seifer et al., 1996). In this study, we used both maternal report and a laboratory assessment to identify infants who were easily frustrated across contexts. In addition, we identified these infants from a larger community sample to generate a group of infants who were clearly different from other, less easily frustrated infants. Our assumption was that associations between maternal behavior and infant frustration would be more likely in such a sample (Crockerberg, 1986; van den Boom, 1994; van den Boom & Hoeksma, 1994). Finally, we collected maternal reports of parenting stress, marital adjustment, and psychopathology.

Our primary question concerned whether infant temperament was related to different types of maternal behavior. More specifically, we hypothesized that mothers of easily frustrated infants would show less sensitivity, more intrusiveness, and lower levels of physical stimulation relative to mothers of less frustrated infants. In addition, we addressed the role of maternal report of adjustment as a factor that might affect maternal behavior. Based on past research, we expected that mothers who reported higher levels of parenting stress, more psychiatric symptoms, and/or lower levels of marital satisfaction would show lower sensitivity, more intrusiveness, and less physical stimulation than mothers who reported fewer difficulties. In addition, we hypothesized that less optimal maternal functioning would exacerbate the effects of dealing with a challenging infant temperament. Thus, we expected that mothers of easily frustrated infants who reported more stress, lower marital satisfaction, or more psychiatric symptoms would be less sensitive, more intrusive, and provide less physical stimulation to their infants than mothers of easily frustrated infants who reported fewer difficulties in these domains.

METHOD

Participants

A total of 346 six-month-old infants and their mothers were participants in the larger study. Parents of this larger recruitment sample were contacted through local child-care centers, pediatricians’ offices, direct-mail marketing lists, and county health and human services facilities. After parents indicated that they were interested in participating in the study, they were contacted by telephone to schedule a laboratory assessment. At that time, they were mailed a temperament questionnaire [Infant Behavior Questionnaire (IBQ); Rothbart, 1981] and asked to complete the questionnaire and bring it with them to the laboratory assessment. During the laboratory assessment, the infants were assessed for frustrated temperament using a standard battery. On the basis of parents’ ratings on the IBQ and the laboratory assessment, 162 healthy,

full-term infants (79 males) and their mothers were selected for the follow-up study (Calkins, Dedmon, Gill, & Johnson, 2002). For the selected sample, average maternal age at the time of the 6-month visit was 29.22 years ($SD = 6.17$). Families' mean socioeconomic status, as measured by the Hollingshead (1975) index, was 35.69 ($SD = 11.37$), and average maternal education was 14.22 years ($SD = 2.20$). The majority of mothers were married rather than single (79.6 vs. 20.4%), and most participating families were European American (79.6%).

The 162 infants were selected based on both maternal report of distress to limitations and their behavior in a two-episode procedure (barrier task and arm restraint) designed to elicit frustration distress (LAB-TAB; Goldsmith & Rothbart, 1993). Although a third task (maternal prohibition) also was included in the assessment, a number of infants fretted prior to this task ($n = 30$); therefore, this task was not used to select infants. Following from Rothbart and Derryberry (1981) and Stifter and Fox (1990), measures of frustration distress were operationalized as the latency to fuss (in seconds), the intensity of distress (scored every 10 s on a scale of 0–5, with 0 indicating no distress and 5 indicating a full-blown scream or cry), and the duration of fussing in seconds. Latency to fuss was subtracted from the total time of the task (120 s) so that higher scores indicated shorter latencies. A summary score of these distress measures across the two frustration tasks was created by standardizing and summing the measures for the entire sample (Cronbach's $\alpha = .83$, $M = -.02$, range = $-9.02-11.00$). High scores on the frustration distress index indicated that the child was very reactive to the frustrating tasks (short latency to cry or fuss, high-intensity fussing, long-duration fussing). For the entire sample ($N = 346$), the correlation between the laboratory index of frustration and maternal report of distress to limits was modest, though significant, $r = .13$, $p = .01$.

To generate groups of infants who could be characterized as easily frustrated versus less frustrated, children scoring at or above the 50th percentile on both the laboratory index of frustration and maternal report of distress to limits were selected for membership in the easily frustrated group while children scoring below the 50th percentile on both the laboratory index and maternal report of distress to limits were selected for the less frustrated group. Of the larger sample, 77 infants met the criteria for the less frustrated group, and 85 met the criteria for the easily frustrated group. The remaining infants were not included in the final (selected) sample that is the focus of this report. For the selected sample, the correlation between the laboratory index of frustration and maternal report of distress to limits was $r = .58$, $p < .001$. Analyses revealed that there was no relation between frustration group and sex of child (47 of 85 infants in the easily frustrated group were females compared with 36 of 77 infants in the less frustrated group), marital status, or child birth order. There was a relation between frustration group status and race, $\chi^2(1, n = 162) = 6.23$, $p = .01$. More children of African American mothers ($n = 33$ of 85, 38.8%) were included in the easily frustrated group than in the less frustrated group ($n = 16$ of 77, 20.8%). There also was a marginal difference between the less frustrated and easily frustrated groups in terms of SES, $t(160) = 1.93$, $p = .06$. Easily frustrated children had family Hollingshead SES scores that were lower ($M = 34.0$) than did families of children in the less frustrated group ($M = 37.5$). Socioeconomic status and race were not significantly correlated, $r(162) = -.12$, *n.s.*

Interestingly, separate analyses of the two factors (race and SES) with the laboratory observation data and maternal ratings of frustration indicated that African American mothers tended to rate their infants as more frustrated ($M = 3.53$) than did mothers of European American infants ($M = 3.08$), $t(153) = -3.20$, $p < .01$. However, mean levels of infant frustration during the laboratory assessment did not differ significantly for African American ($M = 2.52$) and European American infants ($M = 1.93$), $t(160) = -.74$, *n.s.* Thus, African American infants were overrepresented in the easily frustrated group mainly because of maternal ratings of temperament. However, because the frustration groups included only those infants with

congruent scores on both the laboratory assessment and maternal report of frustration, the correlations between the laboratory assessment of frustration and maternal report of frustration were high and not significantly different for European American infants, $r(111) = .60, p < .001$, and African American infants, $r(44) = .57, p < .001$ (Fisher's r to z n.s., $p = .80$). Because there were no a priori hypotheses regarding either SES or race, these factors were treated as covariates in all analyses.

Procedures

Mother–infant interaction. Although participants were assessed in a number of procedures, the focus of this investigation was on the maternal interaction tasks. These tasks were interspersed with tasks assessing attention, empathy, and the frustration tasks that were used to classify infants as easily frustrated and less frustrated. Mother–infant interaction was observed for a total of 12 to 14 min. The entire procedure was videotaped through a one-way mirror and typically lasted 45 min. Infants were assessed in each procedure only if they were calm and displaying no distress. It was not uncommon for breaks to be taken for feeding or diaper changing. To begin the assessment, infants were changed into a gender-neutral sleeper to minimize possible coding bias and then placed in a high chair that reclined at an angle to provide support for infants not capable of sitting upright. The five mother–infant interaction tasks of interest were conducted as follows:

- *Peek-a-boo:* While the infant was seated in the reclining high chair, the mother was instructed to play peek-a-boo with her child as she might at home. The mother was provided specific instructions about how to play only if she indicated that she did not know how. In such a case, she was given a demonstration by a research assistant. This task lasted 2 min.
- *Puppet play:* While the infant was seated in the reclining high chair, the mother was given a large Big Bird puppet and asked to play with the puppet with her child as she might at home. This task lasted 2 min.
- *Soothing:* Following the frustration task of Arm Restraint, the mother was asked to remove her infant from the infant seat and comfort him or her. This task lasted 1 min. However, if the infant did not soothe, the assessment would stop, and the mother would be given an opportunity to feed or comfort her infant until calm.
- *Free play:* Mothers and infants were placed on a quilt on the floor (with the infant seated in a supportive “boppy” cushion) with a set of blocks to play with. The mother was instructed to play with her infant as she might at home. This task lasted 3 min.
- *Caregiving:* As the last task, mothers were asked to move the infant to a changing table and were instructed to remove the neutral sleeper, change the infant’s diaper, wash hands and face, and change the child into his or her own clothes. This task varied in length from approximately 4 to 6 min.

Maternal self-report of parenting stress, psychological functioning, and marital adjustment. Following completion of the laboratory assessment, mothers were asked to take home, complete, and return a packet of the following questionnaires:

Symptom Checklist 90-Revised (SCL-90-R; Derogatis, 1986). The SCL-90-R contains 90 items reflective of commonly encountered adult psychopathology symptoms. Respondents rate each item in terms of how much distress it caused them over the past week, using a 0 (*Not at*

all) to 4 (*Extremely*) scale. The 90 items are then combined to yield a global index of total symptoms as well as nine subscale scores reflective of more specific types of psychopathology (e.g., anxiety). Reliabilities for the scale scores across larger samples of adults are adequate to excellent (Derogatis, 1986; Derogatis & Cleary, 1977). Of interest in the current study was the Total Symptom score, which was generated by the instrument's computer-scoring program.

Parenting Stress Index-Short Form (PSI; Abidin, 1990). The PSI contains 36 items that assess various sources of stress and are rated on a 5-point scale. These ratings are then combined to generate four stress indices using the instrument's computer-scoring program: Total Stress, Difficult Child Stress, Parent Domain Stress, and Parent-Child Relationship Stress. These subscales are moderately to highly intercorrelated ($r_s = .42-.82$). We chose to use the Difficult Child Stress subscale because of its conceptual relevance to infant temperamental frustration. The PSI has shown high reliability and adequate validity (Abidin, 1997).

Dyadic Adjustment Scale (DAS; Spanier, 1976). This measure is designed to assess the quality of the relationship between partners. All mothers who were married or currently in a relationship completed the questionnaire. It consists of 32 items from which four subscale scores assessing various aspects of the relationship can be generated: Dyadic Satisfaction, Dyadic Cohesion, Dyadic Consensus, and Affection Expression. These subscales are all significantly intercorrelated ($r_s = .21-.67$), and a total marital adjustment score was created by summing the four subscales. The DAS has demonstrated high reliability and adequate criterion and construct validity (Spanier, 1976).

A total of 121 mothers completed the entire questionnaire packet. Comparisons across all study measures of mothers who completed the questionnaires versus those who had incomplete or missing data indicated only one significant difference between the two groups. African American mothers were less likely to complete the questionnaires than European American mothers ($p < .05$). Descriptive statistics for the maternal-functioning measures are provided in Table 1.

Measures

Maternal behavior. Maternal and infant behavior was coded across the five tasks using a paper-and-pencil coding system adapted from Fish et al. (1993) and Diener, Mangelsdorf,

TABLE 1. Descriptive Statistics for Psychological Adjustment, Parenting Stress, and Marital Adjustment for Mothers of Easily Frustrated and Less Frustrated Infants

	<i>Easily Frustrated</i>			<i>Less Frustrated</i>		
	<i>N</i>	<i>M</i>	<i>SD</i>	<i>N</i>	<i>M</i>	<i>SD</i>
<i>Maternal Functioning</i>						
Psychological Adjustment						
SCL-90 Total Symptoms Score	71	51.82	11.07	67	53.25	8.78
Parenting Stress						
PSI Difficult Child Stress Subscale*	73	24.30	7.25	66	18.83	5.08
Marital Adjustment						
DAS Total Score	67	106.56	20.25	65	109.54	18.23

* $p < .001$.

McHale, and Frosch (2002). Maternal behavior was coded every 30 s along three dimensions using a scale of 1 (*low*) to 5 (*high*) for each dimension. Each dimension was coded separately across the entire task period. Three coders trained together on 10% of the selected sample to establish agreement on use of the coding system. Coders then separately scored at least an additional 10% of the selected sample to achieve reliability, operationalized as agreement within 1 scale point and calculated using the kappa statistic. Coders were reliable at .80 or above for each scale.

Sensitivity ($\kappa = .86$) was coded with respect to the extent to which the parent's interactions were tuned to the baby's behavior and included such behaviors as well-timed and synchronous responses, acknowledgment of infant's affect, appropriate levels of stimulation, soothing, and picking up on the infant's interests. Higher scores indicated greater sensitivity. *Intrusiveness* ($\kappa = .85$) referred to the extent to which the parent displayed overcontrolling behavior or was focused on her own agenda and ignored the baby's cues. Intrusiveness included behaviors such as failing to modulate the pace or intensity of her behavior when the infant withdrew or turned away, appearing to force toys or self on infant, and intrusive physical interactions. Higher scores indicated greater intrusiveness. *Physical Stimulation* ($\kappa = .82$) referred to the extent to which the mother used physical contact such as holding, touching, and hugging/kissing as well as the extent of stimulating behaviors such as stroking, tickling, or playing with the infant's limbs in an effort to increase the infant's interest and arousal in the interaction. Higher scores indicated more physical stimulation. Descriptive statistics for maternal behavior are presented in Table 2.

To reduce the data, cross-episode correlations were examined. These correlations were in the modest to high range for all measures except physical stimulation. Individual measures across episodes were standardized and summed to create overall measures of sensitivity ($\alpha =$

TABLE 2. Descriptive Statistics for Maternal Behavior Across Five Mother–Infant Tasks for Easily Frustrated ($n = 85$) and Less Frustrated ($n = 77$) Infants

Maternal Behavior	Easily Frustrated		Less Frustrated		Total	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>Min</i>	<i>Max</i>
Sensitivity						
Peek-a-boo	3.69	.67	3.88	.56	1.50	5.00
Puppet Play	3.66	.60	3.91	.61	2.00	5.00
Soothing	4.02	.79	4.09	.73	1.50	5.00
Free Play	3.71	.66	3.67	.68	2.00	5.00
Caregiving	3.70	.85	4.03	.72	1.33	5.00
Intrusiveness						
Peek-a-boo	1.61	.79	1.46	.70	1.00	5.00
Puppet Play	1.68	.69	1.53	.64	1.00	4.33
Soothing	1.29	.49	1.24	.40	1.00	3.50
Free Play	1.59	.60	1.58	.65	1.00	3.50
Caregiving	1.52	.81	1.21	.34	1.00	4.67
Physical Stimulation						
Peek-a-boo	1.96	.98	2.14	1.04	1.00	5.00
Puppet Play	2.30	.78	2.38	.87	1.00	4.50
Soothing	2.04	1.04	2.56	1.31	1.00	5.00
Free Play	1.13	.21	1.25	.40	1.00	3.00
Caregiving	1.26	.39	1.37	.49	1.00	3.17

TABLE 3. Descriptive Statistics for Infant Behavior Across Five Mother–Infant Tasks for Easily Frustrated ($n = 85$) and Less Frustrated ($n = 77$) Infants

Infant Behavior	Easily Frustrated		Less Frustrated		Total	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>Min</i>	<i>Max</i>
Infant Engagement						
Peek-a-boo	3.74	.75	3.83	.69	1.00	5.00
Puppet Play	4.00	.70	3.98	.70	1.67	5.00
Soothing	2.65	.93	2.70	1.04	1.00	5.00
Free Play	3.26	.71	3.09	.59	1.25	5.00
Caregiving	2.61	.88	2.98	.84	1.00	4.33
Infant Affect						
Peek-a-boo	3.31	.96	3.81	.71	1.00	5.00
Puppet Play	3.11	.69	3.45	.60	1.00	5.00
Soothing	2.70	.79	3.22	.56	1.00	4.50
Free Play	2.80	.46	2.90	.44	1.00	4.17
Caregiving	2.44	.72	3.01	.55	1.00	4.25

.72), intrusiveness ($\alpha = .57$), and physical stimulation ($\alpha = .49$). Each summary score was then standardized, and had a mean equal to .00 and a standard deviation equal to 1.00. The internal consistencies for intrusiveness and physical stimulation were relatively low across the five tasks, probably because the different tasks afford somewhat different opportunities for intrusiveness or physical stimulation. We examined alpha reliabilities for different combinations of the tasks. However, aggregating across the five tasks provided the best internal consistency estimates.

Infant behavior. For each of the five tasks, infant behavior was scored along two dimensions using 5-point scales. First, infant *affect* ($\kappa = .86$) referred to the infant's level of positive affect (4–5) versus negative affect (1–2) and was coded with reference to the infant's facial expressions. The infant's *engagement* ($\kappa = .83$) referred to the extent to which the infant was responsive, eager, and willing to engage with the mother (4–5) versus the degree to which the infant was unresponsive and disengaged (1–2). Descriptive statistics are provided in Table 3.

Cross-episode correlations for both measures were moderate to high, and summary variables were created by standardizing and summing the individual measures. The summary variables had alpha reliabilities of .69 for infant affect and .53 for infant engagement. Each summary score was then standardized, and had a mean equal to .00 and a standard deviation equal to 1.00. As with maternal intrusiveness and physical stimulation, the relatively low internal consistency of infant engagement is probably due to different task constraints. For example, the peek-a-boo and puppet play tasks, during which the mother is actively attempting to engage the infant (and the infant is restrained in an infant seat), elicited higher levels of engagement than the other tasks.

RESULTS

Preliminary analyses were conducted to determine whether sex of infant should be included as a variable in subsequent analyses. Several repeated measures MANOVAs with sex of child as the grouping variable and (a) the three maternal-behavior measures, (b) the two infant-behavior measures, and (c) the SCL-90-R Total Symptoms score, the PSI Difficult Child Stress subscale,

and the DAS Total Score revealed no interactions of child sex and scale. There was a main effect of child sex on maternal behavior, $F(1, 158) = 4.92, p < .05$. Follow-up univariate ANOVAs that controlled for SES and race indicated a significant effect of child sex on maternal physical stimulation, $F(1, 158) = 5.97, p < .05$, with mothers of boys showing higher levels of physical stimulation ($M = .20$) than mothers of girls ($M = -.19$). Therefore, child sex was included as a covariate in all analyses that included maternal physical stimulation. Because the frustration groups differed in terms of maternal race and SES, both variables were included as covariates in all analyses.

An additional preliminary analysis examined whether infants were more likely to show greater distress as the laboratory session progressed and they were exposed to multiple frustration tasks (barrier, arm restraint, maternal prohibition). Because the frustration tasks were interspersed with the mother–infant interaction tasks, we wanted to examine whether there were carryover effects from the frustration tasks that might influence infant behavior during the mother–infant interaction tasks, particularly if infants were likely to become increasingly distressed over the course of the visit. A repeated measures MANOVA on the frustration distress scores from the barrier, arm-restraint, and maternal-prohibition tasks by task and frustration group with maternal race and SES covaried indicated a significant interaction between frustration group and task, $F(1, 150) = 6.28, p < .01$. Follow-up t tests indicated that for both the less frustrated and easily frustrated groups, distress was greatest during the arm-restraint task ($p < .001$ for both contrasts), and distress during the barrier and maternal-prohibition tasks was not significantly different for either group. Thus, neither group of infants became more frustrated over time (Calkins et al., 2002).

A final set of preliminary analyses examined associations among and between the maternal behavior and the maternal-functioning measures (see Table 4). Because mean substitution was used to replace missing maternal-functioning data in the predictive analyses reported later, the corrected data for the maternal-functioning measures also were used in the correlations reported in Table 4.

With respect to the maternal-behavior measures, maternal sensitivity was negatively correlated with maternal intrusiveness and positively correlated with physical stimulation. With respect to the maternal-functioning measures, psychological adjustment was negatively correlated with marital adjustment and positively correlated with parenting stress. Finally, across the maternal-behavior and maternal-functioning measures, parenting stress was negatively correlated with maternal sensitivity and positively correlated with maternal intrusiveness.

The following two sections address relations between infant frustration and infant behavior during mother–infant interaction and relations between infant frustration and maternal report

TABLE 4. *Intercorrelations of Maternal Behavior and Maternal Functioning Measures*

	<i>Sensitivity</i>	<i>Intrusiveness</i>	<i>Physical Stimulation</i>	<i>SCL-90 Total Symptoms</i>	<i>DAS Total Score</i>	<i>PSI Difficult Child Subscale</i>
Sensitivity		-.73**	.17*	-.01	-.03	-.23**
Intrusiveness			-.05	.02	.05	.17*
Physical Stimulation				.08	-.14	-.08
SCL-90 Total Symptoms					-.39**	.16*
DAS Total Score						-.05

* $p \leq .05$. ** $p \leq .01$.

of marital satisfaction, psychological adjustment, and parenting stress. Although these analyses do not address the central hypotheses of the study, they provide important descriptive information.

Frustration Group Differences in Infant Behavior During Mother–Child Interactions

To examine whether there were differences between easily frustrated and less frustrated infants in terms of their behavior during interactions with mothers, a repeated measures MANOVA was conducted on the affect and engagement measures from the mother–infant interaction tasks controlling for maternal race and SES. This analysis indicated a significant main effect of frustration group, $F(1, 158) = 9.04, p < .01$, as well as a significant Frustration Group \times Type of Infant Behavior interaction, $F(1, 158) = 28.20, p < .001$. Follow-up ANOVAs that also controlled for maternal race and SES revealed that less frustrated infants displayed significantly greater positive affect ($M = .44$) than did easily frustrated infants ($M = -.40$), $F(1, 158) = 29.14, p < .001$. There were no differences between the two groups in engagement during the tasks.

Frustration Group Differences in Maternal Report of Stress and Psychological and Marital Functioning

To explore the question of whether mothers of easily frustrated infants would report more symptoms of adjustment difficulties, a repeated measures MANOVA was conducted on the measures of marital adjustment, psychological functioning, and parenting stress (i.e., the DAS Total Score, the SCL-90 Total Symptoms score, and the PSI Difficult Child Stress subscale), controlling for maternal race and SES. To maximize statistical power, mean substitution was used to replace missing questionnaire data. The multivariate test indicated a significant Maternal Functioning \times Frustration Group interaction, $F(2, 157) = 9.62, p < .001$. Follow-up ANOVAs with race and SES covaried indicated that mothers of easily frustrated infants reported significantly greater parenting stress than did mothers of less frustrated infants, $F(1, 158) = 22.41, p < .001$ (see Table 1). Mothers of less frustrated and easily frustrated infants did not differ significantly in their report of marital or psychological adjustment.

Predictive Analyses

The predictive analyses examined the role of both infant temperament and maternal functioning as predictors of maternal behavior. The previous set of analyses established differences in intrusiveness and physical stimulation between the mothers of less frustrated and easily frustrated infants. The following set of analyses was designed to extend these findings by testing main effects of maternal functioning on maternal behavior as well as testing possible interactions between maternal functioning and infant temperament. Three hierarchical regressions were conducted to predict maternal sensitivity, intrusiveness, and physical stimulation. Maternal race and SES were entered on the first step of each regression as control variables. In the equation predicting maternal physical stimulation, child sex also was entered on Step 1. Frustration group was entered on Step 2. The three maternal-functioning measures were entered simultaneously on Step 3 using mean substitution for missing data. Finally, interactions between frustration group and each maternal-functioning measure were entered simultaneously on the fourth and final step of the model. Table 5 presents the results from the analyses predicting maternal sensitivity, intrusiveness, and physical stimulation.

TABLE 5. Hierarchical Regression Analyses Predicting Maternal Behavior (Sensitivity, Intrusiveness, and Physical Stimulation) from Infant Temperament, Maternal Functioning, and Their Interaction

	<i>b</i>	<i>R</i> ²	ΔR^2	Significant <i>F</i> Change
Sensitivity				
1. Race	-.34	.05	.05	.02
SES	.01			
2. Frustration Group	-.24	.06	.01	n.s.
3. Marital Satisfaction	-.01	.10	.04	n.s.
Psychological Adjustment	.00			
Parenting Stress	-.03			
4. Frustration Group \times Marital Satisfaction	.00	.11	.01	n.s.
Frustration Group \times Psychological Adjustment	-.02			
Frustration Group \times Parenting Stress	.00			
Intrusiveness				
1. Race	.06	.01	.01	n.s.
SES	-.01			
2. Frustration Group	.31*	.04	.02	.05
3. Marital Satisfaction	.01	.06	.02	n.s.
Psychological Adjustment	.01			
Parenting Stress	.02			
4. Frustration Group \times Marital Satisfaction	.01	.08	.02	n.s.
Frustration Group \times Psychological Adjustment	.03			
Frustration Group \times Parenting Stress	-.01			
Physical Stimulation				
1. Race	-.13	.04	.04	n.s.
SES	.00			
Child's Sex	-.38			
2. Frustration Group	-.46**	.09	.05	.00
3. Marital Satisfaction	-.01	.12	.03	n.s.
Psychological Adjustment	.00			
Parenting Stress	.00			
4. Frustration Group \times Marital Satisfaction	.01	.17	.05	.04
Frustration Group \times Psychological Adjustment	-.01			
Frustration Group \times Parenting Stress	.06*			

* $p \leq .05$. ** $p \leq .01$.

Maternal sensitivity was not related to infant frustration, maternal functioning, or the Infant Frustration \times Maternal Functioning interaction. Consistent with the findings reported earlier, however, maternal intrusiveness was significantly predicted by infant frustration, with mothers of easily frustrated infants showing greater intrusiveness than mothers of less frustrated infants. However, marital functioning, psychological functioning, and parenting stress did not predict maternal intrusiveness nor did these dimensions of maternal adjustment interact with infant frustration.

Given that maternal parenting stress was positively correlated with intrusiveness (see Table 4) and that parenting stress also differed by infant frustration group (see Table 1), we conducted a follow-up analysis to examine the possibility that parenting stress mediated the association obtained between infant frustration and maternal intrusiveness. In this analysis, SES, maternal race, marital adjustment, and maternal psychological functioning were entered simultaneously as covariates on Step 1, and parenting stress and infant frustration group were entered simul-

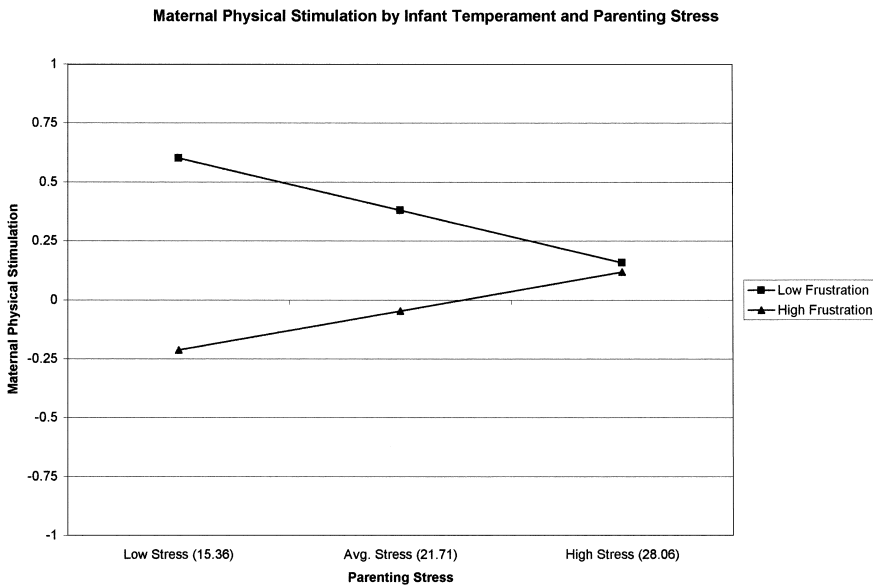


FIGURE 1. Maternal physical stimulation by infant temperament and parenting stress.

taneously on Step 2. No interaction terms were included in the model. Although the effect of infant frustration did decrease, $b = .25$, $t(1, 155) = 1.45$, n.s., when parenting stress was controlled for, parenting stress was not significantly related to maternal intrusiveness, $b = .02$, $t(1, 155) = 1.17$, n.s., indicating that stress did not mediate the association between infant frustration and maternal intrusiveness.

Maternal physical stimulation also was predicted by infant frustration, with mothers of easily frustrated infants showing less physical stimulation of their infants than mothers of less frustrated infants. However, this effect was qualified by a significant interaction of parenting stress and infant frustration. Following procedures outlined by Aiken and West (1991), separate regression equations for each frustration group were calculated. Lines representing each frustration group were then derived by plotting predicted maternal physical-stimulation scores at the sample mean of parenting stress ($M = 21.71$) and at $\pm 1 SD$ ($SD = 6.35$).

As shown in Figure 1, when infants were less frustrated, there was a negative relation between parenting stress and maternal physical stimulation such that increases in parenting stress resulted in lower levels of physical stimulation ($b = -.035$). In contrast, when infants were easily frustrated, increases in parenting stress were related to increases in maternal physical stimulation ($b = .026$). Under conditions of low and moderate stress, mothers of less frustrated infants showed higher levels of physical stimulation than did mothers of easily frustrated infants; however, under conditions of high stress, the difference between the two groups was negligible because of the increase in physical stimulation shown by mothers of easily frustrated infants coupled with the decrease in physical stimulation shown by mothers of less frustrated infants.

The results of the regression analysis indicated that the relation between maternal stress and physical stimulation was significantly different in the two frustration groups, $t(1, 160) = 2.14$, $p < .05$. Following procedures recommended by Aiken and West (1991), the simple slopes for each frustration group were tested to see if either slope differed significantly from zero. The results of these analyses indicated that neither slope was significantly different than zero, $t(1, 151) = -1.48$, n.s., for the less frustrated group, and $t(1, 151) = 1.63$, n.s., for the

easily frustrated group. Thus, although the relation between maternal stress and physical stimulation differed significantly between the two frustration groups, neither slope was significantly different from zero.

DISCUSSION

A major goal of the present study was to investigate the role of infant temperament in mother–infant interactions. We identified a group of infants who displayed frustration in two contexts (home, as observed by mothers, and laboratory), examined multiple dimensions of mothers' behavior in interactions with their infants, and assessed infant responsiveness and maternal functioning. Mothers and infants were observed in a series of interaction tasks that were designed to vary sufficiently so that a range of maternal behaviors could be observed. In addition, rather than focusing exclusively on sensitivity and intrusiveness, which may be the most salient and perhaps influential maternal behaviors, we also observed the degree to which mothers provided physical stimulation to their infants. It should be noted that the descriptive statistics suggest that most mothers were interacting with their infants in a sensitive and nonintrusive manner. Nevertheless, our analysis of frustration-group patterns indicated that there were clear differences between the mothers of these two types of infants. Mothers of less frustrated infants displayed significantly less intrusive and more physically stimulating behaviors than did mothers of easily frustrated infants. There were not significant differences in sensitivity, however, although the mean differences were in the hypothesized direction.

Although past findings relating maternal behavior and infant temperament are mixed, a number of studies have found negative associations between maternal sensitivity and infant temperamental difficulty (e.g., Crockenberg & McCluskey, 1986; Mangelsdorf et al., 1990; Owens et al., 1998; Susman-Stillman, Kalkoske, Egeland, & Waldman, 1996; van den Boom & Hoeksma, 1994). As Owens et al. (1998) noted, negative associations between maternal responsiveness and infant difficulty seem to be more likely when low-income samples are used, presumably because these families are already facing multiple stressors. With few exceptions, however (e.g., van den Boom, 1994; van den Boom & Hoeksma, 1994), past research has not specifically selected groups of infants based on negative emotionality—a strategy that maximized our ability to detect associations between maternal behavior and infant frustration.

It is not clear why there were significant differences in maternal intrusiveness, but not maternal sensitivity, especially since these variables were intercorrelated. Past studies examining associations between maternal behavior and infant temperament have not typically assessed sensitivity and intrusiveness separately. An exception is a study by Fish, Stifter, and Belsky (1991), who examined correlates of continuity and change in negative emotionality between birth and 5 months. Although mothers of infants who increased in negative emotionality were found to be less sensitive at 5 months than mothers of infants who remained low in negative emotionality, there were no differences in intrusiveness. Clearly more research is needed, but we offer some speculations. In 1994, van den Boom and Hoeksma found that although mothers of highly irritable infants did not differ from mothers of less irritable infants in responsiveness to fussing/crying or amount of stimulation (i.e., vocalizations, offering objects to play with) during the infant's first 6 months, they provided lower levels of "effective stimulation" (positive vocalizations, stimulation to play, effective physical stimulation, and affectionate contact). A similar phenomenon may have occurred in the present study. Mothers of easily frustrated infants in the current study were more intrusive (e.g., failing to modulate the pace of interaction when the infant averts gaze, "forcing" toys on infant). It may be that when infants are highly negative, mothers make greater attempts to engage them, resulting in somewhat higher levels of intrusiveness, even in the face of generally sensitive behavior.

Contrary to our expectations, there were no main effects of maternal functioning on maternal behavior. Because our sample of families was predominantly low risk, it is possible there was not sufficient variability in maternal functioning to detect significant associations. Alternatively, our relatively brief observations of maternal behavior may not have been sensitive enough to capture differences in maternal behavior related to maternal functioning. In any case, it is important to note that mothers of less frustrated and easily frustrated infants differed significantly in self-reported parenting stress related to having a difficult child, but not in self-reported marital satisfaction or psychological adjustment. These data thus provide little evidence that maternal difficulties are responsible for the frustrated temperament of the infants. In addition, they minimize the possibility that the mothers of easily frustrated infants are biased in their reporting of infant temperament due to depression or other adjustment problems.

It is important to note that there are multiple theoretical conceptualizations concerning infant temperament and its association with maternal functioning and maternal behavior. For example, one possibility is that maternal functioning mediates associations between infant frustration and maternal behavior. In the current study, the conditions to test for mediation were present only for our measure of parenting stress, but we did not find evidence of mediation. However, the rationale for most of our analyses was not based on a mediation model. Instead, we chose to conceptualize infant frustration as a proximal influence on maternal behavior and maternal functioning as a distal influence. The fact that easily frustrated infants showed less positive affect during mother–infant interaction is consistent with the idea that infant behavior may be the most direct “trigger” for the differences in maternal behavior we observed between mothers of less frustrated and easily frustrated infants.

We did find evidence that maternal functioning and infant temperament interacted to predict maternal behavior. Within the less frustrated group of infants, maternal stress and maternal physical stimulation were negatively related; however, in the easily frustrated group, higher maternal stress was associated with greater physical stimulation. Although mothers of less frustrated infants showed higher levels of physical stimulation than mothers of easily frustrated infants under conditions of low or moderate stress, under conditions of high stress mothers of easily frustrated and less frustrated infants showed similarly low levels of physical stimulation. The nature of this interaction is different than we initially hypothesized. We expected that high levels of stress (or other maternal difficulties) would exacerbate the effect of infant frustration on maternal behavior such that mothers of easily frustrated infants under high stress would show the least optimal parenting. It is important to note that although the slopes for the less frustrated and easily frustrated groups did differ from each other, neither slope was significantly different from zero, indicating a modest effect. Thus, while the interaction is suggestive, replication of these findings is clearly indicated.

Our results are generally consistent with those reported by van den Boom and Hoeksma (1994), who found that mothers of highly irritable infants engaged in less physical contact and less “effective” stimulation, a category which included effective physical stimulation. In general, they found that the interactions of highly irritable infants and their mothers were centered around attempts to relieve infant distress; when infants were not distressed, mothers of highly irritable infants were typically less responsive and less engaged—a pattern that is probably not satisfying for either partner (van den Boom & Hoeksma, 1994).

With respect to the findings of the current study, it is important to note that the lower levels of physical stimulation provided by mothers of easily frustrated infants may have been appropriate given their infants’ affective state. Specifically, more easily frustrated infants were less positive during mother–infant interaction than were less frustrated infants. Thus, physical stimulation, which includes arousing behaviors, may not have been as appropriate for these infants, who were more likely to be showing negative affect with their mothers. It also is

important to note that our definition of maternal physical stimulation included arousing behaviors as well as physical contact that was potentially less arousing, such as physical affection or soothing that involved physical contact. Thus, it is unclear whether mothers of easily frustrated infants simply engaged in less arousing physical stimulation or whether they also showed lower levels of less intense physical contact (e.g., physical affection). Differentiating these types of physical stimulation in future research will help to specify more precisely how infant frustration may influence this dimension of maternal behavior.

With respect to the long-term implications of infant negative emotionality, van den Boom and Hoeksma's (1994) findings indicated that mothers of highly negative infants were less responsive to positive infant signals than other mothers and that this difference increased over the first 6 months of the infants' lives. With respect to our findings, we note that the lower levels of physical stimulation shown by mothers of easily frustrated infants may represent an appropriate adaptation to their infants' greater negative affect during mother–infant interaction, as discussed earlier. Alternatively, they may reflect a more enduring pattern of lower engagement and responsiveness when infants are not distressed, consistent with the findings of van den Boom and Hoeksma. Additional research with a focus on longitudinal design and on the coding of contingencies between maternal and infant behavior will help to address this issue more definitively.

As noted previously, under conditions of high parenting stress, mothers of less frustrated infants engaged in low levels of physical stimulation that were similar to the levels displayed by mothers of easily frustrated infants. These findings suggest that mothers' subjective experience of parenting stress may be as important as the child's temperament in influencing maternal behavior, and they are consistent with past work examining associations between parenting stress and parental behavior (e.g., Crnic & Acevedo, 1995). In contrast to the findings for parenting stress, neither marital adjustment nor psychological functioning interacted with infant frustration to predict maternal behavior. Given that the sample was selected on the basis of infant frustration, it is perhaps not surprising that parenting stress proved to be the most predictive dimension of maternal functioning.

With respect to infant behavior, we found that infants in the easily frustrated group displayed less positive affect during interaction with their mothers than did infants in the less frustrated group. We cannot rule out the possibility that this finding is the result of carryover effects from the frustration assessments. However, with the exception of the soothing interaction following the arm-restraint task, none of the mother–infant tasks were conducted if the infant was fussing. In addition, only two mother–infant tasks (soothing and puppet play) immediately followed a frustration task, and both groups of infants showed high levels of positive affect during puppet play. One explanation for our finding is that easily frustrated infants' temperament is such that they are, in many contexts other than frustrating situations, less positive and more negative. It also is possible that infants' experiences during the laboratory assessment may not be that different from their experiences in everyday contexts. Infants face a number of situations daily that are potentially frustrating (e.g., clothes/diaper changes, car rides, removal of toys) interspersed with other activities. For infants who are temperamentally prone to frustration, these situations may well elicit high levels of negative affect that “carry over” to other daily contexts.

With respect to implications for intervention and/or clinical work, we note that there is likely to be great variability in the quality of interactions between temperamentally frustrated infants and their caregivers. In particular, consistent with past research, the extent to which infant frustration negatively influences mother–infant interaction is likely to depend on the presence of other risk factors, including low levels of social support (Crockenberg, 1981) and economic disadvantage (van den Boom, 1994). Our descriptive statistics indicate that most

mothers in our study interacted with their infants sensitively and appropriately. In addition, the low levels of physical stimulation provided by mothers of easily frustrated infants may be an appropriate response to these infants' greater negativity. More generally, it is important that parenting behaviors observed in mothers of infants with difficult temperaments (including the tendency to become easily frustrated) are not assumed to be "deficits" in parenting because what constitutes appropriate maternal behavior depends in part on the needs and characteristics of individual infants. Thus, although in some circumstances intervention may be warranted, we believe that much more research is needed to inform effective intervention efforts aimed at temperamentally negative infants and their caregivers.

A major limitation of the current study is that we cannot make statements about causality because the data are not longitudinal. Although the contribution of infant temperament appears to be important, it is impossible to know what might have taken place in the mother–infant dyads prior to 6 months of age. Thus, the differences in maternal behavior that we observed between the two groups of infants may be driving the differences in infant frustration and the related differences in infant affect during interactions with the mother. Longitudinal data will help to address this question. Finally, because mothers completed the questionnaires at home, it is possible that their responses may have been influenced by other family members (e.g., fathers).

The strength of this study is that it is a large-scale assessment of a representative selected sample of infants that utilizes multiple assessments and multiple types of measures. The study clearly contributes to our understanding of the relationship functioning of frustrated infants and their mothers. However, this study cannot address the question of the long-term implications of frustration in infancy nor the possible interaction of frustration and maternal behavior in predicting later functioning. An important unknown factor is the extent to which the child's temperament remains stable, or whether the development of regulatory skills and abilities might alter this early profile. For example, it has been demonstrated that the ability to manage distress and anger when frustrated is likely to be critical for later adaptation (Eisenberg et al., 1994). It also is apparent that such skills begin to develop in infancy and become consolidated during toddlerhood, so that by the time the child enters preschool these skills may play an important role in development (Kopp, 1989). The relative contributions of infant temperament and socialization strategies to the development of these skills is an important area for future research because styles of emotion regulation that develop in infancy and toddlerhood may come to play an important role in children's interactions with others (Rubin, Coplan, Fox, & Calkins, 1995).

REFERENCES

- Abidin, R. (1990). *Parenting Stress Index* (2nd ed.). Charlottesville, VA: Pediatric Psychology Press.
- Abidin, R. (1997). Parenting Stress Index: A measure of the parent–child system. In C. Zalaquett & R. Wood (Eds.), *Evaluating stress: A book of resources* (pp. 277–291). Lanham, MD: Scarecrow Press.
- Aiken, L.S., & West, S.G. (1991). *Multiple regression: Testing and interpreting interactions*. Thousand Oaks, CA: Sage.
- Ainsworth, M., Blehar, M., Waters, E., & Wall, S. (1978). *Patterns of attachment*. Hillsdale, NJ: Erlbaum.
- Alpern, L., & Lyons-Ruth, K. (1993). Preschool children at social risk: Chronicity and timing of maternal depressive symptoms and child behavior problems at school and at home. *Development and Psychopathology*, 5, 371–387.
- Anisfeld, E., Casper, V., Nozyce, M., & Cunningham, N. (1990). Does infant carrying promote attach-

- ment? An experimental study of the effects of increased physical contact on the development of attachment. *Child Development*, 61, 1617–1627.
- Belsky, J. (1984). The determinants of parenting: A process model. *Child Development*, 55, 83–96.
- Bretherton, I. (1985). Attachment theory: Retrospect and prospect. In I. Bretherton & E. Waters (Eds.), *Growing points in attachment theory and research* (pp. 3–35). Monographs of the Society for Research in Child Development, 50(1–2, Serial No. 209).
- Calkins, S.D. (1994). Origins and outcomes of individual differences in emotional regulation. In N.A. Fox (Ed.), *The development of emotion regulation: Behavioral and biological considerations* (pp. 53–72). Monographs of the Society for Research in Child Development, 59(2–3, Serial No. 240).
- Calkins, S.D., Dedmon, S., Gill, K., & Johnson, L. (2002). Frustration in infancy: Implications for emotion regulation, physiological processes, and temperament. *Infancy*, 3, 175–197.
- Calkins, S.D., & Fox, N.A. (1992). The relations among infant temperament, security of attachment and behavioral inhibition at 24 months. *Child Development*, 63, 1456–1472.
- Calkins, S.D., & Johnson, M.C. (1998). Toddler regulation of distress to frustrating events: Temperamental and maternal correlates. *Infant Behavior and Development*, 21, 379–395.
- Campbell, S.B., Pierce, E.W., March, C.L., & Ewing, L.J. (1991). Noncompliant behavior, overactivity, and family stress as predictors of negative maternal control with preschool children. *Development and Psychopathology*, 3, 175–190.
- Cassidy, J. (1994). Emotion regulation: Influences of attachment relationships. In N.A. Fox (Ed.), *The development of emotion regulation: Behavioral and biological considerations* (pp. 228–249). Monographs of the Society for Research in Child Development, 59(2–3, Serial No. 240).
- Crnic, K.A., & Acevedo, M. (1995). Everyday stresses and parenting. In M.H. Bornstein (Ed.), *Handbook of parenting: Vol. 4. Applied and practical parenting* (pp. 277–297). Mahwah, NJ: Erlbaum.
- Crockenberg, S.B. (1981). Infant irritability, mother responsiveness, and social support influences on the security of attachment. *Child Development*, 52, 857–865.
- Crockenberg, S.B. (1986). Are temperamental differences in babies associated with predictable differences in caregiving? *New Directions in Child Development*, 31, 53–73.
- Crockenberg, S.B., & McCluskey, K. (1986). Changes in maternal behavior during the baby's first year of life. *Child Development*, 57, 746–753.
- Cummings, E.M. (1995). Security, emotionality, and parental depression: A commentary. *Developmental Psychology*, 31, 425–427.
- Cummings, E.M., & Davies, P.T. (1994). Maternal depression and child development. *Journal of Child Psychology and Psychiatry*, 35, 73–112.
- Derogatis, L.R. (1986). *Manual for the Symptom Checklist 90 Revised (SCL-90R)*. Baltimore, MD: Author.
- Derogatis, L.R., & Cleary, P.A. (1977). Confirmation of the dimensional structure of the SCL-90: A study in construct validation. *Journal of Clinical Psychology*, 33, 981–989.
- Diener, M.L., Mangelsdorf, S.C., McHale, J.L., & Frosch, C.A. (2002). Infants' behavioral strategies for emotion regulation with fathers and mothers: Associations with emotional expressions and attachment quality. *Infancy*, 3, 153–174.
- Donovan, W., Leavitt, L., & Walsh, R. (1998). Conflict and depression predict maternal sensitivity to infant cries. *Infant Behavior and Development*, 21, 505–517.
- Downey, G., & Coyne, J. (1990). Children of depressed parents: An integrative review. *Psychological Bulletin*, 108, 50–76.
- Egeland, B., Pianta, R., & O'Brien, M. (1993). Maternal intrusiveness in infancy and child maladaptation in early school years. *Development and Psychopathology*, 5, 359–370.

- Eisenberg, N., Fabes, R., Nyman, M., Bernzweig, J., Bernzweig, J., & Pinuelas, A. (1994). The relations of emotionality and regulation to children's anger-related reactions. *Child Development*, 65, 109–128.
- Fish, M., Stifter, C., & Belsky, J. (1991). Conditions of continuity and discontinuity in infant negative emotionality: Newborn to five months. *Child Development*, 62, 1525–1537.
- Fish, M., Stifter, C., & Belsky, J. (1993). Early patterns of mother–infant dyadic interaction: Infant, mother, and family demographic antecedents. *Infant Behavior and Development*, 16, 1–18.
- Gianino, A., & Tronick, E.Z. (1988). The mutual regulation model: The infant's self and interactive regulation coping and defense capacities. In T. Field, P. McCabe, & N. Schneiderman (Eds.), *Stress and coping* (pp. 47–68). Hillsdale, NJ: Erlbaum.
- Goldsmith, H.H., Buss, A., Plomin, R., Rothbart, M., Thomas, A., Chess, S., Hinde, R. & McCall, R. (1987). Roundtable: What is temperament? Four approaches. *Child Development*, 58, 505–529.
- Goldsmith, H.H., & Rothbart, M.K. (1993). *The laboratory temperament assessment battery (LAB-TAB)*. Madison, WI: University of Wisconsin.
- Hollingshead, A.B. (1975). *Four Factor Index of Social Status*. New Haven, CT: Yale University.
- Kopp, C. (1989). Regulation of distress and negative emotions: A developmental view. *Developmental Psychology*, 25, 243–254.
- Lewis, M., Feiring, C., McGuffog, C., & Jaskir, J. (1984). Predicting psychopathology in six-year-olds from early social relations. *Child Development*, 55, 123–136.
- Mangelsdorf, S.C., Gunnar, M., Kestenbaum, R., Lang, S., & Andreas, D. (1990). Infant proneness-to-distress temperament, maternal personality, and mother–infant attachment: Associations and goodness-of-fit. *Child Development*, 61, 820–831.
- Owens, E.B., Shaw, D.S., & Vondra, J.I. (1998). Relations between infant irritability and maternal responsiveness in low-income families. *Infant Behavior and Development*, 21, 761–778.
- Pauli-Pott, U., Mertesacker, B., Bade, U., Bauer, C., & Beckmann, D. (2000). Contexts of relations of infant negative emotionality to caregiver's reactivity/sensitivity. *Infant Behavior and Development*, 23, 23–39.
- Pianta, R.C., & Egeland, B. (1990). Life stress and parenting outcomes in a disadvantaged sample: Results of the mother–child interaction project. *Journal of Clinical Child Psychology*, 19, 329–326.
- Pianta, R.C., Sroufe, L.A., & Egeland, B. (1989). Continuity and discontinuity in maternal sensitivity at 6, 24 and 42 months in a high-risk sample. *Child Development*, 60, 481–487.
- Rothbart, M.K. (1981). Measurement of temperament in infancy. *Child Development*, 52, 569–578.
- Rothbart, M.K., & Derryberry, D. (1981). Development of individual differences in temperament. In M.E. Lamb & A.L. Brown (Eds.), *Advances in developmental psychology* (pp. 37–86). Hillsdale, NJ: Erlbaum.
- Rubin, K.H., Coplan, R.J., Fox, N.A., & Calkins, S.D. (1995). Emotionality, emotion regulation, and preschoolers' social adaptation. *Development and Psychopathology*, 7, 49–62.
- Seifer, R., & Schiller, M. (1995). The role of parenting sensitivity, infant temperament, and dyadic interaction in attachment theory and assessment. In E. Waters, B.E. Vaughn, G. Posada, & K. Kondo-Ikemura (Eds.), *Caregiving, cultural, and cognitive perspectives on secure-base behavior and working models: New growing points of attachment theory and research* (pp. 146–176). *Monographs of the Society for Research in Child Development*, 60(2–3, Serial No. 244).
- Seifer, R., Schiller, M., Sameroff, A., Resnick, S., & Riordan, K. (1996). Attachment, maternal sensitivity, and infant temperament during the first year of life. *Developmental Psychology*, 32, 12–25.
- Shaw, D.S., Keenan, K., & Vondra, J. (1994). Developmental precursors of externalizing behavior: Ages 1 to 3. *Developmental Psychology*, 30, 355–364.
- Spanier, G.B. (1976). Measuring dyadic adjustments: New scales for assessing the quality of marriage and similar dyads. *Journal of Marriage and the Family*, 38, 15–28.

- Stifter, C.A., & Fox, N.A. (1990). Infant reactivity: Physiological correlates of newborn and 5-month temperament. *Developmental Psychology*, 26, 582–588.
- Susman-Stillman, A., Kalkoske, M., Egeland, B., & Waldman, I. (1996). Infant temperament and maternal sensitivity as predictors of attachment security. *Infant Behavior and Development*, 19, 33–47.
- Thompson, R.A. (1998). Early sociopersonality development. In W. Damon (Series Ed.) & N. Eisenberg (Vol. Ed.), *Handbook of child psychology: Vol. 3. Social, emotional, and personality development* (5th ed., pp. 25–104). New York: Wiley.
- van den Boom, D.C. (1994). The influence of temperament and mothering on attachment and exploration: An experimental manipulation of sensitive responsiveness among lower class mothers with irritable infants. *Child Development*, 65, 1457–1477.
- van den Boom, D.C., & Hoeksma, J.B. (1994). The effect of infant irritability on mother–infant interaction: A growth-curve analysis. *Developmental Psychology*, 30, 581–590.

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