Doing What *Doesn't* Come Naturally

The Development of Self-Regulation

ROSS A. THOMPSON
University of California, Davis

As adults, we are good at planning for the day's activities, keeping many things in mind, and multitasking. We know how to anticipate what we will need for a meeting and a trip to the gym when getting ready in the morning. We can ignore the distractions of background conversation while paying attention to an important phone call. We know how to respond appropriately, and not impulsively, to a comment that has been hurtful or annoying. We are accustomed to keeping many things in mind as we are simultaneously responding to our spouse, watching dinner cooking on the stove, and monitoring the news report on the radio. At times, it seems as if our minds have created an internal traffic control system that enables us to manage so many different demands on our attention and still accomplish our goals.

By contrast, young children seem to lack these internal controls. They are easily distracted as they are getting dressed in the morning or washing their hands for lunch. They can dissolve into tears of frustration when a block tower collapses or an adult says "no." They have difficulty playing "Simon Says" or following multistep instructions (e.g., preparing to use paints). Young children seem captured by the moment, by their immediate feelings and impulses, and by what is at the top of their minds.

Self-regulaton is a core reason for these differences. From early childhood to the adult years, the ability to monitor and manage one's thinking, attention, feelings, and behavior to accomplish goals develops significantly and helps account for the growth of competency and emotional well-being. Individual differences in self-regulation emerge early in life and are important to children's school achievement and social competence with peers and adults. Understanding why these differences develop and how to help young children who show self-regulatory problems has emerged as one of the important research topics in contemporary developmental science.

When this journal was inaugurated 30 years ago, the limits of early self-regulation were as much of a concern to parents, teachers, and practitioners as they are today. Then, as now, adults wanted to know why toddlers and preschoolers seem unable to stay focused, manage emotional outbursts, and get along better with others. But the conventional view 30 years ago was that self-regulatory problems derive primarily from the need for parents to instill better self-control in their children. The view that poor parenting or willful defiance account for young children's poor self-regulation made sense, because children often negotiate with adults before they cooperate, readily use "no" to assert their own preferences, and can erupt in angry battles with other children over favored toys. Why shouldn't deficiencies in self-regulation also be viewed as young children needing to learn better the rules of how to act appropriately at home, in the classroom, and with peers and adults?

Today, researchers know much more about the development of self-regulation in the early years and the origins of self-regulatory competence in brain development, early social experience, and temperamental individuality. They also understand better the reasons that some children show self-regulatory

Abstract

Self-regulatory limitations are typical of young children, whose impulsiveness, distractibility, and emotional outbursts can amuse and frustrate parents and practitioners. During the last 30 years, however, research into the development of self-regulation has revealed that early childhood is a very early stage in the maturation of brain regions relevant to self-control and that self-regulatory problems often accompany increasing stress in the lives of young children. These discoveries have underscored the importance of adult support for the growth of self-regulatory competence in young children and the need for appropriate developmental expectations for self-control, and they have contributed to the development of early interventions to support self-regulatory ability in the early years.

Photo: © iStockphoto.com/Gina Smith

Young children seem captured by the moment, by their immediate feelings and impulses.

problems. Understanding these influences, researchers have developed a number of promising interventions to provide assistance. This article summarizes some of these new discoveries during the past 3 decades.

Development of Self-Regulation

A 2-year-old's temper tantrums may cause a parent or care provider to conclude that self-regulation is minimal, but this young child has already advanced considerably in the development of self-control (Diamond, 2002; Rothbart, Posner, & Kieras, 2006). The newborn who settles into a daytime–nighttime sleeping schedule, the decline in unexplained fussiness that follows a few months later, and the toddler's ability to maintain more sustained interest in play and to inhibit in response to an adult's cautionary warning each reflect advances in behavioral self-control. Biological maturation of the brain and other nervous system processes help account for these early developmental changes (Diamond, 2002; Posner & Rothbart, 2006). By age 3 years, young children are more capable of managing their impulses for short periods, concentrating on interesting tasks, and following simple instructions—including those that involve the consistent application of rules that require the child's focused attention, memory for the rules, and decision making (Bronson, 2000). Children of this age are also capable of basic forms of emotion self-regulation—for example, leaving an emotionally arousing situation, covering the eyes or ears, or seeking the nurturance of an adult—although children's capacities for emotional and behavioral self-control are limited.

By the end of the preschool years, self-regulatory skills are much more advanced but also easily hidden if children are tired, upset, or under stress (Bronson, 2000). Five-year-olds are less distractable, more planful, and more capable of emotional self-control than are 3-year-olds. They also exhibit more complex problem solving that requires keeping in mind relevant information and enacting plans with multiple steps (e. g., simple science experiments). Children of this age are also beginning to exert control over impulsive judgments, such as providing logical rather than intuitive judgments of quantity or size. Perhaps one of the best reflections of 5-year-olds' developing self-regulation is their pretend play, in which they can be observed planning and coordinating their behavior with others in the creation of complex sociodramatic stories.

There is considerable further progress in self-regulation as children move through the school years and into adolescence. One of the most important skills they acquire is how to use mental processes strategically—for example, rehearsing a list of spelling words to remember them rather than simply staring at them on the page. This reflects the older child's growing understanding of mental processes and the ability to manage them deliberately to accomplish goals. Similarly, with respect to emotional self-control, children become increasingly proficient at enlisting psychological strategies (e. g., engaging in distracting thoughts, altering goals, or reinterpreting the situation) to manage emotion while also using their emotional expressions to accomplish social purposes (e. g., showing pleasure in a disappointing gift when the giver is present). With respect to planning, older children and adolescents develop increasing skill in tasks such as anticipating the time that will be required to complete homework assignments, planning how to complete graduation requirements on time, and saving to buy a used car.

Indeed, it is remarkable how long it takes for self-regulation to fully mature. Although toddlers and preschoolers have made progress in managing their behavior, they are only at the beginning of a process that lasts through early adulthood. The brain regions involved in self-regulation provide one explanation. These brain areas include the anterior cingulate cortex and multiple regions of the prefrontal cortex, including the dorsolateral prefrontal cortex and the orbitofrontal cortex (Zelazo & Cunningham, 2007). The dorsolateral prefrontal cortex, for example, is closely involved in planning and executing event sequences and has one of the longest periods of growth of any region of the brain, taking more than 2 decades to reach full maturity (Diamond, 2002). A similarly extended maturational course is true of the anterior cingulate and other prefrontal brain regions, which are among the most sophisticated of the entire human brain.

As a consequence, one of the reasons for young children's self-regulatory difficulties is that the maturation of relevant brain areas is at such an early stage. This means that young children's tendency to be distractible, impulsive, and poor at planning arises, in part, because the neurobiological controls that facilitate self-management are not fully in place. One implication is that parents and teachers can assist toddlers and preschoolers by ensuring that self-regulatory expectations are within the capabilities of young children rather than expecting greater self-control than young children are able to perform. In addition, when adults offer tangible support for self-regulation—such as providing memory aids, ensuring a predictable routine, and dividing complex activities into more manageable parts—young children are more capable of managing their behavior, emotions, or attention adaptively.

Executive Functions and Self-Regulation

Developmental scientists describe the growth of self-regulation as the development of *executive functions* (Diamond, 2006). As the term implies, these mental functions enable self-regulation in toddlers and children by exerting executive control over more basic attention, emotion, thinking, and behavioral processes. Even though self-regulation is often thought of as a single thing, the idea of executive functions is that they actually involve multiple, interrelated processes. These include inhibition, working memory, and cognitive flexibility.

Inhibition

Inhibition is the ability to resist a strong inclination to do one thing and to instead do what is most appropriate or needed. Inhibition is involved in a wide range of self-regulatory challenges, including emotion regulation (e. g., resisting the impulse to cry or get angry and instead respond in a more socially constructive fashion), concentration and selective attention (e. g., paying attention to the teacher rather than becoming distracted by other voices in the classroom), cognitive self-control (e. g., staying on task and resisting the impulse to daydream or do something else), social competence (e. g., responding to another person's criticism in a socially appropriate manner rather than with impulsive self-defense or attack),

and problem solving (e. g., responding to a problem with a mental rule rather than an intuitive judgment). Inhibition is deliberate because it requires putting the brakes on what one might otherwise do on "automatic pilot." Young children are limited in their inhibitory capacity both because of the slow maturation of relevant brain regions (particularly the anterior cingulate cortex) and because they are often unaware of the need to exert inhibitory control over doing what comes naturally in a social or problem-solving situation. Developmental differences in inhibition can be readily observed by watching young children of different ages play "Simon Says" or "Red Light, Green Light"—games that require inhibiting action under one condition (when Simon *doesn't* say) but acting quickly under the other condition (when Simon *says*). Two- and 3-year-olds routinely fail at these games, whereas 5-year-olds are much more capable, and older children find them too easy to take seriously.

Working Memory

Working memory is the ability to hold information in mind while mentally working on it. Working memory is, in a sense, your mind's equivalent of your computer's desktop. It is also involved in a variety of self-regulatory challenges, including those required for following instructions (particularly when the procedures for achieving a goal are complex or multistep), understanding a text (e. g., a story that involves a developing plot), accomplishing sequential tasks (e. g., a science experiment with multiple steps), and social and emotional understanding (that requires keeping in mind multiple features of the social context, individuals' reactions, and so forth). Working memory has a very limited capacity in people of all ages, which is why information is easily forgotten if you are not using it at the moment. Therefore, developmental changes in working memory do not derive from a growing memory capacity but rather from the developing ability to retain information in memory more efficiently and thus to keep more things in mind. For a young child who is learning to read, for example, sounding out letters and assembling them into words is a painstaking task requiring all the child's mental effort. Most adults, by contrast, read text automatically, and their efficiency in doing so enables them to relate the meaning of the words to other ideas that are in working memory at the same time. Developing working memory, thus, depends on the growth of experience (that enables many previously novel mental operations to be automatized), brain maturation (particularly in the parietal cortex and the anterior cingulate), and the development of other forms of strategic ability.

Photo: © iStockphoto.com/Olga Solovei

Developmental research has shown that young children are really not egocentric.

Cognitive Flexiblity

Cognitive flexibility is the ability to switch perspective, attention, or mental focus. It enables us to alter our actions or thinking in light of new information. Cognitive flexibility is also involved in many forms of self-regulation, such as in problem-solving (when alternative solutions to a problem must be created and tested) and social interaction (to understand how a situation looks from another's point of view). It is easy to understand why young children can be cognitively inflexible: In addition to the slow maturation of relevant brain areas, they are striving to learn how things are supposed to be, not the exceptions to the rule. As a result, young children can sometimes seem rigid, such as when early language learners overregularize grammatical rules (e. g., "I goed to the store with Mommy yesterday") before they master the grammatical exceptions or when they insist that bath must *always* precede bedtime if this is the ordinary routine. With respect to social interaction, cognitive inflexibility is one reason that young children have been conventionally viewed as egocentric when they seem incapable of appreciating how another's goals or desires might be different from the child's own. Developmental research has shown that young children are really not egocentric, but limited cognitive flexibility can make them appear so when their strongly felt interests conflict with those of another (Thompson, 2008).

Understanding that self-regulation has multiple components can help adults who work with toddlers and preschoolers to support their developing capacities for self-control. In situations where the challenges of self-regulation primarily involve inhibitory challenges, providing young children alternative behaviors to their natural impulses can be helpful, whether this involves using words for counting or expressing emotion or giving young children a small manipulable object to keep in their hands to resist fidgeting. In these cases, helping them know what *to do* rather than emphasizing what they are *not to do* can help them overcome inhibitory challenges and instead act constructively. When self-regulatory challenges primarily involve working memory, providing periodic reminders or restructuring tasks into simpler and more memorable formats can be valuable. Cognitive flexibility can be fostered by verbalizing alternative viewpoints with young children. This is why it is so helpful when a parent or teacher explains to a child how another child's tears are related to her desire to join in a game that she has been watching from the sidelines for a very long time.

Temperament and Self-Regulation: Effortful Control

Individual differences in early self-regulation are related to young children's temperamental qualities (Rothbart et al., 2006; Rothbart & Sheese, 2007). Toddlers and preschoolers who are high in temperamental impulsivity or negative emotionality face considerably greater self-regulatory challenges compared with children who are high in behavioral inhibition or soothability. Moreover, temperament helps to define what young children need from parents and other caregivers to support their efforts at self-management. A child whose proneness to fear causes him to respond with caution and inhibition in new

situations may require a caregiver's reassurance to manage these feelings more than a child whose bold impulsiveness calls for an adult's assistance at reining in potentially dangerous behavior.

The temperamental quality that has received greatest attention because of its relevance to developing self-regulation is called *effortful control*. This quality consists of integrated capacities to plan, focus attention, detect errors, and control inappropriate response tendencies in order to respond appropriately instead (Rothbart, 2007). Young children who are high in effortful control seem attentive to doing the right thing and more often spontaneously self-correct when they realize that they are acting incorrectly or inappropriately than do children who are lower in effortful control. Not surprisingly, children who are high in effortful control also tend to be less emotionally intense and more cautious when encountering new situations (Kochanska & Knaack, 2003).

Differences in effortful control can be identified in young children based on their responses to tasks that involve waiting for a pleasant event, slowing down their actions, inhibiting a desired response (e. g., in "Red Light, Green Light"), and paying attention to more subtle, subordinate features of a task (Kochanska & Knaack, 2003). Researchers have found that young children who are high in effortful control are more advanced in early conscience development—in particular, they are more likely to follow rules even when an adult is not present—and are less likely to develop behavior problems by the time they enter school (Kochanska & Aksan, 2006; Kochanska, Barry, Jiminez, Hollatz, & Woodard, 2009). Other studies have shown that early effortful control is related to more positive emotional adjustment and greater social competence in the preschool years (Eisenberg, Hofer, & Vaughan, 2007; Spinrad et al., 2007). It is because of the benefits of effortful control—and how it may protect against the development of behavior problems—that this temperamental quality has received so much interest.

The studies cited here suggest that young children do not all have the same resources and vulnerabilities with which to tackle the challenges of developing self-regulation. These differences begin with their temperamental individuality but are magnified by how parents, teachers, and other caregivers respond to these differences. In particular, it is helpful to sympathize with a young child who is temperamentally prone to negative emotional outbursts but is equipped with an immature brain, and thus many of the higher control centers for managing emotion are still not on line. An adult's pleas to "calm down" or "use your words" may be less helpful than providing support by creating predictable and manageable emotional demands in daily life and offering sensitive assistance in coping with the challenges of self-control.

Development of Self-Regulation and Early Experience

As the temperament research suggests, the biological foundations for the development of self-regulation in brain maturation and temperament do not mean that the quality of care is unimportant. Indeed, children's interactions with parents, child care providers, and other people create an environment of relationships in which brain development unfolds and temperamental individuality is expressed. In the early years, a developmental transition occurs from adults serving as external managers of infants' emotions, behavior, and impulses to young children gradually assuming their own responsibility for self-regulation, with adults providing a supportive context for this growth.

Developmental research indicates that warm, responsive parental care that provides developmentally appropriate structure is an important contributor to the early growth of self-regulatory competence (Kochanska, Murray, & Harlan, 2000; Lengua, Honorado, & Bush, 2007; Spinrad et al., 2007). With respect to the development of emotion regulation, for example, parents' sensitive responsiveness to children's feelings (and avoidance of dismissive, critical, or punitive reactions), a family emotional climate with manageable demands on young children, constructive parent–child conversations about emotion and its management, and supportive parent–child relationships each contributes to the development of self-regulatory skills in children (see Thompson & Meyer, 2007, for a review).

Unfortunately, broader economic and community disadvantage and stress are also important. Children from lower socioeconomic groups show poorer performance on measures of executive functions compared with children from middle-income homes, and neurobiological studies indicate that activity in the prefrontal cortex and other brain regions relevant to self-regulation is reduced in children in socioeconomic disadvantage (Farah et al., 2006; Kishiyama, Boyce, Jimenez, Perry, & Knight, 2009; Noble, Norman, & Farah, 2005). Family stress may be one reason why. Children whose mothers report high levels of stress in the home perform more poorly on measures of self-regulation (Lengua et al., 2007), and this is likely to be true of children who are at a socioeconomic disadvantage. Young children who regularly experience stress are likely to have greater difficulty resisting distractions, controlling impulsive tendencies, managing their emotions, and focusing their thinking because the effects of chronic stress on biological stress-responsive systems in the brain can make children overreact to minor cues of threat or danger (National Scientific Council on the Developing Child, 2005). This can make them irritable and distractible, which are hardly qualities that foster emotional or behavioral self-control.

Consequently, young children growing up in socioeconomic difficulty are likely to have greater self-regulatory difficulties and, as a result, have greater challenges in learning and academic achievement as well as social

Photo: © iStockphoto.com/Nikolay Suslav

Individual differences in early self-regulation are related to young children's temperamental qualities.

and emotional adjustment. Head Start teachers report, for example, that their children exhibit signs of emotional and self-regulatory problems, including withdrawal, depression, and problems with aggression and antisocial behavior (Yoshikawa & Knitzer, 1997). These problems may begin very early, because there is evidence that even chronic stress experienced prenatally can influence the biological development of stress reactivity and self-regulation in young infants (Calkins & Hill, 2007). Children at a socioeconomic disadvantage are thus likely to face early and enduring challenges to self-regulatory competence.

Child care providers, preschool educators, and early elementary teachers are well aware of this. They are often the first persons from outside the family to appreciate that a young child has self-regulatory problems. Indeed, kindergarten teachers report that self-regulatory problems—such as a young child's limited capacity to follow directions, communicate wants and needs in an appropriate manner, and to get along with others—are a more significant impediment to school readiness than are conventional academic skills such as failing to know letters and numbers (Lewit & Baker, 1995; Rimm-Kaufman, Pianta, & Cox, 2000). The behavioral, emotional, attentional, and cognitive problems associated with self-regulatory challenges in young children are important to teachers because even a handful of children with these difficulties can significantly alter the social and academic landscape of the classroom. Teachers' efforts to manage disruptive and uncooperative behavior can draw attention to behavioral problems, divert time and attention away from learning activities, and are often experienced by teachers as draining and frustrating. Not only do children with these difficulties provoke the teacher's exasperation, but their problems in maintaining focus on academic activities also means that, early in their schooling, they fall behind in learning—and that learning gap grows over time. At the same time, they are often developing negative peer reputations that undermine their social experience in the classroom. Preschoolers who perform poorly on self-regulatory measures are delayed on measures of literacy, vocabulary, and math skills even before they enter kindergarten (Blair & Razza, 2007; Howse, Calkins, Anastopoulos, Keane, & Shelton, 2003; McClelland et al., 2007). They are also at greater risk for the development of serious emotional and behavioral problems (Eisenberg et al., 2007; Kochanska et al., 2009).

Early Interventions to Support Self-Regulatory Competence

Recognizing the importance of acting early to address emerging self-regulatory problems, practitioners have begun creating and testing early intervention programs to specifically address problems of behavioral or emotional self-regulation. With the exception of the Tools of the Mind curriculum (see sidebar), these programs have sought to address a wide range of problems encountered by at-risk preschoolers, including deficiencies in emotion understanding, social problem solving, and behavioral problems that may be related to self-regulatory challenges. Most of these programs have targeted young children in Head Start programs. Although progress in this area is still early (especially in comparison with the larger number of well-developed intervention efforts oriented toward school-aged children), initial results are promising.

The strategies underlying these early intervention efforts have varied. In some cases, teachers have been the focus of efforts to create and implement more effective classroom management strategies. Teachers have been provided with training in behavior management techniques and have partnered with mental health consultants who can both support them and also provide direct services for children with the greatest emotional and behavioral problems (Raver et al., 2008). In other cases, the focus has been on curricular development, such as the Preschool PATHS social–emotional curriculum that promotes the development of prosocial friendship skills, emotional understanding and constructive expression, self-control, and problem-solving skills (Domitrovich, Cortes, & Greenberg, 2007; see also Bierman et al., 2008; Izard et al., 2008; Webster-Stratton, Reid, & Stoolmiller, 2008). In general, these programs have shown promising improvements in young children's social and emotional competencies, with children in the intervention groups displaying greater emotion knowledge and social skills and fewer behavior problems compared with children in comparison groups. In some cases, these group differences have also

Tools of the Mind and Educating Self-Regulation in Young Children

The Tools of the Mind curriculum (Bodrova & Leong, 2007) applies the ideas of Vygotsky (1978) concerning the development of self-regulation to the design of an early intervention effort to encourage the growth of self-regulatory skill in preschool children. This curriculum consists of a variety of classroom activities that are intended to stimulate the development of executive functions, including inhibition, working memory, and cognitive flexibility, through group and dyadic play. These activities include exercises encouraging self-regulatory self-talk (e.g., children instructing themselves as they are working through a problem), projects that facilitate memory and attention (e.g., cards depicting an ear when the task is to listen to another child), and dramatic play (e.g., enacting an imaginary story of a family going to the store). Consistent with Vygotsky's theory, dramatic play is a provocative forum for self-regulation because it requires many executive functions, including working memory (to remember the roles of the children who are participating and the continuing story narrative), inhibition (to remain in-role rather than enacting another child's role or becoming distracted by other classroom activities), and cognitive flexibility (to adapt to changes in the evolving plot and to provide "stage directions" to other children while maintaining one's own role in the play). The Tools of the Mind curriculum also enlists young children in planning their activities in the classroom and working together with teachers and other children in coordinating their plans with those of others. In this curriculum, roughly 80% of a typical day's activities are focused specifically on executive function skill training, although instruction in typical academic skills is also provided.

How effective is Tools of the Mind in developing self-regulatory skill in young children? The results of evaluation research indicate that preschoolers who have had 1 year or more of this curriculum demonstrate significant, sometimes dramatic, improvement on measures of executive functions when compared with children in the control group (Barnett et al., 2008; Diamond, Barnett, Thomas, & Munro, 2007). Children who had participated in Tools of the Mind also improved in their classroom behavior, and the overall classroom environment improved as a result. However, there were no significant improvements on measures of language and literacy compared with control group children, contrary to the expectation that improved self-regulatory capabilities would also result in improved learning. More research is needed, therefore, to determine whether a preschool curriculum that is devoted to improving self-regulation will have additional benefits for strengthening cognitive as well as social skills.

extended to improvements in children's self-regulatory behaviors and their emergent academic competencies.

Although few of these early intervention programs have specifically targeted young children's self-regulatory behaviors, they have each addressed some of the correlates of self-regulatory problems in poor classroom engagement, social skills, and behavioral disruptiveness. Taken together, they have confirmed the urging of many developmental scientists that school readiness should be understood not just as a matter of literacy and mathematical skill but also a matter of social–emotional and self-regulatory competence (Blair, 2002; Thompson & Raikes, 2007).

Conclusion

Self-regulatory problems are one of the distinctive characteristics of young children and cause parents, teachers, and other practitioners to become exasperated and perplexed when problems of self-control in children seem to arise from egocentrism, failure to anticipate consequences, or willful defiance. In the past 30 years, we have witnessed considerable progress in our understanding of the development of self-regulation, together with the realization that young children's problems with self-control are often a function of limited brain maturation, family stress, or inappropriate behavioral expectations rather than an unwillingness to cooperate. Temperamental differences in effortful control also help to account for the striking individual differences we can observe in self-control in young children. Taken together, research on the development of self-regulation and the growth of executive functions can help parents and practitioners better understand how young children's self-control can be enhanced through informal and programmatic efforts to help children manage their behaviors more competently.

Ross A. Thompson, *PhD, is professor of psychology at the University of California, Davis. As director of the Social and Emotional Development Laboratory, he studies parent–child relationships and the growth of psychological understanding in young children, including emotion understanding,*

Learn More

Self-Regulation in Early Childhood: Nature and Nurture
M. B. Bronson (2000)
New York: Guilford

Tools of the Mind: A Vygotskian Approach to Early Childhood Education (2nd Ed.)
D. Leong, & E. Bodrova (2006)
New York: Prentice-Hall

From Neurons to Neighborhoods: The Science of Early Childhood Development
National Research Council & Institute of Medicine (2000). J. P. Shonkoff & D. A. Phillips, (Eds.), Board on Children, Youth, and Families; Commission on Behavioral and Social Sciences and Education
Washington, DC: National Academy Press

References

Barnett, W. S., Jung, K., Yarodz, D. J., Thomas, J., Hornbeck, A., Stechuk, R., & Burns, S. (2008). Educational effects of the Tools of the Mind curriculum: A randomized trial. *Early Childhood Research Quarterly, 23*, 299–313.

Bierman, K. L., Domitrovich, C. E., Nix, R. L., Gest, S. D., Welsh, J. A., Greenberg, M. T., et al. (2008). Promoting academic and social-emotional school readiness: The Head Start REDI program. *Child Development, 79*, 1802–1817.

Blair, C. (2002). School readiness: Integrating cognition and emotion in a neurobiological conceptualization of children's functioning at school entry. *American Psychologist, 57*, 111–127.

Blair, C., & Razza, R. P. (2007). Relating effortful control, executive function, and false belief understanding to emerging math and literacy ability in kindergarten. *Child Development, 78*, 647–663.

Bodrova, E., & Leong, D. J. (2007). Play and early literacy: A Vygotskian approach. In K. A. Roskos & J. F. Christie (Eds.), *Play and literacy in early childhood: Research from multiple perspectives* (2nd ed.; pp. 185–200). Mahwah, NJ: Lawrence Erlbaum Associates.

Bronson, M. B. (2000). *Self-regulation in early childhood: Nature and nurture.* New York: Guilford.

Calkins, S. D., & Hill, A. (2007). Caregiver influences on emerging emotion regulation: Biological and environmental transactions in early development. In J. Gross (Ed.), *Handbook of emotion regulation* (pp. 228–248). New York: Guilford.

Diamond, A. (2002). Normal development of prefrontal cortex from birth to young adulthood: Cognitive functions, anatomy, and biochemistry. In D. T. Stuss & R. T. Knight (Eds.), *Principles of frontal lobe function* (pp. 466–503). New York: Oxford University Press.

Diamond, A. (2006). The early development of executive functions. In E. Bialystok & F. I. M. Craik (Eds.), *Lifepsan cognition: Mechanisms of change* (pp. 70–95). New York: Oxford University Press.

Diamond, A., Barnett, W. S., Thomas, J., & Munro, S. (2007, November 30). Preschool program improves cognitive control. *Science, 318*, 1387–1388.

Domitrovich, C. E., Cortes, R. C., & Greenberg, M. T. (2007). Improving young children's social and emotional competence: A randomized trial of the preschool "PATHS" curriculum. *Journal of Primary Prevention, 28*, 67–91.

Eisenberg, N., Hofer, C., & Vaughan, J. (2007). Effortful control and its socioemotional consequences. In J. J. Gross (Ed.), *Handbook of emotion regulation* (pp. 287–306). New York: Guilford.

Farah, M. J., Shera, D. M., Savage, J. H., Betancourt, L., Giannetta, J. M., Brodsky, N. L., et al. (2006). Childhood poverty: Specific associations with neurocognitive development. *Brain Research, 1110*, 166–174.

Howse, R. B., Calkins, S. D., Anastopoulos, A. D., Keane, S. P., & Shelton, T. L. (2003). Regulatory contributors to children's kindergarten achievement. *Early Education and Development, 14*, 101–119.

Izard, C. E., King, K. A., Trentacosta, C. J., Morgan, J. K., Laurenceau, J.-P., Krauthamer-Ewing, E. S., & Finlon, K. J. (2008). Accelerating the development of emotion competence in Head Start children: Effects on adaptive and maladaptive behavior. *Development and Psychopathology, 20*, 369–397.

Kishiyama, M. M., Boyce, W. T., Jimenez, A. M., Perry, L. M., & Knight, R. T. (2009). Socioeconomic disparities affect prefrontal function in children. *Journal of Cognitive Neuroscience, 21*, 1106–1115.

Kochanska, G., & Aksan, N. (2006). Children's conscience and self-regulation. *Journal of Personality, 74*, 1589–1617.

Kochanska, G., Barry, R. A., Jiminez, N. B., Hollatz, A. L., & Woodard, J. (2009). Guilt and effortful control: Two mechanisms that prevent disruptive developmental trajectories. *Journal of Personality and Social Psychology, 97*, 322–333.

Kochanska, G., & Knaack, A. (2003). Effortful control as a personality characteristic of young children: Antecedents, correlates, and consequences. *Journal of Personality, 71*, 1087–1112.

Kochanska, G., Murray, K. T., & Harlan, E. T. (2000). Effortful control in early childhood: Continuity and change, antecedents, and implications for social development. *Developmental Psychology, 36*, 220–232.

Lengua, L. J., Honorado, E., & Bush, N. R. (2007). Contextual risk and parenting as predictors of effortful control and social competence in preschool children. *Journal of Applied Developmental Psychology, 28*, 40–55.

Lewit, E. M., & Baker, L. S. (1995). School readiness. *The Future of Children, 5*, 128–139.

McClelland, M. M., Cameron, C. E., Connor, C. M., Farris, C. L., Jewkes, A. M., & Morrison, F. J. (2007). Links between behavioral regulation and preschoolers' literacy, vocabulary, and math skills. *Developmental Psychology, 43*, 947–959.

National Scientific Council on the Developing Child. (2005). *Excessive stress disrupts the architecture of the developing brain*. Cambridge, MA: Harvard University. Retrieved from http://developingchild.harvard.edu/index.php/library/reports_and_working_papers/wp3

Noble, K. G., Norman, M. F., & Farah, M. J. (2005). Neurocognitive correlates of socioeconomic status in kindergarten children. *Developmental Science, 8*, 74–87.

Posner, M. I., & Rothbart, M. K. (2006). *Educating the human brain*. Washington, DC: American Psychological Association.

Raver, C. C., Jones, S. M., Li-Grining, C., Metzger, M., Champion, K. M., & Sardin, L. (2008). Improving preschool classroom processes: Preliminary findings from a randomized trial implemented in Head Start settings. *Early Childhood Research Quarterly, 23*, 10–26.

Rimm-Kaufman, S. E., Pianta, R. B., & Cox, M. J. (2000). Teachers' judgments of problems in the transition to kindergarten. *Early Childhood Research Quarterly, 15*, 147–166.

Rothbart, M. K. (2007). Temperament, development, and personality. *Current Directions in Psychological Science, 16*, 207–212.

Rothbart, M. K., Posner, M. I., & Kieras, J. (2006). Temperament, attention, and the development of self-regulation. In K. McCartney & D. Phillips (Eds.), *The Blackwell handbook of early childhood development* (pp. 328–357). London: Blackwell.

Rothbart, M. K., & Sheese, B. E. (2007). Temperament and emotion regulation. In J. J. Gross (Ed.), *Handbook of emotion regulation* (pp. 331–350). New York: Guilford.

Spinrad, T. L., Eisenberg, N., Gaertner, B., Popp, T., Smith, C. L., Kupfer, A., et al. (2007). Relations of maternal socialization and toddlers' effortful control to children's adjustment and social competence. *Developmental Psycholgoy, 43*, 1170–1186.

Thompson, R. A. (2008). The psychologist in the baby. *Zero to Three Journal, 28*(5), 5–12.

Thompson, R. A., & Meyer, S. (2007). The socialization of emotion regulation in the family. In J. Gross (Ed.), *Handbook of emotion regulation* (pp. 249–268). New York: Guilford.

Thompson, R. A., & Raikes, H. A. (2007). The social and emotional foundations of school readiness. In D. F. Perry, R. F. Kaufmann, & J. Knitzer (Eds.), *Social and emotional health in early childhood: Building bridges between services and systems* (pp. 13–35). Baltimore: Brookes.

Vygotsky, L. (1978). *Mind and society: The development of higher mental processes.* Cambridge, MA: Harvard University Press.

Webster-Stratton, C., Reid, M. J., & Stoolmiller, M. (2008). Preventing conduct problems and improving school readiness: Evaluation of the Incredible Years teacher and child training programs in high-risk schools. *Journal of Child Psychology and Psychiatry, 49*, 471–488.

Yoshikawa, H., & Knitzer, J. (1997). *Lessons from the field: Head Start mental health strategies to meet changing needs.* New York: National Center for Children in Poverty.

Zelazo, P. D. & Cunningham, W. A. (2007). Executive function: Mechanisms underlying emotion regulation. In J. J. Gross (Ed.), *Handbook of emotion regulation* (pp. 135–158). New York: Guilford.