EXAMINING THE REGULATION OF NEGATIVE AFFECT WITHIN A MULTI-DIMENSONAL FRAMEWORK IN SIX MONTH OLD INFANTS

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ABSTRACT

KELLY A. SUTTON: Examining the regulation of negative affect within a multi-dimensional framework of negative affect in six month old infants
(Under the direction of Martha J. Cox, Ph.D. and Jean-Louis Gariépy, Ph.D.)

The measures of multiple dimensions of expressed negative affect and putative behavioral strategies of regulation in the current study afforded the opportunity to examine early regulation of negative affect within a multi-dimensional framework of emotion. The purpose of the current study was to first describe the dynamic, multi-dimensional nature of expressed negative affect and the use of behavioral strategies of regulation. The study then investigated the relationships between the various dimensions of negative affect and behavioral strategies of regulation, as well as the influence of temperament and the care-giving context on early emotion regulation

Participants of the study included 129 six-month-old infants from the Durham Child and Health Study. As part of this study, infants' expressions of negative affect and their use of behavioral strategies of regulation were observed during the still-face procedure. Measures of temperament were obtained via mother report on the Infant Behavior Questionnaire, while measures of maternal sensitivity were obtained during observations of a free play session. Maternal ethnicity and level of education were obtained through questionnaires.

While the results demonstrated that there was considerable variability in the expression of negative affect across the multiple dimensions, there was only a modest indication that a multi-dimensional framework was important. There was some degree of evidence that the dimensions may combine to form stylistic response to challenging situations, which may, in

turn, influence an infants regulatory efforts. The use of three behavioral strategies (object play, reaching, and venting) differentiated between identified stylistic responses to the still-face. Results from the study also suggest that maternal ethnicity and maternal education were important predictors for expressed negative affect, but not for the use of behavioral strategies of regulation. Generally, infants with African-American mothers displayed less intense negative affect, for shorter durations, and with less lability. Furthermore, infants whose mothers reported lower levels of education expressed negative affect for longer durations with a shorter speed of onset than infants whose mothers reported higher levels of education. Importantly, these predictors were differentially related to the four separate dimension of negative affect, which provides limited support of a multi-dimensional conceptualization of negative affect and emotion regulation.

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INTRODUCTION

Developmental psychologists have long been interested in aspects of emotion regulation such as children's ability to control their excitement (Redl & Wiseman, 1951), delay gratification (Mischel & Baker, 1975), tolerate frustration, and control their impulses (Kopp, 1982). However, only in the past two decades has the concept of emotion regulation moved to the forefront of psychological research. Emotion regulation is the process by which emotional experiences are attuned to the ebb and flow of life's ongoing demands (Cole, Michel, & Teti, 1994). Emotion regulation is not control, but an adjustment of emotional experiences to assist in achieving situational goals. Regulation of emotional states "helps to subdue (or accentuate) the intensity of an experienced emotion, retard (or accelerate) its speed of onset and recovery, limit (or enhance) its persistence over time, reduce (or increase) emotional range or lability, and affect other qualitative features of emotional responding" (Thompson, 1994).

It has been widely demonstrated that the ability to regulate emotions develops within the first three years of life and is critical throughout the life span in organizing behaviors, social relationships, and adaptive functioning (Dodge & Coie, 1987; Fabes & Eisenberg, 1992; Cicchetti, Ganiban, & Barnett, 1991; Sroufe, 1996). For example, failure to acquire adaptive emotion regulation has been linked to a variety of problematic developmental outcomes including poor peer relationships (Dodge & Coie; Fabes & Eisenberg), lower self-esteem (Zahn-Walker, Cole, & Barrett, 1991), low social competence (Dodge, Pettit,

McClaskey, & Brown, 1986), and increased vulnerability to psychopathology (Rutter, 1991; Cicchetti, et al.). Unregulated child negative affect, in particular, has been found to be associated with negative outcomes during the preschool period (NICHD Early Child Care Research Network, 2004).

With the potential for negative outcomes, the recent increased interest in emotion regulation is warranted. However, the study of emotion regulation is complex, especially during the first year of life. During the first year, emotion regulation is largely a dyadic process with the caregiver assisting the infant with regulation efforts. Within the dyad, both child factors and caregiver factors are important for early emotion regulation. Major theories of development agree that factors internal to the infant, such as temperament, and factors related to the care-giving context, such as sensitivity, ethnicity, and socio-economic status (SES), would be important for early emotion regulation capacities. Family systems theory (Cox & Paley, 1997; Sameroff, 1994) argues that development occurs within the context of mutual influences between family relationships. Systems theory illustrates the importance of continuous interaction between levels and elements of the system over time. Relationships form between elements of the system and function in an interdependent manner. The interdependent context of the family system necessitates that developmental issues be examined within the context of relational experiences. Likewise, Sameroff's transactional model of development argues that developmental outcomes are neither a function of the individual alone nor a function of the experiential context alone. Rather, outcomes are a product of the dynamic interactions of infants and their caregivers, as well as their individual characteristics. Both theories support the notion that to better understand the early regulation of negative affect, factors relating to both the child and the caregiver should be examined.

Given that the study of emotion regulation is relatively new, the amount of research and knowledge already gained is quite remarkable. However, three notable weaknesses exist in our understanding of negative affect and emotion regulation. First, scant research exists that focuses on emotion regulation during the first year of life. In order to better understand the developmental trajectory of emotion regulation, we must first determine how early in ontogeny infants begin to regulate negative emotions, what early strategies are used, and how factors internal and external to the infant influence regulation. Only then can we move on to understanding how regulation of negative affect evolves over time. Second, little attention has been given to the multi-dimensional nature of expressed negative affect in relation to emotion regulation. As Thompson (1994) pointed out, the regulation of emotion may be achieved by effecting adjustments in one or more dimensions of emotion: intensity, duration, speed of onset, and lability. Furthermore, it is likely that these dimensions combine in ways that represent stylistic patterns of emotional responding. Early infancy has been identified as an important time period for the emergence of characteristic styles of affective responding (Calkins, 1994; Tronick, 1989). It is likely that infants with different patterns of emotional responding, such as those who respond rapidly and intensely versus those who respond slowly and mildly to the same situations, will approach regulation with different strategies. An examination of styles of regulation based on patterns of expressed negative affect would add significantly to the current body of knowledge regarding the regulation of negative affect. Third, little is known about how temperament and the care-giving context are related to early patterns of negative affect and behavioral responding. Although it is currently understood that the quality and organization of the infant-caregiver interactions early in life are vitally important for emotion regulation, little descriptive research is available to

document this influence (Sroufe, 1996; Cicchetti, et al., 1991; Kopp, 1989; Thompson, 1994; Calkins, Smith, Gill, & Johnson, 1998).

Accordingly, the study outlined here was designed to examine emotion regulation behaviors at 6 months of age in the context of a situation that was constructed to elicit negative affect in infants. This examination is accomplished by 1) characterizing negative affectivity in 6-month old infants within a multi-dimensional framework of emotions as observed in the still-face procedure, 2) characterizing infants' behavioral capacities to regulate negative affect during the still-face procedure and their relationship with expressions of negative affect at six months of age, and 3) characterizing how some factors internal (temperament) and factors external (care-giving context) to the child may influence infant negativity affectivity and behavioral strategy use as observed in the still-face procedure at 6 months of age.

Emotion Regulation and Negative Affect

Over the years, developmentalists have investigated the role emotion plays in many developmental phenomena. Indeed, it has been established that emotions play an important role in development allowing children to accomplish a variety of developmental goals that include individual well-being and the maintenance of supportive social relationships (Tronick, 1989; Shipman & Zeman, 2001; Thompson, 1994). These investigations, however, have predominantly focused on the role of positive emotions. Kopp (1989) suggested that infant negativity has not received due attention because of a prevailing interest in normative development.

Negative affect, however, is an unavoidable experience for the young infant (Kopp, 1989). Furthermore, functionalists have suggested that the expression of negative affect can

be adaptive and serves two basic functions (Campos, Mumme, Kermoian, & Campos, 1994). First, expressions of negative affect may serve to communicate needs and instill change in the behavior of others to meet the infant's needs. Second, the experience of negative affect motivates infants to learn adaptive means to regulate their affective state and enhance their own well-being (Kopp, 1989). The task of young infants is to learn to regulate negative affect in order to adapt to the many contextual demands to which they are exposed. In early infancy, this is best achieved through the maintenance or re-establishment of internal arousal within manageable levels such that optimal functioning is possible (Kopp, 1992).

Although there is a distinction between expressed emotion and the internal experience of emotion, the current study is focusing on expressed emotion. In infancy, expressions of negative affect and their experience are believed to be highly related and to closely reflect the infant's current feeling state (Izard & Malatesta, 1987).

The multiple dimensions of negative affect. Researchers have identified both temporal and intensive differences in the expression of negative affect (Derryberry & Rothbart, 1988; Thompson, 1994). More specifically, individual emotional displays have been found to vary in intensity, duration, speed of onset, and lability (Thompson, Flood, & Lundquist, 1995). For example, speed of onset implies that some bouts of crying begin immediately, while others may take longer to begin. Similarly, a measure of intensity may reveal that crying may be uncontrollable, mild, or consist of intermittent fussing. Attention to these dimensions should reveal considerable variability in the young infants' expressions of negative affect that may have implications for regulation strategies. Importantly, a theoretical connection between specific dimensions of emotional expressions and regulation has been noted previously (Thompson). In particular, the multiple temporal and intensive dimensions of

individual emotional experiences are the same dimensions that regulatory processes seek to modulate in order to attune emotional experiences to environmental demands. This relationship between the expression of negative affect and its regulation may have interesting implications for infants as they learn to effectively adjust their emotions. For example, infants may have characteristic styles of affective responding that influence the use of or need for behavioral strategies during challenging situations. Few empirical studies exist to examine the nature of infant negative affect and its regulation within a multi-dimensional framework of infant emotional expression. The current study was designed to examine the nature of infant emotional expressions of negative affect within a multi-dimensional framework that takes into account intensity, duration, speed of onset, and emotional lability.

Of the four dimensions identified by Thompson (e.g. intensity, duration, speed of onset, and lability; 1994), the dimension of intensity has been of most interest to researchers. Indeed, it has been conjectured that intensity levels of negative affect must be relatively low for infants to successfully initiate and utilize a strategy to manage their own discomfort. With growing levels of arousal or discomfort, infants can easily become unable to enlist strategies on their own (Kopp, 1989; Saarni & Crowley, 1990; Grolnick, Bridges, & Connell, 1996). With little practice in implementation and the relatively simplistic nature of strategies, the intensity of experienced emotion may have a profound influence on the infant's ability to mobilize behavioral means of regulation. Research with toddlers supports this relationship between the intensity of negative affect during challenging situations and behavioral strategies of emotion regulation.

For example, Grolnick et al. (1996) found that toddlers' emotion regulation strategies are related to the intensity of expressed negative affect. When toddlers expressed less intense

levels of negative affect, they were more likely to actively interact with objects in order to create a distraction. However, when expressing more intense levels of negative affect, toddlers tended to use less active and less effective modes of self-regulation, such as focusing on the delay object and physical self-soothing (Grolnick, et al.). While examining the same phenomenon in 12-month-old infants, Diener, Mangelsdorf, McHale, and Frosch (2002) found that higher intensity levels of negative affect were associated with more self-soothing and less use of more complex strategies such as distraction and leave-taking. Thus, infants as young as 12 months have an impressive repertoire of behavioral strategies for emotion regulation, but high levels of negative affect appear to impede the use of the more complex strategies.

It is reasonable to assume that similar results would be found in 6-month-old infants. In fact, the intensity of negative affect may be even more likely to overwhelm the regulatory efforts of the 6-month old. The available behavioral strategies at 6 months are just emerging and infants, having less practice than toddlers, may be less effective at implementing regulatory strategies. Accordingly, a meaningful relation between the intensity of expressed negative affect and the behavioral strategies used to regulate them was expected for 6-month-old infants. Specifically, as the intensity of negative affect increases, young infant should engage in less active forms of behaviors (e.g. object play) and resort to more passive strategies, such as signaling. In the only study examining young infants, Buss and Goldsmith (1998) found that the intensity of negative affect was related to the frequency of behavioral strategies used in some contexts but not others. One explanation that may account for the discrepancies is that other dimensions of negative affect may play a role in regulatory

processes. Further research to investigate this relationship in 6-month-old infants is thus warranted.

In addition to examining strategies of emotion regulation with regard to the intensity of negative affect it appears necessary to examine other key dimensions of negative affect as well, including the dimensions of duration, speed of onset, and lability. While researchers have identified these dimensions as important with regard to emotion regulation (Thompson, 1994), there is a lack of empirical investigation of the relationships between these dimensions of negative affect and behavioral strategies of emotional regulation. Considering negative affect within a multi-dimensional framework should provide additional empirical evidence about the infant's ability to mobilize behavioral strategies for regulating negative affect.

Stylistic responses of expressed negative affect during the still-face procedure. Although the experience of negative affect is universal, infants differ in their styles of response to extrinsic demands and the associated emotional experiences (Braungart-Rieker & Stifter, 1996; Cole, et al., 1994). As explained above, it is expected that infants will vary in their expressions of negative affect across the four dimensions. Likewise, it is expected that infants will express negative affect in ways that demonstrate differences in the combinations of the four dimensions. For example, some infants may express highly intense negative affect, very quickly, for long periods of time, and show low lability. Still other infants may express highly intense negative affect, but only for short durations, with a moderate speed of onset, and low lability. Other combinations likely exist as well. These combinations may represent stylistic responses to the still-face procedure. It is likely that clusters of infants could be identified based on their stylistic response. Furthermore, these stylistic differences may place different constraints on emotion regulation efforts. For example, infants who

express highly intense negative affect for long durations may be more likely to revert to more passive strategies than infants who express highly intense negative affect for only short durations. Identifying clusters of infants who have similar stylistic responses of expressed negative affect in these 6-months of age would provide a first step in advancing our understanding of the importance of styles of responding in the development of regulation capacities. It is strongly believed that a description of the various styles of response to challenging situations is a critical first step to study emotion regulation (Thompson, 1994; Kopp, 1989). Buss and Goldsmith (1998), for example, theorized that regulation behaviors might work for some individuals but not for others. These differences in the choice or the efficacy of behavioral strategies may be related to differing stylistic responses to challenging situations.

Calkins, Dedmon, and Gill (2002) explored this same issue using a large sample of 6-month-olds to examine whether easily frustrated infants employed different strategies of emotion regulation than did their less easily frustrated counterparts. Emotion regulation behaviors were coded during three frustration-inducing tasks: a barrier task, the arms restraint, and a maternal prohibition task. Based on maternal responses on the Infant Behavior Questionnaire (IBQ; Rothbart, 1981), a temperament questionnaire, the children were classified into easily frustrated or not easily frustrated groups. Easily frustrated infants demonstrated different patterns of regulation behaviors, as well as differences on attention and physiological measures. More specifically, more easily frustrated infants engaged in less distraction, more scanning, more orientations to the mother, and more physical (venting) strategies than their less easily frustrated counterparts. Results from this study indicated that distinct regulatory styles are already developing by 6 months of age. Furthermore, the use of

regulatory strategies appears to be related in some way to emotional experience. On the basis of this research, it was expected (1) that clusters of infants with similar stylistic responses to the still face procedure could be identified among 6-month-olds, and (2) that the identified clusters would be differentially related to the use of behavioral strategies.

In order to assess stylistic responses, cluster analysis was utilized to identify groups or clusters of infants who vary in their patterning of emotional responses to the still-face procedure. Cluster analysis is a multivariate statistical technique that allows individuals to be sorted into groups or clusters based on similarities. The multiple dimensions of negative affect will be used to establish the groups. Once these affective stylistic responses have been established, their relationship with the use of behavioral strategies can then be explored.

Measuring infant negative affect. Infants typically experience negative affect in many everyday situations, including being restrained in a car seat or a high chair and having to wait for food or access to toys. Researchers have developed procedures designed to elicit negative affect. The still-face procedure was used in the current study. The still-face procedure has been extensively used to examine communicative abilities, affect synchrony, and more recently, regulation of affective states (Tronick, 1989). This procedure was designed for use with infants aged 2 to 9 months and exposes the infant to age-appropriate stimuli that typically elicit a fear response in the infant (Wienberg & Tronick, 1996). The still face procedure is composed of three phases: (1) a 2-minute period of normal interaction between the mother and the child; (2) a 2-minute period during which the mother is unresponsive to the infant while maintaining a still or "poker" face; and (3) a 2-minute reunion period during which mother and child resume normal interactions. Research utilizing the still-face procedure has found that infants typically display less positive affect, more negative affect,

and increase their motor activity during the still-face period (phase 2 as described above; Weinberg & Tronick).

During the Still-Face Procedure, infants reliably express negative affect through vocal, facial, and bodily reactions (Grolnick, et al., 1996; Tronick & Cohn, 1989; Buss & Goldsmith, 1998). Thus, it is expected that the majority of infants will display negative affect during this challenging situation. In the current study negative affect was assessed by recording the infant's vocal, facial, and body tension on four-point scales using a 5-second interval coding for the duration of the challenge tasks. The four levels of negative affect coded were as follows: no negative affect, low, moderate, and high negative affect.

In addition to the intensity of negative affect, other dimensions were also measured in order to more fully capture the dynamic aspects of this emotion, including its duration, speed of onset, and lability. Duration was measured by calculating the number of intervals that contained expressions of negative affect. Speed of onset was measured by calculating the latency to expressions of negative affect. Lability was measured by totaling the absolute value of changes in expression of negative affect. These assessments were made with the goal of more fully exploring the relationships between the dynamics of negative emotions and observed behavioral strategies of regulation in 6-month old infants.

Early Behavioral Strategies of Emotion Regulation

Kopp (1989) has speculated that emotions are regulated by a set of behaviors that emerge early in life but evolve qualitatively over time as the child matures. These qualitative changes in behavioral strategies of regulation are thought to be related to both maturational processes and ongoing interactions between the child and the caregiver. Such qualitative changes may be related to increases in sophistication of the use of the behavioral strategies.

As such, the relationships between behaviors and expressions of negative affect, as well as the function of regulation served by the behaviors, may evolve over time. By identifying the early strategies and their relationships with expressions of negative affect, the current study will serve to advance our understanding of the foundation of early regulation capabilities and early qualitative relationships. This is a first step in understanding the trajectory of emerging emotion regulation capacities.

In early infancy, the caregiver plays an important role in developing emotion regulation capabilities. In fact, early efforts to regulate emotions are heavily dependent upon the caregiver. It is only over time that the burden of regulation is gradually taken over by the child (Cicchetti, et al., 1991; Grolnick, Durowski, McMenamy, Rivkin, & Bridges, 1998). However, very early in life infants possess some capacity to regulate their own emotions. For example, it has been shown that non-nutritive sucking serves as a regulatory strategy from the first few days of life. Over time, the infant's capacity to regulate negative affect evolves with the maturation of other body systems. The infant's motor, communicative, cognitive, and emotional systems are rapidly maturing and becoming increasingly sophisticated. Not surprisingly, the development of emotion regulation and the maturation of other systems are intertwined. Many strategies utilized for emotion regulation are dependent upon specific maturational levels. For instance, children cannot shift their focus of attention until their motor system has become sufficiently organized to support voluntary control of the head. The child's developing capacities apparently set the stage for self-regulation of emotions. The current study was designed to focus solely on the child's capabilities.

The period around 6 months of age is rich with regard to emerging emotion regulation skills. Already by the 3rd month of age, the infant's visual system is coupled with increased

voluntary control over head rotation (Gesell, 1938), thus giving the infant access to potential regulatory strategies such as looking to mom and gaze aversion. Similarly, the acquisition of voluntary control of the hands and feet allow infants to use motor activity to reach for their mother, other objects, or to simply gaze at their extremities as a means of distraction (Kopp, 1989). At the same time, infants are learning to signal their emotional needs in more competent ways and are becoming more intentional in regulating their emotional states, even if this is still primarily achieved through explicit signals (Sroufe, 1996). As early as 5 months of age, increases in communication skills enable the infant to utilize strategies such as signaling and eliciting the caregiver's attention. Infants are becoming increasingly capable of eliciting specific actions from the caregiver in order to achieve a desired response (Sroufe, 2000). Moreover, between 3 and 6 months of age, attention becomes more selective; a change that now permits infants to disengage their gaze from aversive stimuli and to anticipate the location of upcoming events (Johnson, Posner, & Rothbart, 1991). As shown by Derryberry and Rothbart (1988), the voluntary control of attention is a critical hallmark in the acquisition of emotion regulation skills and certainly plays an important role in the effortful regulation of negative affect. These developmental advances in intentionality, cognitive, and communicative abilities set the stage for the child to take a more active role in the regulatory process (Cohn & Tronick, 1987). As such, this time period around 6 months of age is ripe with opportunities to examine the interplay between expressions of negative affect and early regulative activity.

Examining the regulation of negative affect as early as 6 months of age is further warranted as the internal representations laid down during these early years may become self-perpetuating. Not only do such early representations influence the perception of self, but

they also act as filters that may serve either to bias interpretations of others' reactions, or to elicit responses from social partners that are consistent with one's goals (Thompson, 1999). When children routinely experience recovery from negative affect and learn that behavior can stay organized even when facing difficult challenges, the stage is set for acquiring confidence in their own ability to regulate emotions and control their social surroundings (Sroufe, 2000). As these experiences become integrated into an organized network of behavioral strategies, children generalize these response patterns to maintain personal well being, manage their self-presentation to the social world, and achieve a variety of other goals (Thompson & Calkins, 1996).

Toddler studies of behavioral strategies of emotion regulation. Researchers have made great strides toward identifying the regulation strategies used by toddlers (Grolnick, et. al., 1996; Diener, et al., 2002; Calkins, Gill, Johnson, & Smith, 1999; Buss & Goldsmith, 1998). Behaviors such as self-soothing, signaling, gaze aversion, soliciting the caregiver, venting, and object play have been consistently observed during times of expressed negative affect in young children (Stansbury & Sigman, 2000; Diener & Mangelsdorf, 1999; Feldman, Greenbaum, & Yirmrya, 1999; Bridges, Grolnick, & Connell, 1997). Researchers have reliably demonstrated developmental changes in emotion regulation processes during the preschool years. For example, it has been shown that during this period behavioral strategies used during challenging situations are becoming increasingly complex and flexible and more internalized and independent of caregivers (Stansbury & Sigman; Diener & Mangelsdorf). While these qualitative changes are occurring, the stability observed in the base set of behaviors used to regulate emotions suggests that emotion regulation processes build on a

foundation of behaviors that appear early in life. It remains unclear, however, how early these behaviors are seen or how early they begin to serve true regulatory functions.

Studies have demonstrated that toddlers use a variety of context-related behavioral strategies. For example, Diener and Manglesdorf (1999) found, using a cross-sectional design with 18 and 24 month olds, that during mother-constrained periods, children were more likely to engage in help-seeking. In addition, during the mother-involved periods, children initiated more social referencing, engagement, and leave-taking. Likewise, behavioral strategy varied based on experienced emotion. During anger-inducing situations, children were more likely to seek help from their mother, to engage her, and to use social referencing, problem solving, avoidance, distraction, leave-taking, and tension release than during fear situations. These studies demonstrate that the use of regulatory strategies is susceptible to environmental influences (mother's presence) and internal influences (type of emotion experienced). Use of regulatory strategies may be further constrained by the experience of the multiple temporal and intensive dimensions of negative affect.

The same behaviors identified as serving emotion regulation goals for toddlers and young children have been identified as potential regulators of emotions for infants. Early in life, infants rely heavily on the assistance of caregivers for regulation of emotion, but they also possess an impressive repertoire of behaviors that may serve regulatory functions (Kopp, 1989). The repertoire of behaviors for the regulation of negative affect in infancy has often been described as rudimentary and relatively ineffective (Kopp). However, these behaviors, though simple, may provide the foundation from which future emotion regulation behaviors emerge. While the repertoire of behavioral strategies for regulation of emotion in toddlers has been extensively documented (e.g., Grolnick, et al., 1996; Mangelsdorf, Shapiro, & Marzolf,

1995; Stansbury & Sigman, 2000), few studies have actually demonstrated if and how these strategies are used and whether they actually serve a regulatory function for the 6-month-old infant. Kopp (1989) theorizes that elemental forms of infant emotion regulation arise between 3 and 9 months of age; thus, this is an important gap in the literature.

Possible categories of regulatory behaviors based on putative functions at 6 months. Infant behaviors like self-soothing, gaze aversion, gazing at the mother, distraction with other objects (object play), withdrawal, venting, signaling, and gazing at self have been identified within the current literature as important behavioral strategies for emotion regulation (Stansbury & Sigman, 2000; Diener & Mangelsdorf, 1999; Feldman, et al., 1999; Bridges, et al., 1997). For analytic purposes these may be grouped into five basic categories of regulation strategies: (a) signaling, (b) self-soothing, (c) other-directed, (d) attentional strategies, and (e) venting.

Signaling and other-directed behaviors represent the most passive forms of behavioral strategies. In this category, simple vocalizations of varying intensity like pouting, fussing, and crying serve to alert the caregiver of a need for regulation. Mild negative vocalizations, such as pouting and intermittent fussing, may signal mild levels of negative affect, while fussing and sustained crying would signal moderate to heightened levels, respectively. These variations help the caregiver interpret the needs of the infant. Although these forms of signaling may serve important regulatory functions for infants, they were not considered in the current study. These signaling behaviors are confounded with the measures of negative affect, which would prevent meaningful interpretation from statistical analysis. However, other forms of other-directed behaviors, which are more behaviorally oriented, can be assessed. For example, gazing at the mother is a behavioral rather than a vocal signal. Infants

may use this strategy to convey the expectation of a response on the caregivers' part or to signal that the caregivers' assistance is needed. Proximity seeking, another other-directed behavior, has long been identified as an important set of behavioral responses to a variety of potential stressful situations (Bowlby, 1969/1982). With proximity seeking, infants actively seek to decrease the distance between themselves and their caregiver. This may be accomplished by reaching for, touching, or leaning toward the caregiver. When faced with high levels of negative affect, signaling and other-directed behavior may be one of the strategies 6-month-old infants most frequently use.

Self-soothing encompasses behaviors such as mouthing, sucking, and stereotypic movements. Mouthing involves placing objects in or around the mouth. Sucking may be directed at a body part, such as a finger or thumb, or may simply involve the motion of sucking. Finally, stereotypies are repetitive body movements such as rocking or hand flapping. These behaviors appear very early in life, some from the first few days of life. Thus, infants have considerable experience with these behaviors and, as a result, may use these behaviors frequently.

The ability to focus attention and, thereby, use distraction has been described as a hallmark of emotion regulation (Derryberry & Rothbart, 1988). Behaviors involving the modulation of attention are among the most active strategies available to the 6-month-old. Distraction may take several forms, such as gazing at self, gazing at the environment, or playing with an object. As a group, these behaviors are believed to serve a regulatory function by focusing attention away from the source of negative affect. Gazing at the environment, in particular, has been noted as an important strategy that redirects the infant's attention onto surrounding objects and away from the source of negative affect. These

attentional skills are relatively new to infants and, as such, infants are likely not very adept at using them.

The final category of behavioral strategies, venting, is rooted in anger and frustration. Venting is often expressed by kicking, flailing, thrusting, pushing, or hitting. Venting behaviors are often identified as a means to let out negative feelings.

The current study was designed to assess the behavioral capacities of 6-month old infants as observed during the still-face procedure. As such, the occurrence of behavioral strategies from each of these five categories was coded using 5-second interval recording. On a descriptive level, the rate of behavioral strategies observed, which category of strategy occurred most frequently, and whether infants tended to utilize a single strategy or multiple strategies. In addition to describing the observed behavioral strategies, the present study also assessed the relationship between the multiple dimensions of negative affect and the occurrence of behavioral strategies during the still-face procedure. More specifically, it was expected that the dimensions of intensity, duration, speed of onset, and lability would be differentially related to the infant's use of behavioral strategies. To illustrate, the intensity and speed of onset of negative affect may be the most salient feature for signaling behaviors. It may be that an infant who is expressing highly intense negative affect may only be able to produce the more passive strategies such as signaling. Speed of onset was also expected to be predictive of the use of signaling behaviors. Infants who have the expectation that their mothers will respond to them may not only be more upset due the unresponsiveness of the mother in the still-face procedure, but also would expect their mothers to assist them in regulating their discomfort. For this reason, the immediate response of the infant would be to attempt to communicate by signaling that they needed their mothers' assistance in regulation.

Another expectation of the current study was that the dimensions of intensity and duration might be the most salient for attentional strategies. First, attentional strategies are relatively new and are some of the more complex strategies available to infants. For this reason, high intensities of negative emotion would likely overwhelm the infant's capacity to engage in these strategies. However, given that attentional strategies are more active it is likely that these strategies would be more effective in regulating the infant's negative affect. If this were the case, one would expect the duration of negative affect to be shorter.

By identifying the relationships that exist between the multiple dimensions of negative affect and the use of behavioral strategies of regulation, results from the current study advance our understanding of different functional avenues for regulation of negative affect. Researchers have reliably demonstrated that certain behaviors accompany expressions of negative affect, but have not examined whether or not they may serve a specific regulatory function. Preliminary findings on this issue have been contradictory. One reason for these contradictory findings may be that behavioral strategies may be differentially related to the multiple intensive and temporal dimensions of negative affect. Therefore, the current study sought to determine how behavioral strategies are related to emotional expressions of negative affect across multiple dimensions. Through the examination of negative affect across specific dimensions, we may find more consistent relationships.

The Context of Early Regulation of Negative Affect

From the beginning, infants engage in intimate social interactions with their caregivers. These interactions occur during early infancy when both the infant and caregiver have a high receptivity for adapting to each other (Schore, 2000). It is within the context of these social interchanges that caregivers regulate the emotional states of the infant by reading emotional

signals, providing appropriate stimuli, modulating arousal levels, and reciprocating infant reactions (Cole, Martin, & Dennis, 2004). Also within the context of these social interactions, the infant, over time, learns to internalize regulatory functions. Hence, one can reasonably argue that early emotion regulation occurs within a dyadic system where caregivers play a vital role in managing infants' emotional and behavioral reactions (Kopp, 1989; Sroufe, 1996; 2000; Thompson, 1994; Calkins, et al., 1998).

Given that early emotion regulation occurs within the context of the caregiver-infant relationship, one must also examine key infant and caregiver factors that may contribute to those early relationships. On the part of the infant, temperamental characteristics play an important role in expressed differences in emotions (Calkins & Fox, 2002; Dunn & Brown, 1991). On the side of the caregiver, maternal sensitivity (Lyons-Ruth & Zeenah, 1993), ethnicity (Anderson, 1991), and SES (Halpern, 1993) have all been identified as important for the care-giving context and the quality of the infant-mother relationship.

Temperament. Expressed differences in emotions and behaviors are, in part, based on individual configurations of physiological structures expressed as differences in reactivity known as temperament (Calkins & Fox, 2002; Dunn & Brown, 1991). Temperament is a psychobiological construct that has been shown to be relatively stable over time (Kagan, 1994, Goldsmith, et al., 1987). In addition, there is general agreement that temperament contributes to differences in emotional arousal, behavioral styles, and cognitive skills (Vondra, Shaw, Swearingen, Cohen, & Owens, 2001; Dunn & Brown, 1991; Kagan, 1994). For instance, infants are unique with regard to daily responses to being fed, changed, played with, and bathed. Temperament represents those characteristics that make an infant's responses unique with regard to these patterns of daily interactions (Fox, 1994). Given that

temperament is strongly tied to emotional arousal and emotional responding, it is likely that infants who have higher mother reports of fear and distress to limitations will display more negative affectivity during the still-face procedure than infants with higher mother ratings in stoothability and falling reactivity/recovery. Furthermore, if temperament were found to be related to the identified clusters of negative affect styles, it would provide further evidence that these identified clusters represent true characteristic response styles of the infants.

The influence of temperament on the regulation of negative affect does not end with its influence on styles of expressed affect. Temperamental characteristics may also have an important influence on the use of behavioral strategies. On the one hand, infants must experience and communicate negative affect to learn that certain behaviors can be used to self-regulate. On the other hand, extreme levels of distress may actually inhibit the infant's recruitment and effective utilization of behavioral strategies (Kopp, 1989; Stifter & Braungart, 1995). Thus, differences in reactivity may play a role in the amount of practice with behavioral regulation that an infant receives. The extent to which children are able to utilize strategies to manage initial emotional reactivity in a constructive manner determines the extent to which reactivity influences later behavioral responding (Fox & Calkins, 1993; Stifter, Spinard, & Braungart-Rieker, 1999). However, the degree of success in managing emotions may be influenced by initial reactivity levels where children who display extreme arousal or emotional reactivity may have more difficulty in regulating those experiences, regardless of the strategies used (Calkins, et al., 1999). Thus, temperament theory suggests that infants may vary on the degree to which they develop and utilize behavioral strategies to regulate their negative affect. More specifically, infants who are rated higher on the fear and distress to limitations dimensions of the Infant Behavior Questionnaire (IBQ) may use more

passive and less active strategies of regulation. Infants who are rated higher on soothability and falling reactivity/recovery dimensions of the IBQ will use more active strategies and less passive strategies.

Maternal Sensitivity. Infant-caregiver dyads develop characteristic regulatory patterns based on countless daily interactions (Izard & Malatesta, 1987; Sroufe, 2000; Cicchetti, et al., 1991; Kopp, 1989). Caregivers must assist the infant in establishing and maintaining physiological organization through monitoring changes in alertness and signs of distress (Sroufe; Cole, et al., 2004), while still providing optimal stimulation and assistance (Field, 1994). In addition to monitoring infants' states, caregivers must monitor their own states and then resonate with certain qualities of infants' internal state, not necessarily overt behaviors (Schore, 2000). The caregiver must achieve a balance that allows the child to independently deal with circumstances that are within her capacities, anticipating challenges beyond the child's ability, and then assisting when the child begins to be overwhelmed (Sroufe). When the dyadic system is working, infants and caregivers are attuned to each other and the infant is able to remain organized (Tronick, 1989). When the dyadic system is not working, infants withdraw and interactions with caregivers are characterized by more frequent negative affect and less mutual sharing (Tronick).

Maternal sensitivity represents the mother's capacity to provide warm, responsive, and consistent caregiving. Caregivers with high sensitivity, who are emotionally available, enable their infants to experience positive and negative emotions in a secure, controlled manner (Lyons-Ruth & Zeenah, 1993). On the other hand, caregivers who are emotionally unavailable have infants who do not feel secure in their emotional experiences. It may be that caregivers high in sensitivity are more skilled at soothing infants with high emotion reactivity

levels, which allows the child to remain organized for longer periods of time, thereby, increasing the likelihood of the child developing more effective regulation styles. By allowing the infant to remain organized and experience success in the face of challenge, sensitive mothers may provide increased opportunity for infants to implement and practice behavioral strategies. Thus, infants with more sensitive mothers may utilize a greater variety of strategies, as well as more active and complex strategies, such as attentional strategies.

Maternal sensitivity influences the infant's expectations regarding the responsiveness of the caregiver that, in turn, may influence the infant's responding to a task such as the still-face procedure. It has been suggested that once infants have formed stable internal working models of their parent-infant relationship, sometime after 7 months of age (Ainsworth, Blehar, Waters, & Wall, 1978; Bowlby, 1969/1982), their expectations about how the parent will respond to their emotional needs will be established (Braungart-Rieker, Garwood, Powers, & Wang, 2001). These stable expectations, whether positive or negative, may influence the extent to which infants regulate their own emotions. For infants with sensitive mothers, the still-face may be more discrepant with their expectations and daily experiences. These infants have come to rely on a sensitive, responsive caregiver for dyadic regulation of negative affect. For these reasons, we would expect these infants to have a more intense affective response to the unresponsiveness of their mothers, and thus, will use more passive strategies.

Maternal ethnicity. Within the extant literature, there are few studies that examine potential ethnic differences in emotion regulation. For the most part, the ability to make inferences about ethnic differences is lost due to small sample sizes (Smith & Walden, 2001). The current study is ideally suited to examine relationships between ethnicity and negative

affect and behavioral strategies of regulation. The current study was designed to recruit African Americans for 50% of the sample. Recruitment was based on the mother's ethnicity and the study does include bi-racial families. To clarify that the focus in this study is on the mother's ethnicity, the term maternal ethnicity will be used.

In general, researchers have suggested that broad sociocultural contexts, including environmental factors and chronic stressors such as racism and discrimination contribute to commonalities in ethnic group experiences, beliefs, and values (Anderson, 1991; Anderson, 1989; Anderson & McNeilly, 1991). It has been speculated that for these reasons emotionality and parental socialization of emotion may differ between cultures because of these different environmental demands, social structure, resources, and cultural norms (Essau & Trommsdorff, 1996). In a study designed to evaluate an African American sample of 4 and 5 year-old children within the context of emotion regulation, Smith and Walden (2001) found that parental socialization of emotion was related to differences in behavioral strategies during emotionally arousing situations in the classroom. The study, however, was composed of an all African American sample and, as such, comparisons between groups could not be assessed.

Researchers have shown that African Americans have been found to be more emotionally expressive than European Americans (Boykin, 1986; Dixon, 1976). This difference in expressed emotion is attributed to the finding that African cultural heritage places a higher value on emotional expression (Boykin; Dixon; White & Parham, 1990). In fact, ethnic differences have been consistently found in physiological responding to emotional situations. Specifically African Americans have consistently demonstrated higher physiological responding than European Americans (Anderson & McNeilly, 1991).

On the other hand, research on emotional expressions has been less consistent. Observed differences in emotional expressions may relate to differences in emotion socialization. In a research study evaluating different social context, Vrana and Rollock (2002) found that emotional expressiveness depends not only on one's own ethnic group values, but also on (at least) the situational context, gender roles, and the ethnic characteristics of others in the encounter. Importantly, differences may also occur in laboratory contexts, including the experimental manipulations, perception of, and comfort in the experimental setting; and personal context, such as psychological and behavioral factors (Anderson, 1991; Anderson, 1989; Anderson & McNeilly, 1991). One explanation for these differences based on environmental factors may be that these two ethnic groups have different display rules for facial expressions (Ekman, 1973) that take into account the affective valence and/or other aspects of the encounter.

Although some discrepancy exists within the current literature, it is likely that infants with African American mothers will express higher levels of negative affectivity during the still-face procedure. This expectation is based on the fact that early emotion regulation processes occur within the context of dyadic relationships (Kopp, 1989). Within these early relationships infants are highly susceptible to socialization processes and begin to internalize the beliefs and values of their dyadic partner (Schore, 2000). Given that African American culture places higher importance on emotional expressiveness (Boykin), it is likely that infants with African American mothers will be more expressive.

Socio-economic status. In general, low-SES families endure life experiences that are likely to be more stressful and less supportive than families with higher SES. As a result, low-SES families have a decreased likelihood of responsive and sensitive parenting (Halpern,

1993). For example, a number of studies have reported higher percentages of insecure attachment in low-SES, high-risk samples (Spieker & Booth, 1988) or an increased likelihood of insecurity associated with economic disadvantage (NICHD Early Child Care Research Network, 1997). Furthermore, theory and prior research link SES to caregiver factors that influence the mother-infant care-giving context. More specifically, economic hardship has been linked to lower psychological well-being in parents, which may lead to more punitive, inconsistent, or unresponsive parenting, which partially mediates low-SES effects on child development (McLoyd & Wilson, 1994). In general, these conditions of economic hardship have been recognized as stressors on caregiving and child development (Duncan, Brooks-Gunn, & Klebanov, 1994; Halpern, 1993; McLoyd & Wilson, 1994). Given the large body of research that has shown that lower SES has negative affects on the care-giving context, it is reasonable to expect that lower SES may influence infant negative affectivity and behavioral regulation.

Research examining the role of SES in emotion regulation is sparse. However, SES indicators have been linked to differences in the use of behavioral strategies of older children. More specifically, in 4 and 5 year-old children, Smith and Walden (2001) found that mothers with higher levels of education tended to have children who used more cognitive distraction strategies and more instrumental action. Furthermore, infants of unemployed mothers used more aggressive strategies and more support seeking strategies. These findings would suggest that indicators of higher SES (higher education and employment status) are associated with more active strategies (distraction and instrumental action). On the other hand indicators of lower SES have been linked to increased use of aggression and more passive strategies of regulation (e.g., support seeking). This research is

limited by the fact that the results relied on data from hypothetical stories that the children responded to verbally. No observational data were taken (Smith & Walden). Additional research utilizing direct observation would be beneficial in further exploring these findings.

The current study utilizes a measure of maternal level of education as the indicator of SES. Due to the nature of the sample, income was felt to be an insufficient indicator. Income was confounded by the fact that many of the mothers in the current study were students, which would limit their earning potential.

Overview of Current Study

The measures of multiple dimensions of expressed negative affect and putative behavioral strategies of regulation in the current study afford the opportunity to examine early regulation of negative affect within a multi-dimensional framework of emotion. Negative affect is likely complex in that there are various dimensions of negative affect and the infants' regulation needs likely vary with the experience of negative affect across these multiple dimension, not just one dimension. Additionally, this dynamic nature of negative affect offers multiple avenues for regulation, which may occur along one or more of the dimensions of negative affect. The purpose of the current study was to first describe the dynamic, multi-dimensional nature of expressed negative affect, and the use of behavioral strategies of regulation. The study then investigates the relationships between the various dimensions of negative affect and behavioral strategies of regulation, as well as the influence of temperament and the care-giving context. To this end, the current study addressed three specific goals.

Goals and Hypotheses of the Current Study

Goal 1: To characterize negative affectivity in 6-month old infants within a multi-dimensional framework of emotions as observed in the still-face procedure.

1) How do infants express negative affect during the still-face procedure as measured by intensity, duration, speed of onset, and lability?
    a. While the majority of infants will display negative affect during still-face procedure, there will be variability across infants in their expressions of intensity, duration, speed of onset, and lability.
2) To what extent are these dimension of negative affect correlated with each other?
    a. It is expected that the four dimensions of negative affect will be correlated.
3) Are there identifiable clusters of infants with patterns of stylistic responding in regard to the intensity, duration, speed of onset and lability of expressed negative affect as observed during the still-face procedure at 6 months of age?
    a. Stylistic clusters will be identified based on the combinations of intensity, duration, speed of onset, and lability.

Goal 2: To characterize how some factors internal (temperament) and external (care-giving context) to the child may influence infant negativity affectivity as observed in the still-face procedure at 6 months of age.

1) To what extent do 6 month mother-reported temperamental characteristics predict different patterns of negative affect in the 6-month still-face procedure?
    a. It is expected that infants scoring higher on the distress to limitations and fear will express more negative affectivity.

b. It is expected that infants scoring higher on the soothability and falling reactivity dimensions will express less negative affectivity.

c. It is expected that different temperamental characteristics will be predictive of the different individual dimensions of expressed negative affect.

i. The IBQ dimension of fear will be predictive of intensity and speed of onset.

ii. The IBQ dimension of distress to limitations will be predictive of intensity and duration.

iii. The IBQ dimension of soothability will be predictive of duration and lability

iv. The IBQ dimension of falling reactivity/recovery will be predictive of duration.

2) To what extent does the care-giving context as measured by 6-month maternal sensitivity, maternal ethnicity, and SES predict different styles of negative affectivity as observed during the still-face procedure?

a. It is expected that infants who have more sensitive mothers will display more negative affectivity during the still-face procedure.

b. It is expected that maternal ethnicity will be differentially related to expressed negative affect, with infants with African American mothers expressing more negative affect than infants with European-American mothers.

c. It is expected that infants from lower SES families will express more negative affectivity.

Goal 3: To characterize infants' behavioral capacities to regulate negative affect during the still-face procedure at 6 months of age.

4) What behavioral strategies are observed in infants during the still-face procedure at 6 months of age?
    a. It is expected that behavioral strategies in the categories of other-directed/signaling, self-soothing, attentional, and venting will be observed in 6-month old infant during the still-face procedure.
    b. It is expected that other-directed and self-soothing behaviors will occur more frequently than attentional or venting strategies.
    c. It is expected that 6-month old infants will use multiple strategies during the still-face procedure.
5) To what extent does mother-reported temperament predict the use of different types of behavioral strategies during the still-face procedure?
    a. It is expected that infants with higher scores on the IBQ dimensions of fear and distress to limitations will use more passive strategies.
6) To what extent do aspects of the care-giving context as measured by maternal ethnicity, maternal sensitivity (observed in another context), and SES predict the use of different types of behavioral strategies during the still-face procedure?
    a. It is expected that infants with higher maternal sensitivity, African American mothers, and lower SES will use more passive strategies.

7) To what extent do different stylistic responses of expressed negative affect (i.e., clusters) predict the use of behavioral strategies during the still-face procedure?
    a. It is expected that the identified stylistic clusters (i.e., based on configurations of expressed negative affect) will be related the use of different types of behavioral strategies during the still-face procedure at 6 months of age.
8) How are the individual dimensions of expressed negative affect related to the use of behavioral strategies during the still-face procedure?
    a. It is expected that attentional strategies (e.g., object play and gaze at environment) will be used less with higher levels of negative affectivity.
    b. It is expected that self-soothing behaviors (e.g., self-soothing and gaze at self) will be used more with higher levels of negative affectivity.
    c. It is expected that other-directed strategies (e.g., reaching and gaze at mom) will be used more with higher levels of negative affectivity.
    d. It is expected that venting will be used more with higher levels of negative affectivity.

CHAPTER 2

METHODS

Participants

The current study is part of a larger longitudinal project investigating social, cognitive, and emotional development across the first three years of life. The infants and their families were recruited during the first months of the infants' life from birth records and community contacts. Recruitment procedures specified an approximately equal number of European- and African-Americans at both low-income (i.e., below 2 times the poverty line) and high-income (i.e., above 2 times the poverty line) levels from a predominantly urban area. Recruitment was based on the mother's ethnicity. The larger project includes a total of six assessment points at 3, 6, 12, 18, 24, and 30 months of age, with a combination of home visits and laboratory visits. Measures consisted of a combination of questionnaires, interviews, and laboratory tasks. The participants in the current study were 154 of the 176 families originally recruited by the Durham Child Health and Development (DCHD) Study. For the current study, a subset of the data from the 6-month visit was used.

Sample

Of the 176 participants in the larger DCHD sample, a total of 154 infants participated in the still-face procedure that provided the data for the current study. These infants were approximately 6-months old during the laboratory visit when the data was collected. Sample sizes for the still face challenge task, differed for various reasons, such as dropout due to fussiness, fatigue, or parental refusal.

The final sample consisted of 129 infants who completed the still-face procedure with valid administrations. The final sample was comprised of approximately equal numbers of male (N=64) and female infants (N=65). Forty-seven percent of the subjects were European-Americans and 53% were African-American. With regard to income, 53% of families had an income 2-times above the national poverty level and 47% had income levels falling below 2-times the poverty level. Fifty-three percent of the sample had a four-year degree or more, 6% had some college, 31% had a high school education, and 10% had less than a high school degree.

Procedures

Overview. The current study utilizes observational data from the still-face procedure from the 6-month laboratory visit and the freeplay session from the 6-month home visit. Following informed consent, the mother and infant participated in a variety of behavioral assessments including the still-face and arm-restraint procedures, a free play session, a book reading session, and three memory tasks. In addition to the behavioral assessments, mothers participated in interviews, video rating activities and several physiological measures were collected. The laboratory visit and the home visit lasted for approximately 2 hours each.

Still Face Procedure. For the still-face procedure, infants and their mothers were taken into a standard room that was furnished with a table, chair, and car seat. The caregiver was instructed to place the infant in a car seat situated on top of a large sturdy table. Once the infant was securely in the car seat, there was a two-minute warm-up period, in which the caregiver was instructed to interact freely with the infant. The still face procedure took place immediately following this two-minute warm-up period. The procedure begins with a 15-second interval during which the mother is facing away from her child. Then, the mother

turned back toward her infant, looking at her while maintaining for 2 minutes a still face during which she refrained from smiling, talking, or touching and remained emotionally unresponsive. This period was followed by another 15 seconds period during which she was again facing away from her infant. The infants were videotaped during the challenge tasks that are explained below. Video images from two cameras were transmitted through a split-screen generator in order to produce simultaneous frontal views of the mother's face and the infant's entire body.

Prior to beginning the still-face procedure, the mother was told that she was free to immediately terminate any and all procedures if she was uncomfortable with the assessment protocol. If the infant became too upset (e.g., continuous hard crying for at least 20 seconds) to continue any one of these tasks, the episodes were terminated and the caregiver was asked to comfort the infant. If the child recuperated within a few minutes, the procedure was re-attempted with the permission of the mother. Otherwise, the experimenter moved to the next task. Given that the focus of the current study is on the capacities of the infant, it was felt that the still-face procedure was best suited for this analysis. During this episode the mother was unavailable and the infant had to rely on her own capabilities to regulate negative affect. During the normal interaction periods, the mother was available to assist the infant in regulation efforts.

To ensure procedure validity, only those dyads in which the mother maintained a still-face as described for at least 80% of the time were retained for further analyses. Furthermore, although the assistants remained as unobtrusive as possible, there were instances when the infants were distracted by them and failed to pay attention to their mother. Accordingly, those dyads in which the infant failed to notice within 20 seconds her mother's still-face were

also excluded from the analysis. These exclusionary criteria resulted in the elimination of 25 participants, leaving a total of 129 infant-mother dyads.

Free Play Procedure. At 6-months of child age, the free play procedure occurred in the context of a 2-hour home visit. At each visit a standardized interview was completed along with several joint and individual tasks for the child and mother. For the free play session, mothers were asked to interact with their children as they normally would during a typical day. A standard set of toys was provided for the mother and infant to use, and the pair was asked to sit on a blanket that was laid out across the floor. This session was videotaped for later coding, with researchers monitoring the camera discreetly to minimize interference with the ongoing interaction.

Constructs and Measures

Behavioral strategies of emotion regulation. Putative emotion regulation behaviors were coded from videotapes using 5-second time intervals. Behavioral strategies and negative affect were coded separately and independently. The coders were trained to reliability reaching 85% agreement. A digital time display was used to track the intervals. Tapes were run at normal speed, although they were frequently stopped or rewound to accurately assess the infant's behavior. In the event that the infant's behavior could not be observed, the interval was labeled as uncodable. This code was used if the mother's body was between the infant and the camera preventing the coder from observing the infant's behavior.

Seven emotion regulation behavioral strategies were coded for the purposes of the current study: (a) gaze at mother, (b) gaze at environment, (c) gaze at self, (d) self-soothing, (e) object play, (f) reaching, and (g) venting. Table 1 contains a brief definition of each of these behaviors. For data analysis purposes, only one behavior per interval was recorded. In the event that two behaviors occurred within the same interval, the first strategy coded was

the strategy entered for that interval. For instance, if self-soothing and object play occurred in succession in the same interval, only self-soothing was the strategy coded for that interval. This type of co-occurrence was the most common type. In the majority of intervals, only one behavioral strategy occurred, so it was felt that this approach did not introduce unacceptable error in the data.

Table 1

Brief Definitions of Infant Putative Emotion Regulation Behaviors

Behavior	Description
	Signaling/other-directed
Gaze to mother	Infant looks at mom, either directly in the face or the body.
Reaching	Infant shows a deliberate attempt to touch the caregiver by holding arms towards caregiver or successfully touching caregiver. The action must be performed by the child. Caregiver initiated contact does not count.
	Self-soothing
Self-soothing	Behaviors that are self-stimulating, including thumbsucking, rubbing or patting the body, mouthing objects, and stereotypies.
Gaze at self	Infant is looking at some part of her own body, such as her fingers or feet.
	Attentional/distraction
Gaze at environment	Child is looking around the room or at self, but is not looking at mom.
Object play/distraction	Behaviors that target objects, such as banging on the car seat, pulling off a sock and playing with it, playing with toys and books.
	Venting
Venting	Behaviors used to express anger and frustration including kicking, thrusting, flailing, pushing, or hitting.

Infant negative affect. Videotapes were viewed a second time by different observers to code negative affect. Child negative affect during the still-face procedure was coded in 5-

second intervals using a digital time display. The coders were trained to reliability reaching 85% agreement. To avoid observer drift, reliability was assessed on approximately 15% of the sample. Interrater reliability was found to remain at 0.85 across coders. A digital time display was used to track the intervals. Tapes were run at normal speed, although they were frequently stopped or rewound to accurately assess the infant's behavior.

Intensity. Negative affect was coded using a four-point scale adapted from previous studies (Haley & Stansbury, 2003). The scores were based on a combination of vocalizations, facial expressions, body tension, and body movements. Affect scores ranged from 0 to 3. Infants were given a score of zero if no negative affect was observed during the 5-second interval. A score of 1 was given for mild levels of negativity, including brief negative vocalizations, brief fussiness, or brief frowns or grimaces. Moderate displays of negative affect were given a score of 2, including protesting, pouting, fussiness, brief cries, or contorted facial displays. Infants were given a score of 3 if they showed high levels of negativity, such as prolonged crying, intense protesting, accompanied by tense body postures and contorted facial expressions. The negative affect scores were used to calculate a variety of affect scores. Each of the variables created from the affect scores are described below. For logistic regression, infants were divided into four ordinal categories of intensity: (a) no negative affect, (b) low intensity, (c) moderate intensity, and (d) high intensity.

Table 2

Levels of Negative Affect

Intensity Level	Description
No Negative Affect	The infant displayed no behavioral or vocal signs of negative affect.
Low Negative Affect	The infant displayed brief negative vocalizations, brief fussiness, or brief frowns or grimaces
Moderate Negative Affect	The infant displayed behaviors such as, protesting, pouting, fussiness, brief cries, or contorted facial displays
High Negative Affect	The infant displayed prolonged crying, intense protesting, increased motor activity, accompanied by tense body postures, and contorted facial expressions

Duration of negative affect. Duration of expressed negative affect reflected the total length of time that infants displayed negative affect at any level. Duration of expressed negative affect was calculated by summing the number of intervals where any level of negative affect was observed (i.e., 1 or higher). For logistic regression purposes, infants were divided into four ordinal categories of duration: (a) no duration, (b) low duration, (c) moderate duration, and (d) high duration.

Speed of onset. Latency to negative affect was calculated to assess the time from the onset of an assessment phase to the first signs of infant negative affect at any level above zero. This variable was calculated as the total number of intervals prior to the first sign of infant negative during the still face procedure. For logistic regression purposes, infants were divided into four ordinal categories of speed of onset: (a) low speed of onset, (b) moderate speed of onset, (c) high speed of onset, and (d) no onset.

Lability of negative affect. Lability of emotion was assessed by calculating the absolute value of interval-to-interval changes in the intensity of negative affect. For example, a change from 3 to 1 between consecutive blocks yielded a value of 2 for this interval. Calculated over the full duration of the still-face procedure for each infant, lability scores reflected the sum of these changes across successive 5-second intervals. For logistic regression purposes, infants were divided into four ordinal categories of lability: (a) no lability, (b) low lability, (c) moderate lability, and (d) high lability.

Table 3

Dimensions of Negative Affect

Dimension	Description
Intensity	The qualitative level of negative affect expressed by the infant.
Duration	The total length of time that the infant displayed negative affect.
Speed of Onset	The number of intervals from the onset of an assessment phase to the first signs of infant negative affect.
Lability	A measure of the observed variability in expressions of negative affect represented by the absolute value of changes in expressed negative affect.

Infant Behavior Questionnaire (IBQ). The Infant Behavior Questionnaire (IBQ; Rothbart, 1981) is a 99-item parent-report instrument that assesses the frequency with which certain infant behaviors occurred during the last 2 weeks. The IBQ consists of seven dimensions: (a) activity level, (b) duration of orientation, (c) distress to limitations, (d) fear, smiling/laughter, (e) falling reactivity/recovery, and (f) soothability. The DCHD utilizes only four of these dimensions: (a) distress to limitations, (b) fear, (c) soothability, and (d) falling reactivity/recovery.

The dimension of distress to limitations consists of 16 items that assess the infant's level of fussing, crying, or showing distress while: (a) waiting for food, (b) refusing a food, (c) being in a confining place or position, (d) being dressed or undressed, or (e) being prevented access to an object toward which the infant is directing her attention. The dimension of fear consists of 16 items that assesses the infant's startle response or distress to sudden changes in stimulation, novel physical objects or social stimuli. The soothability dimension consists of 18 items that assess the infant's reduction of fussing, crying, or distress when soothing techniques are used by the caregiver. Finally, the falling reactivity/recovery dimension consists of 13 items that assess the rate of recovery from peak distress, excitement, or general arousal, as well as ease of falling asleep.

The IBQ has demonstrated satisfactory reliability and validity (Goldsmith & Rothbart, 1991). Mothers indicate on a seven-point scale ranging from 1 (*never*) to 7 (*always*) how frequently their infants responded to specific events in a particular fashion during the previous week (e.g., ''when introduced to a stranger, clung to the parent or approached the stranger at once''). Subscales have good internal reliability (.75–.81) and interrater reliability (.54–.66) for 6-month-old infants (Rothbart, 1981), good concurrent validity with home observations of infant temperament at 6 months (mean r = .40; Rothbart & Goldsmith, 1985) and with the negative emotionality and approach-sociability subscales of the Revised Infant Temperament Questionnaire and the Infant Characteristics Questionnaire (rs = .61–.73; Goldsmith, Rieser-Danner, & Briggs, 1991).

Maternal sensitivity. Three scales were used to derive global ratings of maternal behavior in the freeplay session. These measures have been used in previous studies to assess parent-child interaction during long free play sessions (NICHD Early Child Care Research Network, 1999) and a similar variation has been used to code interactions of shorter

duration following the still face procedure (Rosenblum, McDonough, & Muzik, 2002). The three scales included sensitivity/responsiveness, intrusiveness, and positive regard, each scored on a 5-point scale and further described below. An overall composite for maternal sensitivity was created by summing the scale scores for sensitivity, positive regard, and a reverse coding of intrusiveness.

The *sensitivity/responsiveness* scale was adapted from Ainsworth et al. (1978) and rated how the parent responded to the infant's gestures, facial expressions, and signals as she responded to cries, frets, or other expressions of negative affect. The defining characteristic of a sensitive interaction is that it is infant-centered. The sensitive parent is synchronized with the infant, showing an awareness of the infant's needs, moods, interests, and capabilities. If the infant directs gestures of facial displays to the parent (e.g., looking at, reaching toward, waving, clapping hands, handing objects), or makes demands or requests (e.g., stretching arms to be picked up, reaching for toys the parent in holding), the sensitive parent responds appropriately. Mothers received a score of 1 on sensitivity when this description was not at all characteristic of their behavior, and up to 5 if sensitivity was highly characteristic of their interactions. Intraclass correlations across coders reached .82 based on double coding 20% of the parent-infant interactions from all three contexts of observations.

The *intrusiveness* scale was adapted from Fish (1990) and measured the degree to which the interaction between the mother and infant was adult-centered rather than infant-centered. Intrusiveness is seen in parents who impose their agenda on the infant despite her signals that a different activity, level, or pace is needed. High arousal, vigorous interaction, or rapid pace is not defined as intrusive if the infant is active and positively engaged in the activity. Higher ratings on this scale are given only when these behaviors persist after the

infant averts her gaze, turns away, or expresses negativity in response to the parent's actions. Extreme cases such as this can be conceptualized as overcontrol to a point of stripping away the infant's autonomy. Some examples include failure to modulate behavior in response to the child's protest by, for example: (a) continuously overstimulating,(b) taking away objects the infant is clearly engaged with, (c) not allowing her to make choices, and (d) manipulating the infant's body in an intrusive manner. Mothers receive a score of 1 on intrusiveness if this description is not at all characteristic of their behavior, and up to 5 if such behaviors are highly characteristic of their interactions. Intraclass correlations across coders reached .80 based on double coding 20% of the parent-infant interactions from all three contexts of observations.

The *positive regard* scale rated maternal expressions of positive feelings towards the infant. Positive regard is observed when the parent is seen speaking in a warm tone of voice, hugging or engaging in other expressions of physical affection, positive affect, enthusiasm, praise, and showing her general enjoyment of the infant. Mothers were given a rating of 1 if the corresponding description was not at all characteristic of their behavior, and up to 5 when it was highly characteristic of their interactions. Intraclass correlations across coders reached .81 for positive regard, based on double coding 20% of the parent-infant.

Socio-economic status (SES). The current study utilizes mother-reported level of education as the measure for SES. Maternal level of education was obtained from a self-report questionnaire completed by the infant's mother. The levels of education are as follows: (a) did not graduate from high school; (b) graduated from high school or obtained a GED; (c) has some college, but no degree; (d) has completed a bachelor's degree; (e) has completed a master's degree; (f) professional degree; or (g) other. Maternal education was chosen because

the measure of annual income in the current study does not reflect true SES as many mothers in the sample were students.

CHAPTER 3

RESULTS

The results are organized according to the three basic goals outlined above: (a) Goal 1, characterizing negative affectivity within a multi-dimensional framework of emotions as observed in the still-face procedure; (b) Goal 2, characterizing how some factors internal (temperament) and external (care-giving context) to the child may influence infant negativity affectivity; and (c) Goal 3, characterizing infants' behavioral capacities to regulate negative affect during the still-face procedure at 6 months of age.

First, descriptive statistics, correlations, and cluster analysis results are presented in order to examine the questions and hypotheses outlined under the first goal, *to characterize negative affectivity in 6-month old infants within a multi-dimensional framework of emotions as observed in the still-face procedure*. Second, details of the logistic regression analysis are presented to examine the relationship between expressed negative affect and factors internal to the child and factors of the care-giving context. First, data are presented to address the predictability of the stylistic clusters from temperament, maternal sensitivity, maternal ethnicity, maternal level of education, and the interactions between temperament and maternal sensitivity. Data are then presented that explore the predictability of the four individual dimensions of expressed negative affect. These data address the questions and hypotheses from the second goal of the study*, to characterize how some factors internal (temperament) and external (care-giving context) to the child may influence infant negativity affectivity as observed in the still-face procedure at 6 months of age*. Finally, in order to

adequately address the third goal of the project*, to characterize infants' behavioral capacities to regulate negative affect during the still-face procedure at six months of age*, descriptive statistics and a series of logistic regressions are presented. First, descriptive statistics are presented to characterize behavioral strategies as observed during the still-face procedure. Second, logistic regression results are presented to explore the relationship between temperament and the care-giving context with behavioral strategies. Finally, a series of logistic regression analyses are presented to examine the relationships between stylistic clusters and behavioral strategy use and between the individual dimensions of expressed negative affect and behavioral strategy use.

Regression Diagnostics. Diagnostics testing revealed that the assumption of normality necessary for multiple regression had been violated. The measures of expressed negative affect and the use of behavioral strategy use were skewed. Logistic regression has no assumptions about the distribution of the predictor variables, so this analysis strategy was used. Logistic regression does assume a linear relationship between continuous predictors and the logit transformation of the dependent variables. To test this assumption the Box-Tidwell approach was utilized, which adds terms to the model that are composed of the interactions between each predictor and its natural log. The assumption is violated if one or more of the added terms are significant. All models were tested, none were found to be significant. The absence of multicollinearity is also important for logistic regression. In logistic regression, multicollinearity is signaled by standard errors greater than 2. All standard errors in the models were assessed and found to be below 2. Finally, the data set was assessed to reveal outliers. Outliers can be identified in logistic regression through

examination of the residuals and model fit. All models had adequate fit and plots of residuals did not reveal any outliers.

Overall Descriptive Summary of 6-Month Old Infants' Expressed Negative Affect

The first goal of this study was to characterize negative affectivity in 6-month old infants within a multi-dimensional framework of emotions as observed in the still-face procedure. As expected, the majority of infants expressed some level of negative affect during the still-face procedure. Specifically, 64.3% (N=83) of infants expressed at least some level of negative affect. Furthermore, the majority of infants completed the still-face procedure with only 15.5% (N=20) of infants requiring termination of the session due to high negative affect. The average length of the still-face procedure was 21.9 intervals (SD=4.66).

Table 4

Descriptive statistics for the four dimensions of expressed negative affect.

	Mean	Standard Deviation	Range
Intensity	1.12	1.08	0-3
Duration	5.10	6.14	0-23
Speed of Onset	12.33	9.99	0-24
Lability	4.19	4.80	0-19

In order to address the question of how infants express negative affect during the still-face procedure as measured by intensity, duration, speed of onset, and lability, descriptive statistics are presented for each dimension in Table 4. As hypothesized, there was considerable variability across infants' expressions of negative affect across the dimensions of intensity, duration, speed of onset, and lability. As seen in Table 4, the range of expression demonstrates that infants varied from expressing the highest levels of each dimension to the

lowest levels of each dimension of negative affect. Furthermore, examination of the ordinal categories of each dimension demonstrate that a good proportion of infants fall into each of the four categories (see Table 5). Although the majority of infants do express negative affect with considerable variability, the overall level of negative affect observed is low. The average infants expressed a low level of negative affect for an average of 20 seconds (see Table 4).

Table 5

A brief description of the ordinal categories for each dimension.

Category	Intensity[a]		Duration		Speed of Onset		Lability	
	N (%)	M	N (%)	M (SD)	N (%)	M (SD)	N (%)	M (SD)
1	46 (35.7%)	0	46 (35.7%)	0 (0)	39 (30.2%)	0.74 (1.07)	48 (37.2%)	0 (0)
2	42 (32.6%)	1	35 (27.1%)	11.2% (0.06)	25 (19.4%)	6.52 (2.04)	23 (17.8%)	2.13 (0.63)
3	20 (15.5%)	2	29 (22.5%)	45.8% (0.16)	19 (14.7%)	17.58 (3.22)	39 (30.3%)	6.08 (1.75)
4	21 (16.3%)	3	19 (14.7%)	92.1% (0.09)	46 (35.7%)	23.15 (3.09)	19 (14.7%)	13.37 (2.85)

Note: For each dimension, the categories are arranged in ascending order.
a. The ordinal categories for intensity were based on the peak intensity of expressed as coded on the 0-3 scale.

To address the question of how the four dimensions of negative affect were correlated with each other, correlation analyses was performed. As hypothesized, all four dimensions were significantly correlated with each other (see Table 6). More specifically, as infants express higher levels of intensity, they express negative affect for longer periods, are more

Table 6

Correlations among observed variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Peak Intensity	--																
2. Duration	.873**	--															
3. Speed of Onset	-.819**	-.786**	--														
4. Lability	.707**	.604**	-.696**	--													
5. Gaze at Mom	.109	.192*	-.144	.073	--												
6. Gaze at Environment	.009	-.003	-.029	.010	.032	--											
7. Gaze at Self	-.053	-.031	.018	-.022	.023	.102	--										
8. Self-Soothing	.253**	.190*	-.226*	.313**	.099	-.051	.207*	--									
9. Object Play	-.405**	-.405*	.403**	-.276**	-.402**	-.527**	-.194*	-.405**	--								
10. Reach	.116	.094	-.188*	-.002	-.090	-.088	-.099	-.177*	-.330**	--							
11. Vent	.335**	.321**	-.223*	.272**	.210*	-.084	-.051	.100	-.269**	-.107	--						
12. IBQ – Distress to Limitations	.091	.139	-.094	.026	.225*	.170	-.150	-.077	-.126	.043	-.105	--					
13. IBQ - Fear	.207*	.211*	-.128	-.005	.259**	.054	-.068	.113	-.215*	-.004	.151	.352**	--				
14. IBQ – Soothability	-.033	-.028	-.025	.106	.066	.156	.117	.013	-.157	.077	-.139	-.071	-.207*	--			
15. IBQ - Recovery	.067	-.090	-.017	.020	-.013	.138	.042	.030	-.143	.076	-.028	-.443**	-.201*	.327**	--		
16. Maternal Sensitivity	-.094	-.064	.028	-.086	-.003	.023	-.030	-.123	.077	-.072	-.112	-.138	-.134	.073	.193*	--	
17. Mom's Ethnicity	.088	.072	-.129	.228**	.055	.068	.136	.073	-.066	-.115	.062	-.218*	-.205*	.129	.176	.325**	--
18. Maternal Education	-.249**	-.257**	.233*	-.094	.012	.012	.069	-.091	.119	-.107	-.121	-.210*	-.262**	.258**	.164	.373**	.319**

*p<.05, **p<.01

labile in their expressions, and have shorter onset times. Infants who express negative affect for longer durations have higher intensity levels, high lability scores, and shorter speed of onset times. Infants with longer speed of onset times have lower peak intensity ratings, shorter durations, and lower lability scores. Finally, infants with higher lability scores have higher peak intensity ratings, longer durations of expressed negative affect, and shorter speed of onset times.

Cluster Analysis to Examine the Stylistic Responding of Negative Affectivity

Cluster analysis was performed in order to address the question of whether there are identifiable clusters of infants with patterns of stylistic responding in regard to the intensity, duration, speed of onset and lability of expressed negative affect as observed during the still-face procedure at 6 months of age. It was hypothesized that a hierarchical cluster analysis would yield clusters that would represent stylistic emotional responding to the still-face procedure. Hierarchical cluster analysis is an exploratory data analysis technique and, as such, the number of clusters was not pre-specified. The complete linkage (i.e., furthest neighbors) method was chosen because this method generated the most distinct clusters. In the complete linkage method, the distances between clusters are determined by the greatest distance between any two objects in the different clusters (i.e., by the "furthest neighbors"). The complete linkage method is recommended for samples less than 250.

The agglomeration schedule along with confirmation from the dendrogram (Figure 1) was used to determine the number of clusters. The three largest gaps in the agglomeration schedule were between steps 124 and 125 (7.38 to 10.48), steps 126 and 127 (12.75 to 16.98), and steps 127 and 128 (16.98 to 34.35), indicating a 5-, 3-, or 2-

cluster solution, respectively. The distance spacing of the agglomeration schedule is visually represented in Figure 1. Based on the available information, a 5-cluster solution was chosen.

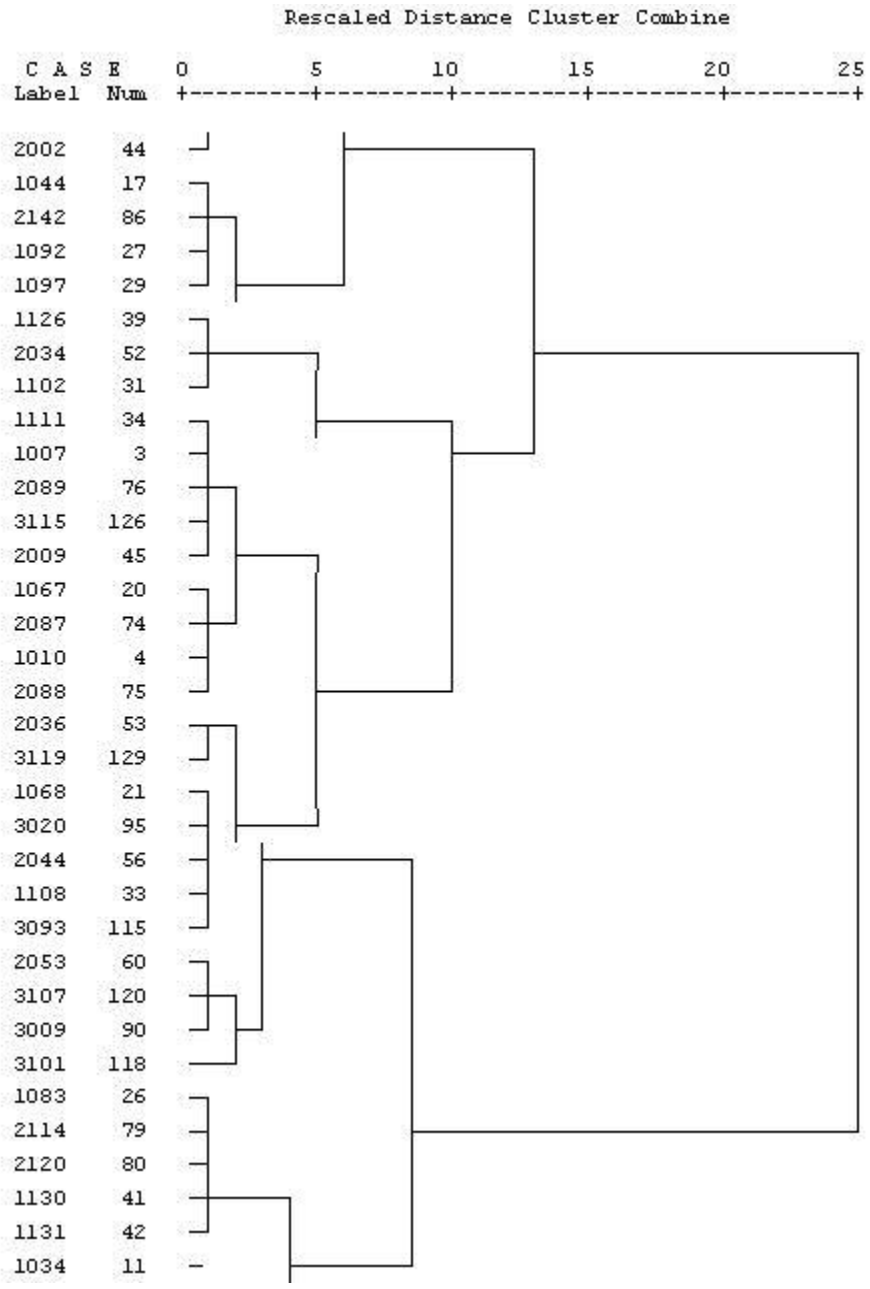

Figure 1. An excerpt of the dendrogram displaying the linkages of the final cluster stages using the rescaled distances.

The first cluster consisted of 16 infants who expressed low negative affectivity. These infants expressed low intensities of negative affect (M = .94), for short durations (15% of the session), with a moderate speed of onset (M = 3.63 intervals), and low lability (M = 3.25). The second cluster consisted of 19 infants who expressed moderate negative affectivity. These infants expressed moderate intensity levels of negative affect (M = 1.68), for moderate durations (35% of the session), with a moderate speed of onset (M = 5.85 intervals), and moderate lability (M = 7.32). The third cluster consisted of 14 infants who expressed high negative affectivity (M = 2.36), for moderate durations (60% of the intervals), with a short speed of onset (M = 2.43 intervals), and high lability (M = 14.21). The fourth cluster consisted of 17 infants who expressed high negative affectivity. These infants expressed high intensities of negative affect (M = 2.71) almost immediately (M = .41 intervals). Once expressed, negative affect lasted for longer durations (93% of intervals), with moderate lability (M = 5.53). The final cluster, cluster 5, consisted of 63 infants who expressed no to very low negative affect.

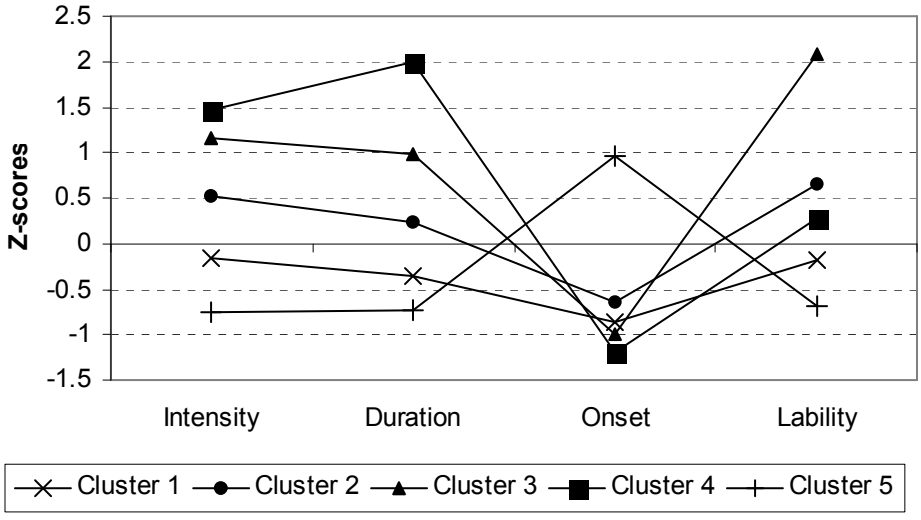

Figure 2. Profiles of the five clusters: z-scores as a function of the dimensions of negative affect.

Means and standard deviations for each of the five dimensions of negative affect across cluster are presented in Table 7. Figure 2 contains a profile analysis of each cluster. Examination of these profiles indicates that the five identified stylistic clusters move together with regard to the dimensions of expressed negative affect. This is likely a result of the high correlations between the dimensions. Initial examinations would indicate that the clustering may not add considerable information above and beyond examination of the individual dimensions of expressed negative affect.

Table 7

Descriptive Statistics for Model Parameters

		Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Total
Peak Intensity	M	.94	1.68	2.36	2.71	.30	1.124
	(SD)	(.25)	(.82)	(.50)	(.47)	(.50)	(1.075)
Duration[a]	M	.15	.35	.60	.93	.02	.269
	(SD)	(.10)	(.13)	(.18)	(.09)	(.04)	(.334)
Speed of Onset	M	3.63	5.84	2.43	.41	21.92	12.333
	(SD)	(3.83)	(2.65)	(2.95)	(1.06)	(3.34)	(9.986)
Lability	M	3.25	7.32	14.21	5.53	.89	4.186
	(SD)	(1.61)	(2.08)	(2.83)	(3.83)	(1.67)	(4.802)
Gaze at Mom[a]	M	.11	.15	.13	.17	.08	.113
	(SD)	(.20)	(.19)	(.19)	(.24)	(.15)	(.183)
Gaze at Environment[a]	M	.19	.27	.14	.20	.19	.199
	(SD)	(.23)	(.23)	(.11)	(.20)	(.21)	(.207)
Gaze at Self [a]	M	.01	.01	.01	.01	.01	.010
	(SD)	(.02)	(.02)	(.03)	(.02)	(.05)	(.035)

		Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Total
Self-soothing[a]	M	.07	.09	.21	.12	.06	.090
	(SD)	(.12)	(.13)	(.26)	(.17)	(.10)	(.149)
Object Play[a]	M	.44	.35	.29	.24	.61	.466
	(SD)	(.34)	(.30)	(.13)	(.29)	(.30)	(.331)
Reaching[a]	M	.19	.15	.09	.10	.05	.093
	(SD)	(.33)	(.20)	(.14)	(.24)	(.08)	(.183)
Venting[a]	M	.01	.02	.11	.08	.01	.034
	(SD)	(.05)	(.08)	(.16)	(.12)	(.06)	(.092)
IBQ – Distress to	M	3.36	3.80	3.50	3.92	3.53	3.606
Limitations	(SD)	(.67)	(1.03)	(.91)	(.97)	(.85)	(.890)
IBQ – Fear	M	2.31	2.42	2.48	3.30	2.41	2.542
	(SD)	(1.01)	(1.10)	(1.25)	(1.33)	(1.04)	(1.141)
IBQ – Soothability	M	5.12	5.37	5.25	5.04	5.20	5.199
	(SD)	(.82)	(.78)	(.47)	(.71)	(.77)	(.737)
IBQ – Falling	M	5.29	5.38	5.14	4.80	5.12	5.137
Reactivity	(SD)	(.57)	(1.06)	(.67)	(.97)	(.85)	(.863)
Maternal Sensivity	M	4.14	2.31	2.93	3.44	3.64	3.412
	(SD)	(2.48)	(2.96)	(1.73)	(2.76)	(2.07)	(2.341)
Maternal Education	M	2.88	3.74	2.64	2.53	3.66	3.313
	(SD)	(1.41)	(2.05)	(1.01)	(1.46)	(1.39)	(1.541)

a. Represent the proportion of intervals. Multiplying by 100 would give you the percent.

Examining the Predictive Relationship between Temperament and the Care-giving context to Stylistic Clusters of Affective Responding

The second goal of this study was to characterize how some factors that are internal (e.g., temperament) and external (e.g., care-giving context) to the infant may influence

negativity affectivity as observed in the still-face procedure at 6 months of age. A multinomial logistic regression was performed, through SPSS NOMREG, in order to assess the questions of whether the five identified stylistic cluster are predicted by: (a) temperament, (b) maternal sensitivity, (c) maternal ethnicity, (d) maternal education level, and (e) the interaction between temperament and maternal sensitivity. The prediction of membership into one of the five categories (Cluster 1, Cluster 2, Cluster3, Cluster4, and Cluster5) was assessed on the basis of four temperament variables, three care-giving context variables, and four interactions variables between each temperament variable and maternal sensitivity. The temperament predictors were the four dimensions of the IBQ: distress to limitations, fear, soothability, and falling reactivity. The care-giving context predictors were maternal sensitivity, mother's ethnicity (i.e., European American and African American), and maternal education level (i.e., no high school, high school/GED, some college, bachelors degree, masters degree, doctorate degree, professional, and other). Education was entered into the model as an ordinal rank variable. There was a good model fit (i.e., discrimination among groups), χ^2 (276, N = 129) = 160.891, $\underline{p}$ = 1.000 using a deviance criterion. A non-significant finding is indicative of a good fit.

A test of the full model with all 11 predictors against a constant-only model was statistically reliable, χ^2 (44, N=129) = 64.186, $\underline{p}$ = .025, indicating that the predictors, as a set, reliably distinguished between the different clusters of expressed negative affect. On the basis this model, correct classification rates were 9% for Cluster one, 9% for Cluster two, 6% for Cluster three, 11% for Cluster four, and 65% for Cluster five. The overall

classification rate was 62%. These results indicate that the cases were overclassified into the largest group, Cluster 5.

Examining the contribution of the individual predictors reveals that only maternal ethnicity (χ^2 (4, N=129) = 12.14, $\underline{p}$ = .016) reliably predicted the membership in the stylistic clusters of expressed negative affect (see Table 8). More specifically, maternal ethnicity differentiated between Cluster 3 (high negative affect with high lability) and Cluster 5 (no negative affect); Wald = 6.40, p=.014 (Odds Ratio = 13.379: 95% confidence interval, 1.691 – 105.865). It was hypothesized that infants with African-American mothers would express more negative affect than infants with European-American mothers. Contrary to this expectation, infants in Cluster 3 (high negative affect with high lability) were 13.38 times less likely to have African-American mothers than infants in the no negative affect cluster (Cluster 5). This indicates that infants with African-American mothers expressed less negative affect during the still-face procedure than infants with European-American mothers.

It was further hypothesized that infants who had more sensitive mothers would display more negative affectivity during the still-face procedure and that infants whose mothers had lower levels of education would express more negative affectivity. Contrary to these expectations, maternal sensitivity and maternal education were not significantly predictive of membership in the five identified clusters (see Table 8). With regard to temperament, it was hypothesized that infants scoring higher on the distress to limitations and fear dimensions of the IBQ would express more negative affectivity, while infants scoring higher on the soothability and falling reactivity dimensions would express less

negative affectivity. Contrary to these expectations, temperament was not a significant predictor of the five identified clusters (see Table 8).

Table 8

Log Likelihood tests for Logistic Regression Predicting Cluster Membership as a Function of Temperament and the Care-giving context

	-2 Log Likelihood of Reduced Model	χ^2	p
Maternal Ethnicity (African American)	173.027	12.137	.016
IBQ – Distress to Limitations	165.530	4.639	.326
IBQ – Fear	164.614	3.724	.445
IBQ - Soothability	166.248	5.357	.253
IBQ – Falling reactvity	163.834	2.944	.567
Maternal Sensitivity	165.402	4.512	.341
Maternal Education	170.039	9.148	.057
Distress to Limitation * Maternal Sensitivity	164.710	3.819	.431
Fear * Maternal Sensitivity	169.322	8.431	.077
Soothability * Maternal Sensitvity	170.230	9.340	.053
Falling Reactivity * Maternal Sensitivity	165.984	5.094	.278

Examining the Predictive Relationship between Temperament and the Care-giving Context to Ordinal Categories of the Dimensions of Expressed Negative Affect

In addition to examining the relationships between temperament, the care-giving context, and stylistic cluster membership, it is valuable to examine each individual dimension of expressed negative affect. Examining the individual dimensions, as well as the stylistic clusters, may provide evidence of whether or not the separate dimensions contribute anything unique to our understanding of emotional responding during the still-face procedure. A series of four ordinal logistic regressions were performed using the

proportional odds model (PLUM) in SPSS to assess the prediction of membership into ordinal categories of each dimension of negative affect on the basis of temperament and the care-giving context. The temperament predictors were the four dimensions of the IBQ: (a) distress to limitations, (b) fear, (c) soothability, and (d) falling reactivity. The care-giving context predictors were maternal sensitivity, mother's ethnicity (European-American and African-American), and maternal education level (no high school, high school/GED, some college, bachelors degree, masters degree, doctorate degree, professional, other). Education was entered into the model as an ordinal rank variable. The interaction terms between maternal sensitivity and each of the four dimensions of temperament were also assessed. The dimensions of intensity (i.e., no, low, moderate, and high negative affect), duration (i.e., no, low, moderate, and high duration), speed of onset (quick, slow, long, no onset), and lability (i.e., none, low, moderate, and high) were each assessed within separate models. There was a good model fit (i.e., discrimination among groups) on the basis of the predictors for each of the four models using a deviance criterion. The goodness of fit statistics are presented in Table 9.

Table 9

Model Goodness of Fit Statistics for individual dimensions as predicted by temperament and the care-giving context

	χ^2	df	p
Peak Intensity	197.909	229	.932
Duration	199.341	221	.922
Speed of Onset	198.287	221	.930
Lability	199.466	221	.912

Note. A non-significant finding indicates a good fit

Model 1: Peak intensity. To assess the dimension of intensity, a test of the full model with all 11 predictors against a constant-only model was assessed. The model was

not statistically significant, χ^2 (11, N=129) = 16.792, p = .114, indicating that the predictors, as a set, did not reliably distinguish between the different levels of expressed peak intensity of negative affect.

Model 2: Duration. To assess the dimension of duration, a test of the full model with all 11 predictors against a constant-only model was performed. This model was statistically significant, χ^2 (11, N=129) = 21.122, p = .032, indicating that the predictors, as a set, reliably distinguished between the different levels of duration of negative affect. Examining the contribution of the individual predictors reveals that only maternal ethnicity (Wald (1) = 7.601, p = .008) and maternal education level (Wald (1) = 6.941, p = .008) reliably predicted the membership in ordinal categories representing the duration of expressed negative affect. Table 10 shows regression coefficients, Wald statistics, odds ratios and 95% confidence intervals for odds ratios for each of the predictors.

It was hypothesized that infants with African-American mothers would express more negative affect during the still-face procedure. Contrary to this expectation, infants with African-American mothers were less likely to have increasing durations of expressed negative affect than infants with European-American mothers. For infants with African-American mothers, the odds of belonging to the high-duration category versus belonging to the combined categories of moderate, low, or none are 1.42 times lower than for infants with European-American infants, given that all other variables are held constant. More specifically, 46% of infants in the combined categories of high, moderate, and low have African American mothers, while 67% of infants in the No negative affect (i.e., no duration) have African-American mothers.

With regard to maternal level of education, it was hypothesized that infants whose mothers have lower levels of education would express more negative affect during the still-face procedure. In support of this hypothesis, results show that mothers with lower levels of education have infants who express negative affect for longer durations. For a one-unit increase in maternal level of education, the odds of infants expressing high durations of negative affect versus the combined levels of moderate, low, and none are .61 times more likely, given that all other variables remain constant. More specifically, infants in the no duration category have mothers with higher levels of education (M = 3.51; SD=1.38) than infants in the combined duration categories of low, moderate, and high duration (M = 3.10; SD=1.62).

Table 10

Parameter estimates for ordinal logistic regression predicting duration by temperament and the care-giving context

Category /Predictor	B	Wald	Sig.	Odds Ratio	95% Confidence Interval for Odds Ratio	
					Lower Bound	Upper Bound
Threshold						
No Duration	-1.992	8.386	.004	.136	.035	.525
Low Duration	-.392	.364	.546	.676	.189	2.416
Moderate Duration	.992	2.199	.138	2.69	.727	9.992
Location						
Maternal Ethnicity (African American)	1.336	7.061	.008	2.803	1.419	10.183
IBQ - Distress to Limitations	.012	.002	.963	1.012	.608	1.685
IBQ - Fear	.289	1.532	.216	1.335	.845	2.108
IBQ - Soothability	.136	.301	.583	1.146	.705	1.863
IBQ – Falling reactvity	-.316	1.397	.237	.729	.432	1.231

Category /Predictor	B	Wald	Sig.	Odds Ratio	95% Confidence Interval for Odds Ratio	
					Lower Bound	Upper Bound
Maternal Sensitivity	.235	.926	.336	1.265	.784	2.044
Maternal Education	-.503	6.941	.008	.605	.416	.879
Distress to Limitation * Maternal Sensitivity	-.383	2.511	.113	.682	.424	1.095
Fear * Maternal Sensitivity	-.485	3.351	.067	.616	.366	1.035
Soothability * Maternal Sensitvity	-.025	.015	.902	.975	.649	1.464
Falling Reactivity * Maternal Sensitivity	-.399	2.126	.145	.671	1.147	.670

Model 3: Speed of onset. To assess the dimension of speed of onset, a test of the full model with all 11 predictors against a constant-only model was preformed. This model was statistically significant, χ^2 (11, N=129) = 21.682, $\underline{p}$ = .027, indicating that the predictors, as a set, reliably distinguished between the different levels of speed of onset of negative affect. Examining the contribution of the individual predictors reveals that only maternal ethnicity (Wald (1) = 7.344, $\underline{p}$ = .007) and maternal education level (Wald (1) = 8.414, $\underline{p}$ = .004) reliably predicted the membership in ordinal categories representing the duration of expressed negative affect. Table 11 shows regression coefficients, Wald statistics, odds ratios and 95% confidence intervals for odds ratios for each of the predictors.

Table 11

Parameter estimates for ordinal logistic regression predicting speed of onset by temperament and the care-giving context

Category /Predictor	B	Wald	Sig.	Odds Ratio	95% Confidence Interval for Odds Ratio	
					Lower Bound	Upper Bound
Threshold						
Low Speed of Onset	.177	.073	.786	1.194	.333	4.279
Moderate Speed of Onset	1.124	2.872	.090	3.077	.839	11.277
High Speed of Onset	2.141	9.524	.002	8.506	2.183	33.137
Location						
Maternal Ethnicity						
(African American)	-1.379	7.344	.007	3.970	.093	.683
IBQ - Distress to Limitations	.053	.040	.842	1.054	.626	1.779
IBQ - Fear	-.155	.430	.512	.856	.539	1.361
IBQ - Soothability	-.196	.593	.441	.822	.499	1.359
IBQ – Falling reactvity	.352	1.609	.205	1.422	.852	2.452
Maternal Sensitivity	-.356	1.993	.158	.700	.427	1.148
Maternal Education	.553	8.141	.004	1.738	1.189	2.544
Distress to Limitation *						
Maternal Sensitivity	.311	1.579	.209	1.365	.840	2.214
Fear * Maternal Sensitivity	.502	3.290	.070	1.652	.961	2.843
Soothability * Maternal						
Sensitvity	.347	2.558	.110	1.415	.925	2.166
Falling Reactivity * Maternal						
Sensitivity	.442	2.187	.139	1.556	.866	2.798

It was hypothesized that infants with African-American mothers would express more negative affect during the still-face procedure. Contrary to this expectation, infants with African-American mothers had longer speed of onsets of expressed negative affect

than infants with European-American mothers. For infants with African-American mothers, the odds of belonging to the no speed of onset category versus belonging to the combined categories of short, moderate, and high are 3.97 times lower than for infants with European-American infants, given that all other variables are held constant. More specifically, 46% of infants in the combined categories of short, moderate, and high have African-American mothers, while 67% of infants in the no speed of onset have African-American mothers.

With regard to maternal level of education, it was hypothesized that infants whose mothers have lower levels of education would express more negative affect during the still-face procedure. In support of this hypothesis, results show that mothers with lower levels of education have infants who express negative affect with shorter speed of onset. For a one unit increase in maternal level of education, the odds of infants having no onset of negative affect versus the combined levels of short, moderate, and high are 1.74 times more likely, given that all other variables remain constant. More specifically, infants in the no onset category have mothers with higher levels of education (M = 3.51; SD=1.38) than infants in the combined duration categories of short, moderate, and high onsets (M = 3.10; SD=1.62).

Model 4: Lability. To assess the dimension of lability, a test of the full model with all 11 predictors against a constant-only model was performed. This model was not statistically significant, χ^2 (11, N=129) = 18.104, p = .079, indicating that the predictors, as a set, did not reliably distinguish between the different levels of lability of negative affect.

Description of Observed Behavioral Strategies

The third goal of this study was to characterize infants' behavioral capacities to regulate negative affect during the still-face procedure at 6-months of age. In order to address the question of what behavioral strategies are observed in infants during the still-face procedure at 6-months of age, descriptive statistics were performed. It was hypothesized that behavioral strategies in the categories of other-directed/signaling, self-soothing, attentional, and venting would be observed in 6-month old infant during the still-face procedure. As expected, behavioral strategies from all four categories were observed. Indeed, all seven behavioral strategies were observed during the still-face procedure. Only 1 infant in the sample used none of the identified strategies. However, 27% (N=35) of the infants had intervals with none of the identified.

It was also hypothesized that other-directed and self-soothing behaviors would be observed to occur more frequently than attentional or venting strategies. Contrary to this expectation, object play, an attentional strategy, was the most commonly observed behavioral strategy with 89.1% of infants using object play. Gaze at self was observed with only 14% of infants making this behavior the least commonly used strategy. For the other strategies, gaze at environment was observed with 75.2% of infants; gaze at mom was observed with 52.7% of infants; reaching was observed with 52.7% of infants; self-soothing was observed with 48.8% of infants; and venting was observed with 19.4% of infants. Means and standard deviations were presented for the proportion of intervals each behavior was observed during the still-face procedure in Table 5.

It was further hypothesized that 6-month old infants would use multiple strategies during the still-face procedure. In support of this hypothesis, infants were observed to use

multiple behavioral strategies during the still-face procedure with an average of 3.43 (SD=1.48) strategies per infant. More specifically, 1% of infants used no behavioral strategies, 9% used only one strategy, 16% used two strategies, 28% used three strategies, 21% used four strategies, 19% used five strategies, 4% used six strategies, and in 2% on the infants all seven strategies were used.

Predicting the Use of Behavioral Strategies as a Function of Temperament and the Care-giving context

To address the question of whether mother-reported temperament and aspects of the care-giving context as measured by maternal ethnicity, maternal sensitivity, and maternal education predicted the use of different types of behavioral strategies during the still-face procedure, a series of direct, binary logistic regression analyses were employed. For each model the dependent variable was a binary category of whether the infant used the behavior or did not use the behavior. A separate model was performed for each of the seven behavioral strategies: gaze at mom, gaze at environment, gaze at self, self-soothing, object play, reach, or venting. The predictor variables were the four dimensions of the IBQ: distress to limitations, fear, soothability, and falling reactivity/recovery, maternal sensitivity, maternal ethnicity, maternal education, and the four interaction terms between the four dimensions of temperament and sensitivity. A test of the full model versus a model with intercept only was performed for each of the seven behavioral strategies. It was hypothesized that infants with higher scores on the IBQ dimensions of fear and distress to limitations will use more passive strategies. It was also hypothesized that infants with higher maternal sensitivity, African American mothers, and lower SES would use more passive strategies. Contrary to these expectations, temperament and care-

giving context variables were not significant predictors of the use of behavioral strategies.

Predicting Cluster Membership as a Function of the Use of Behavioral Strategies

To address the question of the extent to which different stylistic response clusters of expressed negative affect predict the use of behavioral strategies during the still-face procedure, a multinomial logistic regression was performed through SPSS NOMREG. This analysis assessed the prediction of membership in one of five stylistic response clusters (Cluster 1, Cluster 2, Cluster 3, Cluster4, and Cluster5) on the basis of seven behavioral strategies: (a) gaze at mom, (b) gaze at environment, (c) gaze at self, (d) self-soothing, (e) object play, (f) reaching, and (g) venting. There was a good model fit (i.e., discrimination among groups) on the basis of the seven behavioral predictors, χ^2 (140, N = 129) = 132.23, $\underline{p}$ = .668 using a deviance criterion.

A test of the full model with all seven predictors against a constant-only model was statistically reliable, χ^2 (28, N=129) = 55.71, $\underline{p}$ = .001, indicating that the predictors, as a set, reliably distinguished between the different clusters of expressed negative affect. On the basis of the seven behavioral predictors, correct classification rates were 1% for Cluster one, 5% for Cluster two, 12% for Cluster three, 12% for Cluster four, and 71% for Cluster five; the overall classification rate was 54%. These results indicate that cases were overclassified into the largest group, Cluster 5.

It was hypothesized that the identified stylistic clusters would be related to the use of different types of behavioral strategies during the still-face procedure at 6-months of age. Examining the contribution of the individual predictors reveals that only the use of object play (χ^2 (4, N=129) = 15.82, $\underline{p}$ = .003) and venting (χ^2 (4, N=129) = 17.45, $\underline{p}$ =

.002) reliably predicted the membership in clusters representing the styles of expressed negative affect. Table 12 shows regression coefficients, Wald statistics, odds ratios and 95% confidence intervals for odds ratios for each of the seven predictors.

Table 12

Parameter Estimates for Logistic Regression Predicting Cluster as a Function of Behavioral Strategies

Behavioral Strategy	B	Wald	Sig.	Odds Ratio	95% Confidence Interval for Odds Ratio	
					Lower Bound	Upper Bound
Cluster 1						
Gaze at mom	1.021	2.497	.114	2.777	.782	9.854
Gaze at Environment	-.216	.097	.756	.806	.207	3.143
Gaze at Self	-.980	1.415	.234	.375	.075	1.886
Self Soothing	-.185	.091	.763	.831	.249	2.774
Object Play	2.087	2.584	.108	8.059	.633	102.639
Reach	-.772	1.550	.213	.462	.137	1.558
Vent	.308	.068	.795	1.360	.134	13.799
Cluster 2						
Gaze at mom	-.384	.393	.531	.681	.205	2.261
Gaze at Environment	-.575	.579	.447	.563	.128	2.474
Gaze at Self	-.927	1.460	.227	.396	.088	1.779
Self Soothing	-.419	.506	.477	.658	.208	2.084
Object Play	2.690	4.792	.029	14.725	1.325	163.618
Reach	-1.264	3.983	.046	.283	.082	.978
Vent	-.267	.102	.750	.766	.149	3.950

Behavioral Strategy	B	Wald	Sig.	Odds Ratio	95% Confidence Interval for Odds Ratio	
					Lower Bound	Upper Bound
			Cluster 3			
Gaze at mom	-.278	.146	.702	.757	.181	3.158
Gaze at Environment	-1.503	1.607	.205	.222	.022	2.273
Gaze at Self	-.283	.084	.771	.754	.112	5.080
Self Soothing	.128	.027	.868	1.136	.251	5.137
Object Play	2.832	4.469	.035	16.975	1.229	234.449
Reach	.012	.000	.986	1.012	.266	3.851
Vent	-2.488	9.332	.002	.083	.017	.410
			Cluster 4			
Gaze at mom	.374	.307	.580	1.453	.387	5.449
Gaze at Environment	.433	.344	.558	1.542	.363	6.554
Gaze at Self	-.995	1.270	.260	.370	.066	2.086
Self Soothing	-.179	.064	.800	.836	.209	3.342
Object Play	3.637	9.598	.002	37.993	3.805	379.412
Reach	-.728	1.240	.265	.483	.134	1.739
Vent	-2.211	7.617	.006	.110	.023	.527

Note. The reference category is cluster 5 (no negative affect cluster).

As can be seen in Table 12, infants in Cluster 2 were less likely to use object play (M=35% of intervals, sd=.30) and more likely to use reaching (M=15% of intervals, SD=.20) than were infants in Cluster 5 (object play: M = 61% of intervals, SD = .30; reaching: M = 5% of intervals, SD =. 08). Infants in cluster 3 were less likely to use object play (M = 29% of intervals, SD = .26) and more likely to use venting (M = 11% of intervals, SD = .16) than infants in Cluster 5 (object play: M = 61% of intervals, SD = .30; venting: M = 1% of intervals, SD =. 06). Finally, infants in Cluster 4 were less likely

to use object play (M = 24% of intervals, SD = .29) and more likely to use venting (M = 8% of intervals, SD = .12) than infants in cluster 5 (object play: M = 61% of intervals, SD = .30; venting: M = 1% of intervals, SD =. 06).

Predicting Negative Affect Dimensions as a Function of the Use of Behavioral Strategies

To assess the relationship between each individual dimension of expressed negative affect and the use of behavioral strategies, a series of four ordinal logistic regressions were performed through SPSS PLUM. This analysis assessed prediction of membership into ordinal categories of each dimension of negative affectivity on the basis of the use of behavioral strategies. The dimensions of intensity (i.e., no, low, moderate, and high negative affect), duration (i.e., no, low, moderate, and high duration), speed of onset (i.e., quick, slow, long, no onset), and lability (i.e., zero, low, moderate, and high) were each assessed within separate models. There was a good model fit (i.e., discrimination among groups) on the basis of the seven behavioral strategies for each of the four models using a deviance criterion. The goodness of fit statistics are presented in Table 13.

Table 13

Model Goodness of Fit Statistics for predicting the use of behavioral strategies as a function of the individual dimensions of negative affect

Dimension	χ^2	df	p
Peak Intensity	105.833	119	.801
Duration	105.874	119	.800
Speed of Onset	108.950	119	.735
Lability	117.751	119	.515

Note. A non-significant finding indicates a good fit.

Model 1: Peak intensity. A test of the full model with all seven predictors against a constant-only model was statistically reliable, χ^2 (7, N=129) = 32.757, p = .000,

indicating that the predictors, as a set, reliably distinguished between the different levels of expressed peak intensity of negative affect. Examining the contribution of the individual predictors reveals that the use of object play (*Wald* (1, N=129) = 8.98, p = .003), reaching (*Wald* (1, N=129) = 5.35, p = .021), and venting (*Wald* (1, N=129) = 12.85, p = .000) reliably predicted the membership in intensity groups of expressed negative affect. Table 14 shows regression coefficients, Wald statistics, odds ratios and 95% confidence intervals for odds ratios for each of the three predictors for the significant findings.

The results support the hypothesis that infants expressing higher levels of negative affectivity would use less attentional strategies. For infants who did not use object play, the odds of expressing high intensity of negative affect versus the combined levels of none, low, and moderate intensity are 5.3 times higher than for infants who did use object play during the still-face procedure. Of those infants expressing the highest level of intensity of negative effect, only 71% where observed to use object play, while 92.3% of infants expressing none, low, or moderate levels of intensity used object play.

The results also support the hypothesis that other-directed behaviors would be associated with higher levels of negative affectivity. For infants who did not use reaching, the odds of expressing the highest level of intensity of negative affect versus the combined levels of none, low, and moderate intensity are 0.45 times lower than for infants who did use reaching during the still-face procedure. Of those infants expressing the highest level of intensity, 80.9% were observed to use the strategy of reaching, while 47.2% of infants in the none, low, and moderate intensity categories, combined, used reaching.

Finally, the results support the hypothesis that venting would be associated with higher levels of negative affectivity. For infants who did not use venting, the odds of expressing high intensity of negative affect versus the combined levels of none, low, and moderate intensity of negative affect are .20 times lower than for infants who did use venting during the still-face procedure. Of those infants who expressed the highest level of intensity, 42.9% were observed to use venting, while only 14.8% of infants in the none, low, and moderate intensity categories, combined, used venting.

Table 14

Parameter estimates for ordinal logistic regression predicting intensity as a function of the individual dimensions of negative affect

Category/Strategy	B	Wald	Sig.	Odds Ratio	95% Confidence Interval for Odds Ratio	
					Lower Bound	Upper Bound
Threshold						
No Negative Affect	-2.603	17.316	.000	.074	.022	.252
Low Intensity	-.970	2.718	.099	.379	.119	1.201
Moderate Intensity	.129	.049	.825	1.138	.361	3.586
Location						
Gaze at mom	.207	.345	.557	1.229	.616	2.454
Gaze at Environment	-.109	.073	.787	.897	.405	1.984
Gaze at Self	-.173	.128	.721	.841	.326	2.173
Self Soothing	-.370	1.080	.299	.691	.344	1.388
Object Play	1.668	8.980	.003	5.302	1.78	15.78
Reach	-.806	5.345	.021	.447	.225	.884
Vent	-1.678	12.853	.000	.187	.075	.467

Model 2: Duration. A test of the full model with all seven predictors against a constant-only model was statistically reliable, χ^2 (7, N=129) = 27.084, $\underline{p}$ = .000, indicating that the predictors, as a set, reliably distinguished between the different levels

of duration of expressed negative affect. Examining the contribution of the individual predictors reveals that the use of object play (*Wald* (1, N=129) = 9.5, p = .002) and venting (*Wald* (1, N=129) = 9.77, p = .002) reliably predicted the membership in duration categories of expressed negative affect. Table 15 shows regression coefficients, Wald statistics, odds ratios and 95% confidence intervals for odds ratios for each of the three predictors for the significant findings.

Table 15

Parameter estimates for ordinal logistic regression predicting duration as a function of the individual dimensions of negative affect

Category/Strategy	B	Wald	Sig.	Odds Ratio	95% Confidence Interval for Odds Ratio	
					Lower Bound	Upper Bound
Threshold						
No Duration	-2.479	16.280	.000	.084	.025	.279
Low Duration	-1.185	4.097	.043	.306	.097	.963
Moderate Duration	.286	.242	.623	1.331	.426	4.161
Location						
Gaze at mom	.141	.165	.685	1.151	.582	2.279
Gaze at Environment	-.114	.081	.776	.892	.407	1.958
Gaze at Self	-.478	1.000	.317	.620	.243	1.582
Self Soothing	-.196	.308	.579	.822	.412	1.640
Object Play	1.700	9.495	.002	5.47	1.857	16.130
Reach	-.627	3.330	.068	.534	.273	1.05
Vent	-1.434	9.765	.002	.238	.097	.586

The results support the hypothesis that infants expressing higher levels of negative affectivity would use less attentional strategies. For infants who did not use object play, the odds of expressing high duration of negative affect versus the combined levels of none, low, and moderate duration are 5.5 times higher than for infants who did use object

play during the still-face procedure. Of those infants expressing the longest duration of negative affect, 68.4% were observed to use object play, while 92.7% of infants in the none, low, and moderate duration categories combined used object play.

The results also support the hypothesis that venting would be associated with higher levels of negative affectivity. For infants who did not use venting, the odds of expressing high duration of negative affect versus the combined levels of none, low, and moderate duration, combined, are .24 times higher than for infants who did use venting during the still-face procedure. Of those infants who expressed the highest durations of negative affect, 42.1% were observed to use venting, while only 15.5% of infants in the none, low, and moderate affective duration categories, combined, used venting.

Model 3: Speed of onset. A test of the full model with all seven predictors against a constant-only model was statistically reliable, χ^2 (7, N=129) = 18.850, p = .009, indicating that the predictors, as a set, reliably distinguished between the different levels of duration of expressed negative affect. Examining the contribution of the individual predictors reveals that only the use of object play (*Wald* (1, N=129) = 6.73, p = .009) and venting (*Wald* (1, N=129) = 4.74 p = .029) reliably predicted the membership in intensity groups of expressed negative affect**.** Table 16 shows regression coefficients, Wald statistics, odds ratios and 95% confidence intervals for odds ratios for each of the seven predictors for the significant findings.

The results support the hypothesis that infants expressing higher levels of negative affectivity would use less attentional strategies. For infants who did not use object play, the odds of expressing no onset of negative affect versus the combined levels of low, moderate, and high speed of onset are .7 times higher than for infants who did use object

play during the still-face procedure. Of those infants who expressed no onset of negative affect, 95.7% were observed to use the strategy of object play, while 85.5% of infants in the low, moderate, and high duration categories, combined, used object play.

Table 16

Parameter estimates for ordinal logistic regression predicting speed of onset as a function of the individual dimensions of negative affect

					95% Confidence Interval for Odds Ratio	
Category/Strategy	B	Wald	Sig.	Odds Ratio	Lower Bound	Upper Bound
			Threshold			
Low Speed of Onset	.521	.784	.376	1.683	.532	5.327
Moderate Speed of Onset	1.460	5.918	.015	4.305	1.328	13.953
High Speed of Onset	2.151	12.233	.000	8.592	2.573	28.664
			Location			
Gaze at mom	-.201	.332	.564	.818	.413	1.621
Gaze at Environment	.249	.386	.534	1.283	.585	2.818
Gaze at Self	.655	1.815	.178	1.925	.742	4.987
Self Soothing	.088	.062	.803	1.092	.538	2.177
Object Play	-1.487	6.729	.009	.695	0733	.695
Reach	.521	2.301	.129	1.684	.859	3.299
Vent	.999	4.741	.029	6.671	1.105	6.671

The results also support the hypothesis that venting would be associated with higher levels of negative affectivity. For infants who did not use venting, the odds of expressing no onset of negative affect versus the combined levels of low, moderate, and high are 6.7 times higher than for infants who did use venting during the still-face. Of those infants who expressed no onset of negative affect, 8.7% were observed to use venting, while 25.3% of infants in the low, moderate, and high categories, combined, used venting.

Model 4: Lability. A test of the full model with all seven predictors against a constant-only model was statistically reliable, χ^2 (7, N=129) = 18.624 p = .009, indicating that the predictors, as a set, reliably distinguished between the different levels of lability of expressed negative affect. Examining the contribution of the individual predictors reveals that only the use of venting (*Wald* (1, N=129) = 8.86 p = .003) reliably predicted the membership in intensity groups of expressed negative affect**.** Table 17 shows regression coefficients, Wald statistics, odds ratios, and 95% confidence intervals for odds ratios for each of the seven predictors for the significant findings.

Table 17

Parameter estimates for ordinal logistic regression predicting lability as a function of the individual dimensions of negative affect

					95% Confidence Interval for Odds Ratio	
Category/Strategy	B	Wald	Sig.	Odds Ratio	Lower Bound	Upper Bound
			Threshold			
No Lability	-2.251	13.526	.000	.105	.032	.349
Low Lability	-1.452	5.937	.015	.234	.073	.753
Moderate Lability	.288	.246	.620	1.334	.427	4.161
			Location			
Gaze at mom	.095	.075	.784	1.099	.556	2.177
Gaze at Environment	-.503	1.543	.214	.605	.274	1.338
Gaze at Self	-.133	.077	.781	.875	.342	2.239
Self Soothing	-.360	1.045	.307	.698	.350	1.391
Object Play	.288	.297	.586	1.334	.473	3.762
Reach	-.439	1.648	.199	.645	.329	1.259
Vent	-1.347	8.589	.003	.260	.106	.640

The results support the hypothesis that venting would be associated with higher levels of negative affectivity. For infants who did not use venting, the odds of expressing

high lability of negative affect versus the combined levels of none, low, and moderate are .26 times higher thant for infants who did use venting during the still-face procedure. Of those infants who expressed the highest level of lability, 52.6% were observed to use venting, while only 13.6% of infants in the none, low, and moderate affective lability categories, combined, used venting.

CHAPTER 4

DISCUSSION

The current study was the first study in the emotion regulation literature to examine behavioral strategies within a multi-dimensional framework of negative affectivity. Thompson (1994) has suggested that emotion may be regulated across multiple intensive and temporal dimensions. This study examined expressed emotion and the use of behavioral strategies during the still-face procedure in the context of a multi-dimensional framework. In addition, it contributes to our understanding of early negative affectivity and the use of behavioral strategies within the first year of life. The current literature is sparse with regard to empirical evidence during this time period. The first year of life is especially important because the foundation for later emotion regulation is being forged within this time period (Sroufe, 2000). Furthermore, this project is important not only because it provides a description of infants' expressions of negative affect and early behavioral strategies of regulation, but also because it presents an opportunity to identify aspects of the infant-caregiver dyad that may influence behavioral responding during challenging situations. Understanding the dyadic context of early emotion and behavioral strategy use is critical, given that early emotion regulation is a dyadic process occurring within the caregiver-infant dyad (Kopp, 1989).

The first goal of this study was to characterize infant's expressions of negative affect within a multi-dimensional framework of emotion regulation during the still-face procedure. It was hypothesized that infants would express variability across the multiple dimensions of

expressed negative affect: (a) intensity, (b) duration, (c) speed of onset, and (d) lability. The observed range of infants' expressed negative affect supported this hypothesis. While a relatively large proportion of infants (36%) did not express negative affect, the majority of infants (64%) did. Of the infants who did express negative affect, the scores for each dimension ranged from the lowest score to the highest score. However, the overall level of expressed negative affect was relatively low. The average infant took approximately 1 minute to express a low level of intensity for about 20 seconds. The overall low level of expressed negative affect raises the question of whether infants in the current sample were actually distressed or not. Interestingly, Weinberg & Tronick (1996) have found that infants actually express more negative affect during the recovery period of the still-face. More specifically, they found that infants showed signs of physiological distress during the still-face, but relatively low rates of fussing and crying. Once the reunion episode began, infants showed significantly more fussing and crying. The authors speculated that the physiological signs indicated distress, but that infants did not fuss and cry until the reunion when the mother was available to offer assistance (Weinberg & Tronick). The current study was not designed to assess physiological distress, nor did it include the recovery period following the still-face procedure. Thus, this question cannot be adequately addressed. However, this will be an important consideration to keep in mind as the results of the study are discussed.

To further highlight the complex, multi-dimensional nature of expressed negative affect, the current study examined the relationships between the four dimensions. The hypothesis that the four individual dimensions of expressed negative affect would be correlated was supported. In fact, the four dimensions were highly correlated. One of the primary premises of the current study was that it would be valuable to consider each affective dimension

separately, as regulation can occur at any one or more of these dimensions (Thompson, 1994). Although it is certainly intuitive that the dimensions would be correlated to some extent, if the individual dimensions were being differentially regulated, one might expect the correlations to be somewhat lower. Such high correlations call into question the need to utilize more than one dimension of expressed negative affect. With such high correlations, one might reasonably argue that focusing on one dimension, such as intensity, may be the most parsimonious approach.

To further explore the relationships between the multiple dimensions, the stylistic responses of expressed negative affect were examined. Infants have been found to differ in their styles of response to extrinsic demands and the associated emotional experiences (Braungart-Rieker & Stifter, 1996; Cole, et al., 1994). Furthermore, emotions can be regulated by affecting change in one or more dimensions (Thompson, 1994), which may lead to variations in the expression of negative affect in the effected dimensions. It was expected that these stylistic differences would be represented in the patterns of expressions across the four affective dimensions. The attempt to identify stylistic clusters produced a five-cluster solution: (a) low negative affectivity, (b) moderate negative affectivity, (c) high negative affectivity with high lability, (d) high negative affect with moderate lability, and (e) no negative affect. Examination of the profiles revealed that the individual dimensions for each cluster essentially moved together and that the differences were primarily of degree. For example, the low negativity cluster was characterized by low intensities, low durations, low speed of onset, and low labilility, while moderate scores on each dimension characterized the moderate negativity cluster. Although this finding is not surprising given the high

correlations found between the individual dimensions within the current sample, it does bring into question the utility of identifying clusters at this age.

Overall the findings related to the characterization of expressed negative affect suggest that utilizing a multidimensional framework may have limited utility in the investigation of expressed negative affect and emotion regulation processes for 6 month-old infants during the still-face procedure. It could be suggested that utilizing one dimension might be the most parsimonious model. However, to be satisfied that one dimension may sufficiently represent the emotional and regulatory experience of infants, one would need to be satisfied that the infants in the current sample were sufficiently distressed, such that a full range of emotions was displayed. Given the low levels of expressed negative affect, this condition may not have been satisfied. There are several explanations to consider. First, the current study was not designed to assess if the infants were regulating their negative affect such that their expressions of negative affect were suppressed or if the infants simply were not distressed. If the infants were simply not distressed, then it would be difficult to capture the degree to which individual dimensions of expressed negative affect varied as a result of regulation. It is also possible that 6 month-old infants are not regulating their emotions. In addition, Izard and Maltesta (1987) have found that expressed negative affect closely reflects the internal experiences of the infant. This would suggest that infants at this age are not regulating their emotions and it would be reasonable to find such high correlations between the four dimensions. Another consideration for the current findings is that the examination of negative affect was based on a single, relatively brief challenging episode. For example, findings from the toddler literature have demonstrated that multiple environmental factors may influence the expression of negative affect, including mother involvement and type of

emotion (Diener & Mangelsdorf, 1999). It is possible, therefore, that an examination over multiple contexts may reveal a more comprehensive examination of the multidimensional framework.

The second goal of this study was to characterize how some factors internal (e.g., temperament) and external (e.g., care-giving context) to the child may influence infant negative affectivity as observed in the still-face procedure at 6 months of age. Early emotion regulation occurs within the context of the dyadic infant-caregiver relationship (Kopp, 1989; Sroufe, 1996; 2000). Thus, it was expected that temperament and the care-giving context would be predictive of both affective and behavioral responding during the still-face procedure.

More specifically, it was expected that infants scoring higher on distress to limitations and fear would express more negative affectivity, while infants scoring higher on the soothability and falling reactivity dimensions would express less negative affectivity. Contrary to expectation, temperament was not found to be predictive of expressed negative affect during the still-face procedure. Temperament represents predispositions for responding in particular ways; however, there must be an activating condition (Rothbart & Bates, 2006). For example, infants who score high on the fear dimension of the IBQ have the predisposition to respond with higher fear reactions, but only if the predisposition is activated by some environmental condition, such as a vacuum cleaner suddenly starting (Rothbart & Bates). Given the low levels of general distress observed in the current study, it may be that the underlying temperamental characteristics were not activated sufficiently to be observed.

Another possible explanation for the lack of findings is that the measure of temperament in the current study was based on mother report questionnaires. On the one

hand, Rothbart and Bates (2006) argue that parent-report questionnaires provide important insight into the measurement of temperament. Parents are in a unique position to describe an infant's response to a variety of naturally occurring stimuli, including infrequently occurring behavior. On the other hand, parent-reports may have problems with bias and inaccuracy (Kagan 1994). Indeed, some research has found that mother-reports of temperament are found to be uncorrelated with observational measures of temperament (Kagan, 1994). More recently, however, research has shown parent-report questionnaires to demonstrate convergent validity with observational methods (Bishop, Spence, & McDonald, 2003). There are advantages and disadvantages to both parent-report questionnaires and observational methods. For this reason, multiple measures consisting of both questionnaires and observations may produce the most reliable and valid assessment of temperament (Rothbart & Bates, 2006; Kagan & Fox, 2006).

With regard to the care-giving context, infants who have more sensitive mothers were expected to display more negative affectivity during the still-face procedure. The still-face procedure may be more upsetting to infants who have developed the expectation of warm and consistent responding from their mothers. Maternal sensitivity, however, was not found to be predictive of expressed negative affect during the still-face procedure. The lack of relationship between maternal sensitivity and expressed negative affect was surprising. Extant literature has reliably demonstrated the effects of maternal sensitivity on infant and child development (Lyons-Ruth & Zeenah, 1993). However, it is also well documented that these influence develop over time, based on the daily interactions with the mother (Ainsworth, et al., 1978; Sroufe, 2000). Perhaps 6 months of age was still too early to reliably detect these influences in such a brief episode. It has, however, been established that

by about 7 months of age infants have developed reliable expectations that form important working models of interactions with the mother (Ainsworth, et al.). Thus, it is likely that maternal sensitivity would emerge over time as an important predictor of negative affectivity. In addition, the still-face procedure was deliberately chosen for the current study because the mother was uninvolved and the infants' attempts at regulation could be observed independently. It may be that observations where the mother is actively involved would reveal more direct influences of maternal sensitivity. Extant literature with toddlers supports the notion that the mother's level of involvement would be an important factor (Diener & Manglesdorf, 1999).

It was further expected that maternal ethnicity would be differentially related to expressed negative affect. Given the higher cultural value placed on emotional expression ((Boykin, 1986; Dixon, 1976; White & Parham, 1990), it was expected that infants with African-American mothers would express more negative affect than infants with European-American mothers. The care-giving context variable of maternal ethnicity was predictive of both stylistic clusters and the individual dimensions of expressed negative affect, but not in the expected direction. Overall, the analyses revealed that infants with African-American mothers tended to display less negative affect than infants with European-American mothers. More specifically, infants with African-American mothers tended to express negative affect for shorter durations and were less labile in their expressions. In accordance with these trends, infants with African-American mothers were 13 times more likely to belong to the no negative affect cluster than the high negative affect with high lability cluster. This indicates that infants with African-American mothers expressed less negative affect during the still-face procedure than infants with European-American mothers.

These findings are interesting when considered in the context of extant literature. On the one hand, it has been proposed that African Americans are more emotionally expressive than European Americans (White & Parham, 1990). The current findings are contradictory to this supposition. More recent research, however, has demonstrated that the environmental context, including experimental situations, can invoke different display rules for African Americans, leading to less expressions of negative affect (Vrana & Rollock, 2002). It may be that infants begin to learn these display rules as early as 6 months of age. One difficulty with this explanation is the lack of ability of the current study to determine whether infants may be responding to different display rules (i.e. they were distressed, but did not show overt expressions) or if they simply were not distressed by the still-face procedure. The inclusion of physiological response measures in future research would be necessary to examine this topic further. In addition to considering physiological responses, differences in parental socialization may also influence expressions of negative affect. Different mechanisms of parental socialization of emotional expression by African-American parents have been found to be related to differences in emotion regulation (Smith & Walden, 2001). The current study, however, was not designed to measure differences in parental socialization.

Finally, with regard to SES, it is expected that infants with mothers who report lower levels of education would express more negative affectivity. The current analyses revealed that maternal level of education was not predictive of the stylistic clusters of expressed negative affect. However, maternal level of education was predictive of the individual dimensions of duration and speed of onset of expressed negative affect within the current sample. Infants whose mothers reported lower levels of education expressed negative affect

for longer durations with a shorter speed of onset than infants whose mothers reported higher levels of education.

One possible explanation of these findings is the measure of SES used in this study. Researchers have identified income, occupational status, and education level as important measures of SES (Bradley & Corwyn, 2002). There are times when the three indicators are highly correlated and appear to be measuring the same underlying phenomenon, having similar correlations with outcome measures. However, there are times when the three indicators are, at best, modestly correlated and seem to be measuring different underlying phenomena and are differentially related to outcome measures (Ostrove, Feldman, & Adler, 1999). Therefore, different measures of SES may have yielded substantially different results from the data of the current study. In fact there is general consensus that the best measure of SES is a composite score based on all three indicators: income, education, and occupation status (White, 1982).

The final goal of the current study was to characterize infants' behavioral capacities to regulate negative affect during the still-face procedure at 6 months of age. As hypothesized, infants were observed to utilize the behaviors in the four categories of other-directed/signaling, self-soothing, attentional, and venting. This supports the notion that a base set of behaviors develops early in life and evolves over time to serve emotion regulation needs (Kopp, 1989). It was expected that other-directed behaviors (e.g., reaching and gaze at mother) would be the most frequently observed strategies, followed closely by self-soothing behaviors. Although all three of these strategies were used by about half of the infants, they were not the most frequently observed strategies. The most frequently used strategies were object play and gaze at environment, which were characterized as more attentional strategies.

This was not expected. In fact, it was hypothesized that attentional strategies would be less frequently used, given the more complex nature of these strategies. The low levels of negative affectivity observed during the current study may have contributed to this unexpected finding. Such a possibility is supported by findings in the extant literature that suggests that as negative affectivity rises, toddlers become overwhelmed and are then unable to mobilize the more complex strategies (Kopp, 1989; Saarni & Crowley, 1990; Grolnick, et al., 1996). The overall level of negative affectivity may not have been sufficient to overwhelm the infant.

Behavioral strategies are a key component in the regulation of emotions. To this end, understanding factors that may predict the use of behavioral strategies is a critical first step to understanding early emotion regulation. Behavioral strategies of regulation are acquired within the context of dyadic interactions with the caregiver through processes of direct intervention, modeling, verbal instruction, and selective reinforcement (Kopp, 1989). It is, therefore, important to examine the predictability of factors important to dyadic interactions with regard to the use of behavioral strategies. First, it was expected that infants who scored higher on the IBQ dimensions of fear and distress to limitations would use more passive strategies. Second, it was expected that infants with higher maternal sensitivity, African-American mothers, and lower SES would use more passive strategies. These expectations were linked to the expectations that these infants would likely express higher levels of negative affectivity during the still-face procedure. However, as noted above, infants with African-American mothers actually expressed lower negative affectivity and SES was not significantly related to expressions of negative affect. Contrary to expectations, logistic regression analyses examining the relationships between temperament and the care-giving

context, including the interactions between maternal sensitivity and temperament, were not found to be significant predictors of infants' use of behavioral strategies.

Finally, an important aim of the current study was to examine the relationship between infant expressed negative affect and the use of behavioral strategies. It was expected that the identified stylistic clusters (i.e., based on configurations of expressed negative affect) would be related to the use of different types of behavioral strategies during the still-face procedure at 6 months of age. While the findings were modest, this study found several behaviors that were differentially related to the identified stylistic response clusters. Infants who used object play were more likely to be in the no negative affect cluster than in either of the high negativity clusters. On the other hand, infants who used venting were more likely to be in the two high negativity clusters than in the no negative affect clusters. One interpretation of these findings is that infants in the two high negativity clusters were overwhelmed. With higher levels of negative affect, infants became unable to mobilize the attentional strategy of object play and, thus, resorted to venting. This interpretation would lend limited support to the expectation that higher levels of negative affectivity would be associated with more passive behavioral strategies. It should be pointed out that only a small proportion of infants (3.4%) were observed to use venting during the still-face procedure. With such a low percentage of infants utilizing this strategy, it is possible that the findings related to this strategy may be an artifact of the data representing floor effects. However, the findings seem plausible given venting is rooted in the behavioral expression of anger and frustration, and the infants using venting strategies were predominantly in the high negative affectivity clusters.

Additional analyses, which examined the individual dimensions of expressed negative affect, echoed the previously described relationship with the identified clusters. Just as with

the clusters, object play, venting, and reaching were the three behaviors that differentially predicted ordinal categories of individual dimensions of expressed negative affect. Overall, these results suggest that the infants who use object play generally showed lower peak intensity scores, shorter durations, and higher speed of onsets. On the other hand, infants who used venting generally showed higher intensities, longer durations, and lower speed of onset. These results support the hypothesis that attentional strategies are related to lower levels of negative affect. In addition, these findings are congruent with extant literature that suggests that as experiences of negative affect increase, infants may be unable to mobilize these more sophisticated strategies (Grolnick, et al., 1996).

It was also hypothesized that other-directed behaviors would be associated with higher levels of intensity to act as a signal to the caregiver. This, however, was not the case. The results of the current study revealed that reaching was actually more common in infants who expressed no negative affect or moderate levels of intensity rather than the highest intensity levels. While these findings were unexpected, it raises an interesting question about the use of signaling behaviors. One consideration to explain this finding is that infants who utilize reaching as a strategy are perhaps infants who expect that their mothers will respond to them, thereby, making intensification of expressed negative affect unnecessary.

Future Directions

Although this study is a first look at negative affect from a multi-dimensional framework, there are many more questions to be answered. In addition to the data presented in this study, there remain, as part of the larger longitudinal project, many more measures and three later time points, including additional challenge tasks. Perhaps most importantly, observational data were collected during times of mother involvement as well. This

information becomes very valuable for many reasons; including the fact that regulation within the first year of life is larger dyadic in nature. Furthermore, toddler studies demonstrate that toddlers utilized different strategies based on the availability of the mother (Diener & Mangelsdorf, 1999). Utilizing data over the additional time points, the importance of the mother's involvement in emotion regulation over time could be evaluated. Furthermore, it would be possible, with additional data, to examine the direct impact of the mother's behavior on her infant's behavior. More specifically, during the recovery periods of the challenge tasks where the mother actively aids her infant with regulation, a contingency analysis could be performed making it possible to predict the infant's response.

Finally, additional analyses should be conducted to evaluate any temporal relationships between observed behavioral strategies and the dimensions of negative affect. Examination of temporal relationships would make it possible to, first, evaluate the effect a behavioral strategy has on negative affect and, second, to evaluate different avenues of regulation that a multi-dimensional framework would provide.

Although the focus on behavioral evidence of negative affectivity and regulation is important in and of itself, it would be of additional interest to conduct an examination of the physiological regulation. As a part of the larger longitudinal study, physiological measures of vagal tone and cortisol reactivity were also obtained. Examining these measures would provide evidence of internal processes that may affect behavioral processes. It may also be that very early in life, behavioral signs of negative affect and its regulation are in concert with physiological responses. However, as children become more sophisticated and experienced, internal regulation processes may differ from observed behaviors. Moreover, investigations that focus on both physiological processes and behavioral processes provide

the opportunity to evaluate linkages between internal processes and external processes in emotion regulation over time. Any of these extensions would provide a novel contribution to the field in terms of processes and contexts related to the development of emotion regulation.

APPENDIX I

Measures and Coding Manuals

QUALITATIVE RATINGS FOR PARENT/CHILD INTERACTION AT 3 - 12 MONTHS OF AGE

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August 1992
(Revised January 1995; July, 1998)

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These scales are a revision of the qualitative scales developed by Margaret Tresch Owen and Deborah Vandell for the NICHD Study of Early Child Care.

QUALITATIVE SCALES

Each set of qualitative ratings is to be based on 10 - 20 minutes of semi-structured observation. These ratings can be applied to a variety of situations that basically involve free play of mother or father with baby using a standard set of toys. The scales are typically used with parents and infants during the first twelve months of the infant's life. It is recommended that the observer watch the interaction three times. The first time the interaction should be viewed with only minimal notes taken; the second time the observer should take longhand notes of parent or child behaviors as they relate to each scale and organize the notes by coding category; and the third time the observer should use the notes and the observation to consider what scores will be assigned. Notes may be refined during this third observation. The observer should try to reach final decisions on scores at this point, but may watch the interaction again if needed.

In assigning a rating, the observer should use a two-step process (borrowing from the logic of Harter). The first step is to ask, "Is this dimension 'characteristic' (a 3, 3.5, or 4 rating) or 'not characteristic' (a 1, 1.5 or 2 rating) or neither characteristic nor uncharacteristic (a 2.5) of the person being rated?" Once this decision is made, then the rater needs to make a finer discrimination between 3, 3.5, or 4 and 1, 1.5, or 2 ratings.

Ratings for most of these scales should be based on both the quality and quantity of behavior. Thus, evaluations should be made taking into account the quality of the observed behaviors in relation to the proportion of the time they were observed.

SENSITIVITY/RESPONSIVENESS (Adapted from Ainsworth)

This scale focuses on how the parent observes and responds to the child's social gestures, expressions, and signals as well as responds to cries, frets, or other expressions of negative affect. The key defining characteristic of a sensitive interaction is that it is child-centered. The sensitive parent is tuned to the child manifests awareness of the child's needs, moods, interests, and capabilities, and allows this awareness to guide his/her interaction.

If the child initiates social gestures and expressions (looking at the parent, reaching toward the parent, waving, clapping hands, handing objects), or makes demands, desires, or requests known (stretching arms to be picked up, reaching for toys the parent is holding), the sensitive parent responds appropriately.

If the child loses interest, the sensitive parent takes time to re-engage the child in a manner that demonstrates sensitivity to the child's mood. When the child is bored or frustrated, the parent offers toys or other distractions. When the child is interested and involved with toys, the sensitive parent allows him/her to independently explore them. During play, the sensitive parent provides one toy or game at a time and bases continuation on the child's response. How and what they play is geared to whether or not the child seems to be enjoying the activity. The parent does not persist with an activity or toy that the child is obviously not enjoying. During feeding, the parent follows the child's signals (open mouth, reaching, etc.) as to when the child wishes more food.

A sensitive parent provides stimulation that is appropriate to the situation. He/she provides the child with contingent vocal stimulation and acknowledges the child's interest, efforts, affect, and accomplishments.

Sensitive parents can spend some time watching the child, but the difference between them and the detached parent is that the sensitive parent seems to be actively taking an interest in the child's activities, as evidenced by comments and embellishments when the child loses interest. It is at these times--when the child loses interest or is distracted--that the difference between the sensitive parent and the detached, under stimulating parent is most easily seen; the detached parent does not respond, responds in a listless manner, or responds with developmentally inappropriate comments and behavior. The insensitive parent could also be overstimulating/intrusive and might continue in his/her attempts to engage the child even when the child is providing clues that he/she is seeking to end the interaction.

A sensitive interaction is well timed and paced to the child's responses, a function of its child-centered nature. Such an interaction appears to be "in sync". The parent paces games or toy presentation to keep the child engaged and interested, but also allows him/her to disengage in order to calm down and reorganize his/her behavior. Sensitivity involves judging what is a pleasurable level of arousal for the child and helping the child to regulate arousal and affect. When the child loses interest, the sensitive parent switches to a new tactic or toy and observes the child's reaction, or stops interacting entirely. In this way the sensitive parent can be distinguished from both an intrusive and a detached parent.

Markers of sensitivity include: (a) acknowledging the child's affect; (b) contingent vocalizations by the parent; (c) facilitating the manipulation of an object or child movement; (d) appropriate attention focusing; (e) evidence of good timing paced to the child's interest and arousal level; (f) slowing the pace when the child appears over stimulated or tired (e.g., demonstrates gaze aversion, fussiness); (g) picking up on the child's interest in toys or games; (h) shared positive affect; (i) encouragement of the child's efforts; (j) providing an appropriate level of stimulation when needed; (k) sitting on floor or low seat, at the child's level, to interact. Thus, the sensitive parent demonstrates the ability to adapt interactions to the child's mood and level of development. The parent neither over-nor underestimates. The parent knows when it is time to increase or reduce the amount of stimulation the child is experiencing. For example, the parent discontinues an activity that is beyond the child's capacity for response or introduces a new activity when the child appears bored. Ratings on this scale should be based on both quality and quantity of parent behavior.

This scale also focuses on how the parent responds to the child's cries, frets, or other expression of negative affect. It is judged in the following three ways:

1) Proportion of distress signals responded to. The parent consistently responds to all distress signals.

2) Latency of response. The parent responds promptly. Mild fussiness does not require the parent to respond as quickly as does the child's acute distress.

3) Appropriateness of response. Appropriateness of the adult's behavior can generally be inferred by its effectiveness in soothing the child. However, the completeness of the response should also be taken into account. For example, a parent who responds distally (e.g., voice from the other side of the room) should not be judged as sensitive as a parent who approaches and/or picks up the child. Parents who do not acknowledge distress, even if the infant self-soothes quickly, should be judged as less sensitive than those who do acknowledge the distress, however short lived. Parental responses to infant distress generally involve speaking to the child, approaching the child, changing position, offering toys, patting, picking up, holding closely (especially in a ventral/ventral position), and rocking. Any of these or other behaviors can be considered appropriate if they appear to have the effect of soothing the child. If the parent's first response to the distressed infant does not soothe the child, the episode should be judged as insensitive/unresponsive (even if their response was immediate) unless the parent proceeds to offer a "fuller" response (i.e., more proximal soothing behaviors).

1 = Not at all characteristic. There are almost no signs of parent sensitivity. Thus, the parent is either predominantly intrusive or detached. The parent rarely responds appropriately to the child's cues, and does not manifest an awareness of the child's needs. Interactions are characteristically ill timed or appropriate. When the child cries or frets, the parent responds not at all, or very slowly or inappropriately. If there is a response, it is only after the child becomes very demanding, and the response is so delayed that it cannot be construed to be contingent upon the child's behavior. A parent who typically appears oblivious or punitive to the child's distress would receive this score.

2

3 = Minimally characteristic. This rating should be given to parents who display infrequent or weak sensitivity/responsivity. While the parent is sometimes sensitive, the balance is clearly in the direction of insensitivity. The parent may give some delayed perfunctory responses to cues. The parent responds rarely or slowly to child's distress signals, and appears more unresponsive than responsive. The responses tend to be minimal or perfunctory. For example, the parent may talk to or briefly pat a crying child, but he/she does not pick up the child. The parent would not typically bring the child to a ventral/ventral position. He/she seems minimally interested in providing genuine comfort.

4

5 = Moderately characteristic. This rating should be given to parents who are predominantly sensitive/responsive. The parent demonstrated sensitivity in most interactions but may neglect to give a fuller response or a well-timed or appropriate response. If the child cries or frets, the parent typically responds promptly to the child's distress, demands, and signals, but there is some time in which clear child signals do not receive a response or in which the response is somewhat delayed. Some of the parent's responses are mixed, i.e. some are half-hearted or perfunctory, but the majority are full responses.

6

7 = Highly characteristic. This rating should be given to parents who are exceptionally sensitive and responsive.. Instances of insensitivity are rare and never striking. Interactions are characteristically well timed and appropriate. If the child shows distress, this rating should be given to parents who are exceptionally sensitive and responsive to distress. The parent responds quickly and appropriately to the child's distress. If the child is upset, the parent takes the time to soothe and calm the child. Overall most responses are prompt, appropriate, and effective.

INTRUSIVENESS

An intrusive, insensitive interaction is adult centered rather than child centered. Prototypically, intrusive parents impose their agenda on the child despite signals that a different activity, level, or pace of interaction is needed. High arousal, vigorous physical interaction, or a rapid pace are not, by themselves, indicative of intrusive overstimulation--if the child responds positively with sustained interest and is not engaging in defensive behaviors. It is when the child averts his/her gaze, turns away, or expresses negative affect and the parent continues or escalates his/her activity that intrusive behavior is evident. Intrusiveness is also apparent when the parent does not allow the child a "turn" or an opportunity to respond at his/her pace. Some intrusive parents persist in demonstrating toys to the child long after his/her interest has been gained and he/she obviously wants to manipulate the toy him/herself. These parents appear unable to facilitate the child's exploration or regulation of the activity. Another controlling intrusive behavior is displayed by parents who overwhelm the child with a rapid succession of toys or approaches, not allowing him/her time to react to one before another occurs.

Extreme intrusiveness can be seen as overcontrol to a point where the child's autonomy is at stake. It should be kept in mind that a parent can become involved in play with the child without being highly intrusive.

Intrusiveness can also be displayed during routine care. During spoon feeding, a nonintrusive parent will wait for the child to open his/her mouth for food, whereas an intrusive parent will persist in trying to stick the spoon into the child's mouth, even as the child tries to turn away. An intrusive parent will tend to use any opening of the mouth to give the child another bite of food, even when the open mouth clearly has a socially interactive intent (e.g., open-mouth smile, vocalization). A rapid pace of feeding is not in itself a sign of intrusiveness if the pace appears to match the child's desired focus on food.

Specific behaviors characterizing intrusive interactions include (a) failing to modulate behavior that the child turns from, defends against, or expresses negative affect to; (b) offering a continuous barrage of stimulation, food, or toys, (c) not allowing the child to influence the pace or focus of play, interaction, or feeding; (d) taking away objects or food while the child still appears interested; (e) not allowing the child to handle toys he/she reaches for; (f) insisting that the child do something (play, eat, interact) in which he/she is no interested; and (g) not allowing the child to make choices.

Parent's actions which are clearly in the child's best interests, such as removing a child from danger, administering medicine, or putting an obviously tired child to bed, are not included in the considerations of intrusiveness. Similarly, bringing the child back to the mat for play when instructions to the are mother are to do so, will not be judged intrusive unless the child is handled in an unduly perfunctory or rough manner.

Intrusiveness must be evaluated from the perspective of the child. If fast-paced stimulation is enjoyed by the baby, as shown by smiles and laughter, or seems a part of a game or ritual that is clearly enjoyed, parental behavior that might otherwise be judged intrusive will not be counted as such. An important element in judging the behavior as intrusive or not is the degree to which the parent modulates his/her behavior in response to the child's interest and enjoyment in the stimulation.

1 = Not at all characteristic. This rating should be given to parents who display almost no signs of intrusive behavior. The interactions are well-timed and tuned to the baby’s signals. The interaction is clearly “child centered”.

2

3 = Minimally characteristic. This rating should be given to parents who display minimal intrusiveness. There is some evidence of intrusiveness, but it is not typical. The parent may initiate interactions with and offer suggestions to the child which occasionally are not welcomed. The parent sometimes continues his/her activity after the child engages in defensive behavior, but does not escalate the activity.

4

5 = Moderately characteristic. This rating should be given to parents who are regularly intrusive. Parental intrusiveness occurs with moderate frequency. The pace is frequently controlled by the parent and ill-timed to the baby's signals.

6

7= Highly characteristic. This rating should be given to parents who are highly intrusive. The parent is consistently and typically intrusive. Most of the observation period is marked by the parent completely controlling the interaction, allowing the child little self-direction in his/her activities. The parent allows the child little autonomy, and essentially negates the child's experience.

POSITIVE REGARD FOR THE CHILD

This scale rates the parent's positive feelings toward the child, expressed during interaction with him/her. Positive feelings are shown by: (a) speaking in a warm tone of voice; (b) hugging or other expressions of physical affection; (c) an expressive face; (d) smiling; (e) laughing with the child; (f) enthusiasm about the child; (g) praising the child; and (h) general enjoyment of the child. Positive regard is evident when the parent listens, watches attentively, looks into the child's face when talking to him/her, has affectionate physical contact, and is playful. Ratings on this scale are based on both quality and quantity of positive regard.

1 = Not at all characteristic. This rating should be given to parents who display little positive regard. This rating can also be used for positive expressions (laughing, smiling) that appear to be inappropriate to the situation or an inaccurate reflection of the parent's feelings. The parent may be expressionless or flat, or negative.

2

3 = Minimally characteristic. This rating should be given to parents who display infrequent or weak signals of positive regard. The intensity and frequency of behavioral indicators of positive regard are both low.

4

5 = Moderately characteristic. This rating should be given to parents who predominantly display positive regard. More frequent and intense positive affect is shown than in the 2 rating, but the parent is not as consistently positive as those scored as a 4.

6

7 = Very characteristic. This rating should be given to parents who are exceptionally positive, in terms of facial and vocal expressiveness and behavior. Affect is positive and spontaneous. The parent shows a range of expressions and behaviors that are all clearly positive. He/she clearly "delights" in the child.

Negative Affect Coding

Negative affect:

1. Little to no negative affect. No crying, hitting, venting, or negative vocalizations.

   - 1+ (above a 1, but not meeting the requirements or a 2)

2. Mild negative affect, including contorted facial expressions indicating displeasure or distress, minor pouting and protesting, a single, non-repetitive flailing of the limbs.

   - 2+ (above a 2, but not meeting the requirements or a 3)

3. Strong negative affect, including prolonged or intense bouts of crying, venting and repetitive flailing

Notes:

- Negative affect scores should both be made for each 5-second interval. The absence of negative affect is coded as 1 for each.

6-Month Emotion Regulation Contingency Coding

Time_____ Still face procedure

	5	10	15	20	25	30	35	40	45	50	55	60
1st min.												
2nd min.												

Notes:

Time_____ Recovery #1

	5	10	15	20	25	30	35	40	45	50	55	60
1st min.												
2nd min.												

Notes:

Time_____ Recovery #2

	5	10	15	20	25	30	35	40	45	50	55	60
1st min.												
2nd min.												

Notes:

Coding Scheme for the Infant Behavior Questionnaire (IBQ)—Revised

Description:

The Infant Behavior Questionnaire--Revised, IBQ-R, was designed to measure temperament in infants between three and twelve months of age. The items in this questionnaire ask parents to rate the frequency of specific behaviors observed over the past one to two weeks on a seven-point Likert scale.

Modifications:

Several subscales of the IBQ-R are currently being employed in the Durham Child Health and Development Study (DCHD). Specifically, investigators on the DCHD study are examining the "Distress to Limitations", "Fear", "Soothability", and the "Falling Reactivity/Rate of Recovery from Distress" temperament dimensions, and have included questions from these dimensions only.

TEMPERAMENT DIMENSION DEFINITIONS

Distress to Limitations: Child's fussing, crying, or showing distress while: a) waiting for food; b) refusing a food; c) being in a confining place or position; d) being dressed or undressed; or e) being prevented access to an object toward which the child is directing her/his attention.

Fear: The baby's startle or distress to sudden changes in stimulation, novel physical objects or social stimuli; inhibited approach to novelty.

Soothability: Child's reduction of fussing, crying, or distress when soothing techniques are used by the caretaker or child.

Falling Reactivity/Rate of Recovery from Distress: Rate of recovery from peak distress, excitement, or general arousal; ease of falling asleep.

Scoring Procedure:

Scale scores for the Infant Behavior Questionnaire represent the mean score of all scale items applicable to the child during the last week or two weeks, as judged by the caretaker. Scale scores are to be computed by the following method:

1) Sum all numerical item responses for a given scale. Note that:

a) If caretaker omitted an item, that item receives no numerical score.

b) If caretaker checked the "does not apply" response option for an item, that item receives no numerical score.

c) Items indicated with an "R" are reverse items and must be scored accordingly:

7 becomes 1	3 becomes 5
6 becomes 2	2 becomes 6
5 becomes 3	1 becomes 7
4 remains 4	

d) Divide the total by the number of items receiving a numerical response. Do not include items marked "does not apply" or items receiving no response in determining the number of items. For example, given a sum of 40 for a scale of 17 items, with one item receiving no response, two items marked "does not apply", and 14 items receiving a numerical response, the sum of 40 would be divided by 14 to yield a mean of 2.85 for the scale score.

I. Distress to Limitations (16 items):

Definition: Child's fussing, crying, or showing distress while: a) waiting for food; b) refusing a food; c) being in a confining place or position; d) being dressed or undressed; or e) being prevented access to an object toward which the child is directing her/his attention.

Sleeping: Before falling asleep at night during the last week, how often did the baby:

11R show no fussing or crying?

After sleeping, how often did the baby:

15 fuss or cry immediately?
16R play quietly in the crib?
17 cry if someone doesn't come within a few minutes?

How often did the baby:

18 see angry (crying and fussing) when you left him/her in the crib?
19R seem contented when left in the crib?
20 cry or fuss before going to sleep for naps?

Bathing and Dressing: When face was washed, how often did the baby:

41 fuss or cry?

When hair was washed, how often did the baby:

44 fuss or cry?

Play: When something the baby was playing with had to be removed, how often did the baby:

75 cry or show distress for a time?
76R seem not bothered?

Daily Activities: How often during the last week did the baby:

93 protest being placed in a confining place (infant seat, play pen, car seat, etc.)?

When placed on his/her back, how often did the baby:

109 fuss or protest?

When the baby wanted something, how often did the baby:

113 become upset when s/he could not get what s/he wanted?
114 have tantrums (crying, screaming, face red, etc.) when s/he did not get what s/he wanted?

When placed in an infant seat or car seat, how often did the baby:

118 show distress at first; then quiet down?

II. Fear (16 items):

Definition: The baby's startle or distress to sudden changes in stimulation, novel physical objects or social stimuli; inhibited approach to novelty.

Daily Activities: How often during the last week did the baby:

90 cry of show distress at a change in parent's appearance (glasses off, shower cap on, etc.)?
94 startle at a sudden change in body position (e.g., when moved suddenly)?
99 startle to a sudden or loud noise?

Two Week Time Span

When introduced to an unfamiliar adult, how often did the baby:

150 cling to a parent?
151 refused to go to the unfamiliar person?
152 hang back from the adult?
153 never "warm up" to the unfamiliar adult?

When in the presence of several unfamiliar adults, how often did the baby:

154 cling to a parent?
155 cry?
156 continue to be upset for 10 minutes or longer?

When visiting a new place, how often did the baby:

157 show distress for the first few minutes?
158 continue to be upset for 10 minutes or more?

When your baby was approached by an unfamiliar person when you and s/he were out (for example, shopping), how often did the baby:

161 show distress?
162 cry?

When an unfamiliar person came to your home or apartment, how often did your baby:

163R allow her/himself to be picked up without protest?
164 cry when the visitor attempted to pick her/him up?

III. Soothability (18 items):

Definition: Baby's reduction of fussing, crying, or distress when soothing techniques are used by the caretaker.

Two Week Time Span

When rocking your baby, how often did s/he:

174 soothe immediately?
175 not soothe immediately, but in the first two minutes?
176R take more than 10 minutes to soothe?

When singing or talking to your baby, how often did s/he:

177 soothe immediately?
178 not soothe immediately, but in the first two minutes?
179R take more than 10 minutes to soothe?

When walking with the baby, how often did s/he:

180 soothe immediately?
181 not soothe immediately, but in the first two minutes?
182R take more than 10 minutes to soothe?

When giving him/her a toy, how often did the baby:

183 soothe immediately?
184 not soothe immediately, but in the first two minutes?
185R take more than 10 minutes to soothe?

When showing the baby something to look at, how often did s/he:

186 soothe immediately?
187 not soothe immediately, but in the first two minutes?
188R take more than 10 minutes to soothe?

When patting or gently rubbing some part of the baby's body, how often did s/he:

189 soothe immediately?
190 not soothe immediately, but in the first two minutes?
191R take more than 10 minutes to soothe?

IV. Falling Reactivity/Rate of Recovery from Distress (13 items):

Definition: Rate of recovery from peak distress, excitement, or general arousal; ease of falling asleep.

Sleep: When going to bed at night, how often does your baby:

21 fall asleep within 10 minutes?
22R have a hard time settling down to sleep?
23 settle down to sleep easily?

When your baby awoke at night, how often did s/he:

24R have a hard time going back to sleep?
25 go back to sleep immediately?

When put down for a nap, how often did your baby:

26R	stay awake for a long time?
27	go to sleep immediately?
28	settle down quickly?
29R	have a hard time settling down?

Daily Activities:

When frustrated with something, how often did your baby:

119	calm down within 5 minutes?

When your baby was upset about something, how often did s/he:

120R	stay upset for up to 10 minutes or longer?
121R	stay upset for up to 20 minutes or longer?
122	soothe him/herself with other things (such as a stuffed animal, or blanket)?

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