Emotion regulation has captured the interest of behavioral scientists in many disciplines, and one reason is that it addresses core scientific and practical concerns. The nature of emotion regulation—that is, the imposition of higher, rational control over lower, more basic emotion systems to accomplish adaptive goals—highlights fundamental issues in emotions theory, including the role of emotion in adaptive functioning and how to distinguish activational and regulatory influences on emotion. Emotion regulation can be studied at multiple levels of analysis, including neurobiological foundations, the cognitive construction of emotional experience, relational influences, cultural constraints, social facilitation and inhibition, and temperamental individuality, and thus poses opportunities for integrative thinking across these levels. Research on emotion regulation also has practical applications and is often motivated by these applied concerns. The association of emotion regulation with personal adjustment, social competence, and even cognitive functioning suggests that emotion regulation is a core developmental achievement with significant personal consequences. This has contributed to the conceptualization of many forms of child and adult psychopathology (including depression, anxiety disorders, conduct problems, and other internalizing and externalizing disorders) as problems of emotion dysregulation, with new therapeutic approaches to enhance capacities for emotion self-management.

Scientific enthusiasm for emotion regulation must address, however, a number of conceptual and empirical challenges. When emotion regulation is viewed in systems terms involving continuing interaction between higher and lower processes, for example, it becomes apparent that emotion regulation is a component of (rather than activation. Identifying "adaptive" regulation strategies depends on context and the environment; thus it may not always result in positive immediate benefits. Furthermore, the network of component process derives not merely from maturation of capacities but also from more interrelated and connected networks of component processes.

These are important challenges in developmental study of emotion regulation. Our goal is to profile a few of emotion regulation and its implications, with special attention to the applied science in this area. Although of the dilemmas currently facing researchers toward a more complex understanding of emotion regulation and its functioning for its practical applications, our definitional challenges facing emotion regulation is a survey of some of the important definitional challenges facing emotion regulation. This has contributed to the conceptualization of many forms of child and adult psychopathology (including depression, anxiety disorders, conduct problems, and other internalizing and externalizing disorders) as problems of emotion dysregulation, with new therapeutic approaches to enhance capacities for emotion self-management.

Defining Emotion Regulation

Although it is a phenomenon common to emotion regulation than meets the eye continue to debate the definition of emotion regulation (cf. Bridges, Denham, & Ganib 2004; Cole, Martin, & Dennis, 2004; 1994). Developmental scientists have shown that emotion regulation and the structure of emotion regulation and the multifaceted changes in emotion well as minimizing emotional response whether emotion and emotion regulation arises from the extent to which regulatory influences goals. Our own definition addresses these and others:

- Emotion regulation consists of the ability for monitoring, evaluating, and...
Development of Emotional Regulation

Regulation

Regulation is a component of (rather than only a response to) emotional activation. Identifying “adaptive” and “maladaptive” emotion regulation strategies depends on context and goals, moreover, especially in conditions of psychobiological or environmental adversity, and emotion regulation thus may not always result in positive long-term outcomes even when it offers immediate benefits. Furthermore, the growth of emotion regulation derives not merely from maturation of higher neurobiological or behavioral capacities but also from more complicated development of a multifaceted network of component processes.

These are important challenges, and because they commonly arise in developmental study of emotion regulation, they are the focus of this chapter. Our goal is to profile a developmental perspective to the growth of emotion regulation and its implications for developmental psychopathology, with special attention to the challenges facing future basic and applied science in this area. Although we do not have answers for each of the dilemmas currently facing the field, we believe that they will lead researchers toward a more complex and nuanced view of the nature of emotion regulation and its functioning that will ultimately prove more useful for its practical applications. Our discussion opens by profiling some of the definitional challenges facing emotion regulation researchers, followed by a survey of some of the important developmental processes governing the growth of emotion self-management. We then consider the implications of these definitional and developmental issues for questions of emotion regulation and psychopathology before offering some concluding thoughts.

Defining Emotion Regulation

Although it is a phenomenon common to everyday experience, there is more to emotion regulation than meets the eye, and developmental researchers continue to debate the definition of emotion regulation and its core features (cf. Bridges, Denham, & Ganiban, 2004; Campos, Frankel, & Camras, 2004; Cole, Martin, & Dennis, 2004; Gross & Thompson, 2007; Thompson, 1994). Developmental scientists share in common a functionalist orientation to emotion regulation and the view that regulatory influences can create multifaceted changes in emotion (e.g., maintaining, enhancing, as well as minimizing emotional responses). However, they disagree about whether emotion and emotion regulation can be distinguished, whether emotion regulation arises from extrinsic as well as intrinsic influences, and the extent to which regulatory influences consistently advance adaptive goals. Our own definition addresses some of these definitional challenges and others:

**Emotion regulation consists of the extrinsic and intrinsic processes responsible for monitoring, evaluating, and modifying emotional reactions, especially**
their intensive and temporal features, to accomplish one’s goals. (Thompson, 1994, pp. 27-28)

Several features of this definition bear further comment. First, this definition implicitly distinguishes emotion from emotion regulation, although, as we later comment, this distinction is far more complex and nuanced than it might first appear. Second, regulatory processes can target positive as well as negative emotions and can create changes in both the intensity and the temporal qualities of emotional responding (such as changing the speed of onset or recovery, persistence, range, or lability of emotional responding). This is important as a corrective to the common expectation that emotion regulation is devoted to minimizing negative affect and also because many conditions of psychopathology are characterized not just by the prevalence of negative affect but also by disturbances in the intensity, persistence, or lability of negative and positive emotion. Third, emotion is managed through the extrinsic influence of other people as well as the person’s own efforts. This is important to developmental analysis because emotions are primarily managed by caregivers early in life, and a child’s emotional repertoire and tolerances are shaped by these experiences of extrinsic emotion regulation. This is also important to understanding emotion-related psychopathology because of how social facilitation or inhibition can contribute to managing emotion in adaptive or maladaptive ways.

Fourth, a core feature of our definition of emotion regulation is that emotion regulation is defined functionally. In other words, emotion regulation is guided by the regulator’s goals in a specific emotion-eliciting context. Emphasizing the goals motivating emotion regulation and the context in which it occurs together underscores the point that strategies of emotion regulation are rarely inherently adaptive or maladaptive; such a distinction can be made only with reference to the functions of these strategies in specific contexts. This is apparent in developmental analysis. Misunderstanding children’s goals for emotion management can cause adults to perceive them as emotionally dysregulated in situations where children are functioning quite well as emotional tacticians (e.g., a toddler fussing for candy, an adolescent becoming moody to elicit sympathy from friends). Multiple goals can govern emotion regulatory efforts, moreover, and different self-regulatory strategies can serve different goals in different contexts. A child who has been threatened by a peer, for example, may experience conflict between managing emotion to enlist the assistance of others (by enhancing distress and controlling anger), defending oneself and deterring aggression (by controlling fear and enhancing feelings of anger), avoiding further conflict (by controlling feelings of anger and distress), or accomplishing other goals. There may be different immediate and long-term consequences of each strategy, which makes determining their adaptiveness in this context especially difficult. The same is true of adults: A medical professional’s skilled self-regulation of negative emotion in emergency situations may blunt empathic sensitivity in other contexts.

Added to this functionalist analysis, such as the child’s relationship with their caregivers, is the important role of anger in shaping emotional responses. Emotions like anger are important to self-management, and their regulation can have far-reaching consequences. Although a functionalist approach to emotion regulation emphasizes the importance of contextual influences, it also considers the role of more intrinsic factors, such as the child’s perceptions and goals.

Finally, emotion regulation is a lifelong process that begins early in life and is shaped by both biological and environmental factors. Children’s capacities for emotion regulation develop in response to a variety of influences, including their own experiences of heightened emotion, their relationships with caregivers, and the expectations and demands of their environment. The ability to regulate emotions effectively is crucial for children’s social and emotional development, as it enables them to navigate their environment and form healthy relationships with others.

Incorporating emotion appraisal in the classroom is important for other reasons as well. Emotions are not just modulated by cognitive appraisal processes; they also influence cognitive appraisal processes and, for that matter, context selection, and other elements of emotion regulation (Gross & Thompson, 2007). This means that understanding and applying strategies to therapeutic efforts in enhancing self-regulatory capability is essential.

Taken together, the purpose of emotion regulation is not just to improve social skills and empathy, but also to foster healthy emotional development and well-being. Understanding the complexities of emotion regulation provides a framework for understanding how emotions are managed, and it highlights the importance of individual differences in regulatory strategies and the role of environmental factors in shaping these strategies. It also underscores the need for early intervention and support in promoting healthy emotional development.
 Added to this functionalist analysis are other contextual influences, such as the child's relationship with the peer and their shared culture (Nepalese children are socialized to avoid any expression of negative emotion; see Cole, Bruschi, & Tamang, 2002). The broader social context is also important: If the child comes from a socioeconomic setting where expressions of anger are important to self-defense and are actively encouraged by caregivers, an adaptive emotional regulatory response may be much different than in another sociocultural setting (see Miller & Sperry, 1987). Although a functionalist approach to emotion regulation introduces complexity and caution in judgments about the adaptive or maladaptive qualities of emotion regulation strategies, it enhances understanding by focusing attention on the nature of the individual's goals and the importance of contextual influences. As we discuss later, the same is true of efforts to understand psychopathology from the perspective of emotion regulation and dysregulation.

Finally, emotion regulation includes monitoring and evaluating emotional experience as well as evaluating it. In other words, emotional self-monitoring and cognitive appraisals of one's emotional experience are central to emotion regulation because these appraisals, in concert with one's emotion goals in that context, guide whether and how emotions are managed. This definitional feature is also important to developmental analysis because children's capacities for appraising their emotions change considerably from infancy through adolescence, and this has a significant influence on the growth of emotion self-regulation, as we consider next (Thompson & Lagattuta, 2006). It also recognizes that emotional appraisals are likely to be different for children who differ temperamentally, in their biological vulnerability to anxious or sad affect, or in their prior experiences of heightened emotion (such as fear), and subsequently their needs for emotion regulation will be different. Indeed, one of the characteristics of children and adults who have difficulties with emotion self-management is their hypersensitivity to anticipatory cues of emotional arousal or their dysfunctional appraisal of certain emotion-eliciting situations.

Incorporating emotion appraisal into the definition of emotion regulation is important for other reasons also. It highlights that self-regulatory processes can influence emotional reactions at many points in the process of emotion activation: not just modulating emotional responses but altering cognitive appraisals and, for that matter, changing attentional deployment, context selection, and other elements of the process of emotion generation (Gross & Thompson, 2007). This multicomponential approach thus has applications to therapeutic efforts by identifying multiple approaches to enhancing self-regulatory capability.

Taken together, the purpose of definitionally unpacking the concept of emotion regulation is not just to complicate a phenomenon that otherwise seems fairly simple and straightforward. The purpose is instead to show that the complexity of emotion regulation is based on the complexity
of emotion itself and the personal and social goals its expression serves. Understanding the importance of the goals for managing emotion, contextual influences, the effects of other people on emotion regulation, and the significance of the cognitive appraisals and self-monitoring is important for developmental analyses because these features change significantly from infancy through the life course. They are also important for applying the concept of emotion regulation to clinical thinking because of the complexity of the circumstances contributing to emotion-related psychopathology in children and adults.

Development of Emotion Regulation

How does emotion regulation change over the course of development? In light of the foregoing considerations, characterizing the development of emotion regulation as better management of negative emotions is incomplete (Thompson & Goodwin, 2007). The growth of emotion regulation also includes:

- The transition from emotion regulation primarily by others to increasingly self-initiated regulation as children assume responsibility for managing their own positive and negative feelings.
- Growing reliance on mentalistic strategies of emotion self-regulation (e.g., attentional redirection, cognitive reappraisal) over behavioral tactics that rely on contextual support (e.g., seeking help, avoiding emotionally arousing events).
- Increasing breadth, sophistication, and flexibility in the use of different emotion regulation strategies, including capacities to manage emotion in contextually appropriate ways, substituting more effective strategies after others have proven ineffective, and using multiple strategies when needed (e.g., simultaneously enlisting attentional and cognitive strategies to control emotion).
- Enlisting emotion-specific self-regulatory strategies (such as managing fear but not anger through encouraging self-talk) as well as emotion-general strategies (e.g., withdrawal from situations that arouse negative affect).
- Growing sophistication in the social and personal goals underlying self-regulatory efforts (e.g., enlisting emotion regulation to manage social relations, improve cognitive functioning, support self-esteem), and incorporation of cultural and subcultural norms into self-regulatory efforts.
- Development of consistent individual differences in emotion regulation goals, strategies, and general style (e.g., people as emotion suppressors, avoiders) with the development and consolidation of personality.

In this light, the development of emotion regulation in a complex network of loosely allational, and self-referential achievements emotion specific but many of which mature emotion self-regulation are one reason why researchers have found differences in emotion regulation that are these differences are based on a child's neurobiological capacities with differences (see Calkins, Gill, Johnson, & Sowell, 1996).

In this section, we consider emotion regulation in infancy, child (see also Eisenberg & Morris, 2005; Thompson, 1990, 1994). We then consider correlations of these capacities and whether from developmental neuroscience.

Infancy and Preschool

Emotion regulation begins from infancy caregivers to manage the ability that emotion regulation begins maternal stress on fetal psychobiology (Thompson & Hill, 2007). Beginning in infancy childhood and adolescence, children's emotional reactions by soothing play, organizing daily routines to provide reassurance in uncertain feelings in emotionally demanding situations surprisingly early age, these interverr have emotionally regulatory effects. Tressed infants begin quieting in ap their mother when they can hear the testing loudly if the adult approaches them (Gekoski, Rowe-Collier, & Casakin, 1986). Together with the positive port provided by adults in parent child these early experiences embed develop emotion regulation in social improving quality of the parent-child relationship.

Nascent capacities for emotion regulation newborns have innate approach behavior to stimuli and are equipped with primitive behaviors, such as sucking) that help to manage arous
In this light, the development of emotion regulation involves growth in a complex network of loosely allied neurobiological, conceptual, relational, and self-referential achievements, some of which are regulatory and emotion specific but many of which are not. Many of the constituents of mature emotion self-regulation are also slowly developing. Consequently, one reason why researchers have found that early-emerging individual differences in emotion regulation are not very stable over time is because these differences are based on a changing constellation of behavioral and neurobiological capacities with different maturational timetables and origins (see Calkins, Gill, Johnson, & Smith, 1999; Grofnick, Bridges, & Connell, 1996).

In this section, we consider major advances in the development of emotion regulation in infancy, childhood and adolescence, and adulthood (see also Eisenberg & Morris, 2002; Fox & Calkins, 2003; Kopp, 1989; Thompson, 1990, 1994). We then consider the developing neurobiological correlates of these capacities and what we learn about emotion regulation from developmental neuroscience.

**Infancy and Preschool**

Emotion regulation begins from birth in the heroic efforts of parents and other caregivers to manage a newborn’s arousal (indeed, it is arguable that emotion regulation begins *prenatally* if we consider the effects of maternal stress on fetal psychobiological stress responsivity; see Calkins & Hill, 2007). Beginning in infancy and continuing throughout much of childhood and adolescence, parents directly intervene to manage children’s emotional reactions by soothing distress, engaging in exuberant play, organizing daily routines to create manageable emotional demands, providing reassurance in uncertain circumstances, and offering assistance in emotionally demanding situations (Thompson & Meyer, 2007). From a surprisingly early age, these interventions create social expectations that have emotionally regulatory effects. By 6 months of age, for example, distressed infants begin quieting in apparent anticipation of the arrival of their mother when they can hear the adult’s approaching footsteps, protesting loudly if the adult approaches but does not pick them up to soothe them (Gekoski, Rovee-Collier, & Garulli-Rabinowitz, 1983; Lamb & Malkin, 1986). Together with the positive expectations and self-regulatory support provided by adults in parent–infant play (Adamson & Frick, 2008), these early experiences embed developing capacities for stress tolerance and emotion regulation in social interaction and contribute to the developing quality of the parent–child relationship.

Nascent capacities for emotion self-regulation emerge early, however. Newborns have innate approach–withdrawal responses to pleasant or aversive stimuli and are equipped with primitive self-soothing behaviors (such as sucking) that help to manage arousal. Early in the first year, the matura-
tion of neurobiological attentional systems provides infants with greater voluntary control over looking and the ability to disengage from emotionally arousing events (Posner & Rothbart, 2000; Rothbart, Posner, & Boylan, 1990). Later in the first year, advances in motor control enable infants to be more deliberate in their efforts to manage distress by reaching toward caregivers for comfort, self-soothing (sometimes with a special toy or blanket), or avoiding or departing from unpleasant situations.

The importance of temperamental individuality further underscores the biological foundations of emotion regulation in the early years. Temperamental characteristics can affect emotion management in at least three ways (Thompson & Goodvin, 2007). First, certain qualities, particularly thresholds for the arousal of negative emotion, contribute to the intensity and persistence of emotional responses that require regulation. Toddlers who are high in emotional reactivity for fear or anger, for example, have been found to be less in emotional self-control in independent assessments (Calkins et al., 1999; Calkins & Hill, 2007). Second, other temperamental qualities, such as effortful control, are directly associated with enhanced emotion regulation and behavioral self-control (Kochanska, Murray, & Harlan, 2000). Third, temperamental qualities may influence the development of emotion regulation through their interaction with caregiving influences: Temperament is important primarily in the context of certain qualities of care. In a study of the responses of 18-month-olds to moderate stressors, for example, Nachmias and her colleagues reported that the interaction of toddlers’ inhibited temperament with an insecure parent–child relationship predicted elevations in cortisol levels (Nachmias, Gunnar, Mangelsdorf, Parritz, & Buss, 1996). Only toddlers who were both insecurely attached and highly inhibited exhibited physiological stress; for inhibited toddlers in secure relationships, the mother’s presence helped to buffer the physiological effects of challenging events, and uninhibited toddlers functioned well regardless of the security of attachment. Studies such as these are important for underscoring that, although the biological foundations of emotion regulation are important, the most useful approach to understanding the growth of self-regulatory capacity is through the interaction of biological vulnerability or resiliency with social support or stress.

**Childhood and Adolescence**

With the growth of language in early childhood, emotions become represented mentally and better understood in relation to other events. This provides young children with greater conceptual tools for managing their feelings. By age 2, for example, they can be overheard making spontaneous comments about emotion, the causes of emotion, and even emotionally regulatory efforts (e.g., “I scared of the shark. Close my eyes” at 28 months) (see Bartsch & Wellman, 1995; Bretherton, Fritz, Zahn-Waxler, & Ridgeway, 1986). During the preschool period, the associations between emotion and social behavior are strong, and children’s emotional experience, and even their mistaken beliefs (e.g., “Kato felt sad because, but really she was”) and adults’ joint activity may help children to develop their understanding of emotion regulation and seeking the assistance of others to manage their feelings (Thompson, 1990).

These conceptual advances in emotion understanding, self-regulation, and social skills may ensure that before they can feel better. An older child’s understanding of emotional experience (i.e., that other people can feel the same emotions) can contribute to a sense of empathy, such as when a 5-year-old smiles and the presence of the gift giver. Taken together, these findings suggest that children who understand the importance of emotion regulation are more likely to feel better.

The growth of young children’s understanding of emotions also provides further opportunity to contribute to emotion regulation by providing a sense of the different ways in which children can express their feelings. This understanding helps children to develop their own strategies for managing their emotions, and illustrates the importance of teaching children to identify and express their emotions in a healthy way. Miller & Sperry (1987) developed a program for teaching young children to identify and express their emotions in a healthy way. Their approach involved coaching children in the context of a warm parent–child relationship, and then providing specific strategies for managing their emotions, such as taking deep breaths or counting to 10. The effectiveness of this approach has been demonstrated in a number of studies, showing that children who learn these strategies are more likely to regulate their emotions in a healthy way.
Development of Emotional Regulation

...emotions provides infants with greater ability to disengage from emotion (Rothbart, 2000; Rothbart, Posner, & Boylan, 2000, in motor control enable infants to manage distress by reaching toward sometimes with a special toy or unpleasant situations.

Individuality further underscores regulation in the early years. Temperament management in at least 07). First, certain qualities, participatory emotion, contribute to the responses that require regulation. Activity for fear or anger, for example, self-control in independent 

Second, other temperaments, are directly associated with behavioral self-control (Kochanska, et al., 2007). Second, other temperaments, are directly associated with behavioral self-control (Kochanska, et al., 2007). Only toddlers who highly inhibited exhibited physiological relationships, the mother’s prescriptive, effects of challenging events, and regardless of the security of attachment for underscoring that, although emotional regulation are important, the most important of self-regulatory capacity is vulnerability or resiliency with social 

...childhood, emotions become repressed in relation to other events. This conceptual tools for managing their can be overheard making spontaneous uses of emotion, and even emotion of the shark. Close my eyes” at 28....
tural expectations for emotion and its expression, and comment on strategies for emotion management (Thompson, Laible, & Ontai, 2005). These conversations also become a context for learning gender differences in emotion and its expression (Fivush, 1998). The growth of language-based mental representations of emotion in early childhood thus significantly expands the scope of socialization influences by which children learn to manage their feelings.

Early socialization of emotion regulation is multilayered and complex, however. It is influenced, for example, by how caregivers evaluate young children’s emotional responses in sympathetic and constructive ways or instead by dismissing, denigrating, or criticizing them, particularly when children are expressing negative feelings. Considerable research indicates that children develop more constructive emotion regulatory capacities when parents respond acceptingly and supportively to their negative emotions (see Denham, Bassett, & Wyatt, 2007; Eisenberg, Cumberland, & Spinrad, 1998). However, parents sometimes misidentify children’s feelings and, as a consequence, may coach emotion regulation strategies in ways that are unhelpful or irrelevant. In our lab, mothers and their 4½-year-old children participated in a frustration task and afterward separately watched a videotape of this task and were interviewed about how the children felt. Nearly 60% of the mothers reported different emotions from those the children self-reported, even though children’s reports were confirmed by observational ratings of the frustration task. Maternal representations of emotion in their own lives (e.g., beliefs about the importance of attending to emotional experience) and the quality of the mother–child relationship were important predictors of mother–child concordance in this study.

Finally, early socialization of emotion regulation is also affected by the broader emotional climate of family life and its emotional demands, models of emotional coping, and expectations for emotional self-control. An emotionally positive home environment fosters the development of more constructive emotion regulatory capacities in children than one characterized by intrafamilial anger and hostility (Halberstadt, Crisp, & Eaton, 1999; Halberstadt & Eaton, 2003). Consistent with this view, young children with secure attachments to their caregivers are more competent at managing their negative emotions than are children with insecure attachments (see Thompson & Meyer, 2007, for a review).

With the conceptual advances of middle childhood and adolescence, emotion understanding and emotion regulation incorporate deeper insight into the mental, attitudinal, personality, and motivational qualities that also inform self-understanding (Thompson, 1990, 1994). Older children are more competently self-reflective, and as they think about their emotional experiences and those of others, they become more competently self-managing. Children’s developing awareness, for example, of how emotional intensity gradually dissipates over time, how personal background and personality can yield unique emotional reactions, and how the same event can provoke mixed emotions, people recognize how emotions can inform strategies of emotion regulation (such as thinking of happy things in order to reduce sadness or of how to handle stressful situations; such as analyzing the consequences of their actions and the reasons for their frustration, adjusting their emotional response, or altering the emotional quality of their behavior). Children’s approaches are complemented by strategies such as playing music that has specific calming effects.

One reason why older children logically oriented emotion regulation is the development of executive functions that include attention, inhibition, and working memory (Thompson, 2007). The neurobiological foundations (primarily in the prefrontal cortex and related regions) of the development of self-control, which is the ability to control one’s behavior and engage in goal-directed actions, are essential for the development of social, cognitive, and emotional skills during childhood. Adolescence is an important period for the development of executive functions, particularly those related to emotion regulation (e.g., inhibiting impulses, managing stress, and making decisions). The development of executive functions is critical for the smooth transition from childhood to adulthood, as it allows individuals to manage their emotions and make decisions that are in their best interest.

A broadened social context also contributes to emotion regulation. Peer relationships, for example, can provide support and validation for children’s emotions. Children who have developed good social skills and are able to communicate their emotions effectively are better able to manage their emotions in social situations. Peer relationships can also provide opportunities for children to observe and learn from the emotions of their peers, which can help them develop a better understanding of emotions and how to regulate them.
pression, and comment on strategies, Laible, & O'Neil, 2003). These learning gender differences in (the growth of language-based early childhood thus significantly changes by which children learn to

emotion is multilayered and complex, by how caregivers evaluate young athetic and constructive ways or criticizing them, particularly when. Considerable research indicates motion regulatory capacities when relative to their negative emotions, Cumberland, Cumberland, & Spinrad, identify children's feelings and, as emotion strategies in ways that are forers and their 45-year-old childrenoward separately watched a video about how the children felt. Nearly emotions from those the children ports were confirmed by observatio-dental representations of emotion: importance of attending to emotion mother-child relationship were oncordance in this study.

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Thompson, 1990, 1994). Older effective, and as they think about of others, they become more con-

cloping awareness, for example, of pates over time, how personal back-

some event can provoke mixed emotions leads to more psychologically informed strategies of emotion regulation. In middle childhood, young people recognize how emotions can be managed by internal distraction (such as thinking of happy things in difficult circumstances), redirection of thoughts (such as analyzing the technical qualities of a scary movie), cognitively reframing the situation (such as changing goals when initial objectives have been frustrated), acting in a manner that fosters a competing emotional response (such as behaving indifferently in anxious situations), altering the physiological dimensions of emotional arousal (e.g., breathing deeply), or concentrating on the benefits of managing one's feelings or their expression (Thompson, 1990). In adolescence, these self-regulatory approaches are complemented by strategies that are unique and personal, such as playing music that has special meaning to evoke desired feelings or seeking support from close friends.

One reason why older children are capable of enlisting these psychologically oriented emotion regulation strategies is because of growth in executive functions that include strategic planning, error detection and correction, and inhibitory control of initial responses (Zelazo & Cunningham, 2007). The neurobiological foundations of these executive functions (primarily in the prefrontal cortex) emerge early but have a prolonged maturational course, and the growth of executive functions in childhood and adolescence has important implications for thinking and problem solving as well as for behavioral and emotional self-control. In middle childhood, these developing capacities enable children to be more thoughtful and careful problem solvers and to respond emotionally in a less impulsive and more strategic manner.

A broadened social context also contributes to developing sophistication in emotion regulation. Peer relationships (and, to a lesser extent, sibling relationships) present children with different emotional demands, models, and incentives for emotion regulation than do parent-child relationships. Beginning in the preschool years, social competence with peers requires young children to coordinate their behavior with that of other children (who are less competent social partners than adults), manage conflict, negotiate over shared resources or interests, and assert self-interest as well as accurately perceive and respond to others' feelings and master the "feeling rules" of the peer environment. These are formidable challenges for emotion regulation, and research has shown that young children's social competence with peers is significantly affected by their emotional competence, including their skills in emotion self-regulation (Denham et al., 2003). With the increasing importance of peer relationships in middle childhood, furthermore, emotion talk between friends becomes a significant form of affective self-disclosure and a way of acquiring group norms for feeling rules as well as offering and receiving support for competent emotion self-regulation (Gottman & Parker, 1986). Peer relationships are important, therefore, because the skills of emotion regulation required in
the family or other adult contexts may not generalize well to the norms and
demands of the peer environment; thus, interactions with other children
provide a forum for broadening a child's repertoire of self-regulatory skills
as well as learning how to adapt skills to different social contexts.

Adulthood

The development of emotion regulation does not end with adolescence,
and its continuing growth underscores the importance of the personal
goals and social contexts governing emotional self-control. Although there
are important individual differences in self-regulatory styles and biases, by
early adulthood most individuals have acquired a basic repertoire of stra-
tegies for managing emotions and their social expression (John & Gross,
2007). These skills enable adults to function successfully in the employ-
ment, familial, recreational, and other social contexts that characterize
their lives. In concert with personality, gender, and cultural influences on
emotion regulation, these contexts guide expectations for emotional self-
control and the goals for emotional management that individuals must
achieve (compare, e.g., the requirements for emotional management of
a judge, a medical doctor, a professional athlete, and an entertainer). To be
successful, adults must refine the repertoire of self-regulatory skills needed
to function in the different contexts in which they live and work, percep-
tive of the emotional goals that must be achieved in these contexts, and
acting consistently with self-perceived personality characteristics, gender
expectations, and cultural norms.

Emotion regulation also changes developmentally during the adult
years in ways that are consistent with this analysis. According to socioemo-
tional selectivity theory (Carstensen, Isaacowitz, & Charles, 1999; Charles
& Carstensen, 2007), changing time perspective during the adult years
alters the priority accorded different investments of time and energy.
When the future time horizon is long, investment in activities with future
payoffs (e.g., knowledge and skill acquisition) is emphasized, but when the
future time horizon is shorter, investment in activities that are emotionally
meaningful is more important. As a consequence, older adults are more
concertedly self-regulatory of their emotional experiences, striving to
maintain close relationships that are affirming (such as with family
members), biased to appraise situations more positively, and actively modify-
ing their circumstances to create more manageable emotional demands
(such as avoiding people and contexts that create anxiety). The view that
older adults engage in these strategies as part of a broadly self-regulatory
approach to emotional experience emphasizes the importance of these
emotional goals and context and contrasts with traditional theories of
later-life emotion that emphasize either social disengagement or the asso-
ciation of aging with decline in neurobiological emotion systems.

Neurobiology and the Development of Emotion

Emotion fundamentally involves a distributed inhibitory systems. These neurobiol-
ogy at birth. Subcortical structures of the hypothalamus, function in con-
adrenocortical (HPA) axis to activate and arouse the newborn. The HPA
course, and there are important early years that are influenced, in par-
(Gunnar & Vazquez, 2006). Inhibi-
tional course and include multiple r
(particularly the dorsolateral PFC an-
rior cingulate, and the parasympath-
2007, Porges, Doussard-Roosevelt, &
07). In the early years, the gradu-
tems also helps to account for devel-
transition from the reactive, to the more graded, controllable, and
of the young child. Maturation of th
is also associated, as earlier noted, with involve inhibitory control over fr
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These developing neurobiological c
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regulatory control over lower limbic
eng emotional activation.

This straightforward story is, how-
tioned in favor of a more complex
sizes the continuing interaction be-
"regulatory" emotion systems (e.g.,1
2007; Quirk, 2007; Thompson, Lewi
is the mutual influence that exists be-
limbic structures: The PFC exerts i
for example, but the amygdala also
ing to emotional meanings that ha
& Todd, 2007; Quirk, 2007). In this
occurs through the interaction bet-
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A second reason why research
approach, consistent with the forego
Neurobiology and the Development of Emotion Regulation

Emotion fundamentally involves a dynamic relation between arousal and inhibitory systems. These neurobiological systems are active but immature at birth. Subcortical structures of the limbic system, including the amygdala and hypothalamus, function in concert with the hypothalamic–pituitary–adrenocortical (HPA) axis to activate sympathetic nervous system activity and arouse the newborn. The HPA system has an extended maturational course, and there are important declines in systemic lability during the early years that are influenced, in part, by the responsiveness of caregivers (Gunnar & Vazquez, 2006). Inhibitory systems also have a long maturational course and include multiple regions of the prefrontal cortex (PFC) (particularly the dorsolateral PFC and the orbitofrontal cortex), the anterior cingulate, and the parasympathetic nervous system (Ochsner & Gross, 2007; Porges, Doussard-Roosevelt, & Maiti, 1994; Zelazo & Cunningham, 2007). In the early years, the gradual maturation of these inhibitory systems also helps to account for developmental changes in emotionality, such as the transition from the reactive, all-or-none quality of newborn arousal to the more graded, controllable, and environmentally malleable emotions of the young child. Maturation of the prefrontal cortex later in childhood is also associated, as earlier noted, with the growth of executive functions that involve inhibitory control over impulsive reactions and the substitution of more reasoned responding, strategic planning, and error correction. These developing neurobiological capacities have significant implications for emotional regulation and also make emotional reactions more environmentally responsive and manageable through extrinsic incentives. Thus, the developmental neurobiology of emotion regulation can be regarded as the maturational unfolding of higher cortical inhibitory systems that exert regulatory control over lower limbic and neurohumoral systems governing emotional activation.

This straightforward story is, however, becoming increasingly questioned in favor of a more complex neurobiological account that emphasizes the continuing interaction between lower “activational” and higher “regulatory” emotion systems (e.g., Lewis & Todd, 2007; Ochsner & Gross, 2007; Quirk, 2007; Thompson, Lewis, & Calkins, 2009). A primary reason is the mutual influence that exists between regulatory cortical systems and limbic structures: The PFC exerts inhibitory control over the amygdala, for example, but the amygdala also constrains cortical processing according to emotional meanings that have been previously established (Lewis & Todd, 2007; Quirk, 2007). In this view, therefore, emotion regulation occurs through the interaction between higher and lower brain systems, not just the inhibitory influence of cortical systems alone.

A second reason why researchers favor a more integrative systems approach, consistent with the foregoing, is that the effects of early-emerging
emotional biases may exert strong influence throughout emotion-relevant brain systems. In one study, for example, 2-year-olds who were behaviorally identified either as emotionally shy/inhibited or as uninhibited were later studied as adults, and functional magnetic resonance imaging analyses revealed heightened amygdala activation in the inhibited group when viewing novel (vs. familiar) faces but no differences in the uninhibited group (Schwartz, Wright, Shin, Kagan, & Rauch, 2003). Although more longitudinal research is needed, these findings suggest that a strong biological bias toward fearful reactions to unfamiliar events based in limbic system thresholds may color emotional processes to maturity, despite the growth of higher cortical inhibitory systems. Importantly, these early biases can be established temperamentally, experientially (such as through chronic fear activation), or by an interaction between biological predispositions and caregiving quality (Galkins & Hill, 2007). Finally, a neurobiological systems view is consistent with the recognition that emotion regulatory influences do not always follow emotional activation but may precede it. This occurs, for example, through antecedent-focused emotion regulation strategies that manage emotion through anticipatory appraisals, situation selection, and other strategies intended to avert anticipated emotional reactions before they occur (Gross & Thompson, 2007). Such antecedent-focused self-regulation strategies are likely based on a combination of lower and higher neurobiological systems.

What does this updated developmental neurobiological account mean for the development of emotion regulation? First, differences between emotion and emotion regulation cannot be directly mapped onto the distinction between antecedent activation processes and consequent inhibitory processes. Instead, emotion regulation must be viewed as a continuing component of emotion itself, with the interaction between higher and lower neurobiological systems regulating emotional reactions (Thompson et al., 2009). This does not mean that emotion regulation cannot be studied as a distinct process, but rather that the focus should be on the reciprocal influences of multiple emotion-related brain systems rather than designating some systems as exclusively “activational” and others as specifically “regulatory.” Second, the developmental neurobiology of emotion regulation is not just the maturation of higher cortical inhibitory systems but also their continuing interaction with more basic emotion systems lower in the neuroaxis. As earlier suggested, this developmental systems view means that early emotional biases may have a long-standing influence on developing neurobiological emotion systems. Finally, as we discuss further next, this systems view of emotion regulation means that regulatory processes do not necessarily result in psychologically constructive or even healthy outcomes. Particularly for individuals at biological vulnerability or environmental risk, the multilevel regulation of emotion may result in emotional functioning that has potentially maladaptive outcomes owing to the growth of stable interactions between lower and higher emotion systems that contribute, for example, to depressive concomitants (Thompson et al.

Implications for Development

A significant impetus to research on psychopathology, including developmental difficulties in emotion regulation, is that many major affections—bipolar disorder, anxiety disorder, and other internalizing and externalizing disorders, posttraumatic stress disorder, and so forth—are also characterized by a lack of young children’s inability to adapt to problems in social competence, particularly in the care of potentially enhancing risk for affective and depressive disorders.

Emotion regulation research is relevant to the care of children, and its function in, for example, we have drawn of children’s emotions and the family emotion self-regulation, which is “expressed emotion”—parental criticism—involvement—in a number of clinic Brody, Faraone, & Rosenbaum. 199 regulation includes the influence of emotion on behavior partly to the importance of the relevance of anxiety and mood disorders. With respect to assessment, Luby and Johnson’s (1994) model of emotional dysregulation difficulties of children with clinical profiles in terms of variance: also the latency, rise time, duration. These and other formulations from future also have potential therapeutic.

One of the most important applications to clinical understanding is the regulation of children and adults at emphasis on emotion goals and con circumstances in which individuals to manage emotions and the goals whenever assessing the adaptiveness...
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Implications for Development and Psychopathology

A significant impetus to research on emotion regulation is its applications to psychopathology, including developmental psychopathology. It is not difficult to see why. Many major affective disorders (such as depression, bipolar disorder, and anxiety disorder) involve dysregulated affect, and other internalizing and externalizing disorders (such as conduct problems, posttraumatic stress disorder, and attention-deficit/hyperactivity disorder) are also characterized by emotion undercontrol. Furthermore, even young children’s inability to adaptively manage their feelings can contribute to problems in social competence and emotional adjustment and potentially enhance risk for affective psychopathology. The connections between research on emotion regulation and psychopathology seem self-evident.

Emotion regulation research contributes more, of course, than merely characterizing major psychological problems as difficulties of emotion dys-regulation. It is also relevant to understanding the processes leading to emotion dysregulation and its functions in clinical populations. In this chapter, for example, we have drawn attention to how parents’ evaluations of children’s emotions and the family emotional climate influence adaptive emotion self-regulation, which is relevant to the influence of family “expressed emotion”—parental criticism, hostility, and emotional over-involvement—in a number of clinical problems (Hirsfeld, Biederman, Brody, Faroone, & Rosenbaum, 1997). Our definition of emotion regulation includes the influence of emotion appraisals and self-monitoring, owing partly to the importance of these construals to the onset and maintenance of anxiety and mood disorders (Campbell-Sills & Barlow, 2007).

With respect to assessment, Luby and Belden (2006) have used Thompson’s (1994) model of emotional dynamics to characterize the emotional regulatory difficulties of children with mood disorders, describing different clinical profiles in terms of variability in not just in the intensity but also the latency, rise time, duration, and recovery of emotional reactions. These and other formulations from the emotion regulation research literature also have potential therapeutic applications.

One of the most important applications of research on emotion regulation to clinical understanding is how we characterize the emotion dysregulation of children and adults at risk. Consistent with the functionalist emphasis on emotion goals and context, it is essential to understand the circumstances in which individuals with emotional problems are striving to manage emotions and the goals that they are seeking to accomplish whenever assessing the adaptiveness or maladaptiveness of their emotion
regulation strategies. In our view, the self-regulatory challenges faced by many children and adults at risk is not primarily that they are enlisting inappropriate or maladaptive strategies of emotion management, but that they are trying to cope with emotionally impossible conditions in which there may be no more adaptive manner of regulating emotion. Their self-regulatory strategies are likely to involve inherent trade-offs that purchase immediate coping at the cost of long-term difficulty and that ultimately increase rather than diminish their emotional problems (Thompson & Calkins, 1996; Thompson, Flood, & Lundquist, 1995). Because of this, emotion regulation is for them a double-edged sword: The strategies that are most adaptive for accomplishing immediate emotional goals often render individuals more vulnerable to longer term problems.

**Emotion Regulation and Child Maltreatment**

The importance of this approach to understanding emotion regulation is evocatively illustrated in the case of maltreated children. These children have elevated rates of a number of psychological disorders, including conduct disorder, attention-deficit/hyperactivity disorder, mood disorders, posttraumatic stress disorder, and substance abuse, so it is appropriate to view child maltreatment as a significant risk factor for psychopathology (Cicchetti & Toth, 1995). Children who experience physical or sexual abuse or chronic neglect are faced with a formidable challenge in emotion regulation: A caregiver who should be the source of support for coping is instead the source of distress. In this sense, we can view maltreated children as doubly disadvantaged: forced to manage the frequent, intense emotional trauma associated with their abuse without the assistance of caregiver support.

In this light, we would anticipate that maltreated children would be seriously deficient in skills of emotion self-regulation, but research evidence does not support this simple deficit model. Instead, a number of studies indicate that maltreated children acquire a repertoire of self-regulatory strategies that enable them to adapt to the unpredictable and potentially dangerous caregiving environment in which they live. These strategies confer some benefits to children at home but are a liability especially when these children enter other social settings, such as school or peer environments.

An important emotion regulation strategy is attention deployment: focusing on certain elements of the environment in ways that contribute to emotion management (Gross & Thompson, 2007). Several studies indicate that maltreated children are hypersensitive to adult expressions of anger, perhaps because this enables them to anticipate and prepare for abusive conduct before it begins. In one study, when pictures of adult facial expressions of emotion were progressively “morphed” from one prototypical expression (e.g., sadness) to another (e.g., anger), maltreated children were more likely to identify were nonmaltreated children (Pollak, 2005). Treated children also exhibit a lower anger in the vocal expressions of the woman (Shackman & Pollak, 2005). In a study using event-related brain showed higher ERP responses to图片 with nonmaltreated children, responses to pictures of happy or pictures of happy or of Thatcher, & Cicchetti, 2001). Taken maltreated children are sensitized, anger, potentially because this sens children to anticipate and prepare for have abused them in the past. In a socially overwhelming attack of an abu anticipate it and flee, avoid, or other.

Outside the home, however, the undermines emotion management at treated children are more physically peers (Cicchetti & Toth, 1995) and a motion or withdrawal to peer distress this respect, the hypersensitivity to th at home is a liability at school, w are more likely to be misinterpreted.

This double-edged sword of en is apparent for other conditions of chen with anxiety disorders, some to anxious affect, exhibit heightened through self-regulatory strategies the provoking stimuli, active (sometimes and overattention to internal cues or accompany anxious overarousal. children purchase immediate relief fear-provoking events but, at the sei their pathology and undermine dew (Thompson, 2000). Similar self-reg who are offspring of mothers who are and who are themselves at risk of in combination of genetic and experier (Thompson & Calkins, 1996). For maltreated, the lesson they have le cannot be controlled, it can at least biate negative arousal these childr dysfunc.
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children were more likely to identify blended expressions as angry than were nonmaltreated children (Pollak, 2002; Pollak & Kistler, 2002). Maltreated children also exhibit a lower attentional threshold for detecting anger in the vocal expressions of their mothers (but not of an unfamiliar woman) (Shackman & Pollak, 2005) and have more difficulty attentionally disengaging from perceived angry cues (Pollak & Tolley-Schell, 2008). In a study using event-related brain potential (ERP), maltreated children showed higher ERP responses to pictures of angry facial expressions compared with nonmaltreated children, but there were no differences in their response to pictures of happy or fearful expressions (Pollak, Korman, Thatcher, & Cicchetti, 2001). Taken together, these findings argue that maltreated children are sensitized, not habituated, to signals of adult anger, potentially because this sensitivity manages emotion by enabling children to anticipate and prepare for aversive encounters with adults who have abused them in the past. In a sense, if one cannot avert the emotionally overwhelming attack of an abusive adult, it is helpful to be able to anticipate it and flee, avoid, or otherwise prepare for it.

Outside the home, however, their sensitivity to cues of anger and threat undermines emotion management and is more socially dysfunctional. Maltreated children are more physically and verbally aggressive toward their peers (Cicchetti & Toth, 1995) and are more likely to respond with aggression or withdrawal to peer distress (Klines-Dougan & Kistner, 1990). In this respect, the hypersensitivity to threat that may serve as a protective factor at home is a liability at school, where the social cues of other children are more likely to be misinterpreted and imbued with hostile intent.

This double-edged sword of emotion regulation for children at risk is apparent for other conditions of developmental psychopathology. Children with anxiety disorders, some of whom are biologically vulnerable to anxious affect, exhibit heightened efforts to anticipate fearful arousal through self-regulatory strategies that include their hypervigilance to fear-provoking stimuli, active (sometimes aggressive) avoidance of these stimuli, and overattention to internal cues of physiological arousal that anticipate or accompany anxious overarousal. By enlisting these strategies, anxious children purchase immediate relief from the turmoil of encountering fear-provoking events but, at the same time, consolidate and perpetuate their pathology and undermine developmentally appropriate functioning (Thompson, 2000). Similar self-regulatory challenges arise for children who are offspring of mothers who are depressed or have bipolar disorder and who are themselves at risk of internalizing disorders because of the combination of genetic and experiential risk conferred by their caregivers (Thompson & Calkins, 1996). For these children, as for those who are maltreated, the lesson they have learned is that if their negative emotion cannot be controlled, it can at least be anticipated, but in learning to anticipate negative arousal these children become vulnerable to longer term dysfunction.
Conclusion

In characterizing emotion regulation as "more than meets the eye," our goal is to show that this familiar, everyday phenomenon is psychologically, developmentally, and neurobiologically complex, particularly when emotion regulation is applied to psychopathology. More important, what is "more than meets the eye" contributes to the developmental and clinical applications of emotion regulation research.

In developmental analysis, research findings (including our own) convince us that children's emotion self-regulation at any age is based on sophisticated emotion appraisals, goals, and contextual influences that are developmentally changing and yields responses that may be perplexing unless they are interpreted in this light. In applications to psychopathology, it is equally apparent that emotion regulation efforts are adapted to complex biological and environmental risks and the trade-offs between immediate and long-term goals that are relevant to psychological pain. In each case, we believe, greater insight into the functions of emotion regulation in typical and atypical functioning is achieved when emotion regulation is regarded not just as the imposition of higher behavioral or neurobiological control but as an interaction between higher and lower systems related to emotional activation and its management. As other chapters in this volume indicate, perspectives to emotion regulation that incorporate these complexities yield therapeutic applications that begin to address the emotion goals underlying emotion dysregulation, the appraisals and constraints that perpetuate self-defeating emotion management styles, and the contextual influences that help to create the emotionally impossible environments with which distressed individuals must cope.

In a culture like ours, where emotional experience underlies the peaks and valleys of human experience, it is natural to hope that processes of emotion regulation will help to elevate the valleys and refine the peaks of that experience. The constructive—sometimes reconstructive—process by which emotion regulation accomplishes this reveals much about how deeply interconnected are emotion and its management in development and psychopathology.

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CHAPTER 3

How We Heal
What We Don’t Want

THE FUNCTIONAL NEURAL ARCHITECTURE OF EMOTION REGULATION

Bryan T. Denny, Jennifer A. Silb
and Kevin N. Ochsner

Whether trying to mollify a fearful child, the need to adaptively regulate its ubiquity, in the past decade emotion regulation has exploded. If the consequences of specific resources and social-emotional regulation (Oelofse et al., 2016) offer an opportunity to determine healthy individual differences in the assessment of these mechanisms varies across these neural mechanisms might fairly be said to underlie successful regulation strategies. This chapter seeks to address the need for understanding the process of generating an emotion, and the evidence for a working model of the regulation strategy known as reappraisal. Review neuroimaging methods used to this point.