

Chapter 3

Why We Think We Can Make Things Better with Evidence-Based Practice: Theoretical and Developmental Context

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The Ecological—Transactional Model of Development

More than 20 years ago, Cicchetti and Lynch (1993) developed a theory to explain how child maltreatment could have such a potent effect on children’s development: the ecological-transactional model of development. Ecological-transactional theory is founded on an understanding that different qualities of children’s environments—their cultural environments, social resources, family environments, and individual differences all combine to shape the way children respond to the surrounding world. Like Belsky (1980), they called these different types of environments “ecologies”: the “macrosystem” (i.e., cultural environment), “exosystem” (i.e., community), “microsystem” (i.e., family system), and at the individual level, a child’s ontogenesis. They proposed that characteristics of these environmental systems influence the way children negotiate different developmental tasks, providing foundations of structures at one point in time that influence later development. Cicchetti and Lynch (1993) proposed that these ecologies contain “potentiating factors,” or conditions that increase the likelihood that either maltreatment might occur or negatively affect the child, and “compensatory factors,” that reduce the likelihood of maltreatment and violence and their accompanying negative effects. For example, the Administration for Youth and Families’ 2010 report on Child Maltreatment in the United States showed that 3.9 % of child victims of maltreatment were reported to have behavior problems (U.S. Department of Health and Human Services (USDHHS), Administration for Children, Youth & Families, & Children’s Bureau, 2011). While this aggressive behavior is likely a response to problems in their own family, we might also expect to observe higher levels of aggression in children living

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in cultural environments more accepting of domestic violence (e.g., Guerra, Hammons, & Clutter, 2011; Staub, 1996) or in communities with high levels of violence (Guerra, Huesmann, & Spindler, 2003). In this way, cultural attitudes towards domestic violence and the community experience of violence serve as a *potentiating factor* in the child's exosystem for aggressive behavior in children. However, a family value system strongly advocating self-control and non-violence might serve as a *compensatory factor* reducing the likelihood that a child would be aggressive.

These compensatory and potentiating factors, present in all levels of children's ecologies are also described as varying according to their stability, or enduring quality (Cicchetti & Toth, 2000). Certain risk factors, such as a parent's mental health, may be enduring. Enduring risk factors are considered to be *vulnerabilities*—existing across developmental stages. Other risk factors, such as a child's medical condition, might be a transient challenge—causing stress and *potentiating* the likelihood of abuse until the condition is resolved or managed. Certain compensatory factors like parent intelligence or employment may also be enduring. These are considered to be *protective factors*—protecting the child from abuse or the negative effects of abuse across developmental stages. More transient protective factors, like influential teachers, are referred to as *buffers*, creating a temporary wall against the tides of misfortune. When the potentiating factors and challenges outnumber the protective factors and buffers, theory suggests that the child will display maladaptive behavior, creating developmental vulnerabilities and increasing the likelihood of psychopathology.

So far this model seems simple—the ratio of positives to negatives from different parts of the child's environment should increase the likelihood of maladaptation. However, it is important to point out that the strength of these factors in promoting risk or resilience at any one point in time varies according to both the developmental stage of the child and what has happened to the child at earlier ages (Alink, Cicchetti, Kim, & Rogosch, 2009; Sroufe, Egeland, & Kreutzer, 1990). In other words, the same negative event occurring at two different points in children's development can have different outcomes for children's mental health because of differences in their abilities to understand the event (i.e., differences in cognitive ability), the meaning the event has at the particular point in development that it occurred, and the meaning the event has for the child's ongoing ability to adapt positively, “collecting” protective and buffering factors. For example, Sroufe and his colleagues, using data from a longitudinal study, examined the power of early attachment, adaptation during preschool and kindergarten, and the home environment to affect a child's emotional health in elementary school. They found that earlier positive adaptation and home environment predicted emotional health even when they took into consideration the current home environment. However, the quality of children's attachment at 12–18 months of age did not significantly predict functioning in elementary school when they considered children's adaptation in preschool and kindergarten. The message from this research, taken from the perspective of the ecological transactional theory is that the power of early traumatic experiences to continue to exert negative influences on children's development depends on the degree to which they link to later potentiating factors and maladaptive behaviors.

While the development of mental health problems seems inevitable when considering the trauma of witnessing violence or experiencing abuse, it is difficult to estimate the power that certain experiences or conditions have to build resilience in the child (O'Connor, 2003). Even when you think you know all the salient facts of a child's environment, there is always the mystery of the resilience inherent in the child's physiological, neurological, and cognitive makeup and how they work together in the developing child. From an ecological-transactional perspective, the best that we can say is that the development of psychopathology is probabilistic and not certain. Furthermore, this theory views development as "a series of qualitative reorganizations among and within biological and psychological systems" as children mature (Cicchetti & Toth, 2000, p. 94). In other words, as children mature cognitively they perceive the world around them qualitatively differently. This maturation is thought to drive reorganization of previous experiences, prompting children to adopt a more complex understanding of their environment and life history (Cicchetti & Lynch, 1993).

While cognitive maturation most certainly limits or shapes children's understanding of their worlds, it is also believed that each developmental stage contains different "tasks" considered central to children's ability to successfully negotiate that stage. How well these tasks are resolved determines the quality of the organization and integration of different systems (e.g., neurological, cognitive, social, emotional) in that stage. The network of integrated systems is believed to provide a groundwork upon which subsequent developmental structures are built. In this way, different developmental tasks always retain significance over time, even when other developmental tasks are more salient. In other words, if a developmental task in one system is negotiated poorly or incompletely—this affects not only the quality of that system, but of the whole—as the weakness of one system can limit the strength of other integrated systems, both at that developmental stage and at hierarchically more advanced developmental stages. For example, take the example of an infant boy who experienced chronic domestic violence over several months, and often cried inconsolably when his mother was out of sight. One task of this developmental stage is increased independence from the primary caregiver and tolerance of strangers. This poorly resolved task, connected with heightened activation of the fear response system, might also spill over into the child's ability to reach other developmental milestones. An infant that is hypervigilant to his mother's emotional presence might not be attending fully to other information in his environment important to language or cognitive development. If, as we suppose, these early skills, emotional reactivity, attention, and learning strategies serve as a foundation for higher-level skills, then early chronic activation of the fear-response system could inhibit the optimal development of later cognitive and social-emotional systems.

Two guiding principles of developmental psychopathology are that one should expect many different kinds of outcomes to exposure to a type of event (multifinality) and that there are many paths to a single type of outcome (equifinality). So, in spite of the gloomy forecast one might have for a child exposed to violence or maltreatment at an early age, one would expect that not all of these children end up with problems. In fact, research has supported this expectation (Cicchetti & Rogosch, 1997).

Hence, we can say that negative outcomes are not inevitable, but probabilistic. There is always room to build resilience and improve functioning. The assumption that the development of psychopathology is probabilistic, and that these probabilities are constantly being shaped and reshaped by experience is the most important assumption of this theory for people interested in prevention and intervention for traumatized children. What this means is that changing the trajectory of development is always possible when there is a possibility of accumulating new, more positive experience, particularly when the new experience forces a reorganization of old experiences and thought patterns through the lens of more positive experience. Effective mental health interventions should be able to help modify the negative effects of early trauma on future functioning if, as we believe, there is always a path to a new, more positive way of functioning.

While we understand that theoretically there should be a path to more positive functioning for maltreated children, finding that path is not always simple. What determines the most effective intervention for different children? We believe that to make a proper judgment about which intervention to use, it is important to understand what is happening to children neurologically, physiologically, cognitively, emotionally, and behaviorally.

Maltreatment and Development

Ecological-transactional theory (Cicchetti & Lynch, 1993) would suggest that the younger a child is when he or she experiences an adverse event such as maltreatment, the more far-reaching its effects would be, since these same systems affected by the stress of maltreatment rapidly develop in the early years of life. While this makes logical sense, we know that infants will not remember their preverbal experience, and think that they are probably safe from the most devastating effects of maltreatment. These adverse events do not generate memories and learning in the way it might in a 5-year old. And yet, accumulating evidence from research on animals and humans suggests that chronic exposure to fear and anxiety, and abusive caregiving leave a neurological footprint (e.g., Cicchetti, Rogosch, Gunnar, & Toth, 2010; Sanchez et al., 2010) that underpins the shape of their attachment to primary caregivers (Cicchetti, Rogosch, Toth, & Sturge-Apple, 2011), determine which events in their environment are perceived, how they are interpreted (Pollak, Cicchetti, Hornung, & Reed, 2000), and which events are remembered (Goodman, Quas, Batterman-Faunce, Riddlesberger, & Kuhn, 1997).

Neurological Effects

Chronic or acute stress resulting from maltreatment or other adverse early life experiences can cause different types of neurological responses in infants: (1) through the sympathetic adrenomedullary system they can cause a release of norepinephrine

and epinephrine (flight or fright response); (2) or through the locus coeruleus they can cause increased neural activity in the amygdala (Ellis, Jackson, & Boyce, 2006). These neurological responses cause two types of onward physiological effects. They can stimulate corticotropin-releasing hormone (CRH) production, which increases hypothalamic-pituitary axis (HPA) activity (Herman et al., 2003). They can also directly excite the HPA axis by activating the hypothalamus and thus stimulate the release of cortisol. A stress hormone, cortisol activates or inhibits other physiological systems involved in promoting survival in response to acute stress. When infants are chronically exposed to stress hormones, the body's feedback systems for managing and regulating their production can become dysregulated, showing a hyperresponse to stressors (i.e., greater than expected) followed by a period of hyporesponsiveness (i.e., less than expected) (Heim, Ehler, & Hellhammer, 2000). Animal studies have shown that high levels of cortisol in the system have been found to have harmful, even toxic effects on neural tissue (Zhang et al., 2002). When levels are high, cortisol can regulate gene transcription (McEwen, 2000) and is related to specific patterns of gene expression (Yehuda et al., 2009). HPA-axis dysregulation resulting from early adverse care or maltreatment has the potential for disrupting healthy development, because it increases allostatic load—the physiological vulnerability from chronic exposure to stressful adverse experiences and their accompanying neuroendocrine responses (McEwen & Stellar, 1993). Increased allostatic load may cause dysregulation in the physiological stress management system (e.g., Juster, McEwan, & Lupien, 2009) and impair emotional, cognitive, and physical health (Felitti et al., 1998). The take-away message of this research is that early trauma affects the way children respond to future stressful events; and the way they respond makes them vulnerable to difficulties and delays that create other problems later in development.

While any infant's first experience with an extreme threat is likely to result in the "high-cost" endocrine response described above (e.g., Lupien et al., 2006), subsequent encounters (or anticipated encounters) with the threat should result in the infant seeking out their primary caregivers for help in modulating their anxiety and fear (Heim, Newport, Mletzko, Miller, & Nemeroff, 2008). Infants are dependent on their caregivers for help in soothing, and their soothing helps regulate the infant's stress response system. These social and behavioral solutions have been termed "low-cost" solutions for the infant because of the relatively low expenditure of neurobiological resources needed to accomplish system regulation (Lupien et al.). As an example, maternal separation can cause considerable anxiety for infants once they reach about 8 months of age. When an infant cries inconsolably upon separation from the mother, the baby's HPA axis kicks into gear and sends cortisol into the blood stream. However, one study found that cortisol levels did not increase in 1-year olds who interacted with their babysitters when faced with a separation from their mothers, although it did increase in infants who withdrew and in those who fell asleep (Gunnar, Larson, Hertsgaard, Harris, & Brodersen, 1992). It is interesting that even when the child reacted in a way that would seem benign to an observer—falling asleep or withdrawing rather than engaging with a strange caregiver—there were still signs of increased physiological stress. The strong message of this study

was that children who received caregiving presented a more regulated stress response system.

Other related investigations have further shown the power of sensitive and responsive caregiving in promoting children's emotion regulation, stress responsivity, and healthy development (e.g., Bugental, Martorell, & Barraza, 2003; Sroufe, 2005). In fact, the quality of the parent-child relationship, which includes both the child's attachment style and parenting quality have been shown to play important roles in determining the effect of children's early experience of maltreatment on later development of psychopathology.

Sensitive Periods

There is thought that some of maltreatment occurring in infancy may have long-lasting consequences for children because these early negative experiences occurred at a *sensitive period* of development (Knudsen, 2004). In a *sensitive period*, the effects of experiences on the brain are particularly strong for a brief period of time (Knudsen). In infancy, where many neurological and biological systems are growing and changing, early maltreatment might have a particularly strong effect, increasing the chances that a child's future healthy growth and development might be compromised. Alternately, early maltreatment could be particularly devastating for children because there may be *critical periods*, where certain positive experiences are necessary for optimal, healthy development to occur (Knudsen), so that when children experience maltreatment, their developmental trajectories are irrevocably altered. There is no doubt that when maltreatment occurs early, children's likelihood of later exposure to risk is also heightened (Appleyard, Egeland, van Dulmen, & Sroufe, 2005), which naturally increases the likelihood of seeing long-term negative outcomes for these children. But does early maltreatment that results in dysregulation of the stress response system doom the child to a future of psychological problems?

Results of studies comparing children adopted out of Eastern European orphanages at different ages give some evidence for sensitive periods. These studies typically compare the cognitive functioning and attachment styles of children who have spent varying amounts of time in environments of neglect with non-institutionalized children, allowing the investigator to test the notion that if social deprivation occurs before a certain age, it is less likely to cause permanent psychological damage. Several studies' findings suggest that in fact, if children are adopted out of the institution within the first 6 months of their lives, they are indistinguishable from non-institutionalized infants and fare better than their later-adopted counterparts across a range of developmental outcomes (e.g., Beckett et al., 2006; Fisher, Ames, Chisholm, & Savoie, 1997). A meta-analysis of adoption studies conducted by Bakermans-Kranenburg, van IJzendoorn, and Juffer (2008) reported no significant differences in the probability of secure attachment in children adopted before they reached 1 year of age compared to non-adopted children. In addition to studies of

institutionally raised children, scholars investigating the effects of maltreatment on neural circuitry have described results in which early maltreatment (before 5 years of age) appeared to be associated with more negative outcomes than maltreatment that occurred later in childhood (Cicchetti et al., 2010), supporting the idea that there is a sensitive period to the effects of maltreatment.

In spite of these convincing findings supporting the existence of sensitive periods, it is important to remember the principle of *multifinality*, one of the guiding theories of developmental psychopathology. This principle asserts that given a similar history, many outcomes are possible, since many environmental events and internal psychophysiological strengths and challenges work together to forge a particular outcome. Given the complex array of behaviors associated with attachment, it is difficult to accept that it could be subject to a sensitive period. According to Knudsen (2004), sensitive periods are properties of neural circuits, not complex behaviors, even though they tend to be defined in terms of behavior and are dependent upon experience. When a neural circuit is repeatedly and intensely activated during a sensitive period, the synapses associated with the neural circuit consolidate, and the architecture of the circuit stabilizes a “preferred” pattern of connectivity (Knudsen). Afterwards, the circuits retain some plasticity, but Knudsen asserts that the plasticity is limited by the architecture established during the sensitive period. At the same time, it is also important to remember that the brain is organized so that higher order circuits can compensate for maladaptive neural circuits at lower levels, supporting our theoretical belief in the probabilistic nature of the outcomes associated with maltreatment.

The Role of Attachment

John Bowlby, who first wrote on attachment, observed that infants appeared driven to form attachment relationships, but that the quality of these relationships might vary considerably (Bowlby, 1969/1982). He believed that the quality of infants’ attachment provided a foundation for later personality development, in particular the growth of self-reliance and emotional regulation (Bowlby, 1973). For example, Bowlby believed that when caregivers successfully helped regulate infants’ emotions, infants would discover through experience that they could regulate their own emotions, growing increasingly more confident in this ability.

Later research found that infants displayed one of three different consistent, organized strategies to get a particular parent’s help when they were anxious or perceived a threat (Ainsworth, Blehar, Waters, & Wall, 1978). Some infants showed secure attachment, displaying an easy ability to use their caregivers for help in regulating distress. Some were anxious-avoidant, where they behaved as though they did not need help. Others displayed anxious-ambivalence, not responding quickly to parents’ attempts to soothe, and often seeking help. Later research found that not all infants had an organized attachment (Main & Solomon, 1986). These infants were categorized as having disorganized attachment.

Unlike organized attachment (e.g., insecure and secure attachment), children with disorganized attachment displayed multiple qualities in the same interaction. For example, an infant approaching a caregiver when agitated, then turning away or freezing might be classified as disorganized because it is both secure and avoidant in equal measure. Main and Hesse (1990) proposed that when caregivers were a source of fear and anxiety in addition to being a protective source, this created a psychological contradiction for the infant and would increase the likelihood of developing insecure or disorganized attachment. In fact, Carlson, Cicchetti, Barnett, and Braunwald (1989) noted a higher incidence of disorganized attachment among maltreated than non-maltreated children.

Alan Sroufe and his colleagues at the University of Minnesota began exploring the role of attachment in child development in a longitudinal study in 1975, testing this hypothesis. In a 2005 article, Sroufe confirmed Bowlby's hypotheses that attachment is linked with critical development pathways like arousal modulation and emotional regulation, but also described considerable complexity in the attachment system over the course of development. Outcomes were probabilistic, not definite, and subject to the influences of a changing environment. A secure infant attachment strategy, occurring when the caregivers were a source of comfort and emotional regulation, "promoted" the likelihood of future adaptive responses (Sroufe, 2005). Luijk and her colleagues (2010) tied attachment strategies together with variations in stress response in a study of 369 infants and their mothers. They found that infants with an insecure-anxious strategy showed increasing stress in an assessment exposing them to multiple separations from their caregivers (i.e., Strange Situation Procedure) and a flattened, shut down response to the same assessment among infants showing disorganized attachment (Luijk et al.). Trying to discover what disorganized attachment meant for ongoing development, Lyons-Ruth, Alpern, and Repacholi (1993) found that 71 % of preschoolers who showed high levels of hostile behavior toward classroom peers had been classified as showing disorganized attachment at 18 months. Even more convincingly, Sroufe reported that the disorganized attachment was a strong predictor of later disturbance: the degree of disorganization in infancy correlated strongly ($r=.40$) with the number and severity of psychiatric symptoms at age 17.5.

Taken together, the evidence suggests a strong connection between early attachment and stress response systems, particularly those of emotional regulation during infancy. In general, researchers have found considerable flexibility in the degree to which attachment predicted outcomes as infants matured, confirming the idea that many environmental and family factors play a part in ongoing personality development. However, researchers have found repeatedly that disorganized attachment seems to be accompanied by greater ongoing vulnerability.

Maltreated children's vulnerability to disorganized attachment, and the subsequent negative outcomes associated with this lack of organization (including accompanying risks), suggest that the ingredients of attachment—the infant-caregiver relationship, and particularly caregiver responsiveness and warmth—would be excellent targets for early intervention.

The Role of Parenting

In addition to the clear effects of violence and trauma on children, results of numerous studies have also illustrated different effects of harsh and coercive parenting both on children's stress response system (Blair et al., 2008; Bugental et al., 2003; Hill-Soderlund et al., 2008), as well as the subsequent likelihood of observing aggression (e.g., Denham et al., 2000; Gershoff, 2002), anxiety (McLeod, Wood, & Weisz, 2007), depression (McLeod, Weisz, & Wood, 2007), withdrawn behavior (e.g., Booth-LaForce & Oxford, 2008) and other mental health problems (e.g., Cicchetti & Toth, 2000; Patterson, 1982; Schechter & Willheim, 2009).

Why does harsh parenting have such a toxic effect on young children? Evolutionary psychologists might argue that infants are attuned to threatening tones of voices and behaviors, and react as they would to any other high stress situation, usually with distress (e.g., screaming, crying, and other dysregulated behavior). Over time, they may learn other ways of managing their emotional dysregulation through observing others' behaviors when they are distressed. In some ways, infants' and young children's aversive behavior can be thought of as strategies for adapting to frightening, threatening environments (Ellis, Boyce, Belsky, Bakermans-Kranenburg, & van IJzendoorn, 2011). While these behaviors might be considered "adaptive" responses, they can also be considered as cogs in a larger family mechanism that sustains a cycle of violence (Patterson, 1982).

Parenting does not have to be harsh or coercive to cause problems in the parent-child relationship or to be associated with problem behaviors in children. Children of depressed mothers also are reported to have more behavior problems (e.g., Gartstein, Bridgett, Dishion, & Kaufman, 2009) and a higher risk of later psychopathology (e.g., Downey & Coyne, 1990; Goodman & Gotlib, 1999). Some of the most dramatic findings illustrating the importance of sensitive parenting for children's healthy development have emerged in studies of children who experienced neglect or inconsistent caregiving. In 1951, John Bowlby first reported to the World Health Organization that even when all their physical needs were met, children still showed serious negative effects from institutional care, which he attributed to their inability to form stable, continuous attachment relationships with a primary caregiver.

Recent studies have also documented effects of inadequate caregiving on attachment security, finding even higher rates of disorganized attachment strategies than among maltreated children (Cyr, Euser, Bakermans-Kranenburg, & Van IJzendoorn, 2010). Researchers have also explored the effects of institutional care on children and have found that children who spent their first few years in institutions showed delayed physical (Van IJzendoorn, Bakermans-Kranenburg, & Juffer, 2007) and cognitive growth (e.g., Zeanah, Smyke, Koga, & Carlson, 2005). Atypical diurnal cortisol patterns have also been noted in these children (Carlson & Earls, 1997), similar to the pattern found in children in foster care (Fisher, Gunnar, Chamberlain, & Reid, 2000). In sum, studies of children who spend their early years in institutions show disruptions in most areas of development, suggesting that neglectful caregiving also undermines the foundations of healthy physical, neurological, and psychological development.

Taken all together, research suggests that in the early years, emotional dysregulation resulting from attempts to manage the anxiety of perceived threats is at the root of many mental health problems in young children. Furthermore, parenting seems to directly influence children's stress response system. The stress response system, in turn, is central to children's developing capacity for emotional regulation. When parenting is sensitive, it appears to buffer the effects of stress on children (Dozier, Lindheim, Lewis, Bick, & Bernard, 2009), promoting more healthy responses to stress. When parenting is ineffective and non-optimal, it magnifies the stressfulness of early traumatic experiences, possibly by increasing their perceived threat (Martorell & Bugental, 2006). Improving the quality of parenting would seem to be a promising and productive focus for intervention through early childhood.

The Role of Cognition

Executive functions are cognitive skills associated with frontal lobe operations (Rubia et al., 2001), that help to control and coordinate our thoughts and behavior, by aiding in planning and sequencing a set of tasks to accomplish a goal, decision-making, selective attention and multitasking, and impulse control (Luria, 1980; Shallice, 1982). Different dimensions of executive functions have been described as proceeding through three active and distinct stages of maturation: early childhood (6–8 years), middle childhood (9–12 years), and teenage years (Brocki & Bohlin, 2004). Studies of performance on tasks testing many executive functions showed continued development and improvement through adolescence, in particular inhibitory or impulse control (Leon-Carrion, Garcia-Orza, & Perez-Santamaria, 2004; Luna, Garver, Urban, Lazar, & Sweeney, 2004), how quickly information is processed (Luna et al., 2004), and the size of working memory (Luciana, Conklin, Cooper, & Yarger, 2005).

Possibly because many of these executive functions are still “under construction,” particularly those that inhibit impulsive behavior, thinking processes may be more vulnerable to heuristics like the emotional loading of a decision or goal. For example, studies have shown that adolescents make riskier decisions in “hot” (i.e., emotionally laden contexts) more than in “cold” contexts, ignoring important information about the value of an outcome and probabilities of its occurrence (Casey, Jones, & Hare, 2008). In “hot” contexts, teenagers have been found to make decisions that are biased towards acquiring gains and maintaining the “winning, positive” feeling, even when continuing to make this particular choice has clear and negative consequences (Cauffman et al., 2010).

Research findings suggest that emotions are often dysregulated or poorly regulated in maltreated youth (Cicchetti & Toth, 2000). Risks and negative experiences accumulate, possibly triggering fear and anxiety. Emotional dysregulation interferes with good decision-making, and increases the likelihood of making risky decisions that support “good feelings.” Understanding when and how executive functions develop, and the role emotions play in decision-making during childhood and adolescence suggests that successful interventions for these children will involve strategies for managing emotions, and improve impulse control.

Moving Toward Adolescence

Youth grow more independent from their parents as they move into their adolescent years, undergoing a significant and obvious hormonal and physical metamorphosis that is represented by changes in cognitive flexibility, identity, and self-consciousness (Rutter & Rutter, 1993). While adolescence has long been recognized as a time of physiological change—the time when hormones rage and children transform into adults—it is only recently that this developmental period has been identified as a period of great neurological change. In 1989, the National Institute of Mental Health (NIMH) began to conduct a longitudinal study of brain development, collecting magnetic resonance images of typically and atypically developing children every 2 years (Giedd, 2008). This large-scale longitudinal pediatric neuroimaging study of participants aged 4 through 20 revealed that although the amount of white matter appeared to increase linearly, as previous cross-sectional studies had shown (e.g., Pfefferbaum et al., 1994), cortical gray matter did not decrease at an equally linear rate, as expected (Giedd et al., 1999). Instead they found concomitant but nonlinear changes in cortical gray matter, with a preadolescent increase followed by a postadolescent decrease (Giedd et al.). Results of later studies suggested that this decrease in gray matter was likely due to increased myelination (which is the primary characteristic separating gray matter from white matter), and synaptic pruning (Sowell, Thompson, Tessner, & Toga, 2001). What does this mean? It means that during the teenage years, important parts of the brain involved in high level thinking and planning is transforming, speeding up and streamlining its neural processes. Researchers believe that a pruned and more myelinated adult brain speeds processing and reaction times to problems, and focuses the activation of the frontal cortex (Blakemore & Choudhury, 2006). In sum, it seems that the teenage brain is not just bigger or faster, but going through a process that makes adolescents structurally different from both children and adults. This section will describe some of the ways in which adolescents are different, both in the way they think, react to social and emotional situations, and the way view the world.

Decision Making

While many studies of the development of executive functions and decision-making show substantive improvements over time, studies have found that in emotion-laden contexts, teenagers are less able to resist impulsive responses than both children and adults (Somerville, Hare, & Casey, 2011). For example, Somerville et al. used a go/no-go task using neutral (calm faces) and emotional cues (happy faces). The ability to resist pushing the “go” button when the neutral face was the “no-go” cue increased linearly with age. However, when the happy face was the “no-go” cue, adolescents performed worse than children and adults, showing less ability to inhibit this dominant response. When examining brain activity during this task from the fMRI, Somerville and colleagues found a significantly greater magnitude of activity in teenagers’ ventral striatum—the area that is activated when anticipating a reward—compared to those of

children and adults. These studies combine to provide additional evidence that teenagers' brains function differently, not necessarily less efficiently than adults. Not only do teenagers' judgments seem to be more strongly influenced by their emotions, but also the decisions they make are more likely to be oriented towards acquiring immediate gains rather than minimizing loss. Teenagers' preference for acquiring gains contrasts noticeably with adult preferences, who are strongly biased towards avoiding loss rather than acquiring gains (Tversky & Kahneman, 1991).

The Social Context: Decision-Making, Risk-Taking, and Social Cognitions

One of the places teenagers display the deficits in their decision-making is when they are behind the wheel of a car. Research tells us that 15–24 year olds account for 14 % of the population, but nearly 30 % of the costs of motor vehicle injuries (Finkelstein, Corso, & Miller, 2006). Apart from making poorer decisions about the risks and hazards while driving, the presence of other teen passengers increases their risk of accident and injury; and that risk increases with each additional passenger (Simons-Morton, Lerner, & Singer, 2005). One study using driving simulation games, compared driving risks taken when alone and with two peers in study participants ranging from adolescence to adulthood (Gardner & Steinberg, 2005). They found that while adolescents and adults took similar numbers of risks when alone, they performed differently when driving with friends: adolescents took almost three times the number of risks when driving in the presence of their friends as adults. A study repeating Gardner and Steinberg's driving task using fMRI found that when adolescents were in the presence of peers, there was less activity in the brain areas related to cognitive control (e.g., prefrontal cortex) and more activity in the ventral striatum and the orbitofrontal cortex when critical driving decisions had to be made—the same area that processes anticipated rewards (Chen, Albert, O'Brien, Uckert, & Steinberg, 2011). Furthermore, Chien and colleagues found that activity in these brain regions predicted subsequent risk taking.

While research suggests that the presence of peers is likely to increase the emotionality of events and risk-taking, researchers are also considering the possible effects of adolescents' "mentalizing" (i.e., the ability to understand how others' dissimilar mental states would shape different behavior) on their decision-making (e.g., Blakemore & Robbins, 2012). Recent studies using "theory of mind" types of tasks suggest that the ability to understand others' limitations and make judgments based on this understanding is still developing in adolescence, and continues to improve into late teen years (Dumontheil, Apperly, & Blakemore, 2010). Possibly related to adolescents' emerging mentalizing and perspective taking skills is the mounting evidence that adolescents' recognition of others emotions also is not completely developed until late adolescence. Studies investigating age differences in emotional recognition via categorization of facial expressions (e.g., Thomas, De Bellis, Graham, & LaBar, 2007) and using displays of body movement (Ross, Polson, & Grosbras, 2012) found evidence of non-linear improvement in emotional identification during adolescent years, particularly in identifications of anger expressions.

Parenting Adolescents

In western societies, adolescence is generally marked by increased influence of peers and independence from parents. Parents typically have less influence in directly helping to regulate emotions, adopting a more supervisory role, structuring adolescent children's environments to reduce opportunities for risk taking and monitoring physical and psychological well-being. In spite of these shifts in social contexts, research suggests that parenting continues to play a role in supporting positive growth and development, with parents' competence and style relating strongly to adolescents' competence and adjustment (Furstenburg, Cook, Eccles, Elder, & Sameroff, 1999; Steinberg, Blatt-Eisengart, & Cauffman, 2006; Steinberg, Lamborn, Darling, Mounts, & Dornbusch, 1994). More specifically, research has supported *parental monitoring*—defined as the parent's knowledge of their child's whereabouts, activities, and friends (e.g., Fletcher, Steinberg, & Williams-Wheeler, 2004; Jacobson & Crockett, 2000; Patterson & Stouthamer-Loeber, 1984; Pettit, Bates, Dodge, & Meece, 1999) and *parental control*—the extent to which decisions regarding key activities in adolescents' lives were made by parents instead of by adolescents themselves—as reducing the likelihood of children's involvement in risky and delinquent behavior (e.g., Barber, 1996). For example, parental monitoring has been associated with less antisocial behavior (e.g., Patterson & Stouthamer-Loeber; Snyder, Dishion, & Patterson, 1986), substance use (e.g., Steinberg et al., 2006), and improved school performance (Crouter, Macdermid, McHale, & Perry-Jenkins, 1990). The quality of parenting and the family environment has even been found to account for variations in the adjustment of juvenile offenders (Furstenburg et al., 1999; Ikaheimo, Laukkanen, Hakko, & Rasanen, 2013), suggesting that parenting and the family environment have the potential for buffering the development of more serious psychological problems in adolescence.

Maltreatment and Adolescence

While trauma continues to have the same biological effect on the stress response system in older children as it does for younger children, there is clear evidence that certain individual factors mediate the effects of trauma on older children's mental health (Heim et al., 2008). These include early maltreatment (Cicchetti et al., 2010), early attachment relationships, social support, attributional styles, self-esteem, developing cognitions about self and others, and social competence (Cicchetti & Valentino, 2006). One of the most widely documented effects of child maltreatment is an increased risk of internalizing behaviors in middle childhood (Keiley, Howe, Dodge, Bates, & Pettit, 2001; Kim & Cicchetti, 2006) and depression and suicide ideation in adolescence (Dube et al., 2001). Dube and colleagues also found that among a cohort of more than 17,000 primary care clinic patients, having a history of adverse experiences in childhood such as abuse, neglect, domestic violence, and parents' substance abuse doubled to quintupled the likelihood of attempted suicide in adolescence. However, research has not really identified

the mechanism that links maltreatment with depression and suicidality in adolescence.

Taken all together, the developmental neurological research described here paints a complex picture of adolescence as a unique developmental period, where the brain transforms, jumping off the ladder of accumulating cognitive skills into a new dimension of functioning. What we know at this point in time is that adolescents can use reasoning skills as well as adults, in situations absent of emotion. When aroused by emotions or the presence of others, however, decisions are likely to be based on perpetuating positive emotion, focusing on opportunities for reward and not minimizing risk. In these situations, behavior is likely to be more impulsive and risky. We know that although emotions are involved in much of adolescents' decision-making, their ability to perceive and understand others' emotions is still developing. This constellation of characteristics may challenge parents and caregivers, and yet their role appears to continue to play an important role in supporting healthy development. Research on the effects of maltreatment on adolescent mental health suggests that early adversity may disrupt adolescents' developing emotional regulation systems (Cicchetti et al., 2010), particularly with respect to their ability to modulate negative emotions. Research on adolescent cognitions reveals the interconnections among emotions, social contexts, and cognitions. The path to psychological wellbeing for adolescents is likely to be similarly complex. Effective interventions should include strategies for managing negative emotions, supporting healthy decision-making and impulse control, and involve parents, helping them to support and monitor their adolescents.

Conclusions

To conclude, we reiterate our belief that there are many paths to more positive functioning for maltreated children, though the paths may be difficult to follow and fraught with distress. If we did not accept and even cling to this premise, it would be difficult to justify spending the time describing and discussing the value of empirically based treatments for maltreated children, much less encourage the reader to read on! After reviewing and describing the elements contributing to positive developmental trajectories, we believe that what determines the most effective intervention for different children will vary by age and developmental stage, though the family environment will likely play a role in their success over the course of development.

Descriptions of healthy development in infancy, childhood, and adolescence support the view that emotional regulation underlies much of psychological wellbeing. However, the interventions that support and facilitate emotional regulation in different developmental stages are likely to be quite different because much of development is described better by multidimensional transformations rather than a linear growth trajectory. For example, we argue that maltreated children's

vulnerability to disorganized attachment, and the subsequent negative outcomes associated with this lack of organization (including accompanying risks), suggest that the infant-caregiver relationship is an excellent target for intervention in infants and toddlers. In early childhood, we believe that improving parenting skills is a promising and productive focus for intervention because of its strong influence on children’s stress response system, and ability to buffer the effects of stress on children (Dozier et al., 2009). In middle childhood, as executive functions begin to play a bigger role in predicting behavior, we maintain that successful interventions for these children will involve cognitive strategies that help them to regulate their emotions and improve impulse control, thereby reducing their exposure to risk. In adolescence, the connection between emotional regulation, executive functions, and social contexts suggests that in addition to cognitive-based models, which are likely to be essential for improving emotional regulation, decision-making, and impulse control, adolescents may also benefit from efforts to help their parents understand their particular needs, and from activities that involve peers.

In closing, we present the table below, which synthesizes the mental health issues of maltreated infants and toddlers, young children, school age children, and adolescents, describes the targets for change, and lists the empirically-based interventions included in this volume. While this is not an exhaustive list of EBTs for maltreated children, we believe it represents the types of interventions most successful in meeting these children’s needs.

Developmental age	Issues addressed by interventions	Targets for change	Intervention
Infants/toddlers	Attachment Emotional regulation Parent–child relationships	Parent self-understanding Parenting behaviors Parent understanding of child Quality of parent–child relationship	Child Parent Psychotherapy (Van Horn & Leiberman) Attachment and Biobehavioral Catch-up (ABC; Dozier, Meade, & Bernard)
Preschooler/early school-age children	Parent–child relationships Emotional regulation Social skills Stress management and coping Externalizing behavior problems	Parenting behaviors Parent understanding of child Child behavior training Child emotional regulation Quality of parent–child relationship	Incredible Years (IY; Webster-Stratton) Multidimensional Treatment Foster Care for Preschoolers (MTFC-P; Fischer & Gilliam) Parent–child Interaction Therapy (PCIT; Urquiza & Timmer) Triple P (Sanders & Pickering)

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Developmental age	Issues addressed by interventions	Targets for change	Intervention
School-age children	Peer relationships Anxiety, depression, PTSD Stress management and coping Parent-child relationships Externalizing behavior problems	Child cognitions Parenting behaviors Child emotional regulation Child behavior training Parent understanding of child	Alternatives for Families: A Cognitive-Behavioral Therapy (AF-CBT; Kolko) Trauma Focused-Cognitive Behavioral Therapy (TF-CBT; Mannarino & Cohen)
Adolescents	Peer relationships Anxiety, depression, PTSD Self-injurious behavior Stress management and coping Externalizing behavior problems Intimate interpersonal relationships parent-child relationships	Child cognitions Child emotional regulation Child behavior training Parenting behaviors Parent understanding of child	Multisystemic Therapy for Child Abuse and Neglect (CAN-MST; Cupit Swenson & Schaeffer) Dialectical Behavior Therapy (Berk & Shelby)

References

- Ainsworth, M. D. S., Blehar, M. C., Waters, E., & Wall, S. (1978). *Patterns of attachment: A psychological study of the strange situation*. Hillsdale, NJ: Erlbaum.
- Alink, L., Cicchetti, D., Kim, J., & Rogosch, F. (2009). Mediating and moderating processes in the relation between maltreatment and psychopathology: Mother-child relationship quality and emotion regulation. *Journal of Abnormal Psychology, 37*(6), 831–843.
- Appleyard, K., Egeland, B., van Dulmen, M. H., & Sroufe, L. A. (2005). When more is not better: The role of cumulative risk in child behavior outcomes. *Journal of Child Psychology and Psychiatry, 46*(3), 235–245.
- Bakermans-Kranenburg, M., van IJzendoorn, M., & Juffer, F. (2008). Earlier is better: A meta-analysis of 70 years of intervention improving cognitive development in institutionalized children. *Monographs of the Society for Research in Child Development, 73*(3), 279–293.
- Barber, B. K. (1996). Parental psychological control: Revisiting a neglected construct. *Child Development, 67*, 3296–3319.
- Beckett, C., Maughan, B., Rutter, M., Castle, J., Colvert, E., Groothues, C., et al. (2006). Do the effects of early severe deprivation on cognition persist into early adolescence? Findings from the English and Romanian Adoptees Study. *Child Development, 77*(3), 696–711.
- Belsky, J. (1980). Child maltreatment: An ecological integration. *American Psychologist, 35*(4), 320–335.
- Blair, C., Granger, D. A., Kivlighan, K. T., Mills-Koonce, R., Willoughby, M., Greenberg, M. T., et al. (2008). Maternal and child contributions to cortisol response to emotional arousal in young children from low-income, rural communities. *Developmental Psychology, 44*, 1095–1109. doi:10.1037/0012-1649.44.4.1095.

- Blakemore, S.-J., & Choudhury, S. (2006). Development of the adolescent brain: Implications for executive function and social cognition. *Journal of Child Psychology and Psychiatry*, *47*(3), 296–312.
- Blakemore, S.-J., & Robbins, T. (2012). Decision making in the adolescent brain. *Nature Neuroscience*, *15*(2), 1184–1191. doi:10.1038/nn.3177.
- Booth-LaForce, C., & Oxford, M. (2008). Trajectories of social withdrawal from grades 1 to 6: Prediction from early parenting, attachment, and temperament. *Developmental Psychology*, *44*(5), 1298–1313.
- Bowlby, J. (1951). *Maternal care and mental health* (World Health Organization (WHO) monograph, serial no. 2). Geneva, Switzerland: WHO.
- Bowlby, J. (1973). *Attachment and loss: Vol. 2. Separation: Anxiety and anger*. New York: Basic Books.
- Bowlby, J. (1982). *Attachment and loss: Vol. 1. Attachment* (2nd ed.). New York: Basic Books. (Original work published 1969)
- Brocki, K. C., & Bohlin, G. (2004). Executive functions in children aged 6 to 13: A dimensional and developmental study. *Developmental Neuropsychology*, *26*, 571–593.
- Bugental, D. B., Martorell, G. A., & Barraza, V. (2003). The hormonal costs of subtle forms of infant maltreatment. *Hormones and Behavior*, *43*, 237–244. doi:10.1016/S0018-506X(02)00008-9.
- Carlson, M., & Earls, F. (1997). Psychological and neuroendocrinological sequelae of early social deprivation in institutionalized children in Romania. In M. Carlson & F. Earls (Eds.), *The integrative neurobiology of affiliation* (pp. 419–428). New York: New York Academy of Sciences.
- Carlson, V., Cicchetti, D., Barnett, D., & Braunwald, K. (1989). Disorganized/disoriented attachment relationships in maltreated infants. *Developmental Psychology*, *25*(4), 525–531.
- Casey, B. J., Jones, R. M., & Hare, T. A. (2008). The adolescent brain. *Annals of the New York Academy of Science*, *1124*, 111–126.
- Cauuffman, E., Shulman, E. P., Steinberg, L., Claus, E., Banich, M. T., Graham, S., et al. (2010). Age differences in affective decision making as indexed by performance on the Iowa Gambling Task. *Developmental Psychology*, *46*, 193–207.
- Chein, J., Albert, D., O'Brien, L., Uckert, K., & Steinberg, L. (2011). Peers increase adolescent risk taking by enhancing activity in the brain's reward circuitry. *Developmental Science*, *14*, F1–F10.
- Cicchetti, D., & Lynch, M. (1993). Toward an ecological/transactional model of community violence and child maltreatment: Consequences for children's development. *Psychiatry*, *56*, 96–118.
- Cicchetti, D., & Rogosch, F. A. (1997). The role of self-organization in the promotion of resilience in maltreated children. *Development and Psychopathology*, *9*, 799–817.
- Cicchetti, D., Rogosch, F. A., Gunnar, M. R., & Toth, S. L. (2010). The differential impacts of early physical and sexual abuse and internalizing problems on daytime cortisol rhythm in school-aged children. *Child Development*, *81*(1), 252–269. doi:10.1111/j.1467-8624.2009.01393.
- Cicchetti, D., Rogosch, F., Toth, S., & Sturge-Apple, M. (2011). Normalizing the development of cortisol regulation in maltreated infants through preventive interventions. *Development and Psychopathology*, *23*, 789–800.
- Cicchetti, D., & Toth, S. L. (2000). Developmental processes in maltreated children. In D. Hansen (Ed.), *Nebraska symposium on motivation: Vol. 46. Motivation and maltreatment* (pp. 85–160). Lincoln, NE: University of Nebraska Press.
- Cicchetti, D., & Valentino, K. (2006). An ecological transactional perspective on child maltreatment: Failure of the average expectable environment and its influence upon child development. In D. Cicchetti & D. J. Cohen (Eds.), *Developmental psychopathology* (2nd ed., Vol. 3, pp. 129–201). New York: Wiley.
- Crouter, A. C., MacDermid, S. M., McHale, S. M., & Perry-Jenkins, M. (1990). Parental monitoring and perceptions of children's school performance and conduct in dual- and single-earner families. *Developmental Psychology*, *26*, 649–657.
- Cyr, C. A., Euser, E. M., Bakermans-Kranenburg, M. J., & Van Ijzendoorn, M. H. (2010). Attachment insecurity and disorganization in maltreating and high-risk families: A series of meta-analyses. *Development and Psychopathology*, *22*, 87–108.

- Denham, S. A., Workman, E., Cole, P. M., Weissbrod, C., Kendziora, K. T., & Zahn-Waxler, C. (2000). Prediction of externalizing behavior problems from early to middle childhood: The role of parental socialization and emotional expression. *Development and Psychopathology, 12*, 23–45. doi:10.1017/S0954579400001024.
- Downey, G., & Coyne, J. C. (1990). Children of depressed parents: An integrative review. *Psychological Bulletin, 108*, 50–76.
- Dozier, M., Lindhiem, O., Lewis, E., Bick, J., & Bernard, K. (2009). Effects of a foster parent training program on young children's attachment behaviors: Preliminary evidence from a randomized clinical trial. *Child and Adolescent Social Work Journal, 26*(4), 321–332.
- Dube, S. R., Anda, R. F., Felitti, V. J., Chapman, D. P., Williamson, D. F., & Giles, W. H. (2001). Childhood abuse, household dysfunction, and the risk of attempted suicide throughout the life span: Findings from the adverse childhood experiences study. *Journal of the American Medical Association, 286*, 3089–3096.
- Dumontheil, I., Apperly, I. A., & Blakemore, S.-J. (2010). Online usage of theory of mind continues to develop in late adolescence. *Developmental Science, 13*, 331–338.
- Ellis, B. J., Boyce, W. T., Belsky, J., Bakermans-Kranenburg, M. J., & Van Ijzendoorn, M. H. (2011). Differential susceptibility to the environment: An evolutionary neurodevelopmental theory. *Development and Psychopathology, 23*, 7–28. doi:10.1017/S0954579410000611.
- Ellis, B. J., Jackson, J., & Boyce, W. T. (2006). The stress response system: Universality and adaptive individual differences. *Developmental Review, 26*(2), 175–212.
- Felitti, V., Anda, R. F., Nordenberg, D., Williamson, D. F., Spitz, A. M., Edwards, V., et al. (1998). Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: The Adverse Childhood Experiences (ACE) Study. *American Journal of Preventive Medicine, 14*(4), 245–258.
- Finkelstein, E. A., Corso, P. S., & Miller, T. R., Associates. (2006). *Incidence and economic burden of injuries in the United States*. New York: Oxford University Press.
- Fisher, L., Ames, E., Chisholm, K., & Savoie, L. (1997). Problems reported by parents of Romanian orphans adopted to British Columbia. *International Journal of Behavioral Development, 20*(1), 67–82.
- Fisher, P. A., Gunnar, M. R., Chamberlain, P., & Reid, J. B. (2000). Preventive intervention for maltreated preschoolers: Impact on children's behavior, neuroendocrine activity, and foster parent functioning. *Journal of the American Academy of Child and Adolescent Psychiatry, 39*, 1356–1364.
- Fletcher, A., Steinberg, L., & Williams-Wheeler, M. (2004). Parental influences on adolescent problem behavior: Revisiting Stattin and Kerr. *Child Development, 75*(3), 781–796.
- Furstenburg, F. F., Cook, T., Eccles, J., Elder, G., & Sameroff, A. (1999). *Managing to make it: Urban families and adolescent success*. Chicago: University Press.
- Gardner, M., & Steinberg, L. (2005). Peer influence on risk taking, risk preference, and risky decision making in adolescence and adulthood: An experimental study. *Developmental Psychology, 41*, 625–635.
- Gartstein, M., Bridgett, D., Dishion, T., & Kaufman, N. (2009). Depressed mood and maternal report of child behavior problems: Another look at the depression-distortion hypothesis. *Developmental Psychology, 30*(2), 149–160.
- Gershoff, E. T. (2002). Corporal punishment by parents and associated child behaviors and experiences: A meta-analytic and theoretical review. *Psychological Bulletin, 128*, 539–579. doi:10.1037/0033-2909.128.4.539.
- Giedd, J. (2008). The teen brain: Insights from neuroimaging. *Journal of Adolescent Health, 42*, 335–343.
- Giedd, J., Blumenthal, J., Jeffries, N. O., Castellanos, F. X., Liu, H., Zijdenbos, A., et al. (1999). Brain development during childhood and adolescence: A longitudinal MRI study. *Nature Neuroscience, 2*, 861–863.
- Goodman, S., & Gotlib, I. (1999). Risk for psychopathology in the children of depressed mothers: A developmental model for understanding mechanisms of transmission. *Psychological Review, 106*(3), 458–490.

- Goodman, G. S., Quas, J. A., Batterman-Faunce, J. M., Riddlesberger, M. M., & Kuhn, J. (1997). Children's reactions to and memory for a stressful event: Influences of age, anatomical dolls, knowledge, and parental attachment. *Applied Developmental Science, 1-2*, 54–75.
- Guerra, N. G., Hammons, A. J., & Clutter, M. O. (2011). Culture, families, and children's aggression: Findings from Jamaica, Japan, and Latinos in the United States. In N. G. Guerra, A. J. Hammons, & M. O. Clutter (Eds.), *Socioemotional development in cultural context* (pp. 281–304). New York: Guilford Press.
- Guerra, N. G., Huesmann, R., & Spindler, A. (2003). Community violence exposure, social cognition, and aggression among urban elementary school children. *Child Development, 74(5)*, 1561–1576.
- Gunnar, M., Larson, M., Hertsgaard, L., Harris, M., & Brodersen, L. (1992). The stressfulness of separation among nine-month-old infants: Effects of social context variables and infant temperament. *Child Development, 63(2)*, 290–303.
- Heim, C., Ehler, U., & Hellhammer, D. H. (2000). The potential role of hypocortisolism in the pathophysiology of stress-related bodily disorders. *Psychoneuroendocrinology, 25*, 1–35.
- Heim, C., Newport, D. J., Mletzko, T., Miller, A. H., & Nemeroff, C. B. (2008). The link between childhood trauma and depression: Insights from HPA axis studies in humans. *Psychoneuroendocrinology, 33*, 693–710.
- Herman, J. P., Figueiredo, H., Mueller, N. K., Ulrich-Lai, Y., Ostrander, M., Choi, D., et al. (2003). Central mechanisms of stress integration: Hierarchical circuitry controlling hypothalamo-pituitary-adrenocortical responsiveness. *Frontiers in Neuroendocrinology, 24*, 151–180.
- Hill-Soderlund, A. L., Mills-Koonce, W. R., Propper, C., Calkins, S., Granger, D. A., Moore, G. A., et al. (2008). Parasympathetic and sympathetic responses to the strange situation in infants and mothers from avoidant and securely attached dyads. *Developmental Psychobiology, 50*, 361–376. doi:10.1002/dev.20302.
- Ikaheimo, O., Laukkanen, M., Hakko, H., & Rasanen, P. (2013). Association of family structure to later criminality: A population-based follow-up study of adolescent psychiatric inpatients in Northern Finland. *Child Psychiatry and Human Development, 44(2)*, 233–246.
- Jacobson, K. C., & Crockett, L. J. (2000). Parental monitoring and adolescent adjustment: An ecological perspective. *Journal of Research on Adolescence, 10(1)*, 65–97.
- Juster, R.-P., McEwen, B. S., & Lupien, S. J. (2009). Allostatic load biomarkers of chronic stress and impact on health and cognition. *Neuroscience and Biobehavioral Reviews, 35*, 2–16.
- Keiley, M. K., Howe, T. R., Dodge, K. A., Bates, J. E., & Pettit, G. S. (2001). The timing of child physical mal-treatment: A cross-domain growth analysis of impact on adolescent externalizing and internalizing problems. *Development and Psychopathology, 13*, 891–912.
- Kim, J., & Cicchetti, D. (2006). Longitudinal trajectories of self-system processes and depressive symptoms among maltreated and nonmaltreated children. *Child Development, 77*, 624–639.
- Knudsen, E. I. (2004). Sensitive periods in the development of brain and behavior. *Journal of Cognitive Neuroscience, 16*, 1412–1425.
- Leon-Carrion, J., Garcia-Orza, J., & Perez-Santamaria, F. J. (2004). The development of the inhibitory component of the executive functions in children and adolescents. *International Journal of Neuroscience, 114*, 1291–1311.
- Luciana, M., Conklin, H. M., Cooper, C. J., & Yarger, R. S. (2005). The development of nonverbal working memory and executive control processes in adolescents. *Child Development, 76*, 697–712.
- Luijk, M. P. C. M., Saridjan, N., Tharner, A., van IJzendoorn, M. H., Bakermans-Kranenburg, M. J., Jaddoe, V. W. V., et al. (2010). Attachment, depression, and cortisol: Deviant patterns of insecure-resistant and disorganized infants. *Developmental Psychobiology, 52*, 441–452. doi:10.1002/dev.20446.
- Luna, B., Garver, K. E., Urban, T. A., Lazar, N. A., & Sweeney, J. A. (2004). Maturation of cognitive processes from late childhood to adulthood. *Child Development, 75*, 1357–1372.
- Lupien, S., Ouellet-Morin, I., Hupbach, A., Tu, M., Buss, C., & Walker, D. (2006). Beyond the stress concept: Allostatic load—A developmental biological and cognitive perspective. In S. Lupien, I. Ouellet-Morin, A. Hupbach, M. Tu, C. Buss, D. Walker, J. Pruessner, & B. McEwen (Eds.), *Developmental psychopathology: Vol. 2. Developmental neuroscience* (2nd ed., pp. 578–628). Hoboken, NJ: Jon Wiley & Sons Inc.

- Luria, A. R. (1980). *Higher cortical functions in man* (2nd ed.). Oxford, UK: Basic Books.
- Lyons-Ruth, K., Alpern, L., & Repacholi, B. (1993). Disorganized infant attachment classification and maternal psychosocial problems as predictors of hostile-aggressive behavior in preschool children. *Child Development, 64*, 572–585.
- Main, M., & Hesse, E. (1990). Parents' unresolved traumatic experiences are related to infant disorganized attachment status: Is frightened and/or frightening parental behavior the linking mechanism? In M. T. Greenberg, D. Cicchetti, & E. M. Cummings (Eds.), *Attachment in the preschool years: Theory, research, and intervention* (pp. 161–182). Chicago: University of Chicago Press.
- Main, M., & Solomon, J. (1986). Discovery of an insecure-disorganized/disoriented attachment pattern. In M. Main & J. Solomon (Eds.), *Affective development in infancy* (pp. 95–124). Westport, CT: Alex.
- Martorell, G. A., & Bugental, D. B. (2006). Maternal variations in stress reactivity: Implications for harsh parenting practices with very young children. *Journal of Family Psychology, 20*–4, 641–647.
- McEwen, B. (2000). Allostasis and allostatic load: Implications for neuro-psychopharmacology. *Neuropsychopharmacology, 22*, 108–124.
- McEwen, B., & Stellar, E. (1993). Stress and the individual mechanisms leading to disease. *Journal of the American Medical Association, Archives of Internal Medicine, 153*, 2093–2101.
- McLeod, B. D., Weisz, J. R., & Wood, J. J. (2007). Examining the association between parenting and childhood depression: A meta-analysis. *Clinical Psychology Review, 27*, 986–1003. doi:10.1016/j.cpr.2007.03.001.
- McLeod, B. D., Wood, J. J., & Weisz, J. R. (2007). Examining the association between parenting and childhood anxiety: A meta-analysis. *Clinical Psychology Review, 27*, 155–172. doi:10.1016/j.cpr.2006.09.002.
- O'Connor, T. G. (2003). Early experiences and psychological development: Conceptual questions, empirical illustrations, and implications for intervention. *Development and Psychopathology, 15*(3), 671–690.
- Patterson, G. R. (1982). *Coercive family process*. Eugene, OR: Castilia.
- Patterson, G. R., & Stouthamer-Loeber, M. (1984). The correlation of family management practices and delinquency. *Child Development, 55*, 1299–1307.
- Pettit, G., Bates, J., Dodge, K., & Meece, D. (1999). The impact of after-school peer contact on early adolescent externalizing problems is moderated by parental monitoring, perceived neighborhood safety, and prior adjustment. *Child Development, 70*(3), 768–778.
- Pfefferbaum, A., Mathalon, D. H., Sullivan, E. V., Rawles, J. M., Zipursky, R. B., & Lim, K. O. (1994). A quantitative magnetic resonance imaging study of changes in brain morphology from infancy to late adulthood. *Archives of Neurology, 51*(9), 874–887.
- Pollak, S., Cicchetti, D., Hornung, K., & Reed, A. (2000). Recognizing emotion in faces: The developmental effects of child abuse and neglect. *Developmental Psychology, 36*, 679–688.
- Ross, P. D., Polson, L., & Grosbras, M.-H. (2012). Developmental changes in emotion recognition from full-light and point-light displays of body movement. *PLoS One, 7*(9), e44815. doi:10.1371/journal.pone.0044815.
- Rubia, K., Russell, T., Overmeyer, S., Brammer, M. J., Bullmore, E. T., Sharma, T., et al. (2001). Mapping motor inhibition: Conjunctive brain activations across different versions of go/no-go and stop tasks. *NeuroImage, 13*, 250–261.
- Rutter, M., & Rutter, M. (1993). *Developing minds*. London: Penguin.
- Sanchez, M. M., McCormack, K., Grand, A. P., Fulks, R., Graff, A., & Maestripieri, D. (2010). Effects of sex and early maternal abuse on adrenocorticotropin hormone and cortisol responses to the corticotrophin-releasing hormone challenge during the first 3 years of life in group-living rhesus monkeys. *Development and Psychopathology, 22*, 45–53.
- Schechter, W., & Willheim, E. (2009). Disturbances of attachment and parental psychopathology in early childhood. *Child and Adolescent Psychiatric Clinics of North America, 18*(3), 665–686.

- Shallice, T. (1982). Specific impairments of planning. *Philosophical Transactions of the Royal Society of London. Series B, Biological Sciences*, 298, 199–209.
- Simons-Morton, B., Lerner, N., & Singer, J. (2005). The observed effects of teenage passengers on the risky driving behavior of teenage drivers. *Accident Analysis and Prevention*, 37(6), 973–982.
- Snyder, J., Dishion, T. J., & Patterson, G. R. (1986). Determinants and consequences of associating with deviant peers during preadolescence and adolescence. *Journal of Early Adolescence*, 6, 29–43.
- Somerville, L. H., Hare, T., & Casey, B. J. (2011). Frontostriatal maturation predicts cognitive control failure to appetitive cues in adolescents. *Journal of Cognitive Neuroscience*, 23, 2123–2134.
- Sowell, E. R., Thompson, P. M., Tessner, K. D., & Toga, A. W. (2001). Mapping continued brain growth and gray matter density reduction in dorsal frontal cortex: Inverse relationships during postadolescent brain maturation. *Journal of Neuroscience*, 21, 8819–8829.
- Sroufe, L. A. (2005). Attachment and development: A prospective study from birth to adulthood. *Attachment & Human Development*, 7(4), 349–367.
- Sroufe, L. A., Egeland, B., & Kreutzer, T. (1990). The fate of early experience following developmental change: Longitudinal approaches to individual adaptation in childhood. *Child Development*, 61(5), 1363–1373.
- Staub, E. (1996). Cultural-societal roots of violence: The examples of genocidal violence and of contemporary youth violence in the United States. *American Psychologist*, 51(2), 117–132.
- Steinberg, L., Blatt-Eisengart, I., & Cauffman, E. (2006). Patterns of competence and adjustment among adolescents from authoritarian, indulgent, and neglectful homes: A replication in a sample of serious juvenile offenders. *Journal of Research on Adolescence*, 16, 47–58.
- Steinberg, L., Lamborn, S. D., Darling, N., Mounts, N. S., & Dornbusch, S. M. (1994). Over-time changes in adjustment and competence among adolescents from authoritative, authoritative, indulgent, and neglectful families. *Child Development*, 65, 754–770.
- Thomas, L., De Bellis, M., Graham, R., & LaBar, K. (2007). Development of emotional facial recognition in late childhood and adolescence. *Developmental Science*, 10(5), 547–548.
- Tversky, A., & Kahneman, D. (1991). Loss aversion in riskless choice: a reference dependent model. *Quarterly Journal of Economics*, 106(4), 1039–1061.
- U.S. Department of Health & Human Services (USDHHS), Administration for Children, Youth and Families, & Children’s Bureau. (2011). *Child maltreatment 2010*. Available from http://www.acf.hhs.gov/programs/cb/stats_research/index.htm#can. Accessed 23 Oct 2012.
- Van IJzendoorn, M., Bakermans-Kranenburg, M., & Juffer, F. (2007). Plasticity of growth in height, weight, and head circumference: Meta-analytic evidence of massive catch-up after international adoption. *Journal of Developmental and Behavioral Pediatrics*, 28(4), 334–343.
- Yehuda, R., Cai, G., Golier, J. A., Sarapas, C., Galea, S., Ising, M., et al. (2009). Gene expression patterns associated with posttraumatic stress disorder following exposure to the World Trade Center attacks. *Biological Psychiatry*, 66(7), 708–711.
- Zeanah, C., Smyke, A., Koga, S., & Carlson, E. (2005). Attachment in institutionalized and community children in Romania. *Child Development*, 76(5), 1015–1028.
- Zhang, L. X., Levine, S., Dent, G., Zhan, Y., Xing, G., Okimoto, D., et al. (2002). Maternal deprivation increases cell death in the infant rat brain. *Brain Research. Developmental Brain Research*, 133(1), 1–11.