The field of developmental psychology has made substantial theoretical and empirical contributions that extend into the more applied areas of behavioral science, such as child mental health and school performance. Clinical scientists, practitioners, and educators have looked to the field to address basic issues that have implications for children's everyday functioning, and considerable developmental research has been translated into practice that has improved the quality of life for children in their homes, with their peers, and in their schools.

Traditionally, researchers in the field of developmental psychology have made these important contributions even as they have segregated themselves into those who focus exclusively on emotional development versus those who focus on cognitive development. Early work in these distinct research areas examined normative developmental processes using cross-sectional studies to elucidate the developmental achievements of infancy, early childhood, middle childhood, and adolescence (Bjorklund, 1987; Brainerd, 1977; Izard & Malatesta, 1987). More recent work has examined the degree to which functioning in a particular domain early in development influences func-
tioning in that and related domains, as children manage the transitions that characterize development. So, for example, research that has examined the origins of the social skills children exhibit in kindergarten has focused largely on emotional predictors and processes, such as emotionality, emotion regulation, and emotion understanding, that have been implicated in early childhood social competence (Eisenberg et al., 1995; Fabes & Eisenberg, 1992). In contrast, research on early academic success has emphasized cognitive precursors, especially processes associated with metacognition (e.g., Bransford, Brown, & Cocking, 1999; Gaskins, 1994), strategy use (e.g., Griffin, Case, & Siegler, 1994; Pressley, 1995), and other skills central to executive functioning, such as memory and problem solving (e.g., Stipek & Ryan, 1997).

The notion that emotion and cognition are biologically based psychological phenomena that may be mutually influential is not new. Early emotion research and classic emotion theorists (i.e., William James, Walter Cannon, Philip Bard) attempted to address the biological, physical, and mental manifestations of emotion. Schacter’s work on emotional appraisal theory (Schacter & Singer, 1962) and Zajonc’s (1980) view of the primacy of affect are salient examples of approaches that address the explicit role of emotion versus cognition in psychological phenomena. There is clear value in studying these processes separately, to both understand basic functions and their development and to assess their implications for later outcomes.

However, a more integrated view that acknowledges the mutual influences of both sets of processes may be more fruitful when considering the complex developmental skills that clearly draw on both domains. Indeed, little research has explored the combined contributions of emotional and cognitive processes to the development of the social and academic skills necessary for school success and mental health, despite recent acknowledgment that such integration will likely yield the most complete understanding of early adjustment (Bell & Wolfe, 2004; Blair, 2002; Gray, 2004; Ladd, Birch, & Buhs, 1999) and be of the greatest benefit to the design and implementation of educational practice and interventions.

Despite the lack of empirical work that crosses the two domains, it is clear that research that integrates cognition and emotion is essential to any comprehensive conceptualization of development (Gray, 2004; Rothbart, 2004). Although traditionally considered separate processes, cognition and emotion are dynamically linked, at the level of both biology and behavior, both “in the moment” and across development, working together to process information and execute action (Blair, 2002; Cacioppo & Berntson, 1999). Cognitive processes of thinking, learning, and action can be viewed as regulators of a child’s emotion behaviors. Likewise, emotions can be understood as organizers of behavior, essentially modifying a child’s thinking, learning, and action (Cole, Martin, & Dennis, 2004). Thus, cognition and emotion represent inseparable components of the developmental process (Bell & Wolfe, 2004).
There has been much conceptual work proposing the integration of cognition and emotion (e.g., Bell & Deater-Deckard, 2007; Fox & Calkins, 2003; Posner & Rothbart, 2000), as well as suggesting that cognition and emotion are fully integrated by school age (Blair, 2002). However, the empirical data on this cognition–emotion developmental process are sparse, and existing work tends to focus on cross-sectional samples of preschool children (e.g., Kerr & Zelazo, 2004; Rothbart, Ellis, Rueda, & Posner, 2003). To date, there have been no longitudinal studies on emerging cognition–emotion relations across very early development, despite speculations that this integration may have its beginnings in infancy (e.g., Bell & Wolfe, 2004; Calkins & Fox, 2002). Nevertheless, pieces of the developmental puzzle can be assembled from existing research examining some basic emotion and cognition processes, and researchers who traditionally focus on one domain or the other have begun to address the likely behavioral and biological processes that link the two domains. This volume represents an attempt to present these first efforts by examining—systematically—hypotheses about the codevelopment of basic emotional and cognitive processes across childhood and by integrating research that has taken some first steps toward studying both emotion and cognition processes.

Our rationale for examining emotion and cognition together in this volume emanates from multiple conceptual and empirical literatures. First, recent work in the area of self-regulation in children and adults has noted that both emotion and cognition processes are clearly implicated in the successful regulation of thought and behavior (Baumeister & Vohs, 2004; Gray, 2004; Lewis & Stieben, 2004). A second literature focusing on early childhood psychopathology has emphasized that among children with early adjustment difficulties, deficits in both emotion and cognitive processing are often observed (Cicchetti & Posner, 2005; Nigg & Huang-Pollock, 2003). A third relevant literature has examined these processes from a neuroscientific framework that links emotion and cognition processes in the developing brain (Bell & Wolfe, 2004; Nigg & Huang-Pollock, 2003; Posner & Rothbart, 1994, 2000). Such an approach offers a functional explanation for the dynamic processes that direct the interaction between emotion and cognition during early childhood. It is surprising that despite the considerable theoretical work describing this functional relation, there has been relatively little empirical work in developmental psychology focusing on emerging emotion–cognition relations in early development and how these links may affect child outcomes. Our goal for this volume was to bring together prominent scientists whose work is beginning to address these relations.

This edited volume is organized around three areas of work that explicitly or implicitly address the relations between emotional and cognitive processes and the implications of such functioning for social relationships, school performance, and mental health. Part I addresses basic behavioral and biobehavioral developmental processes associated with emotion and emo-
tion control and with cognition and cognitive control, as well as attentional control. Part II focuses on the application of developmental neuroscience and genetics to these basic behavioral processes, thus providing a functional brain–behavior link for conceptualizing cognition–emotion interactions. Part III highlights research on atypical emotion and cognitive processing and the implications for early adjustment problems and for functioning in the typical academic and social setting of school. Implications for clinical and education research and interventions are the focus of this final section. The afterword synthesizes the theory and research presented in the volume, with speculations on the likely developmental pathways that may be implicated in normative development, as well as suggestions for future research to further elucidate both the connections among these processes and to better understand how individual differences in child functioning may emerge. Each of these research areas is crucial for conceptualizing the integrative nature of emotion and cognition across development.

PART I: BASIC DEVELOPMENTAL PROCESSES

Fundamental to any effort to describe and explain development is a clear need to examine these emotion and cognition processes at a behavioral and biobehavioral level early in development, when differential growth will provide a window on their emerging relations (Blair, 2002). A first important step in examining the relations between emotion and cognition at this level involves specification of the component processes within each domain (Blair, 2002; Gray, 2004). The discrete processes to be examined in this endeavor are described in these six chapters.

From a developmental point of view, it is especially useful to describe explicit types of emotional and cognitive processes, their biological foundation, and how they emerge. Such specificity may provide insight into successful developmental adaptation to the peer and school environment as well as normative developments and problems that emerge as a result of deficits in specific components of emotion and cognition at particular points in development (Calkins, 2007; Calkins, Graziano, & Keane, 2007). All of the authors in Part I focus on developing emotion–cognition relations at the biobehavioral level and discuss various contextual factors that may affect this developing association.

Clancy Blair and Tracy Dennis (chap. 2) present a developmental psychobiological approach to cognition–emotion relations over early development. The chapter focuses on ways in which a number of aspects of early experience may shape the development of relations between cognition and emotion, emphasizing the ways in which emotional and physiological arousal may facilitate goal-directed activity, which has clear implications for school readiness, developmental disabilities, and mood/anxiety problems.
Susan Calkins and Stuart Marcovitch (chap. 3) describe emotion regulation and executive functioning in early development both from a normative "what happens when" perspective and with special attention to the predictive implications of the development of these controls. Calkins and Marcovitch note the shared biological and psychological foundations of these processes, as well as their common predictive utility, in arguing that integration emerges early. The chapter addresses the development of the ability to control emotional arousal, an ability that allows children to engage in challenging tasks that provide opportunities for using and practicing cognitive function skills (Calkins & Dedmon, 2000), as fundamental to some of the more sophisticated and later developing cognitive control skills.

Pamela Cole, Laura Marie Armstrong, and Caroline K. Pemberton (chap. 4) examine the role of language in the development of emotion regulation. Although this role is well acknowledged, this chapter highlights how specific interactions between children and adults predict specific regulatory outcomes.

Ross Thompson (chap. 5) profiles the means by which relational processes influence young children's developing representations of emotion, their feelings about their emotions, and their capacities to manage emotions in academic and social contexts. Relational processes include a caregiver's sensitivity and support, conversational prompts to emotion understanding, and the broader warmth and security of the parent-child relationship. Thompson notes that each of these dimensions relates in particular ways to children's ability to independently regulate emotion.

Philip D. Zelazo, Li Qu, and Amanda Kesek (chap. 6) discuss how emotion influences the development of cognitive control. They contrast hot (highly emotional) and cool (not emotional) executive function tasks. Hot tasks rely on the affective aspects of executive function and are associated with orbitofrontal cortex, whereas cool tasks rely on more purely cognitive aspects and are associated with dorsolateral prefrontal cortex. Zelazo and colleagues present a model for the regulation of affect and motivation based on their research on hot and cool executive function tasks.

Research on basic biobehavioral developmental processes is essential to fill an important gap in our understanding of the complex interactions between emotion and cognition at the behavioral level. Brain-based research has highlighted how these basic developmental processes operate at the neurological level, shedding further light on developing emotion–cognition interactions. Much of this neurophysiological research has also highlighted individual differences in brain–behavior relations, which may also reflect genetic contributions to emotion and cognition interactions.

PART II: NEUROSCIENTIFIC AND GENETIC CONTRIBUTIONS

The authors of the chapters in Part II focus on developing emotion–cognition relations at the cortical or genetic level. Recent work in develop-
mental neuroscience has identified specific brain regions that may play a functional role in the deployment of attention and in the processing and regulation of emotion and cognition, suggesting that these processes are controlled by closely related areas in the brain (Davis, Bruce, & Gunnar, 2002; Davidson, Putnam & Larson, 2000) and may become integrated very early in development (Posner & Rothbart, 1994, 1998). This work has identified areas of the prefrontal cortex as central to the effortful regulation of behavior via the executive attention system. This system is guided by the anterior cingulate cortex (ACC), which includes two major subdivisions. One subdivision governs cognitive and attentional processes and has connections to the prefrontal cortex. The second subdivision governs emotional processes and has connections with the limbic system and peripheral autonomic, visceromotor, and endocrine systems (Lane & McRae, 2004; Luu & Tucker, 2004).

Recent research has suggested that these subdivisions have a reciprocal relation (Davidson et al., 2000; Davis et al., 2002). Moreover, the functional relation between these two areas of the cortex provides a biological mechanism for the developmental integration of specific types of knowledge and control processes in childhood. The functioning of this biological mechanism may be the source of individual differences in the process of emotion–cognition integration in early development. Such individual differences likely reflect basic genetic, as well as experiential, processes. Both types of processes are addressed in the four chapters of this section of the volume.

Martha Ann Bell, Denise Green, and Christy Wolfe (chap. 7) discuss their longitudinal work regarding psychobiological mechanisms of cognition–emotion integration in early development. Using frontal electroencephalogram measures during infancy, early childhood, and middle childhood, they highlight individual differences in the developing relations between a specific aspect of executive functioning (i.e., working memory and inhibitory control) and emotion and attention.

Kirby Deater-Deckard and Paula Mullineaux (chap. 8) discuss several of the predominant theories (e.g., temperament, social cognition) regarding the development of individual differences in emotion expression and regulation and in cognitive skills and performance. They also review evidence from behavioral genetic studies pertaining to the independence of, and connections between, emotion and cognition, and suggest some next steps for more fully integrating genetic studies of these two domains of development.

Mark H. Johnson (chap. 9) shows that infants are born attuned to stimuli that have social importance. In the first part of the chapter, he reviews literature and recent findings suggesting that there are cognitive processes associated with the specialized processing of faces, particularly gaze, in the infant brain. The second part of the chapter focuses on infant processing of another important aspect of the infant’s social world: the human body and the actions that it will produce.
Marc D. Lewis (chap. 10) reflects on day-to-day infant behavior during emotion-eliciting situations. Lewis links this behavior to brain motivation systems. In particular, he argues that motivation influences concept formation.

Findings from basic biobehavioral studies and from brain-based research can be combined to provide a framework for studying the integration of emotion and cognition with respect to developmental outcome. Implications of emerging emotion—cognition relations for both mental health and school achievement are discussed in Part III of this volume.

PART III: IMPLICATIONS FOR CLINICAL AND EDUCATIONAL RESEARCH

To date, most of the work that examines developmental predictors of child mental health and school performance has examined very specific emotional or cognitive predictors of particular types of disorders or specific academic skills. For example, in the realm of emotional development, problems characterized by poor or undercontrolled emotion regulation may be broadly related to externalizing behavior problems characterized by aggression (Calkins, Gill, & Williford, 1999). In addition, the overcontrol of emotion may characterize children with anxiety and depression, which are indicators of internalizing spectrum problems (Eisenberg, Smith, Sadosky, & Spinrad, 2004). Thus, much past research has indicated that patterns of emotion expression and emotion regulation that children acquire in development influence the nature of their subsequent psychological functioning in important ways (Fox & Calkins, 2003). Similarly, work in cognitive development has focused on predictors of specific types of performance deficits that hinder children’s school performance. For example, immature executive functioning is common in children with attention problems (Nigg, Hinshaw, Carte, & Treuting, 1998; Hinshaw, 1994), but executive function deficits have also been linked to conduct problems and learning style differences (Moffitt, 1993, Pennington & Ozonoff, 1996). However, the development of childhood psychopathology and academic performance difficulties may be of greater concern when there are deficits in both emotion and cognition processing. Clearly, then, emerging emotion—cognition relations and possible atypical development have implications for both clinical and education research. Those implications are highlighted in the chapters of this part of the book.

Frederick Morrison, Claire Cameron Ponitz, and Megan M. McClelland (chap. 11) discuss the importance of self-regulation for school success and highlight the origins of variability in the preschool years. They also focus on the measurement of behavioral and cognitive self-regulation, the sources of growth in self-regulation (e.g., family, preschool, school, child gender) and larger sociocultural factors, and the impact of self-regulation on school achievement and adaptation.
Joel Nigg, Michelle M. Martel, Molly Nikolas, and B. J. Casey (chap. 12) highlight the intersection of emotion and cognition in developmental psychopathology by focusing on attention-deficit/hyperactivity disorder (ADHD), impulsivity, and types of externalizing behavior. Specifically, they outline the potential intersecting influences of cognitive and emotional dysregulation in ADHD in children, along with potential mechanism distinctions between types of externalizing behavior based on relatively greater involvement of cognitive versus emotional dysregulatory processes.

To date, the foundational research on emotion–cognition integration has operated within behavioral, psychobiological, or intervention research literatures. The merging of these three research areas is essential for an integrative investigation of emotion and cognition.

The volume concludes with a brief afterword by Martha Ann Bell and Susan D. Calkins that summarizes the promise of the integration of emotion and cognition for future developmental research on basic and neurological processes, as well as implications for applied work and intervention research. We also note some of the conceptual and empirical challenges to such a direction and acknowledge that this kind of work should be approached as a necessary complement to, rather than a replacement for, research addressing emotion and cognition processes independently of one another, as each has a clear contribution to make to an understanding of psychological development.

In summary, the chapters in this volume highlight the foundations of developing relations between emotion and cognition by focusing on basic behavioral processes and on brain mechanisms of emotion and cognition. The focus on both behavior and brain mechanisms of emotion–cognition integration make this volume unique in the developmental literature. Adding to the distinctive content of this volume is the translational research highlighting emotion–cognition impact on mental health and school performance. The contributors to this volume are doing some of the field’s most innovative research, and it is our hope that this volume will influence future work in this rapidly evolving area.

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