SECTION 1. CRITICAL IMPORTANCE OF EMOTIONAL DEVELOPMENT

Temperament and Regulation of Emotion in the First Years of Life

Nathan A. Fox, PhD

ABSTRACT. Temperament is the tendency to express particular emotions with a certain intensity that is unique to each individual child. Although temperament seems to be biologically based, learning to regulate emotional expressions depends on caregiver input and socialization. Part of this process involves forming a trusting relationship with the infant so that he or she learns to rely on the parents to help “regulate” stressful or frustrating situations. *Pediatrics* 1998;102:1230–1235; child, infant, reactivity, cognitive skills, temperament, emotional recognition.

Perhaps one of the most important insights for new parents is that their new infant brings to the world his or her own set of individual characteristics that in no small way shape the world in which they all live. New parents are given considerable advice on how to feed their infant, how to get their infant to sleep through the night, and what to do with that infant when, in the midafternoon, he or she begins a “fussy period.” Yet most of this advice is for the “average” infant. And parents often do not have an average infant. Rather, their infant may exhibit a pattern of behaviors that sets him/her off from the average and may at times present challenges in parenting. These individual characteristics and patterns of behavior are what developmental psychologists call temperament. Temperament represents those characteristics that make an infant unique with regard to his or her daily responses to being fed, changed, bathed, played with, or put down for a nap. These characteristics sometimes have been ignored by developmentalists as well as by advice-givers. Yet temperament may represent an important construct around which the relationship between parent and child is formed, through which the pattern of daily interaction is constructed, and by which the infant’s nascent personality emerges.

In modern developmental psychology, Thomas and Chess were the first to emphasize the importance of temperament in infant behavior and parenting.1 These researchers recruited a sample of >100 expectant families and began a long-term study of infant and parent–infant behavior. Thomas, Chess, and their colleagues visited families on a monthly basis to interview the parents and to observe the infant alone and the mother and infant together. They took copious notes about the infant’s behavior and the daily routine of the mother and infant. From these notes they generated lists of behaviors that infants exhibited. They then grouped these behaviors into nine dimensions or factors that they believed characterized the range of individual differences in the style that infants responded to the range of normal events in their lives. For Thomas and Chess, these factors represented the “how” of behavior. For example, for a daily activity such as bathing, they observed differences in activity level, the degree to which infants adapted to the water, whether the infant “liked” the bath, and the intensity of their response to the activity.

The nine dimensions that Thomas and Chess produced are shown in Table 1. Each dimension ranges from high to low, and an individual infant could be placed anywhere on each of the nine dimensions. Obviously, the dimensions were not orthogonal to one another, and infants who were placed high on given dimensions could place high on others as well. From these clusterings, Thomas and Chess created three classifications of infants: difficult, easy, and slow to warm up.2

Since Thomas and Chess’s original work, there have been several conceptualizations of infant temperament, some of which have been offshoots of the Thomas and Chess model, whereas others have developed from different theoretic positions regarding the origins of temperament. Among the more recent temperament theories is one described by Rothbart and Derryberry.3 Their model of temperament was based initially on European temperament theorists such as Strelau, who themselves were considered neo-Pavlovians regarding the etiology of individual differences.4 Originally, Pavlov and colleagues noted that there were differences among animals in their rate of conditioning. Pavlov attributed these differences to “strength of the nervous system,” with animals having strong nervous systems taking longer to condition than animals with “weak” nervous systems. Pavlov’s students, particularly those interested in human personality, expanded this notion in an attempt to understand individual differences in response to sensory stimulation. They reasoned that differences in response to a stimulus, as measured by the latency to respond, the threshold of response, the intensity of response, and the time needed to return...
to homeostasis, were a function of the strength of the individual nervous system. Individual differences in reactivity were the material that created temperament. Eastern European psychologists used models based on Pavlov to develop methods for assigning individuals to occupations.

Rothbart adapted this model to the study of individual characteristics of human infants. She reasoned that important differences in individual infant responses to the environment could be assessed via measurement of their reactivity. Reactivity in turn could be assessed by measurement of threshold to respond, latency to respond, and intensity of response. Rothbart proposed that reactivity could be assessed behaviorally and could be understood physiologically; that is, individual differences in reactivity probably were a function of differences in the manner in which autonomic, central, and hormonal systems respond.

Rothbart believed that a second dimension to individuality was the degree to which infants could modulate reactivity. She proposed that infant temperament was comprised of differences in the degree to which infants reacted and regulated their reactivity. Whereas reactivity itself was the response to external stimuli, regulation was the manner in which the infant returned to homeostasis. Regulation could be best measured by the time it took the infant to soothe after the initial reaction. In subsequent writings, Rothbart expanded on the dimension of regulation and, with her colleagues, has proposed that the regulation of behavioral reactivity comes to depend more and more on the development of specific cognitive systems that facilitate modulating behavioral reactivity. Rothbart has written extensively about the attentional system and its role in regulation of reactivity. She postulates that this system is involved in modulating reactivity both physiologically and behaviorally. For example, the toddler’s ability to be distracted when upset, or the degree to which the child can break set and move on, is an important factor in his or her ability to regulate reactivity. This model has a distinct developmental component in which the development of cognitive processes is seen as an integral part of the formation of infant temperamental style. Although infants may be born with individual differences in reactivity, their regulatory capacities are far from complete at birth.

The notion that temperament could be conceptualized in terms of individual differences in reactivity has been refined further in the work of Goldsmith and Campos. Both developmentalists come from a tradition in which they stress the importance of emotions in the psychological life of the child. For Campos and Goldsmith, emotions play an important functional role. They regulate internal psychological states and interpersonal and social interaction. In their attempt to integrate this functional view of emotions into a theory of temperament, Goldsmith and Campos used Rothbart’s notion of reactivity. They maintained that temperament may be defined as the manner in which infants express each of the discrete emotions. The expression of emotion may vary among individuals along the same dimensions as reactivity in Rothbart’s model: threshold, latency to respond, intensity of response. For example, an infant may have a low threshold to express fear, a short latency of response, and a high intensity of response. This infant may be contrasted with one whose threshold to express fear is high, latency is long, and intensity is low when it is elicited. Thus, in Goldsmith and Campos’s model, temperament may be described as individual differences in the tendency to express each of the different discrete emotions.

Our own work reflects a definition of temperament that is a synthesis of the positions of Rothbart and Goldsmith and Campos. It emphasizes the importance of individual differences in the expression of discrete emotions, but simultaneously includes a broader definition of reactivity as well as an emphasis on regulation. We view temperament as the setpoint around which an infant reacts to unfamiliar or mildly stressful stimuli by expressing a predominant emotional response. The degree to which infants are aroused and the affect they express during that arousal best characterizes one infant from another. It also reflects the degree to which the infant is successful in modulating an emotional response. There are a number of critical points to this definition. First, it is proposed that there are differences among infants in the setpoint, or threshold, by which they will respond to novelty or mild stress. Second, that reaction is characterized in terms of both the affect expressed and the degree of arousal (intensity of response). Finally, infants differ in the manner that they “handle” that arousal; that is, the way in which they modulate that response. Differences in the predisposition to express specific emotions and to react with a certain intensity and the disposition toward regulatory behaviors are thought to be governed by a neurophysiologic system that includes limbic and frontal regions of cortex.

### A BROAD VIEW OF EMOTION REGULATION

In a chapter written for the Society for Research in Child Development monograph “The Development of Emotion Regulation,” Pamela Cole and colleagues list seven dimensions that they believe are critical to understanding emotion regulation (Table 2). The dimensions (from top to bottom) form an interesting developmental sequence. They indicate the issues that are critical during formative periods of infancy, preschool, and school years. For example, in the first years of life, a critical aspect of development may be characterized in terms of the management of state,

<table>
<thead>
<tr>
<th>TABLE 1. Nine Temperament Dimensions of Thomas and Chess</th>
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<tbody>
<tr>
<td>Activity level</td>
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<tr>
<td>Rhythmicity</td>
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<td>Adaptability</td>
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<tr>
<td>Approach–withdrawal</td>
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<td>Mood</td>
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<td>Intensity</td>
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<td>Attention span–persistence</td>
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<td>Distractibility</td>
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<td>Threshold of responsiveness</td>
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related processes. Cole and colleagues address this by examining the role that emotional states have in regulating arousal. They list three dimensions: availability of a range of emotions, modulation of intensity of emotion, and fluid shifts in emotion. As it is necessary for the young infant to have a full range of states, to modulate these states, and to transition from one state to another, too, is it important that emotional behavior be governed by these same principles. An important characteristic of infant expressivity is access to a full range of emotions. Infants predisposed to one particular type of emotion are very different from those who express a range of affects. Infants also may differ in the degree to which they are able to modulate a particular emotional state. One underlying cause of their inability to modulate affect intensity is the lack of fluid transition from one state to another. The result may be an infant predisposed to negative affect, unable to modulate an intense reaction, and showing lack of fluid transitions to calmer states.

In the preschool years, the issues involving regulation of emotion are different. The child now finds himself in different contexts, interacting with peers and unfamiliar adults. There is a transition at this time from the toddler whose immediate needs are usually satisfied to the preschooler who must learn to wait his turn, who must realize that every toy in the store or every cereal on the shelf cannot be bought. The child learns that it is often inappropriate to laugh in certain contexts and that certain rules of conduct apply in specific situations. The development of rule-bound behavior and the increased ability for delay of gratification go hand-in-hand in the developmental processes in emotion regulation in the preschool period. The child learns the display rules of his culture: when it is appropriate to laugh and when it is necessary to maintain a solemn expression. The child also learns to use verbal skills to modulate emotional responses. Here Cole’s idea is similar to that of Rothbart in placing emphasis on the development of cognitive skills (in this case, language) as an important element in the development of regulatory strategies. Finally, Cole and colleagues emphasize an often overlooked aspect of emotional development: the recognition of mixed emotions. At some point in early childhood, the child realizes that some situations are neither happy or sad, but may contain elements of both. The idea that one can feel more than one emotion simultaneously, and that occasionally these emotions conflict is one recognized by adult emotion theorists as an important state seldom addressed in the developmental literature.

Emotion regulation does not take place in a vacuum, but most certainly develops within the framework of interaction and relationships. Parents provide more than just strategies for their infants and children to use in modulating emotional arousal. The very interaction between parent and child may in itself be a modulating force, as seen in the work of Myron Hofer.11 Through a series of experiments, Hofer has detailed the nature of the interaction between rat pups and their mothers during the first days of life. He found that aspects of this interaction regulate physiologic as well as behavioral development. It is important to note that the aspects of this interaction that are modulatory do not necessarily involve the provision of food or heat to the pup, but are behavioral in nature. As such, the relationship itself seems to have a modulatory effect on the arousal system. The mother–infant relationship then may be viewed as a biobehavioral system, the outcome of which is the modulation of those physiologic systems involved in emotional arousal.

A set of interactive factors may be viewed in parallel to Cole and colleagues’ seven dimensions and are important in understanding the effects of interaction on the development of emotion regulation (Table 3). These factors form (from top to bottom) a developmental sequence parallel to that provided by Cole and colleagues. For example, during early infancy, the mother provides soothing and comforting to her infant when the infant is distressed. This external source of emotion regulation is critical, particularly for the infant who does not have the internal resources to self-sooth.

During the first years, the infant presents parents with a variety of facial expressions during different contexts. Parental labeling of these expressions and subsequent validation of the infant’s emotional states also are important for successful regulation. It is important that the infant understand that the feelings he/she has are not unusual and are shared within the context of the family. The matching and confirmation of infant internal states by the adult caregiver seems particularly important because it allows the infant to associate its feeling state with the shared state of another. One reason that the “still face” paradigm is so successful is that it violates for the infant the shared affect state that he or she has established with the caregiver. Instead of returning a smile, the mother is asked to present a neutral, blank facial expression. Many infants will work to elicit a return smile in this situation.

A third dimension of caregiver interaction is the provision of effective environments for the modulation of emotion. Infants differ in the degree that they can modulate their responses to external stimulation.

**TABLE 2. Seven Dimensions of Emotion Regulation**

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<th>Access to a full range of emotions</th>
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<td>Modulation of intensity and duration of emotion</td>
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<td>Fluid, smooth shifts in transition from one state to another</td>
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<tr>
<td>Conformance of cultural display rules</td>
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<td>Integration of mixed emotions</td>
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<tr>
<td>Verbal regulation of emotional processes</td>
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<td>Management of emotions about emotion</td>
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**TABLE 3. Emotion Regulation at the Level of Interaction**

| Maternal comforting and soothing of infant distress |
| Reciprocity and confirmation of affective states within the family |
| Provision of effective environments for the modulation of emotion |
| Use of peers as a source of affect modulation |
| Friendship and the development of intimacy as a context for regulation |
As such, caregivers often are aware of the need to provide the infant with a quiet place that will enable self-regulation. Environments with considerable stimulation may be too chaotic or overwhelming for some infants and may not allow the child to develop the self-regulatory mechanisms necessary for appropriate emotion regulation. Parental input is critical here. For example, in the early months, parents may need to provide a quiet room with dim lights to calm a fussy infant; later on, it may be necessary to remove an infant from a situation that is too stimulating or exciting and that does not allow the child sufficient latitude to modulate his or her reactivity.

As the child matures, peers become important agents of socialization. Children take cues from their peers as to what is amusing and how to react in given situations. The peer group becomes an important source of affect modulation for the young child. To the extent that there is disorganization within the peer group, this may lead to inappropriate emotional behavior by individual children. Also, young children learn to "read" the affective cues of other children. They learn how to handle the needs of other children in the group and how to modulate their own emotional responses when their immediate goals are not met. One primary example concerns disputes over toys. Very early, children learn (or do not learn) how to manage conflict over object acquisition and how to modulate their individual desires for toys.

A final dimension of importance in the development of emotion regulation and a source of important modulation is the formation of friendships within the peer group. Current research on the development of friendships in early childhood has stressed the importance of forming intimate relationships among older children. As children spend more time with peers, they are exposed increasingly to the effects of other social agents on emotion and have the opportunity to learn or practice regulatory strategies. Rejection by peers has a documented association with negative emotional states. Social rejection has been shown to induce negative affect in 7- to 8-year-old children. Moreover, even 5-year-old children seem to be aware that social rejection or verbal harassment will induce negative emotions and that social nurturance, maternal help, or verbal support can mediate negative feelings. Sibling relationships as sources of emotion regulation become important in late childhood as well, and seem to have long-term consequences.

For older children, adolescents, and adults, external sources of emotion regulation also include the responsiveness and support of peers (especially best friends), particularly during times of stress (for review, see Rubin et al.). Peer interactions create emotional responses during peer interactions. Such inappropriate social situations lead inexorably to the individual becoming isolated and rejected by the peer group. On the other hand, positive expectations of others, feeling secure in the company of others (peers), and the experience of positive social interactions may give the child confidence to explore the peer universe and develop social skills and competencies that result in peer acceptance and popularity.

### ISSUES IN THE STUDY OF EMOTION REGULATION

Because emotion regulation in the developing infant and young child is so important, we need to clarify exactly what we are studying and how we can go about completing research in this area. The following section outlines four critical issues in approaching the research of emotion regulation. These issues are applicable across development and can serve as a starting point for those interested in the study of emotion regulation.

#### What Is Being Regulated in Emotion Regulation?

This question is both conceptual and methodologic, although answers to both components are clearly interrelated. Conceptually, we assume that individuals differ in the degree that they react to environmental stimulation. Both the nervous system and behavioral responses contribute to these differences in reactivity. Indeed, the organization of behavioral responses is most probably similar to the organization of physiologic responses to stimulation. A similarity for behavioral and nervous system responses may be that the system attempts to return to the resting state that existed before stimulation. Although it is true that the absolute energy level of resting states differs among individuals, it is still beneficial (behaviorally and physiologically) to remain in a resting state, when not responding actively, to conserve energy. The principles of homeostasis most probably guide both behavioral and physiologic regulation. Thus, one research imperative would be to measure emotion regulation across multiple systems, including physiologic and behavioral responses. Such an approach must take into account the baseline pattern, the reactive response, and the attempt to return to "baseline." It is important that all three of these conditions be measured to provide the most complete picture of emotion reactivity and regulation.

#### What Is the Role of Context?

Emotions are a critical method of social communication among individuals. They provide information about an individual’s internal state, but more important, about an individual’s reaction to a particular event. Thus, when an unfamiliar person walks into a room, most infants first look toward their mother to see how she responds to the person. This “checking” is known as social referencing and provides the infant with clues about the context in which the event (entrance of an unfamiliar adult) is taking place.

Often, an infant’s response to a situation is guided by the context in which it occurs. For example, when
they are almost 1 year old, infants tend to respond with distress when their mother leaves them alone. This reaction, often known as separation protest, is much more likely to occur in an unfamiliar environment than at home. Here, context modifies the emotional response of the child. Context also may be a clue to the appropriateness of certain emotion expressions. As the infant gets older, context becomes even more important, because new rules and conventions about appropriate or inappropriate behavior depend on context. For example, cultural norms are socialized by the family; in certain cultures it may be inappropriate for young children to laugh out loud in public. The child learns the display rules of the culture through parental socialization and with it the critical nature of context. Thus, context is a critical variable that must be taken into account when formally analyzing differences in emotion regulation.

What Cognitive Skills Are Associated With Emotion Regulation?

The developing ability of the child to regulate emotion seems to indicate that processes are at work that mature over the first years of life facilitating these developments. A number of workers have speculated about these processes. Among those mentioned are attention and what may be loosely known as executive functions (such as the ability to switch set, to plan, to generate multiple option responses). Rothbart and colleagues have written about the role of attention in regulation of behavior.5,16 They see attention as providing the child with options for response. Infants who are upset, for example, may be able to divert their attention away from stimuli that initiated the distress to other, less aversive events.

For many young children, emotion dysregulation is not the result of excessive negative affect, but the result of frustration in not obtaining a desired goal—whether that goal is getting their favorite cereal or playing with their favorite toy. Many instances of emotion dysregulation and temper tantrums take place as a result of anger and frustration over blocked goals rather than of distress. As the child gets older, he or she develops the ability to generate alternative strategies to achieve those goals. The ability to generate alternatives, to switch set, and to plan successfully are important competencies involved in mature emotion regulation. Studies of these developing abilities are critical to understanding mature emotion regulation.

Is “Good Regulation” Always the Dampening of Negative Affect?

Most often the process of emotion regulation is thought of as entailing the modulation of distress or negative affect in the young child. Of course, a large portion of emotion regulation involves the modulation of other emotions such as anger or joy. Anger in young children often is the result of frustration at being unable to achieve a goal. Infants as young as 6 months will display facial expressions reflecting anger when they cannot reach an attractive toy or when they have a cookie taken away. Over the next few years, the young child must learn how to regulate that anger response. As most parents of toddlers know, this is not a trivial process and it is one that usually necessitates considerable parental guidance. The critical point here is that “good regulation” is the modulation of both positive and negative affects. Depending on the situation and context, infants may display a range of different emotions with varying degrees of intensity. The task of bringing that system back into homeostasis or equilibrium may be difficult with emotions such as anger, distress, or sadness. Differences in the degree of difficulty may be a function of the child’s initial predisposition toward the expression of one type of emotion versus another.

SUMMARY

The tendency to express particular emotions with a certain intensity is an important individual difference among infants and young children. This difference is known as the temperament of the child. The ability to modulate that expression also is an important competency for which there are important individual differences. Whereas temperament seems to be a biologically based difference evident early in life, the ability to regulate emotions depends as much on caregiver input and socialization.

Children learn over the first years of life rules of appropriate social conduct. Included among these rules is the need to modulate emotions such as anger and distress when confronted with either frustrating or unfamiliar situations. One of the challenges of successful parenting is the task of providing children with strategies to use their own cognitive abilities in successful emotion regulation. This is a gradual process involving the formation of trusting relationships between caregivers and infants so that infants may realize that when confronted with frustration or novelty, they can rely on their parents to regulate the situation for them. Over time, the child develops these skills, transfers them to the peer group, and assumes an independent emotional life.

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