Mothers’ representations of their infants may influence early development of emotional self-regulation. This study examined the associations between characteristics of mothers’ (N = 100) narratives about their 7-month-old infants, maternal depression, and their infants’ affect regulation during the Still Face procedure. Findings showed that (1) mothers’ representations were linked with individual differences in their infants’ behavior across the Still Face procedure, (2) the association between mothers’ representations and their infants’ behavior was mediated by parenting behavior, and (3) mothers’ representations explained unique variance in their infants’ affect regulation beyond the contribution of maternal depression. Although infants’ displays of positive affect diminished while mothers held a still face, only infants of mothers in the balanced representation category returned to high levels of positive affect upon resuming interaction. These findings highlight the role of maternal representations in the process by which dyads repair temporary disruptions in interaction, as well as individual differences in infants’ and mothers’ responses to the Still Face.

INTRODUCTION

Interpersonal processes play an integral role in infant emotional development. During the first year of life, infants make a dramatic transition from primarily external regulation of affective experience to increasingly higher levels of self-regulation, and this transition is facilitated by interactive experiences with primary caregivers (Sameroff & Fiese, 2000). Parents’ behavior in interaction with their infants is likewise subject to regulatory forces, including the parents’ own mental representations, or working models, of relationships, which may influence the parents’ interpretation of infant behavior and their behavioral response to their infant. This, in turn, is likely to affect the quality of their infants’ early social–emotional development (Bowlby, 1969/1982; Bretherton, 1990).

The present study was designed to examine the association between mothers’ mental representations of their infant and infant affect regulation during a stressful situation, the Still Face procedure. Parents’ mental representations of relationships are presumed to be dynamic, internal mental templates, constructed based on the quality of personal interactive experiences (Benoit, Parker, & Zeanah, 1997; Bowlby, 1982). It is suggested that these representations tend to be stable, and that they guide behavior in caregiving relationships. There is evidence that mothers’ representations of their infants predict subsequent infant attachment security (Benoit et al., 1997), yet less is known with regard to the contemporaneous associations between mothers’ representations of their infants, caregiving behavior, and infant emotion regulation prior to 1 year of age.

The Still Face procedure has been widely used to examine infant communicative abilities, qualities of the dyadic interaction between mothers and their 2- to 9-month-old infants, and the increasingly broad array of self-regulatory capacities displayed by infants across that age span (e.g., Mayes & Carter, 1990; Toda & Fogel, 1993; Tronick, 1989; Tronick & Cohn, 1989). The temporary maternal unavailability and lack of responsiveness during this procedure is a reliable stress inducer, even for very young infants (Field, Vega-Lahr, Scafidi, & Goldstein, 1986; Weinberg & Tronick, 1996). Although some researchers have emphasized the utility of the Still Face procedure for examining the process by which parents and infants return to a positive affective state following disruptions in dyadic interaction (i.e., interactive repair), less is known with regard to what makes parents more or less effective in this process (Kogan & Carter, 1996; Weinberg & Tronick, 1996).

Prior research has focused on maternal depression as a predictor of infants’ and mothers’ responses to the Still Face (Tronick, 1989; Tronick & Weinberg, 1997); however, mothers’ representations of their infants may be another important influence. There is evidence that mothers’ mental representations of their infants are associated with their infants’ attachment classification during the Strange Situation at 1 year of age (Benoit et al., 1997), and that infants’ affect regulation during the Still Face procedure is linked with infants’ attachment classification at 12 and 13 months (Braungart-Rieker, Garwood, Powers, & Wang,
2001). It has also been suggested that mothers’ internal representations of their infants may influence their infants’ earlier self-regulatory capacity, including their infants’ Still Face response, as well as the mothers’ ability to facilitate the process of repair (Gergely & Watson, 1996; Mayes, Carter, Egger, & Pajer, 1991). However, no studies have explored the contemporaneous associations between maternal representations of their infants, maternal depression, and mother and infant behavioral responses to the Still Face, nor how mothers’ representations may be linked with infant affect regulation strategies prior to 1 year.

**Infant Still Face Response and Early Emotion Regulation**

The Still Face procedure has been used extensively to examine infant emotion regulation in response to temporary maternal emotional unavailability (Trocknick, Weinberg & Tronick, 1996). The Still Face procedure is composed of three brief segments that challenge infant affective self-regulation: a first segment, during which the mother and infant interact in face-to-face play; a second period, the “Still Face,” during which the mother holds a still face and is unresponsive to the infant; and a final “Reengagement” episode, during which the mother again interacts in face-to-face play with the infant. Emotion regulation is often used to describe behaviors that serve to modulate arousal (Braungart-Rieker et al., 2001). The infant may, for example, employ a variety of self-directed (e.g., avoidance, gaze aversion) or other-directed (e.g., attention seeking) behaviors to regulate the distress elicited during the Still Face procedure (Braungart-Rieker et al., 2001; Kogan & Carter, 1996).

Researchers using the Still Face procedure have identified contrasting trajectories for infant positive and negative affect across the three episodes. Weinberg and Tronick (1996) found that 6-month-old infants display relatively high levels of positive affect, and correspondingly low levels of negative affect, during the initial pre-Still Face episode, while engaged in face-to-face play with their mothers. Conversely, during the middle episode, while mothers held a still face, infants displayed decreased positive affect and increased negative affect (the “Still Face effect”). Finally, during the last episode of the procedure, the Reengagement, infants displayed a mixed pattern of high positive and negative affect.

Prior research has highlighted the dyadic emotion regulation processes evident in the Still Face procedure. Infants are assumed to experience both positive and negative affect, even during well-coordinated interactions. In general, it is expected that the predominant affect in well-coordinated dyads will be positive, and that predominantly positive interaction is maintained through interactive reparation (i.e., the process of transforming mismatching to matching states; Mayes & Carter, 1990; Tronick & Cohn, 1989). Individual differences in infant or maternal responses to the Still Face, therefore, may reflect the dyad’s capacity to successfully engage in interactive reparation during the routine perturbations or disruptions of day-to-day interaction.

Research on parent–infant attachment relationships provides a framework for understanding how early interpersonal dyadic processes influence the organization of infant social–emotional experience (Sroufe, 1995). Attachment theorists have proposed that based on the quality of day-to-day interactions with a primary caregiver, the infant develops an internal emotional–cognitive template, or mental model, which in turn affects the infant’s emotional and behavioral displays in interaction with the caregiver (Bowlby, 1982; Bretherton, 1990). Using the Strange Situation procedure (Ainsworth, Blehar, Waters, & Wall, 1978), which, like the Still Face paradigm, heightens the infant’s distress via the imposition of maternal unavailability, researchers have identified four primary patterns of attachment security. These four patterns reflect, in part, differences in the infant’s emotional self-regulation (Braungart & Stifter, 1991). Less is known, however, with regard to the infant emotional and behavioral precursors to secure attachment. There is some evidence that infant emotional displays during the first year are related to subsequent attachment security; for example, decreases in positive emotion expression across the first year of life have been linked to increased risk for subsequent insecure attachment classifications (Belsky, Fish, & Isabella, 1991; Malatesta, Culver, Tesman, & Shepard, 1989). A number of recent investigations have begun to identify associations between infant behavior during the Still Face procedure and subsequent attachment security. Specifically, Cohn, Campbell, and Ross (1991) reported that 6-month-old infants who demonstrated any attempt at positive eliciting behaviors (e.g., smiling, play-face expressions) while their mother held a still face were more likely to be securely attached at 12 months. Kogan and Carter (1996) analyzed 4-month-old infant Reengagement behavior following the Still Face and found that infants who displayed more resistance (e.g., crying, lack of soothability) and avoidance (e.g., gaze aversion, turning away from mother) during Reengagement were less likely to demonstrate contact maintenance, a common feature of secure attachment, during the Strange Situation procedure at 12 months. Finally, Braungart-Rieker and colleagues
Maternal Representations and Infant Emotional Development

Although it is clear that parents’ sensitivity in interaction with their infants has implications for infant emotional development (DeWolff & van IJzendoorn, 1997; Sroufe, 1995), there remains a need to identify the parental characteristics that are likely to influence parents’ ability to interact in a behaviorally and emotionally sensitive, attuned fashion (Gergely & Watson, 1996; Seifer & Schiller, 1995). In their study of mothers’ cognized emotional responses to the Still Face, Mayes et al. (1991) found marked differences in the degree to which mothers themselves reported feeling distressed by holding a “flat expression” during the Still Face episode. Differences in reports of distress corresponded to different maternal interactive behaviors with their infants during Reengagement. The authors suggest that this variability in maternal Still Face response may be a function of differences in the mothers’ internal working models of their relationship with their child. Similarly, in their proposition of a theoretical model for the process by which infants develop an emotional self-awareness, Gergely and Watson (1996) suggest that mothers’ own internal representations of relationships may shape their ability to accurately perceive and respond to their infants’ emotional displays.

Research on adult attachment representations have focused primarily on the individuals’ current state of mind with respect to early attachment relationships assessed via the Adult Attachment Interview (AAI; George, Kaplan, & Main, 1985). Responses to the AAI are thought to yield important information about internal working models of relationships. Attachment researchers have proposed that access to relevant emotional experience, without the need to minimize or distort emotional material, distinguishes the secure (autonomous) working model category from other insecure patterns of representation (Main, Kaplan, & Cassidy, 1985). Significant intergenerational correspondence in parents’ AAI classifications and infant attachment security has been well established (e.g., Benoit & Parker, 1994; Fonagy, Steele, & Steele, 1991; van IJzendoorn, 1995).

Recently a number of interviews have been developed to assess parents’ representations of caregiving or of their relationship with their child (Bretherton, 1990; George & Solomon, 1996; Slade, Belsky, Aber, & Phelps, 1999). It is possible that the representation of a specific child may hold unique implications for parenting behavior and the emotional context in which that child develops. Indeed, there is a growing literature that addresses the relation between child-specific representational interviews and infant attachment security (Aber, Belsky, Slade, & Crnic, 1999; George & Solomon, 1996; Slade et al., 1999). One version of this type of child- and relationship-specific representational interview is the Working Model of the Child Interview (WMCI; Zeanah & Benoit, 1995). The WMCI focuses on parents’ representations of their child’s personality and of their relationship with their child. Prior research has established significant correspondence between WMCI-derived representational classifications and child attachment security at 1 year (Benoit, Parker, & Zeanah, 1997).

Parenting behavior should be the logical mediator of parents’ representations of their infants and their infants’ emotional development; however, there are limited data directly exploring these links. Several studies have provided preliminary support for the hypothesis that mothers’ representations of early attachment relationships (assessed via the AAI) are related to parenting sensitivity (Crowell & Feldman, 1988; Haft & Slade, 1989; Pederson, Gleason, Moran, & Bento, 1998; Slade et al., 1999); however, a number of these studies are limited by relatively small sample sizes, or have focused on the assessment of nonrepresentative children older than 1 year of age. Less is known with regard to the links between parents’ representations of their infants and parenting behavior.

Maternal Depression and Infant Emotion Regulation during the Still Face

Maternal depression is another important parental characteristic that has been linked with individual differences in infant emotion regulation. Research has identified differences in behavioral state matching, emotional display, and interactional synchrony in depressed versus nondepressed mother–infant dyads (Field, Healy, Goldstein, & Guthertz, 1990; Tronick & Weinberg, 1997). During the Still Face procedure, infants of mothers who are depressed tend to engage in less playful interaction, and evidence less positive
and more negative or neutral affect. Furthermore, depressed mothers tend to be more disengaged, less behaviorally sensitive, and more affectively negative than their nondepressed counterparts (Field, 1994; Tronick, 1989). Kogan and Carter (1996) suggest that the emotional tone of early experience may provide the framework within which the infant develops his or her own affective repertoire. Therefore, depressed mothers’ reduced capacity to engage in emotionally positive interaction with their infants may take on a particularly important role.

However, in research with toddlers and preschool-age children, maternal depression alone was insufficient as an explanatory variable for predicting child outcomes (Murray & Cooper, 1997). For example, Zahn-Waxler, Iannotti, Cummings, and Denham (1990) found that some depressed mothers were able to engage in positive interaction with their 2-year-old children, thus promoting better child outcomes 4 years later. Other maternal psychological factors, such as mothers’ mental representations of their child, may therefore simultaneously affect the quality of mother–child interaction, and consequently, infant emotion regulation.

Goals of the Present Study

The present study was designed to examine the contemporaneous association between mothers’ mental representations of their infants and their infants’ emotion regulation during the Still Face procedure. This research extended prior work in a number of ways, including (1) focusing on maternal characteristics (beyond depression) that may contribute to individual differences in their infants’ still face responses—specifically, maternal representations of their infants; (2) examining the association between mothers’ representations and their infants’ emotion regulation prior to 1 year of age; and (3) identifying parenting processes that mediate the link between mothers’ representations and their infants’ emotion regulation. We predicted that mothers’ representations would be associated with differences in their infants’ behaviors across the Still Face procedure, and that these differences would be evident in the infants’ distress regulation, independent of the degree of distress evoked by the procedure itself. We also predicted that the association between mothers’ representations and their infants’ behavior would be mediated by parenting behavior during interaction. Finally, although we expected to replicate prior associations between maternal depression and infant behavior during the Still Face procedure, we predicted that mothers’ representations would explain additional variance in their infants’ regulation, and thus the association would be maintained even when controlling for maternal depressive symptomatology.

METHODS

Participants

Participants in this study were a community sample of 100 mother–infant dyads recruited from local pediatric clinics to participate in the Michigan Family Study (MFS), a longitudinal study of early infant development (McDonough, 1994). Two hundred fifty-eight mothers and infants participated in the 7-month assessment of the MFS, which included a home and a laboratory visit. Of these, the first 100 for whom complete maternal interview data were available were included in the present investigation.

Mothers in this sample comprised a range of demographic and socioeconomic circumstances, reflecting their community of residence: 77% of the sample were European American; 15% were African American; 5% were Asian, Latino, biracial, or “other”; and 3 mothers did not indicate their race or ethnicity. Mothers ranged in age from 16 to 42 (M = 28.7, SD = 5.64). Family income was reported by the mothers, who checked 1 of 16 categories (from less than $5,000 to more than $100,000) that best described their total household income for the past year. The median income category for the present sample was between $45,000 and $49,999 (interquartile range between $20,000 and $74,999).

Family situations varied, with 77% married, 11% unmarried but living with the child’s father, 10% never married, 1% divorced, and 1% living with a partner who was not the child’s father. The mothers’ median level of education was completion of a 4-year college degree; 15% of the sample had a high school education or less, and 17% had completed a graduate degree. Approximately half of the mothers (46%) were home full time with the baby, 25% were employed part time, and 29% were employed full time.

Procedure

The MFS protocol involved a home and laboratory visit when the infants were 7 months of age. The laboratory visit involved both mother–infant interaction tasks and a maternal representational interview.

During the home visit, a trained graduate student research assistant interviewed the mother with regard to demographic information and her perceptions of her infant’s behavior and development. At the completion of the home interview, each mother was provided with a packet of questionnaires that
included a self-report depression inventory. These questionnaires were returned to the project staff during the subsequent visit to the developmental laboratory at the university, generally within 2 weeks after the home visit.

During the laboratory play session, each mother and infant dyad engaged in a series of videotaped interactive tasks. Following a series of free-play and structured teaching tasks, the mother and infant participated in the Still Face procedure (Tronick, 1989). The infant was placed in a highchair, and his or her mother sat in a swivel chair in front of the highchair. Both maternal and infant behaviors were recorded using separate cameras and split-screen technology. The experimenter was not in the room during the procedure, and gave instructions to the mother through a microphone from behind a one-way mirror. The Still Face procedure consisted of three 2-min segments in the following sequence: Highchair Play, mothers’ Still Face, and the Reengagement episode. Episodes were cut short if the infant demonstrated high levels of distress and cried continuously for more than 30 s.

Following the Still Face procedure, a trained graduate student administered the representational interview to the mother while the infant was cared for in an adjacent room. Whenever possible, the infant was kept out of the room while the mother completed the interview. When the mother or infant was resistant to being separated, an additional staff person stayed in the room to care for the infant during the interview; thus attempting to minimize any potential distraction for the mother.

Measures

Infant and maternal behavior. Infant behavior was scored during each of the three Still Face episodes (i.e., Highchair Play, Still Face, and Reengagement). In contrast, because the primary interest in maternal behavior was on how mothers might facilitate the process of interactive repair following disruptions, maternal behavior was scored only during the Reengagement episode. Each dimension of infant and maternal behavioral outcomes was given a global score along a 4-point scale from 0 (absent) to 3 (high levels present).

A series of six infant Still Face procedure codes were selected to reflect the degree to which infants successfully regulated distress (i.e., low resistance, low negative affect, and high positive affect), and the extent to which they used self-directed (i.e., avoidance) versus other-directed (i.e., attention seeking/contact maintenance) regulatory strategies. Several of these behaviors were coded using the system developed by Kogan and Carter (1996). These dimensions included resistance (e.g., crying, distress, non-soothability), avoidance (e.g., gaze aversion, twisting away from mother), and contact maintenance/attention seeking (e.g., looking toward mother, play behavior, responsiveness to mother’s interactive bids). The infants’ affective expression was assessed on two scales: infant negative affect and infant positive affect. Finally, the degree to which infants directed attention toward themselves or objects in the immediate environment, versus attention directed toward their mothers, was coded on the self–object engagement scale.

Six scales were used to assess the mothers’ behavior during the Still Face Reengagement episode (Miller, 2000). The dimensions of behavior captured by these scales were level of involvement, sensitivity, intrusiveness, positive affect, resignation/anxiety, and rejection. The sensitivity scale was designed to capture the degree to which mothers displayed sensitive, infant-focused behavior. Initial coding distinguished between maternal sensitivity to infant distress versus sensitivity to infant nondistress. However, for the present analyses these scores were combined to create an average maternal sensitivity score, reflecting mothers’ sensitivity to their infant in both conditions of infant distress and nondistress. The involvement scale was designed to assess mothers’ attempts to engage their infants in playful interaction, whereas the intrusiveness scale assessed mothers’ controlling, overstimulating, or rough handling behavior. The positive affect scale reflected the degree of positive affect displayed by mothers during interaction with their infants, whereas the rejection scale reflected the degree to which mothers rejected their infants’ bids or made negative comments directly to or about their infants. Finally, the resignation/anxiety scale assessed mothers’ apparent tendencies to express negative feelings or anxiety by fidgeting, sighing, retreating from interaction, looking worried, or using a high-pitched tone of voice.

All coders of the parent–infant interaction were trained extensively and supervised by a primary interaction coder (A.M.). Reliability for each interaction segment (e.g., Highchair Play, Reengagement) was established on a subset of at least 20 videotapes between the primary coder and the training coders. Efforts were taken to ensure that the same coder did not code both the mother and infant Reengagement behavior. After establishing initial reliability (i.e., at least 80% exact agreement on 20 segments), continued double coding at regular intervals was conducted to minimize any rater drift. Weighted $\kappa$ coefficients for the mother and infant behavior scales on a subset of 50 segments ranged from .61 to .87.
Maternal representations. A slightly modified version of the WMCI (Zeanah & Benoit, 1995) was administered to assess mothers’ representations. The WMCI is a semistructured interview, typically about 1 hr in length, in which the mother is asked to describe her perceptions of her infant’s personality and development, characteristics of her relationship with her infant, and perceived and anticipated difficulties with her infant’s behavior and development. Adaptations to the Zeanah and Benoit (1995) WMCI interview were made to include questions regarding current family experiences that the mother perceives as particularly stressful or difficult, along with a number of questions regarding the mother’s family of origin experiences. The WMCI questions regarding the experience of pregnancy were not included to reduce the duration of the interview.

The modified WMCI interviews were audiotaped, and verbatim transcripts were obtained from these recordings; all scoring was done from the written transcripts. Transcribers received extensive training and supervision to ensure adequacy of the transcriptions. The coding scheme for the maternal representational interview (modified WMCI) was drawn from the system developed by Zeanah and Benoit (1995). Each narrative was assigned to one of three categories that represented different representational “typologies”: balanced, disengaged, or distorted.

Balanced representations were characterized by emotional warmth and acceptance; sensitive responsiveness to infant needs; coherence; and richly detailed, accessible descriptions. Parents in this category seemed to “know” their infants in an essential way, and provided convincing details and experiences that conveyed their involvement in their relationships and delight in their infants. Although parents in the balanced category may have experienced feelings of challenge or difficulty in parenting their infants, such issues and concerns did not overwhelm their ability to cope, and did not dominate their perceptions of their infants. Characteristic of this group of parents was their ability to access a range of emotions, without the need to minimize or the tendency to be overwhelmed by the experience of feelings regarding their infants and their relationships.

Disengaged representations were characterized by an emotional aloofness and distance from the infant. Parents in this category were likely to describe their infants in a manner that minimized affective involvement, revealing the parents’ tendency to reject their infants’ emotional and dependency needs. Occasionally these mothers idealized the relationship with their infants, but then were often unable to support these idealizations with specific episodic memory accounts. Repressed hostility and anger were frequent, manifested in the form of cool distancing and rejection of the infant. However, “hot” emotional expression was rare for parents whose narratives fell within this category.

Finally, distorted representations were characterized broadly by a distortion imposed on the representation of the infant and/or the relationship with the infant. As described by Zeanah and Benoit (1995), distortion refers to an internal inconsistency in the narrative rather than necessarily reflecting a contradiction with putative “objective” reality. Parents in the distorted category often appeared to be confused or unsure about their relationship with their infants, and anxiously overwhelmed by their infants’ perceived needs and experiences. Some were role reversed in their relationships with their infants, describing their young babies as “buddies” or “confidants,” revealing a tendency to place the emotional burden of the relationship on their infants. Parents in this category were often very incoherent, and provided confused, contradictory, bizarre, or “unresolved” descriptions of their infant and their relationship. Characteristic of these types of narratives was a tendency to heighten rather than minimize affect, and a poorly organized narrative. Unlike their disengaging counterparts, parents in this category tended to express a great deal of “hot” emotional experience, and this affective arousal often interfered with their ability to provide a coherent, organized narrative.

Research assistants were trained extensively in the coding of the WMCI interviews. Training involved extensive and ongoing consultation with Charles Zeanah with regard to the implementation and scoring of the representational typologies. To establish reliability in coding the WMCI typologies, consistent with the guidelines established by prior published research using the WMCI and related measures, each coder was required to establish 80% interrater agreement. The primary WMCI coder (K. R.) established greater than 80% agreement with Charles Zeanah on a subset of 30 interviews from the current study, and coded all 100 transcripts used for the present study. Two additional coders, trained by the primary WMCI coder, achieved at least 80% agreement for the typology scores, average Cohen’s $\kappa = .70$, on a subset of 25 interviews (25% of the entire sample), with additional double coding of interviews conducted on randomly selected subsequent transcripts to minimize rater drift. Differences in classifications and ratings were settled by conferencing, and the consensus classifications were used in data analyses. The use of conferencing to resolve disagreements is a commonly accepted practice among researchers in this field (Benoit et al., 1997).
Prior research has demonstrated the reliability and validity of the WMCI classification categories. For example, Benoit et al. (1997) reported significant stability in mothers’ WMCI classifications from the third trimester of pregnancy to 12 months postpartum (80% observed versus 51% expected by chance alone). WMCI classifications have been found to distinguish infant clinical status (Benoit, Zeanah, Parker, Nicholson, & Coolbear, 1997), and WMCI classifications assigned before birth, as well as WMCI classifications assigned at 11 months, demonstrate significant concordance with infant attachment classification in the Strange Situation at 12 months of age (e.g., 74% concordance versus 54% expected by chance for the prenatal WMCI classifications; Benoit et al., 1997).

Maternal depression. The Center for Epidemiological Studies–Depression Inventory (CES-D; Radloff, 1977) was used to assess mothers’ depressive symptomatology. The CES-D is a 20-item self-report checklist designed to assess current somatic and mood depressive symptomatology. Respondents rated on a 4-point scale how often, during the past week, each statement described them, from “rarely or none of the time” to “most or all of the time.”

RESULTS

Are Maternal Representations Related to Differences in Infant Still Face Response?

Of the 100 transcripts coded, the majority were classified into the balanced typology category ($n = 55$), whereas the remainder were fairly evenly split between the distorted ($n = 23$) and disengaged ($n = 22$) typology categories. Four mother–infant dyads did not complete the Still Face procedure, either because the infant was excessively distressed at the outset of the procedure, or because the mother took the infant out of the highchair during the Still Face task. Failure to complete the Still Face procedure did not appear to be related to maternal representational typology: two of these infants had mothers in the balanced category; one in the disengaged, and one in the distorted category. Thus, subsequent analyses that linked maternal representation with infant Still Face response involved 96 mother–infant pairs.

Initial analyses were conducted to examine whether mothers’ representations were associated with differences in their infants’ behavior across the Still Face procedure. A series of six repeated-measures ANOVAs were conducted to identify group differences in each of the six infant behaviors across the Still Face procedure between infants of mothers in each of the three maternal representation typology categories. The three Still Face episodes were entered as the within-subjects factor, and maternal typology was entered as the between-subjects factor. Analyses were run separately for each of the infant behavior codes.

Episode effects. There was a significant main effect for Still Face procedure episodes for all six of the infant behavior codes, indicating that the three episodes elicited different levels of infant behavior. Table 1 provides the overall group means and standard deviations for each of the behaviors at each episode, along with significant mean contrasts. In general, infants displayed high levels of positive affect and attention seeking during the initial Highchair Play; whereas during the Reengagement infants displayed a mixture of positive affect, attention seeking, negative affect, and resistance. During the Still Face episode, infants displayed higher levels of negative affect and self-soothing strategies (e.g., avoidance and self-object engagement; for a detailed discussion of the main effect of situational contexts on infant behavior and associations among the infant and maternal behavior scales for the entire MFS sample, see Miller, 2000, and Miller, McDonough, Rosenblum, & Sameroff, in press).

Representation effects. The present study’s primary focus was on individual differences in infant trajectory-
ries for infant regulatory behaviors across the Still Face procedure. We predicted that mothers’ representational typologies would interact with infant behavior across the Still Face procedure episodes. Indeed, results of the repeated-measures MANOVAs were that the Typology × Episode interaction was significant for two of the six infant behavior codes: positive and negative affect.

Although there was a significant main effect for positive affect, $F(1, 93) = 72.84, p < .01$, with the highest levels of positive affect occurring during the Highchair Play and Reengagement periods, there was also a significant Episode × Typology Category interaction, $F(2, 93) = 2.79, p = .05$ (see Figure 1). A series of post hoc one-way ANOVAs were conducted separately for Positive Affect during Each Episode of the Still Face Procedure and Maternal Typology categories. During the initial Highchair Play episode, infants of mothers in all three categories demonstrated similar levels of positive affect, $F(2, 95) = 0.29, ns$. Similarly, during the middle Still Face episode, there were no group differences, $F(2, 95) = 2.93, ns$. However, during the Reengagement episode, there were significant group differences in infant positive affect, $F(2, 93) = 7.25, p < .01$; infants of mothers in the balanced category demonstrated significantly more positive affect than did infants of mothers in the disengaged or distorted categories. The standardized effect size for balanced versus nonbalanced maternal representations during Reengagement was defined as the mean level difference between the balanced group and the average of the disengaged and distorted groups, divided by the standard deviation of the within-group error. During the Reengagement, the standardized effect size for a balanced representation was large, $d = .78$ (Cohen, 1988).

Similarly, although there was a significant main effect for negative affect across the Still Face procedure, $F(2, 92) = 23.23, p < .01$, with the highest levels of infant negative affect observed during the Still Face and the Reengagement episodes, there was also a significant Episode × Typology Category interaction, $F(4, 184) = 2.34, p < .05$ (see Figure 2). Again, as a post hoc analysis, a series of one-way ANOVAs were conducted separately for Negative Affect during Each Segment of the Still Face Procedure and the Typology Categories. During the initial Highchair Play episode, infants of mothers with disengaged narratives demonstrated more negative affect than did infants of balanced mothers, $F(2, 95) = 7.55, p < .01$. The standardized effect size for disengaged maternal representations during the Highchair Play episode was defined as the mean level difference between the disengaged group and the average of the balanced and distorted groups, divided by the standard deviation of the within-group error. During the Highchair Play, the standardized effect size for a disengaged representation was large, $d = .82$ (Cohen, 1988). There were no significant group differences in infant displays of negative affect during the second and third episodes of the Still Face procedure.

Next considered was the possibility that infants of mothers in the different categories may have been differentially distressed by the Still Face procedure, corresponding to differences in infant behavior during Reengagement. To examine whether infants’ efforts at regulating distress were associated with mothers’ representations, independent of the level of distress aroused in the infants by the Still Face procedure itself, another MANOVA was conducted. In this analysis, the six infant behavior codes during the Reengagement episode were entered as dependent variables.

Figure 1  Infant positive affect across the Still Face procedure.  
Figure 2  Infant negative affect across the Still Face procedure.
To highlight each infant’s attempts at regulation, the amount of distress (i.e., the negative affect score) expressed by each infant in the prior Still Face episode was entered as an initial covariate. Thus, any observed association would not be due to differences in the infants’ experience of distress but rather reflective of differences between groups of infants in their use of distress regulation strategies. The Typology × Infant negative affect interaction was nonsignificant, and was consequently excluded from the model. The MANOVA yielded a significant overall effect for maternal typology category, $F(12, 170) = 1.86, p < .05$ (see Table 2). There were significant typology differences for two of the six dependent measures: positive affect, $F(2, 90) = 4.86, p < .01$, and attention seeking/contact maintenance, $F(2, 90) = 3.35, p < .05$. Pairwise comparisons on these two measures revealed that infants of mothers with balanced representations demonstrated more positive affect than did infants of mothers with disengaged or distorted representations, and infants of mothers with disengaged representations demonstrated less attention seeking/contact maintenance than did infants of mothers with balanced representations.

Does Maternal Parenting Behavior Mediate the Association between Mother’s Representations and Infant Emotion Regulation?

To assess whether maternal behavior during Reengagement mediated the association between typology and infant behavior during the same episode, we first determined whether mothers’ representations were related to maternal behavior during the Reengagement episode (the proposed mediator), as well as whether maternal behavior was related to infant behavior during Reengagement (Baron & Kenny, 1986). As with the previously reported analyses, the interest was in the association between maternal representation and infant emotion regulation; thus, to control for differences that might be due to differing levels of prior infant distress, all analyses were conducted using infant negative affect during the Still Face as a statistical control.

To examine whether mothers’ representations were related to her behavior during the Reengagement episode, controlling for infant distress during the prior episode, a MANOVA was conducted using the six maternal behavior scales as the dependent variables and maternal WMCI typology classification as the independent variable. The Typology × Infant prior negative affect interaction was nonsignificant, and was consequently excluded from the model. The omnibus test for overall group differences was significant, $F(12, 170) = 2.07, p < .05$. Means and standard deviations for each of the Maternal Behaviors WMCI Typology are reported in Table 2, with significant post hoc comparisons for the groups reported in the far right column. Significant maternal typology group differences emerged on two of the dependent measures: maternal positive affect, $F(2, 90) = 5.57, p < .01$, and rejection, $F(2, 90) = 4.68, p < .05$. Post hoc comparisons for these two variables indicated that

### Table 2 Infant and Mother Behavior during the Still Face Reengagement by Maternal Representation Typology

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<tr>
<th>Infant behavior</th>
<th>Disengaged (DG)</th>
<th>Balanced (B)</th>
<th>Distorted (DT)</th>
<th>$F(2, 90)$</th>
<th>Post Hoc Comparisons</th>
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<tbody>
<tr>
<td>Positive affect</td>
<td>.96 (.17)</td>
<td>1.54 (.11)</td>
<td>1.21 (.17)</td>
<td>4.86*</td>
<td>B &gt; DG,* DT*</td>
</tr>
<tr>
<td>Negative affect</td>
<td>1.94 (.18)</td>
<td>1.51 (.12)</td>
<td>1.59 (.18)</td>
<td>2.10</td>
<td>ns</td>
</tr>
<tr>
<td>Avoidance</td>
<td>1.93 (.14)</td>
<td>1.74 (.09)</td>
<td>1.53 (.14)</td>
<td>2.18</td>
<td>ns</td>
</tr>
<tr>
<td>Resistance</td>
<td>1.97 (.17)</td>
<td>1.74 (.11)</td>
<td>1.66 (.17)</td>
<td>.97</td>
<td>ns</td>
</tr>
<tr>
<td>Attention seeking/contact maintenance</td>
<td>1.30 (.17)</td>
<td>1.82 (.11)</td>
<td>1.57 (.17)</td>
<td>3.35</td>
<td>B &gt; DG*</td>
</tr>
<tr>
<td>Self-/object engagement</td>
<td>1.50 (.17)</td>
<td>1.35 (.11)</td>
<td>1.13 (.16)</td>
<td>1.34</td>
<td>ns</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Maternal behavior</th>
<th>Disengaged (DG)</th>
<th>Balanced (B)</th>
<th>Distorted (DT)</th>
<th>$F(2, 90)$</th>
<th>Post Hoc Comparisons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Involvement</td>
<td>2.48 (.12)</td>
<td>2.57 (.08)</td>
<td>2.36 (.12)</td>
<td>1.39</td>
<td>ns</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>1.91 (.16)</td>
<td>1.92 (.10)</td>
<td>1.78 (.16)</td>
<td>1.19</td>
<td>ns</td>
</tr>
<tr>
<td>Intrusiveness</td>
<td>1.57 (.16)</td>
<td>1.68 (.10)</td>
<td>1.77 (.16)</td>
<td>.38</td>
<td>ns</td>
</tr>
<tr>
<td>Positive affect</td>
<td>1.33 (.16)</td>
<td>2.02 (.10)</td>
<td>1.68 (.16)</td>
<td>5.57*</td>
<td>B &gt; DG*</td>
</tr>
<tr>
<td>Resignation/anxiety</td>
<td>.76 (.16)</td>
<td>.32 (.10)</td>
<td>.73 (.16)</td>
<td>2.81</td>
<td>ns</td>
</tr>
<tr>
<td>Rejection</td>
<td>.19 (.16)</td>
<td>.34 (.10)</td>
<td>.82 (.15)</td>
<td>2.51*</td>
<td>DT &gt; DG,* B*</td>
</tr>
</tbody>
</table>

Note: All analyses were conducted controlling for infant negative affect during the Still Face episode prior to Reengagement; reported mean values are adjusted for this control variable.

* $p < .05$. 
mothers with balanced representations demonstrated more positive affect than did mothers in the disengaged group, and mothers in the distorted group demonstrated more rejecting behavior than did mothers in the disengaged or balanced groups.

To examine whether maternal behavior was associated with infant behavior during the Reengagement, a series of correlational analyses were conducted, using partial correlations to control for infant negative affect during the prior Still Face episode (see Table 3). Overall, maternal positive affect, resignation/anxiety, and involvement were associated with multiple aspects of infant behavior during the Reengagement episode. The infant self- and object-engagement behavior scores were unique in that they were unrelated to any of the concurrent maternal behaviors. Similarly, the maternal sensitivity, intrusiveness, and rejection scores were unrelated to most of the infant behavior codes.

Results from these analyses indicated that only maternal positive affect satisfied the Baron and Kenny (1986) criteria for testing for mediation (i.e., related to both maternal representation and infant behavior during Reengagement). Infant positive affect during Reengagement was entered as the dependent variable because it was related to both maternal representation and the proposed mediator.

A hierarchical multiple regression analysis was conducted, using dummy variables to contrast distorted and disengaged representations with balanced representations to predict infant positive affect during Reengagement (i.e., the balanced category was the omitted comparison category). Infant negative affect during the prior Still Face episode was entered in the first step as a control, the dummy coded distorted and disengaged variables were entered in the second step, and maternal positive affect during the Reengagement episode was entered in the third step. Table 4 presents the standardized and unstandardized β coefficients, R^2, and ΔR^2 for this hierarchical regression analysis. In the last step of the model, the previously significant association between the maternal typology variables and infant positive affect was reduced to nonsignificance when maternal behavior during the Reengagement was entered, thus indicating that the association between maternal representation and infant positive emotion during Reengagement was mediated by maternal positive affect.

Table 3 Partial Correlations between Maternal and Infant Behavior during the Still Face Reengagement Episode

<table>
<thead>
<tr>
<th>Maternal Behavior</th>
<th>Infant Behavior</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive Affect</td>
<td>Negative Affect</td>
<td>Avoidance</td>
<td>Resistance</td>
<td>Attention Seeking</td>
<td>Self-/Object Engagement</td>
</tr>
<tr>
<td>Involvement</td>
<td>.42**</td>
<td>-.28**</td>
<td>-.12</td>
<td>-.07</td>
<td>.21*</td>
<td>-.07</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>.14</td>
<td>-.05</td>
<td>-.17</td>
<td>-.19</td>
<td>.20*</td>
<td>-.02</td>
</tr>
<tr>
<td>Intrusiveness</td>
<td>.02</td>
<td>-.09</td>
<td>.23*</td>
<td>.13</td>
<td>-.07</td>
<td>.13</td>
</tr>
<tr>
<td>Positive affect</td>
<td>.46**</td>
<td>-.44**</td>
<td>-.30**</td>
<td>-.32**</td>
<td>.44**</td>
<td>.04</td>
</tr>
<tr>
<td>Resignation/anxiety</td>
<td>-.34**</td>
<td>.44**</td>
<td>.25**</td>
<td>.42**</td>
<td>-.47**</td>
<td>-.10</td>
</tr>
<tr>
<td>Rejection</td>
<td>-.12</td>
<td>-.03</td>
<td>.12</td>
<td>-.06</td>
<td>-.11</td>
<td>.18</td>
</tr>
</tbody>
</table>

Note: N = 96. All correlations include infant negative affect during the prior Still Face episode as covariate. *p < .05; **p < .01.

Does Maternal Depression Explain the Association between Mothers’ Representations and Infant Emotion Regulation?

As noted previously, much prior research on infant Still Face response has focused on the role of maternal depression. Thus, the possibility that the mother’s depression may also mediate the association between her representation and infant behavior was examined. Mothers’ scores on the CES-D ranged from 0 to 45 (M = 11.91, SD = 8.67); 23% of the sample (n = 23) scored above the commonly employed clinical screening cutoff of 16.

A one-way ANOVA yielded significant group differences in depressive symptomatology between the three WMCI typology categories, F(2, 96) = 4.08, p < .05. Mothers in the distorted category (M = 16.2, SD = 10.9) reported significantly higher levels of depressive symptomatology than did mothers in the balanced category (M = 10.2, SD = 7.4), whereas mothers in the disengaged category (M = 11.7, SD = 7.8) did not differ significantly from mothers in either the balanced or the distorted category.

Partial correlations between maternal CES-D scores and infant behavior during Reengagement, controlling for infant negative affect during the Still Face, yielded no significant associations. Zero-order corre-
lations (i.e., not controlling for infant distress during the Still Face) were consistent with this finding, yielding no significant associations between maternal depressive symptomatology and infant Reengagement behavior. There were also no significant associations between CES-D scores and maternal behavior during the Reengagement episode. Finally examined was whether differences would emerge when the mothers' CES-D scores were dichotomized, creating a "nondepressed group" with scores below the clinical screening cutoff of 16, and a "depressed" group, with scores greater than or equal to 16. No differences emerged between the depressed versus the nondepressed groups for any of the infant reengagement behaviors. Of the six maternal behavior codes, only maternal involvement yielded significant differences between the two groups, with depressed mothers (M = 2.27, SD = .55) demonstrating significantly less involvement than their nondepressed (M = 2.58, SD = .55) counterparts, F(1, 93) = 5.11, p = .03.

Because the bivariate associations between maternal depressive symptomatology and infant behavior were nonsignificant, the hierarchical regression model to examine the possible mediating role of maternal depression was not conducted. However, for the disengaged group, the β coefficient in the second step remained significantly different from the balanced (omitted) category, standardized β = -.27, p < .01, and was again mediated by maternal positive affect in the third step of the model, standardized β = -.15, ns. Thus, even when controlling for maternal depression, the association between the disengaged typology and infant positive affect was mediated by maternal positive affect.

**DISCUSSION**

The present investigation was aimed toward elucidating the links between mothers’ representations of their infant and infant emotion regulation. Results provide support for most of our hypotheses. Mothers’ representations of their infant were associated with individual differences in the infants’ display of both positive and negative emotion across the Still Face procedure, and with the infants’ use of positive emotion and other-directed regulatory behaviors to regulate distress during the Reengagement. Furthermore, maternal affective displays appeared to mediate the association between mothers’ representations and their infants’ successful distress regulation. Prior research has established associations between parents’ emotional dysregulation (e.g., depression) and infant responses to the Still Face (Field, 1994; Tronick & Weinberg, 1997). In the present study, however, although maternal representations and depressive symptomatology were related, there was no association between mothers’ depressive symptomatology and their infants’ behavior during the Reengagement.

<table>
<thead>
<tr>
<th>Table 4 Summary of Hierarchical Regression Analysis for Variables Predicting Infant Positive Affect During Reengagement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
</tr>
<tr>
<td>B</td>
</tr>
<tr>
<td>Infant negative affect during still face episode</td>
</tr>
<tr>
<td>Distorted</td>
</tr>
<tr>
<td>Disengaged</td>
</tr>
<tr>
<td>Maternal positive affect</td>
</tr>
<tr>
<td>R²</td>
</tr>
<tr>
<td>ΔR²</td>
</tr>
</tbody>
</table>

*Note: N = 96. *p < .05; **p < .01.
representations did explain unique variance in their infants’ Still Face response. Thus, the present study was the first to establish a contemporaneous association between maternal representations of their infants and infants’ behavior during the Still Face, indicating that individual differences in infants’ emotion regulation strategies may vary as a function of mothers’ representations of their infants.

The Association of Maternal Representations and Infant Still Face Behavior

The present study’s findings highlight the association between mothers’ representations of their infants and differences in their infants’ emotion regulation style, and emphasize the importance of identifying individual differences in infant Still Face response. Many of the studies that have employed the Still Face procedure methodology have focused on the identification of age-related changes or presumed normative patterns of response to the Still Face itself (e.g., Mayes & Carter, 1990; Tronick, 1989; Weinberg and Tronick, 1996). Weinberg and Tronick (1996), for example, describe unique trajectories for infant positive and negative affect across the Still Face procedure. Using a sample of 6-month-old infants, they identified both a Still Face effect (high negative and low positive affect during the Still Face) as well as a mixed pattern of infant affect at Reengagement, specifically, high positive affect (a “rebound effect”) and high negative affect (a “carryover effect”). The authors speculate about the importance of positive affect in helping to downregulate infant distress during the Reengagement period.

In the present study, a similar overall pattern of high–low–high positive affect emerged; however, the pattern differed for the infants of mothers with balanced versus nonbalanced representations. The pattern observed by Weinberg and Tronick (1996) in their low-risk, middle-class sample appeared to most closely approximate the pattern presently observed among the infants of mothers with balanced representations. Mothers with disengaged or distorted representations, however, had infants who demonstrated less positive affect both during the Still Face (a heightening of the still face effect) and during the Reengagement episode (a heightening of the carryover effect and diminishment of the rebound effect). Importantly, the three groups did not differ in their display of positive affect during the initial Highchair Play segment, emphasizing the dynamic regulatory nature of these emotion displays in response to stress-inducing events (e.g., maternal nonresponsiveness during the Still Face).

Interestingly, although there was a significant Typology × Episode interaction obtained for infant negative emotion across the Still Face, the effect was driven primarily by group differences in negative affect prior to the Still Face episode. Specifically, infants of mothers in the disengaged category expressed more negative emotion during the Highchair Play than did infants of mothers in the balanced category. Thus it appears that the associations between maternal typology and infant Still Face Reengagement behavior were most clearly evident for infant positive emotion expression. However, the finding that infants of mothers with disengaged representations demonstrated heightened negative affectivity during face-to-face play prior to the still face, coupled with a diminished Still Face effect (i.e., their negative affect was fairly stable across the procedure and did not demonstrate the predicted rise in response to maternal availability) raises a number of important questions. Research on the hormonal stress–reactivity system has suggested that blunted responses to stress-inducing stimuli (e.g., lack of an elevated cortisol response) may be the result of chronic overactivation of this system (Heim, Ehlert, & Hellhammer, 2000). It is possible that infants in this category experience this type of chronic stress activation.

These results highlight the dynamic regulatory nature of both infants’ positive and negative emotion displays in response to changing levels of stress, and also reveal unique and differentiated trajectories for infants’ positive versus negative emotion expression across the Still Face procedure as a function of maternal representation. Given Weinberg and Tronick’s (1996) suggestion that infants may use positive affect to downregulate feelings of distress induced by the Still Face, the present results, particularly for positive affect, have important implications for understanding individual differences in the dyad’s capacity to effectively regulate distress. Indeed, both the infants of parents with nonbalanced representations, as well as the parents themselves, appear to demonstrate a reduced capacity to effectively engage in the process of reparative interaction following this temporary disruption. This is likely to have important implications for the infants’ subsequent development of effective self-regulation strategies.

In addition to the findings regarding infant positive and negative affect across the Still Face procedure, maternal representations were associated with infant behavior during the Reengagement, even when controlling for infant distress during the prior episode. These differences were most apparent in two primary domains: infant positive affect and other-directed attention seeking/contact maintenance, and
were strongest for the balanced versus disengaged distinction. Specifically, infants of mothers with balanced representations demonstrated more positive affect and more attention seeking/contact maintenance than did infants of mothers with disengaged or distorted representations.

The infants of disengaged mothers lesser use of interpersonally oriented regulation strategies, such as attention seeking/contact maintenance, may have parallels in the avoidant infants' responses to the Strange Situation. Avoidant infants tend to exhibit less contact maintenance behavior during the reunion phase of the Strange Situation, and tend to have mothers in the disengaged WMCI category (Benoit et al., 1997; Zeanah, Benoit, Hirshberg, Barton, & Regan, 1994). Thus, the present finding for the infants of disengaged mothers may be an early emotion regulation marker of the development of an avoidant attachment style.

Furthermore, the association between nonbalanced maternal representations and lower levels of infant display of positive affect during the Still Face Reengagement is particularly notable given that prior research has emphasized the important role of infant positive affect in predicting subsequent attachment security (Cohn et al., 1991; Malatesta et al., 1989). Although much attention has been directed toward infant regulation of negative affect during the Still Face procedure (e.g., Tronick, 1989), it is increasingly apparent that the infant’s ability to use positive affect in the service of interactive reparation may hold significant consequences for effective regulation and attachment security (Cohn et al., 1991; Weinberg & Tronick, 1996). Given the contemporaneous association between maternal representations and infant display of positive affect during the Still Face procedure, these findings further underscore the importance of infant positive affect during the first year of life.

Maternal Representations and Parenting Behavior during the Still Face Procedure

Research has confirmed that the imposition of maternal unavailability during the Still Face procedure is a reliable method for eliciting distress among young infants (Field et al., 1986). However, there are limited data regarding the nature of the experience for the parents, who must consciously “impose” the unavailability by holding a still, unresponsive face, and are prohibited from responding to the infant. Mayes and colleagues (1991), in one of the only studies focused on the mothers’ experience of participating in the Still Face procedure, found that over half of the mothers in their sample reported experiencing at least some discomfort or anxiety while holding a still face and behaved differently upon resuming normal interaction with the infant following the Still Face. These mothers were more likely to take their infants out of the seat and hold them physically close, or to mark their return to normal interactions with soothing comments or statements remarking on their own feelings. Thus, it appears that the Still Face task pulls for emotional responses in mothers as well as in infants.

Differences in mothers’ internal working models of their infant may have been linked to differences in their own emotion regulation strategies during the Still Face procedure. For example, mothers with nonbalanced mental representations may have been less able to tolerate feelings of distress, and their increased distress may have diminished their capacity to respond empathically to their infant. Conversely, balanced mothers may have felt guilty or anxious about having been nonresponsive to their infant during the Still Face episode, yet may have viewed the resumption of normal interaction as an opportunity to “repair” the quality of the interaction. Their ability to respond to the infant with positive emotionality during the Reengagement may have reflected their own ability to successfully modulate the anxiety provoked by the procedure and their infant’s heightened distress. The anxiety aroused for the mothers in the nonbalanced categories may have been more difficult for them to successfully modulate, and consequently, the mothers may have been less able to use positive emotion to “repair” the interaction and resume previous levels of positive interaction with the infant. Taken together, the present results confirm that the Still Face procedure may be a fruitful approach for studying individual differences in maternal as well as infant emotion regulation.

Not surprisingly, maternal behavior assessed concurrently (i.e., during the Still Face Reengagement episode) was strongly correlated with infant behavior during the Still Face Reengagement episode. Although this raises questions with regard to the direction of effects, it is important to note that these analyses were all conducted controlling for the level of infant distress during the prior episode, and therefore cannot be seen as simply reflecting different degrees of infant distress affecting mothers’ emotional responses. During the Reengagement episode there was a particularly strong degree of correspondence between mothers’ expression of different affective states and infants’ behavioral responses. For example, mothers who demonstrated more positive affect had infants who demonstrated more positive affect, less negative affect, less avoidance, less resistance, and more attention seek-
What Mediates the Association between Maternal Representation and Infant Emotion Regulation?

Although a great deal of research has established links between parental representations of early attachment relationships (i.e., AAI classifications) and infant attachment at 12 months, there has remained a “transmission gap” (van IJzendoorn & Bakermans-Kranenburg, 1997); in other words, relatively few data directly assess what specific processes mediate or account for these associations. There is a similar “transmission gap” for the association between mothers’ representations of their infants and their infants’ attachment security; no studies have directly explored the processes that may account for these associations. The present study provided support for the hypothesis that some aspects of maternal behavior mediate the association between maternal representations of their infants and individual differences in 7-month-old infants’ emotion regulation strategies.

Mothers’ affective tone—in particular, positive affect during the Reengagement—fully mediated the association between mothers’ representations of their infants and their infants’ positive emotion expression. It is important to emphasize again that these analyses were conducted controlling for the amount of prior distress displayed by the infant, and therefore differences in mothers’ responses were not solely a reflection of variance in infant distress levels. Thus the Still Face task pulls for differences primarily in the domain of maternal affective behavior, and it is mother affective responses to this stress-inducing task that most clearly explain differences in infant affective responses. Furthermore, given the present study’s findings, it appears possible that maternal representations shape the quality of the mothers’ affective responses to the Still Face task, and consequently these differences in maternal affective response may explain the association between mothers’ representations and infant positive emotion expression.

Maternal Representations, Depression, and Infant Emotion Regulation

Although there was some overlap between maternal representation and depressive symptomatology scores, these measures were not redundant. Mothers in the distorted category were more likely to have higher rates of self-reported depressive symptomatology than were mothers in the balanced category, with mean scores for the distorted group in the clinical range of the CES-D (i.e., scores higher than 16).

The present findings are consistent with the work of Pianta, Egeland, and Adam (1996), who found that mothers in the AAI preoccupied category (which, like the WMCI distorted category, is often characterized by heightened affect and low levels of cognitive organization) self-report the highest levels of psychiatric symptomatology. Individuals with distorted representations were experiencing a level of marked symptomatology, and were willing to disclose their distress. In contrast, it is possible that mothers with disengaged representations may have underreported their emotional distress. Indeed, in the present study, although rates of depressive symptomatology among mothers in the disengaged category were not significantly higher than those in the balanced category, the association between representation and low infant positive affect during reengagement was strongest for the disengaged versus balanced typology distinction. There is some prior evidence that mothers who report low levels of depressive symptomatology may also have infants at risk for emotion dysregulation (e.g., Pickens & Field, 1993).

In the present study, 23% of the sample scored above the CES-D clinical screening cutoff of 16. However, it is important to note that the CES-D is not a clinical diagnostic instrument; rather, the cutoff is for screening purposes, and is therefore likely to include a number of false positives. The CES-D also includes a number of items about somatic complaints typically associated with depression that may also be regarded as normative responses to parenting a young infant (e.g., sleep disturbance); this may have led to elevated rates of depressive symptomatology among the sample participants. A recent meta-analysis of studies on postpartum depression estimated that between 16% to 20% of women score above the CES-D screening criteria of 16 during the first year of their infants’ life, which is slightly higher than the rates obtained for other postpartum depression screening inventories (O’Hara & Swain, 1996). In light of these findings, the observation in the present study that slightly over 20% of the women in the sample reported elevated depressed mood is not surprising.

Although the association between nonbalanced representations and low levels of positive affect during the Reengagement episode is similar to some of the prior research findings on maternal depression and infant emotion regulation, in the present study, maternal depression scores were unrelated to infant behavior during the Still Face Reengagement. This
failure to obtain an association between maternal depression and infant Still Face Reengagement response was surprising, particularly given that others have clearly demonstrated such an effect (e.g., Field, 1995; Tronick, 1989). It is possible that the age of the infants contributed to the failure to obtain an association between maternal depressive symptoms and infant behavior; much of the research on infant Still Face response has been conducted with infants 6 months of age and younger (e.g., Field et al., 1990; Toda & Fogel, 1993). However, given that infants in the present study were 7-months-old, one might expect to find stronger associations between maternal depressive symptomatology and infant Still Face response. It is also possible that the global approach used to code the infants Still Face behavior occluded some of the subtle differences between maternal depression and infant emotion regulation. Many of the commonly employed infant emotion regulation coding systems rely on more microanalytic approaches to coding infant behavior (e.g., Field et al., 1990; Pickens & Field, 1993; Toda & Fogel, 1993). It is important to note that many of the effect sizes reported in studies of maternal depression tend to be in the small to medium range.

Finally, controlling for maternal depressive symptomatology did not diminish the association between the disengaged typology and infant positive affect, suggesting that both maternal depression and maternal representations may play a unique role in infant emotional development.

Limitations and Future Directions

There are several limitations of the present study. Most important, the present data are cross-sectional and correlational in nature, thus precluding definitive conclusions with regard to causation. Longitudinal data, in particular research that links prenatal assessments of parents’ representations with subsequent assessments of parenting and infant emotion regulation, would allow for more inferences with regard to possible causation.

Although the mediational pathways identified in the present investigation provide some insight into the “transmission gap,” very few of the maternal behavior variables met criteria for inclusion in these models. The use of structural equation models would allow for the inclusion of more of the individual maternal behavior variables as indicators of latent variables, and would allow for the simultaneous testing of multiple pathways. There is clearly a need for research with larger sample sizes that would allow for the use of structural equation modeling approaches to test these hypothesized pathways.

Future research on this topic may benefit from inclusion of physiological measures of infant and parent emotion regulation. The present findings raise questions with regard to underlying brain mechanisms that may be involved in the individual differences in infant positive emotion expression during the Still Face task. There is rapidly accumulating evidence for underlying brain mechanisms that may be reflected in individual differences in infant emotion expression as a function of maternal depression (e.g., Dawson et al., 1999; Field, Fox, Pickens, & Nawrocki, 1995).

Nonetheless, the present study raises a number of important issues, highlights individual differences in infant emotion regulation across the Still Face, and emphasizes the important role that may be played by parents’ representations in shaping the dyads ability to effectively engage in the process of interactive repair. Given the convergence of recent literature that has established associations between infant Still Face response and subsequent attachment security, the present study’s findings help to further illuminate the process by which internal working models and emotion regulation strategies may be transmitted across generations.

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