

The Development of Self-Control of Emotion: Intrinsic and Extrinsic Influences¹

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Abstract:

In this paper, we review evidence that supports the notion that intrinsic and extrinsic factors contribute to the development self-control of emotions. Intrinsic factors include the infant's temperament, and cognitive processes such as attention and inhibitory control. Extrinsic factors involve the caregiving environment, sibling and peer relationships, and cultural expectations regarding emotional displays. Integrative approaches to the study of the development of self-control of emotion will be most fruitful if investigations examine the interplay, over time, among these internal and external factors.

KEY WORDS: self control of emotions; temperament; cognitive processes; caregiver-child interaction.

Article:

Self-control is a capacity that develops over the first years of life and has profound effects upon the child's behavioral repertoire (Kochanska, Coy, & Murray, 2001; Kopp, 1982). Notions of self-control are discussed in the psychological literature in relation to the development of motor skills, attention and cognition, and with regard to emotion (Calkins, 1994; Gross, 1999; Posner & Rothbart, 2000). The capacity to control expression of emotion, particularly negative emotions, develops over the first years of life and has particular importance for the unfolding of appropriate and adaptive social behavior (Eisenberg et al., 1996; Eisenberg, Murphy, Maszk, Smith, & Karbon, 1995; Thompson, 1994). Furthermore, the lack of adequate development of control over emotion (as well as, in some instances, over-control of emotion) may be a precursor for the development of psychopathology (Calkins & Dedmon, 2000; Calkins & Fox, 2002).

Like other areas of self-control, understanding the development of control of emotions necessitates examination of both intrinsic and extrinsic factors (Calkins, 1994). By intrinsic factors we mean those individual differences that are usually thought of as "innate." We recognize, however, Gottlieb's important qualification (Gottlieb, 1991) that no differences in physical, physiological, or biological characteristics are ever solely the result of genes without important environmental input. Nevertheless, for purposes of this presentation, we wish to contrast temperament and the maturation of certain cognitive skills from processes involving parent socialization. For this reason we use the term intrinsic (rather than "internal") and contrast it with "extrinsic" factors (specifically parent socialization) involved in the development of

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emotion control. Intrinsic factors include the temperamental disposition of the child, certain cognitive skills, and the underlying neural and physiological systems that support and are engaged in the process of control (Calkins, 1994; Fox, 1994; Fox, Henderson, & Marshall, 2001). Extrinsic factors include the manner in which caregivers shape and socialize emotional responses of the child. Caregivers may utilize specific strategies to enhance development of self-control by providing supportive and responsive environments to the child and by socializing culturally appropriate behavior (Thompson, 1994, 1998). In addition, other socializing agents, including siblings and peers, influence the extent to which children successfully utilize self-control strategies.

Over the past 10 years there has been an increased recognition of the importance of self-control of emotion in the developmental literature (e.g., Fox, 1994). This work has appeared under the rubric of emotion regulation and has generated a number of empirical studies designed to assess the influence of either intrinsic or extrinsic factors in its development (Calkins & Johnson, 1998; Stifter & Braungart, 1995; Stifter, Spinrad, & Braungart-Rieker, 1999). It has also led to some confusion or ambiguity as to exactly what is meant by “regulation” of emotion. Some have argued that emotion regulation is defined by both the intrinsic and extrinsic processes involved in the monitoring, evaluating, and moderating of emotional responses (Thompson, 1994). Others have noted that emotions themselves regulate social interaction (Campos, Mumme, Kermoian, & Campos, 1994). Redefining emotion regulation as the processes involved in self-control of emotion may help eliminate some of the ambiguity in these definitional issues.

Defining self-control of emotion first necessitates agreement on the nature of emotion. Most contemporary definitions of emotion agree that it is a psychological state of specific duration that involves expressive behavior for communication. This state is the result of cognitive appraisal or evaluation of a change in the environment. It may also involve peripheral physiological changes that contribute to the intensive aspects of the state. This working definition of emotion may be used to outline areas in which one may examine processes underlying self-control of emotion or emotion regulation. These processes, including attention, response inhibition, and executive function, emerge and change in nature over the first years of life and provide strategies for controlling the duration of expression, the manner of expression, or intensive aspects of emotion. During early childhood as some of these cognitive processes come on line, they interact with extrinsic factors that support the development of self-control of emotion. These extrinsic factors involve socialization processes by which children learn strategies for self-control and the cultural display rules of emotion. The goal of this paper is to provide a brief review of the intrinsic and extrinsic factors that contribute to the process of self-control of emotion in young children. We take a developmental approach, attempting first to describe individual differences in the tendency to express different emotions and second to understand when particular processes come on line to support adaptive self-control of emotion expression.

Although we acknowledge a distinction between emotional expression and internal emotional experiences, our focus will largely be on the expression of emotion. We take the view that early in development, these two processes are likely to be tightly integrated, with control processes that affect one also influencing the other. Indeed, the term emotional reactivity suggests a direct link between arousal, emotion experience, and expression, which is observed later in infancy and in early childhood. As children mature, their emotional goals consist largely of controlling

internal feeling states with consequent changes in facial, vocal, and physiological indices of emotion. Caregivers provide support and scaffold or structure the environment to assist children in the control of emotional reactivity. Around the age of 4 or 5, children become more familiar with their own emotional responses, culturally specific display rules, and the use of control processes.

As we examine the development of control processes in infants and young children, we provide data from our own longitudinal studies of social withdrawal (Fox et al., 1995; Fox, Henderson, Rubin, Calkins, & Schmidt, 2001) and aggression (Calkins & Dedmon, 2000; Calkins, Gill & Williford, 1999) in young children. This work demonstrates the importance of measurement of both intrinsic and extrinsic factors in the development of self-control of emotion and how, in turn, individual differences in self-control of emotion affect personality development and psychological adjustment. The work focuses on extreme groups of infants selected for temperamental characteristics of negative reactivity to novelty (in the case of our studies of social withdrawal) or negative reactivity to frustration (in the case of studies of aggressive behavior). The studies are longitudinal in design and adopt a multimeasure approach for assessing both intrinsic and extrinsic factors.

OVERVIEW OF NORMATIVE DEVELOPMENTS IN THE SELF-CONTROL OF EMOTION

Self-control of emotion emerges early in infancy and is influenced by the infant's reactivity to environmental stimulation. Initial responses of an infant are characterized by their physiological and behavioral reactions to sensory stimuli of different qualities and intensities. This reactivity is present at birth and reflects a relatively stable characteristic of the infant (Rothbart, Derryberry, & Hershey, 2000). It is, in fact, how we (Calkins, Fox, & Marshall, 1996; Fox, Henderson, & Marshall, 2001) have defined temperament in the infant. So, for example, infants will differ initially in their threshold to respond to visual or auditory stimuli as well as in their level of reactivity to stimuli designed to elicit negative affect (e.g. Calkins et al., 1996).

These initial affective responses that are characterized by vocal and facial indices of negativity are presumed to reflect generalized distress, a rudimentary form of the more sophisticated and differentiated emotions that will later be labeled as fear, anger, sadness. Emotions undergo further differentiation with cognitive development and the emergence of self-awareness during early childhood. This initial emotion reactivity has neither the complexity nor the range of later emotional responses. Nevertheless, the infant's subjective experience is "emotional" in the sense that it reflects a viscerally aroused internal state and a defined motor component. In addition, the infant's signals of visceral arousal will usually elicit an adaptive response from the environment.

Over the course of early development, the child's increasing capacity to control or modulate emotional reactivity is a result of increasing cognitive control. The cognitive processes that appear to facilitate control of emotional reactivity include regulation of attention, inhibitory control, and certain processes that have been called executive function (Fox, Henderson, & Marshall, 2001; Ruff & Rothbart, 1996). Opportunities for management of emotional reactivity are themselves the product of the temperament of the child. That is, the manner (type of emotion) and frequency with which a young child responds to stimulus situations provide opportunities for external intervention (extrinsic factors). For example, the experience of negative affect creates

opportunities for external intervention. Parents respond to their infant's distress and the manner and success of their intervention provides a history and basis for subsequent emotion control.

A central process in the emergence of self-control of emotion is the regulation of attention (Kopp, 2002). The development of attention and its use in the control of emotional reactivity begins to emerge in the first year of life and continues throughout the preschool and school years (Rothbart, 1989). Individual differences in the ability to voluntarily sustain focus or shift attention are critical aspects of self-control. These skills assist in the management of both negative and positive emotions. Clear individual differences exist in the ability to utilize attention to successfully control emotion. For example, Rothbart (1981, 1986) found increases in positive affect and decreases in distress from 3 to 6 months during episodes of focused attention, suggesting that control of attention is tied to affective experience. Moreover, negative affectivity is believed to interfere with the child's ability to explore and learn about the environment (Ruff & Rothbart, 1996).

During the second half of the first year of life there is good evidence for the development of inhibitory motor control in the infant. This involves the ability to inhibit a prepotent motor response (Diamond, 1991). Specific types of motor behavior such as self-comforting (e.g. thumb-sucking) and help seeking (e.g. reaching for the caregiver) are present early (Stifter & Braungart, 1995) but motor inhibition develops in rudimentary form in the second half of the first year of life and primarily during the second and third years of life. Self-control of emotion via inhibitory skills appears to be useful in situations of positive affective arousal in that they allow the child to keep arousal within a manageable and pleasurable range (Grolnick, Cosgrove & Bridges, 1996; Stifter & Moyer, 1991).

By the end of infancy, children begin to integrate control of attention and motor inhibitory control in ways that allow for a variety of developmental tasks to emerge. Thus, compliance to adult demands, the ability to delay gratification, and management of impulses become possible (Kopp, 1982). Rothbart (1989) links the emerging ability to control attention at the end of the first year of life with later behavior that requires an active suppression of approach even when the rewards may be pleasurable, or when the initiation or maintenance of behavior might be unpleasant. As children begin to move into the toddler period, they become more systematic in the deployment of their attention and they gain better inhibitory control (Ruff & Rothbart, 1996).

The brief description of the normative developments of self-control in infancy and early childhood points to the central role played by modulation of arousal for the control of emotion. This modulation of arousal begins early in infancy and is reflected in the child's mastery of state regulation and control of sleep-wake cycles. It is elaborated and integrated into the child's repertoire of emotional control behaviors during the preschool years (Calkins & Dedmon, 2000; Calkins & Fox, 2002). Individual differences in arousal and reactivity that appear early in life underlie many developments that occur later at the level of behavioral control of emotion experience and expression. That is, the control processes mentioned earlier, such as attention and inhibitory control, are themselves influenced by the style of emotional reactivity of the infant and young child. Thus, control processes are a function of child temperament and individual differences in these processes contribute to the normal development of social functioning.

INTRINSIC FACTORS IMPLICATED IN EARLY SELF-CONTROL OF EMOTION

Temperament

Following from the tradition of Thomas and Chess (Thomas, Birch, Chess, Hertzog, & Korn, 1964; Thomas, Chess, & Birch, 1970) examining the role of “behavioral style” or temperament in developmental outcome, several investigators have concluded that infant and child temperament may play a role in the development of self-control of emotions (Calkins & Johnson, 1998; Fox, Henderson, Rubin, et al., 2001; Rothbart & Bates, 1998; Stifter & Braungart, 1995). Rothbart (Rothbart & Derryberry, 1981) includes both individual differences in reactivity and the development of self-regulation as centerpieces of her model of temperament. Reactivity is characterized by the infant’s latency to respond, threshold of responsiveness, and intensity of response to sensory stimulation. The “second half” of this temperament model involves individual differences in the development of attention and inhibitory skills that regulate these reactive responses.

A good deal of empirical work has focused on the effects of temperamental negative reactivity on the development of self-control. Negative reactivity has been characterized by the degree of infant distress in response to novel unfamiliar events or the infant’s distress in frustrating situations. For example, Fox, Henderson, Rubin, et al. (2001) selected infants who displayed high levels of distress and motor activity in response to novel auditory and visual stimuli. A significant number of these infants displayed patterns of behavioral inhibition later on in the first year of life. Fox and colleagues speculated that those who did not go on to display inhibited behavior might have utilized adaptive self-control strategies that modulated the disposition to express negative affect. In support of this possibility, Henderson, Fox, and Rubin (2001) found that among infants characterized as having negative reactive temperaments at 9 months of age, those displaying left frontal EEG asymmetry were less likely to exhibit behavioral inhibition later in childhood compared to those exhibiting right frontal EEG asymmetry. Henderson et al. (2001) argue that the temperamentally negative infant exhibiting left frontal EEG asymmetry may have access to more adaptive attention and inhibitory strategies (e.g. language skills) that are important in the control of negative affect.

Frontal EEG asymmetry has been described as reflecting the infant or child’s disposition to express approach or avoidance related behaviors. Research with adults examining this metric has found that a pattern of right frontal EEG asymmetry is related to the tendency to express dysphoric affect in response to mild stress. Davidson (1992) has written that this particular right frontal pattern may be viewed as a stress diathesis, a marker for a heightened disposition to a stress response. Individuals exhibiting right frontal EEG asymmetry may be more vulnerable to stress and may respond with avoidance and negative affect. Supportive data from Davidson’s laboratory with adult subjects (Davidson & Henriques, 2000) and confirmatory data from our lab with young children (Calkins et al., 1996; Fox et al., 1995; Fox, Henderson, Rubin, et al., 2001) argue that the pattern of right frontal EEG asymmetry may be a marker for temperamental negative reactivity.

Studies of the development of emotional reactivity and temperament have also utilized measures of cardiac function to examine individual differences. A dimension of cardiac activity that has been linked specifically to temperament is heart rate variability. Although there are multiple ways to measure this variability, Porges (1985, 1991, 1996) and colleagues have developed a

method that measures the amplitude and period of the oscillations associated with inhalation and exhalation. This measure, called vagal tone, refers to the variability in heart rate that occurs at the frequency of breathing (respiratory sinus arrhythmia, RSA) and is thought to reflect the parasympathetic influence on heart rate variability via the vagus nerve (Porges 1996; Porges & Byrne, 1992). Suppression of vagal tone during demanding tasks may reflect physiological processes that allow the child to shift focus from internal homeostatic demands to the generation of coping strategies to control affective or behavioral arousal (Porges, 1996). Thus, suppression of vagal tone is thought to be a physiological strategy that permits sustained attention and behaviors indicative of active coping that are mediated by the parasympathetic nervous system (Porges, 1991, 1996; Wilson & Gottman, 1996).

In our research, we find support for the notion that individual differences in vagal tone are associated with the development of self-control of emotion and behavior. For example, Calkins (Calkins, 1997; Calkins, Smith, Gill, & Johnson, 1998) found that decreases in vagal tone characterized preschool children's response to tasks that required regulation of both negative and positive affect. In addition, children whose behavior both in the laboratory and at home was characterized by anger, defiance, and acting-out were less likely to display vagal tone suppression during several tasks requiring emotional and behavioral regulation (Calkins & Dedmon, 2000). And, among infants characterized by high levels of anger and frustration, suppression in an attention-demanding task was lower than for infants who were not as easily frustrated (Calkins, Dedmon, Gill, Lomax, & Johnson, in press).

Research on the role of temperament in the development of emotional control skills has examined the extent to which behavioral manifestations of temperament influence the development of specific styles of control. For example, a number of studies have found relations between temperamental negative reactivity to frustration and self-control of emotion. Braungart-Rieker and Stifter (1996) demonstrated that distress as a result of frustration at 5 months of age was related to the use of fewer emotion regulation behaviors, such as self-soothing, at 10 months of age. Calkins and Johnson (1998) demonstrated relations between specific behaviors, such as distraction and help seeking, and the tendency to be distressed in frustrating situations. Similarly, Buss and Goldsmith (1998) observed that a number of different self-soothing behaviors that infants display when observed in frustrating or constraining situations appear to reduce negative affect.

A small number of studies conducted with children of various ages suggest that it might be possible to identify profiles of infants at risk for problems in self-control of emotion. For example, Aksan and colleagues (Aksan et al., 1999) report that a preschool temperament type characterized by uncontrolled expressive behavior was predicted by the temperament factor of infant distress to limitations (the degree to which an infant gets distressed when restrained). In our research focusing on early frustration and aggression (Calkins et al., in press; Calkins & Dedmon, 2000; Calkins & Johnson, 1998) we have observed that infants and toddlers who are easily frustrated are much less likely to utilize strategies such as distraction or redirection of attention. These children are more likely to have difficulty exhibiting self-control of emotion. In sum, there is evidence that early individual differences in temperamental tendencies, particularly those reflecting differences in negative affectivity, influence the development of self-control of emotion.

Although the evidence cited above describes the link between temperamental reactivity and self-control, it does not address the issue of how individual differences in reactivity affect the processes that underlie self-control of emotion. As noted earlier, three general cognitive processes have been suggested to affect self-control of emotion. These are attention, effortful control, and what have been called more generally executive functions. Data and theory suggest that these processes affect individual differences in self-control of emotion. In the following sections we discuss these processes, their role in self-control of emotion and the possible manner in which temperament may affect or bias their performance.

Attention

The capacity for control of attention begins to emerge toward the end of the first year of life. However, development of complex processes involved in attention continues throughout the preschool and school years (Rothbart, 1989). Individual differences in the ability to voluntarily sustain focus and to voluntarily shift attention are believed to be early behavioral reflections of an emerging system of effortful control of behavior (Ahadi & Rothbart, 1994).

Posner (1992) was the first to describe the behavioral and neuroanatomical components associated with three attention systems: the orienting, vigilance, and executive attention systems. Rothbart, Posner, and Hershey (1995) have written about the development of each of these systems and their role in reactivity and regulation. These three systems provide the young child with the underlying processes necessary to regulate reactivity. There are clear developmental differences across the period of early childhood in the relations between attention and emotional control, specifically with respect to how successfully the child is able to use attention as a means of achieving emotional control. For example, as noted earlier, Rothbart (1981, 1986) observed increases in positive affect and decreases in distress from 3 to 6 months during episodes of focused attention. However, not all children will be able to engage in these behaviors successfully in order to control reactivity. There are also individual differences in the ability to utilize attention to successfully control emotion and behavior. For example, in a study of the efficacy of regulatory behaviors, Rothbart and colleagues (Rothbart, Posner, & Boylan, 1990) observed that attentional control was related to decreases in negative emotionality in situations that evoked distress in infants. Moreover, negative affectivity is believed to interfere with the child's ability to explore and learn about the environment and to maintain on-task behavior (Calkins & Dedmon, 2000; Ruff & Rothbart, 1996).

In our research, we found clear relations between the capacity for focused attention and multiple indices of emotional self-control. For example, we studied 9-month-old infants' abilities to focus on a visual stimulus presented directly in front of them in the presence of a second visual stimulus (a distracter) presented off to one side. Infants varied in the degree to which they were distracted by the second stimulus and the degree to which they focused on the central stimulus. These individual differences in infant attention were related to subsequent emotion control and social behavior. Specifically, greater attentional focus and lower distractibility was related to higher positive affect, less reticence and social withdrawal in peer situations, lower morning cortisol levels, and greater relative left frontal EEG asymmetry (Pérez-Edgar & Fox, 2000). Thus, children with a higher capacity for attentional control display behaviors suggesting greater self-control of emotion. In our studies of frustration and aggression, we found a similar pattern.

In early infancy, less frustrated infants displayed longer attentional focus and better physiological regulation than more easily frustrated infants (Calkins et al., in press). Among a sample of toddlers, those with a higher level of behavioral problems as indexed by the Child Behavior Checklist also displayed poorer attention across a variety of tasks than did children lower on such problems (Calkins & Dedmon, 2000).

Effortful Processes

A third factor that is intrinsic to the child and that likely influences self-control of emotion is the ability to engage in effortful control of behavior. Effortful control, or the ability to inhibit responses to environmental stimuli in order to pursue a cognitively represented goal, has been related to the ability to maintain a state of vigilance over time and response inhibition (Vaughn, Kopp, & Krakow, 1984). During the toddler and preschool periods, effortful control develops such that by age 4 children can successfully use a rule to inhibit a dominant response. These same children are described by their parents as more skilled at focusing and shifting attention, less impulsive, and less prone to frustration (Gerardi, Rothbart, Posner, & Kepler, 1996). For example, Zelazo and colleagues developed a task in which young children had to sort cards either by shape or color (Zelazo, Reznick, and Pinon, 1995). Three- and four-year-old children understood and could articulate the rule for both dimensions. However, only 4-year-olds could utilize the rule to successfully shift their performance from one dimension to the second. Three-year-olds, on the other hand, persisted in sorting according to the rule they performed first (Zelazo et al., 1995). In a similar type of task, Diamond asked children to name a picture card of the sun as “night” and a picture card of the moon and stars as “day.” Three-year-olds made more naming errors on this task than 4-year-olds (Diamond, 1991). Diamond and Zelazo both attribute the changing ability of the child to maturation of certain areas of prefrontal cortex involved in the skill of response inhibition.

Effortful control processes, such as response inhibition, are capable of regulating approach and avoidance behavioral tendencies, including positive and negative emotional reactivity. For example, effortful direction of response allows an individual to approach a stimulus that will induce distress or discomfort in order to obtain a desired goal. Alternatively, similar processes may be invoked in order to inhibit the desired approach toward a positive or attractive stimulus to avoid a perceived negative consequence of that approach. Thus, effortful control allows individuals to oppose their predisposition of reactivity in order to behave in accordance with certain rules or expectations.

Gross and Levenson (1997) have recently explored the physiological “costs” of cognitive effort involved in self-control of emotion. They had subjects view sad, neutral or amusing film clips under one of two conditions: the subjects either watched and naturally responded to the clip or they were asked to suppress their emotional response to the clip. Gross and Levenson (1997) found that when subjects were asked to suppress emotion to either the happy or sad film clip there was increased sympathetic activation (enhanced skin conductance and increased heart rate). Gross argues that voluntary control over emotion expression while facilitative of adaptive psychosocial functioning has a physiological “cost.” Another way to view these results is that the act of regulating emotion response tendencies requires active inhibition as reflected in the physiological change associated with such inhibition.

Executive Function Processes

With development, a fourth factor, executive cognition, emerges as a component of self-control. Two types of “executive function” skills are important for self-control of emotion. First, infants and young children develop the knowledge that it is useful to utilize certain behaviors in particular situations. The ability to anticipate the eventual effects of particular strategies is likely a relatively late developing skill (Thompson, 1998). As children move through the preschool period into the early school years, the capacity for cognitive self-regulation increases. Paris and Newman (1990) define this type of self-regulation as involving planfulness, control, reflection, competence, and independence. Cognitive self-regulation has also been defined as self-directedness and performance-control before, during, and after a task activity (Zimmerman, 1998). Importantly, earlier forms of self-regulation likely support this more sophisticated level of self-regulation. In fact, Kuhl and Kraska (1993) argue that children’s school performance is influenced not only by behavioral self-regulation, but also by attention control, motivation control, and emotion control or emotion regulation.

Second, as infants mature, they acquire an understanding that the people around them will respond or behave in a particular manner. As children become more sophisticated in social interactions, they will learn when it is necessary and appropriate to regulate displays of affect, and will develop the ability to apply any of a variety of strategies to suit the circumstance. At this point, the child will utilize a complex sequence of information processing skills that enable them to recognize, interpret and evaluate a given set of circumstances prior to generating a suitable emotion-regulating response (Dodge, 1991; Garber, Braafladt, & Zeman, 1991).

Overall the intrinsic processes involved in the attainment of self-control of emotion during early childhood are both biological and behavioral in nature. However, there are clearly opportunities for each of these processes to be influenced by external factors. The extent to which the child gains mastery of these processes will likely vary as a function of the environmental support available during periods of skill acquisition.

EXTRINSIC FACTORS IMPLICATED IN THE DEVELOPMENT OF SELF-CONTROL OF EMOTIONS

Although temperament and certain cognitive processes play a prominent role in the emergence of self-control of emotion, they are influenced, to varying degrees, by numerous external factors (Cicchetti, Ganiban, & Barnett, 1991; Thompson, 1994, 1998). Primary among these factors is the quality of interactions with caregivers (e.g., Cassidy, 1994; Field, 1994). As the child gets older, more explicit methods of training children to behave in accordance with given standards, norms, and parental expectations arise (Thompson, 1998). The nature of these interactions is influenced by the infants’ temperament, and by the development of the intrinsic cognitive skills necessary to manage emotions. For example, in a study of easily frustrated infants we found that the mothers of these infants appeared less sensitive and more intrusive in normal dyadic interactions. However, these infants also displayed less positive affect with others during the interactions (Calkins, Dedmon, Gill, & Hungerford, 2002). These results suggest that early temperament may affect the nature and extent of caregiver interventions through the infants’ affective behaviors.

Interactions with caregivers can act to shape both the infant's cognitive interpretation of given affect-eliciting events and the emotions displayed to those events. For example, an infant's capacity to manage distress, coupled with maternal support, can facilitate the ability to self-comfort, as well as foster a sense of security (Fogel, 1982). On the other hand, an inability to manage distress may lead to both withdrawn behavior and feelings of insecurity on the part of the infant. Evidence from our own research supports the relation between caregiving environment and temperament of the child as predictive of adaptive social behavior. Fox, Henderson, Rubin, et al. (2001) report on a long-term follow-up of infants identified as displaying negative reactivity. While a significant percentage (approximately 50%) of infants at age 4 displayed social withdrawal when confronted with unfamiliar peers, the other half did not display social withdrawal of any consequence. An examination of factors that influence either stability or discontinuity of temperament over time revealed that if the high negative reactive infant was a male, he was more likely to exhibit stability of social withdrawal. Females of a similar temperament exhibited greater discontinuity. Fox, Henderson, Rubin, et al. (2001) reasoned that caregivers might react differentially to an inhibited boy versus an inhibited girl, paying more attention to the former (because of its salience and violation of cultural norms) than the latter. Evidence from studies of behavioral inhibition with older children supports this contention. Stevenson-Hinde and Glover (1996) found that males who were behaviorally inhibited were more likely to be overprotected and needy compared to girls with a similar temperament. Recently, Rubin, Cheah, and Fox (2001) reported that reticent children were more likely to elicit overprotection and solicitous caregiving compared to nonreticent children, and that such a parenting style was associated with greater internalizing problems in the child. Thus, the manner in which caregivers respond to the temperament of their child has important consequences for the child's developing self-control of emotions and ultimately their social competence.

One important assumption of much of the research on the acquisition of self-control is that caregiving practices may support or undermine such development (Thompson, 1994). In infancy, there is an almost exclusive reliance on caregivers as the "regulators" of emotion. Over time, interactions with parents in emotion-laden contexts teach children the use of particular strategies that may be useful for the reduction of emotional arousal. There is also evidence that infants rely on parents for help in regulating physiological arousal related to behavioral organization (Spangler & Grossman, 1993; Spangler, Schiechle, Ilg, Maier, & Ackerman, 1994). Extensive caregiver support is likely to be critical in early childhood during the child's transition to greater autonomy. Given the toddler's reliance on parents for emotional and behavioral support, there is reason to believe that particular maternal strategies related to inhibition of impulses and compliance to external demands are potent external regulators that eventually become internalized (Kopp, 1982). It is likely that the management of autonomy and changing relationships that are characteristic of adolescence may involve parental control (Bell & Calkins, 2000). Thus, parental practices are related to individual differences in regulatory behavior throughout development (Cicchetti et al., 1991).

During early childhood, different developmental demands are placed on both children and parents, thus changing the kinds of interactions that will be influential in the acquisition of toddler self-control. One important aspect in the development of self-regulation is the pattern of child management that parents may use as the infant makes the transition to early childhood. During this transition, many of the interactions between parent and child may be marked by

efforts of the parent either to exert control over the child or to support competent self-management as the child seeks autonomy and independence. Such parental practices may be observed in everyday interactions where the parent has opportunities for modeling and reinforcing the child's behaviors (Thompson, 1998).

In one study of mothers and toddlers, we examined the relations between maternal behavior across a variety of different situations and child emotional self-control in frustrating situations (Calkins et al., 1998). Our analyses indicated that maternal negative and controlling behavior was related to the use of orienting to or manipulating the object of frustration (the barrier-box) and negatively related to the use of distraction techniques. The ability to control attention and engage in distraction (such that ruminating over the object of denial is minimized) has been related to the experience of less emotional arousal and reactivity (Calkins, 1997; Grolnick, Bridges, & Connell, 1996; Grolnick, Cosgrove, et al., 1996).

Our data also address the issue of parental over-control and its effects upon child self-control of emotion. Mothers demonstrating controlling behavior in contexts that do not explicitly require the regulation of emotions had children who employed nonadaptive strategies when in situations where they had to regulate their emotions (Calkins et al., 1998). Perhaps because these mothers typically exert significant control over their children's behavior, these children may not have a repertoire of optimal regulation strategies. The children may depend on external, extrinsic support and, therefore, have not developed the intrinsic processes necessary for self-control. In line with these findings, several studies have found a relation between parental negative control and harsh discipline practices and the development of behavior problems characterized by a lack of behavioral control (Crockenberg, 1981; Pettit & Bates, 1989; Weiss, Dodge, Bates, & Pettit, 1992). Negative and controlling behavior on the part of the mother may inhibit the development of child behaviors that will support autonomy when the mother is unavailable (Crockenberg & Littman, 1990). In addition, there is a growing consensus that positive interactions with parents are important for the development of competent psychosocial behavior; a lack of positive maternal interactions may be harmful to the child and hinder attempts at self-management (Petit & Bates, 1989). Positive maternal guidance, characterized by efforts to reinforce and support the child's attempts at autonomy, may contribute to the development of appropriate self-regulatory behavior and emotional control. In our study of aggressive children, we found that across the 2 to 4 year age period, increases in maternal negative and controlling behavior were related to an increase in behavior problems characterized by a lack of control for boys, but not for girls. For girls, worsening of behavior was predicted by a decrease in negative control (Smith, Calkins, Keane, Anastopoulos, & Shelton, 2002).

It is important to acknowledge that, although most of the research on extrinsic factors in the development of emotional self-control has focused on caregiving, there are other extrinsic factors that play a role as well. First, although caregivers are the primary emotion socializers in the family (Eisenberg, Cumberland, & Spinrad, 1998), siblings also may be involved in the process as well. Siblings have been found to provide comfort and assist in emotional control in arousing situations (Garner, 1995; Volling, 2001) and likely model behaviors that support emotional control and regulation. Moreover, sibling relationships may be one source of negative affect and conflict.

Peers, and the peer environment, are yet another extrinsic factor that may affect the development of emotional control in young children. Like siblings, peers may be a source of emotional support and modeling of control skills. Peers also provide a venue for the practice of emotional control skills. However, they may be implicated in the development of problematic styles of emotional control (Deater-Deckard, 2001). Children who are rejected or who withdraw from the peer group may have fewer opportunities for the practice of social competence skills that involve emotional control (Calkins, 1994). Problems with peer relationships are reliable predictors of later behavior adjustment difficulties (Parker & Asher, 1987) and it is thought that one mediating process in the pathway to maladjustment is emotion regulation (Deater-Deckard, 2001).

Cultural context is an additional extrinsic factor that may be implicated in the development of emotional self-control. The transmission of cultural display rules may affect when and how the child learns to hide, mask, and control emotional expressions. Such display rules are transmitted both directly through institutions such as the family, school, or religious organizations and indirectly through the practice of social conventions and exposure to the media. Children learn display rules relatively late in their emotional development and the successful practice of such rules may not take place until they reach school age. Culture may also influence the development of emotional control in terms of the degree of caregiver and family involvement in emotional development that is sanctioned by a given culture. Cultural expectations about caregiving practices affect when, how, and how often children may be physically soothed by caregivers which in turn affects the development of self control.

FUTURE DIRECTIONS

In this paper, we have argued that the development of self-control of emotion is a critical process for social competence that takes place across the infancy and early childhood periods of development. We have described normative developments in this process and articulated a view of these developments as occurring as a function of both intrinsic and extrinsic factors. Moreover, we have described how individual differences in temperament or emotional reactivity may influence the role of these internal and external factors. Importantly, we have argued that describing individual differences in self-control of emotion is not simply a matter of identifying the different strategies that may be used in particular emotionally arousing situations: The developmental process by which these strategies are acquired is itself subject to individual differences.

There are a number of important research issues to be addressed in the next generation of studies on development of emotion control. A primary one is how temperament affects the development of cognitive processes such as attention, inhibitory control, and executive strategies. Researchers in the area of emotion regulation assumed that individual differences in infant reactivity were moderated by the maturation of cognitive processes. However, recent work, particularly with adult populations would suggest just the opposite: Cognition is modified by temperament. For example, Derryberry & Reed (1996) report that individuals high in neuroticism responded differently on an attention task compared to controls. A number of similar reports using clinical populations (e.g. patients with anxiety disorders) find similar patterns of response on tasks of attention and cognitive control. The implication is that the subject's personality (or temperament) modifies the manner in which he or she perceives and processes stimuli in the environment. Thus, control strategies for a child with a negative biased temperament may work differently

than those for an exuberant child. The neural networks that support these cognitive processes may themselves be different depending upon the manner and context in which they were built. A child with a history of behavioral inhibition or social withdrawal may develop a pattern of cognitive processing of the social world quite different from a non-inhibited child (Rothbart & Derryberry, 1997). One challenge is to understand exactly how these developmental processes emerge over time.

A second issue for consideration is whether the degree of utilization of cognitive processes described above are adaptive for a range of temperaments. The use of attention, inhibitory or effortful control and executive strategies may facilitate optimal self-control for the exuberant child but may lead to different outcomes for a child with a different temperament. Such reasoning relates to the issue of over-control, which may be as maladaptive as under-control of emotion. The balance between over- and under-control is reminiscent of the thinking of Block and Block (1980) who studied ego rigidity and flexibility. They argued that neither extreme rigidity nor flexibility was optimal for adaptive behavior. Rather, the goal of personality development was to provide some balance between these two positions. Yet another neglected focus in the research in this area has been the question of how control processes operate over time. While most research examines whether and how frequently children employ certain control processes the efficacy of these processes over time has not been addressed. Basic information on how intrinsic factors change during early childhood must be addressed. Questions about continuity and change in psychophysiological systems and the implications of such change at the behavioral level have largely been ignored in the emotion regulation literature (for an exception, see Fox, Calkins, & Bell, 1994). Empirical investigations of physiological processes involved in the self-control of emotion must move beyond correlational approaches toward investigating the patterns and profiles associated with both different developmental processes and different developmental outcomes.

The complexities of simultaneously studying intrinsic and extrinsic factors would seem to require a focus on transactions between the child and the social environment, broadly construed, across both biological and behavioral levels. Such studies necessitate large samples, studied longitudinally, and analytical approaches sufficiently sophisticated to elucidate transactions over time.

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