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# Socioemotional, Personality, and Biological Development: Illustrations from a Multilevel Developmental Psychopathology Perspective on Child Maltreatment

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## Abstract

Developmental theories can be affirmed, challenged, and augmented by incorporating knowledge about atypical ontogenesis. Investigations of the biological, socioemotional, and personality development in individuals with high-risk conditions and psychopathological disorders can provide an entrée into the study of system organization, disorganization, and reorganization. This article examines child maltreatment to illustrate the benefit that can be derived from the study of individuals subjected to nonnormative caregiving experiences. Relative to an average expectable environment, which consists of a species-specific range of environmental conditions that support adaptive development among genetically normal individuals, maltreating families fail to provide many of the experiences that are required for normal development. Principles gleaned from the field of developmental psychopathology provide a framework for understanding multilevel functioning in normality and pathology. Knowledge of normative developmental processes provides the impetus to design and implement randomized control trial (RCT) interventions that can promote resilient functioning in maltreated children.

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## INTRODUCTION

Child maltreatment represents a pathogenic relational environment that confers significant risk for maladaptation across psychological and biological domains of development. The deleterious sequelae accompanying child maltreatment not only result in adverse consequences during infancy and childhood, but also often initiate a negative developmental cascade that continues throughout the life course. The proximal environment involving the nuclear family as well as more distal factors associated with the culture and community more broadly transact to undermine normal psychological and biological developmental processes in children who have experienced child maltreatment (Cicchetti & Toth 2015).

## DEFINITIONAL CONSIDERATIONS

The National Society for the Prevention of Cruelty to Children defines maltreatment as “all forms of physical and/or emotional ill-treatment, sexual abuse, neglect or negligent treatment, or commercial or other exploitation, resulting in actual or potential harm to the child’s health, survival, development or dignity in the context of a relationship of responsibility, trust, or power” (Butchart et al. 2006, p. 9).

A fundamental difficulty inherent in the investigation of child maltreatment is that the range of phenomena covered by the term is quite varied. In terms of the subtypes of maltreatment, neglect involves failure to provide for the child’s basic physical needs for adequate food, clothing, shelter, and medical treatment. In addition to inadequate attention to physical needs, forms of this subtype include lack of supervision, moral-legal neglect, and educational neglect. Emotional maltreatment involves extreme thwarting of children’s basic emotional needs for psychological safety and security, acceptance and self-esteem, and age-appropriate autonomy. Examples of emotional maltreatment of increasing severity include belittling and ridiculing the child, showing extreme negativity and hostility, exposing the child to severe marital violence, abandoning the child,

and making suicidal or homicidal threats. Physical abuse involves the nonaccidental infliction of physical injury on the child (e.g., bruises, welts, burns, choking, broken bones). Injuries range from minor and temporary to permanently disfiguring. Finally, sexual abuse involves attempted or actual sexual contact between the child and the caregiver for purposes of the caregiver's sexual satisfaction or financial benefit by forced prostitution. Events range from exposure to pornography or adult sexual activity, to sexual touching and fondling, to forced intercourse with the child.

The Maltreatment Classification System (MCS) (Manly 2005) was developed for coding official records; it captures not only subtypes of maltreatment, but also dimensions such as severity, frequency/chronicity, perpetrator(s), and developmental periods during which maltreatment occurred. The timing of maltreatment (i.e., early onset, early and recent, or recent only) may play an important role in developmental outcomes. The MCS has been used in more than 50 research laboratories in both the United States and Europe and has demonstrated excellent psychometric properties.

Because extensive research information is required if it is to be useful in making policy decisions, researchers must be able to communicate their findings and compare their results across laboratories and across samples. Standardizing and unifying definitions of child maltreatment are fundamental steps toward improving research and hence the knowledge base about abuse and neglect. Systematized definitions are also crucial to ensure the provision of consistent and adequate services to children in need.

## DEVELOPMENTAL ANALYSIS

A developmental analysis is essential for tracing the roots, etiology, and nature of maladaptation so that interventions may be timed and guided as well as developmentally appropriate (Toth et al. 2013). In addition, a developmental analysis proves useful for uncovering the compensatory mechanisms—biological, psychological, and social-contextual—that may be used to promote resilient functioning despite the experience of significant adversity (Masten & Cicchetti 2016).

A developmental analysis strives to examine the prior sequences of adaptation or maladaptation in development that have contributed to a given outcome in a particular developmental period. Because developmental psychology assumes a life-span view of developmental processes and aims to delineate how prior development influences later development, a major issue in the discipline is how to determine continuity in the quality of adaptation across developmental time. The same behaviors in different developmental periods may represent quite different levels of adaptation. For example, behaviors indicating competence within a developmental period may indicate incompetence within subsequent developmental periods. Normative behaviors manifested early in development may indicate maladaptation when exhibited at a later time. The manifestation of competence in different developmental periods is rarely indicated by isomorphism in behavior presentation.

## PRINCIPLES OF DEVELOPMENTAL PSYCHOPATHOLOGY

A focus on the boundary between normal and abnormal development is central to the field of developmental psychopathology (Cicchetti & Toth 2009, Rutter 2013). Such a perspective emphasizes not only how the study of normal development can inform the understanding of maladaptation and psychopathology, but also how the investigation of risk and pathology can enhance our comprehension of normal development. The investigation of developmental processes in maltreated children can make important contributions to our understanding of the processes underlying normal development. It contributes precision to developmental theory, and

it challenges and impels scholars to critically examine extant developmental theories in the light of knowledge about maladaptation, psychopathology, and resilience.

Conversely, to grasp the deviances in a developing system, one must also possess an accurate description of the system itself. To comprehend how abnormalities are transmitted from one developmental level to another, one must first know how the normal transitions from one level of functioning to another take place. Only by understanding the total ongoing development of normal systems is it possible to comprehend developmental deviations as adaptational irregularities of those systems.

Developmental psychopathology is not primarily the study of disorders. That is not to say that the field does not seek to enhance our understanding of psychopathology; however, the central focus of developmental psychopathology is the elucidation of developmental processes and how they function as indicated and elaborated by the examination of extremes in developmental outcome. Such extremes contribute substantial diversity to the possible outcomes in development, thereby enhancing our understanding of developmental processes.

Additionally, developmental psychopathologists are interested in variations in the continuum between the mean and the extremes. These variations may represent individuals who currently are not divergent enough to be considered disordered, but who may progress to further extremes as development continues. Such individuals may be vulnerable to developing future disordered outcomes. Diversity in process and outcome are hallmarks of the developmental psychopathology perspective. The principles of equifinality and multifinality derived from general systems theory are relevant in this regard (von Bertalanffy 1968). Equifinality refers to the observation that a diversity of paths may lead to the same outcome. In contrast, multifinality suggests that any one component may function differently depending on the organization of the system in which it operates (Cicchetti & Rogosch 1996). For example, research in molecular genetics suggests that maltreated children's risk for psychopathology is not inevitable. Gene–environment interaction ( $G \times E$ ) occurs when the effect of exposure to an environmental pathogen (such as child maltreatment; Karg et al. 2011) on a behavioral, health, or biological phenotype is conditional upon a person's genotype or, conversely, when the genotype's effect is moderated by the environment. Specific examples of  $G \times E$  on (child maltreatment) developmental outcomes are provided in later sections in this article.

A central tenet of developmental psychopathology is that individuals may move between pathological and nonpathological forms of functioning. Adaptive coping mechanisms may be at work even in the presence of pathology (Cicchetti 2010, Masten 2014). Thus, it is only through the consideration of both adaptive and maladaptive processes that it becomes possible to define the presence, nature, and boundaries of the underlying psychopathology. Furthermore, investigators in the field of developmental psychopathology are invested in comprehending how individuals achieve competent adaptation despite experiencing great adversity or prolonged trauma. They also emphasize the importance of understanding the functioning of individuals who, after diverging onto deviant developmental pathways, resume positive functioning and achieve adequate adaptation.

Following advances in the comprehension of developmental processes in both typical and atypical development, research in the field has increasingly incorporated a multilevel approach and an interdisciplinary perspective (Cicchetti & Natsuaki 2014, Pellmar & Eisenberg 2000). To understand typical and atypical development as well as resilience in their full complexity, one must examine and integrate all levels of analysis. Each level both informs and constrains the others. Because the influence of levels on one another is almost always bidirectional, no component, subsystem, or level of organization possesses causal privilege in the developmental system (Thelen & Smith 1998).

## THE CASE OF CHILD MALTREATMENT

What happens to individual development when there are severe disturbances in the child-rearing environment? How do these atypical, unexpected organism–environment interactions and transactions influence socioemotional, personality, and neurobiological development?

The investigation of maltreated children affords an opportunity to examine environmental experiences that are far beyond the range of what is normatively encountered. By studying child maltreatment, we can learn more about how typical and atypical environments influence biological and psychological development. An examination of models focusing on average expectable environments and probabilistic epigenesis will enhance our understanding of the processes and mechanisms associated with individual development in the face of severe environmental challenge.

## ORGANIZATIONAL PERSPECTIVE

Much of the research conducted on the effects of child maltreatment has been guided by the organizational perspective on development, a powerful theoretical framework for conceptualizing a life-span approach to risk and resilience as well as normal development. The organizational perspective sees development not as a series of tasks that need to be accomplished and that subsequently decrease in importance; rather, development is conceived as comprising a number of age- and stage-relevant tasks from infancy through adulthood. Although the salience of these tasks may wane in relation to newly emerging issues, the tasks remain important to adaptation over time (Sroufe 2013). A hierarchical picture of adaptation emerges in which the successful resolution of an issue salient at an early stage increases the probability of subsequent successful adjustment. As each new stage-salient issue comes to the fore, opportunities for growth and consolidation as well as challenges and new vulnerabilities arise. These tasks include the development of emotion regulation, the formation of attachment relationships, the development of an autonomous self, the formation of effective peer relationships, and successful adaptation to school. To our knowledge, little research has been conducted on the stage-salient issues of adolescence and emerging adulthood in child maltreatment, such as autonomous self-development, forming close relationships within and across gender, and deriving a cohesive sense of self-identity. These latter issues deserve future attention.

Because each stage-salient issue is also a lifelong task that is integrated and coordinated with each subsequent issue, no one is ever completely inoculated against or totally doomed to maladaptive and/or psychopathological outcomes. Individuals are continuously affected by new socioemotional and biological experiences. Thus, changes in the biological and socioemotional conditions in their homes and in their courses of adaptation—positive or negative—remain possible throughout the life span. Despite this possibility, however, prior adaptation does place constraints on subsequent adaptation. In particular, the longer an individual persists along a maladaptive pathway, the more difficult it is to reclaim a normal developmental trajectory.

This article examines how maltreated children resolve the central developmental tasks of infancy and childhood. Due to space constraints, the focus herein is on the stage-salient issues of emotion, emotion recognition, and emotion regulation; attachment; self-development; and peer relationships.

## EMOTION, EMOTION RECOGNITION, AND EMOTION REGULATION

Theorizing about emotional development without considering the deviations that might be expected from prominent and pervasive intra- and extra-organismic disturbances, as well as the transactions among them, would result in an incomplete and ambiguous portrayal of the

developmental process. The central function of the emotions system is to motivate and organize behavior. The emotions system is composed of separable components involving dedicated neural processes, expressive behaviors, and subjective experiences or feeling states. Although the emotions system and the cognitive system are highly interactive and have reciprocal causal relations, each system has a degree of independent functioning. The independence is greatest in early childhood and declines thereafter as system intercoordination increases. From this perspective, a central tenet of emotion regulation is the intercoordination of the emotions and cognitive systems. Problems of intersystem communication cause regulation failures, and this dysregulation brings about affective-cognitive products that are maladaptive to particular situations (Calkins & Perry 2016). Emotion regulation is critical both in initiating, motivating, and organizing adaptive behavior and in preventing stressful levels of negative emotions and maladaptive behavior.

A major advantage of investigating emotional development in maltreated children is that whereas the basic emotional environment experienced by most typically developing nonmaltreated children may be so invariant that environmental/experiential influences are overlooked (Pollak et al. 2000), the emotional experiences of maltreated children enable researchers to parse the relative contributions of experience and learning versus innate predispositions. In comparison with nonmaltreating parents, maltreating parents exhibit less positive emotion and more negative emotion, including episodes of intense hostility and interpersonal threat (Cicchetti & Valentino 2006). Moreover, maltreating parents are more likely to isolate themselves and their families from others, thereby minimizing the number of nonparental models of emotional communication to whom their children are exposed. Because brain development occurs most rapidly during the first years of life (Stiles 2008), these aberrant emotional experiences may result in neuropathological connections that undermine effective expression, perception/recognition, regulation, processing, and understanding of emotion (Cicchetti 2002, Cicchetti & Ng 2014).

Divergences in the emotional expression of maltreated children have been observed as early as in infants 3 months of age: Severely physically abused infants have exhibited increased rates of fearfulness, anger, and sadness during mother-infant interactions (Cicchetti & Ng 2014). The early expression of fear and anger is a particularly salient finding, considering that the normative development of these affects does not typically occur until approximately 7–9 months of age (Sroufe 1996). In contrast, neglected infants displayed an attenuated range of emotional expression and an increased duration of negative affect compared to nonmaltreated infants.

Early malevolent care may accelerate the development of negative affect circuitry in the brains of maltreated infants. This may be accomplished by excessive synaptic pruning of the positive affect neural circuits as a result of inadequate or insufficient early positive experiences by abused babies. The accelerated development of negative affect circuitry may be the groundwork for the negativity bias (Ayoub et al. 2006) manifested by abused children in behavioral and psychophysiological studies of attention to facial expressions and in studies of social information processing (see below for empirical examples of negativity bias). Thus, maltreated children may be at risk for developing differential developmental pathways to emotion dysregulation very early in life.

Accurate emotion recognition is critical because it represents the early use of social cues on which children's subsequent interpretations and behavioral responses will depend. The identification of basic emotions from both facial and contextual clues is normatively mastered by the preschool years. Unfortunately, maltreated children evince lower accuracy in recognizing emotions than nonmaltreated children, even after controlling for receptive linguistic ability (Pollak et al. 2000).

Developmentally, early information processing limitations require children to focus their attention on the most salient aspects of their environment (Bjorklund 1997). For children who are physically abused, displays of anger may signal imminent threat. Consequently, Pollak and

colleagues (2000) hypothesized that 3- to 5-year-old physically abused children would exhibit an increased sensitivity to anger-related cues, perhaps also resulting in decreased attention to other types of emotional cues. Confirming this hypothesis, they found that physically abused preschoolers perceived angry faces as more salient and distinctive relative to other emotions (e.g., sadness, fear, disgust, happiness) on a perceptual scaling task, whereas nonmaltreated comparison children did not show this pattern. Moreover, when physically abused children were instructed to match facial expressions to emotional situations, they demonstrated a lower threshold for detecting anger compared to demographically comparable nonmaltreated children. Further studies have confirmed this heightened vigilance to anger in physically abused children: Compared to nonmaltreated children, physically abused children display broader perceptual category boundaries for detecting anger (Pollak & Kistler 2002), they require less visual information to perceive angry facial expressions (Pollak & Sinha 2002), and they recognize anger earlier in the formation of the facial expression when fewer cues are available (Pollak et al. 2009).

Psychophysiological studies also provide evidence that physically abused children allocate more attentional resources to the detection of anger but respond similarly to nonmaltreated children when attending to happy and fearful faces. Specifically, measurement of cognitive event-related brain potentials (ERPs) indicates that school-aged maltreated children display larger P3b amplitude when their attention is directed toward angry targets as opposed to happy or fearful ones (Pollak et al. 1997). This pattern of response appears to be specific to anger rather than to negative emotions such as fear (Pollak et al. 2001). P3b amplitude varies as a function of task relevance and has been used to clarify specific cognitive operations such as the evaluation of stimulus significance (Johnson 1993). It may also be reflective of processes involved in the updating of mental representations in working memory. In general, such psychophysiological processes serve to maintain representations of one's environment by highlighting events that are significant.

A study examining the neural correlates of facial affect processing in 15-month-old maltreated and nonmaltreated infants revealed differences between the two groups on three ERP components: P1, P260, and Nc. Findings for the P260 waveform were consistent with previous ERP findings in older maltreated children, revealing a hyperresponsivity to angry relative to happy facial affect in maltreated infants. However, the findings for P1 and Nc waveforms indicated a hyperresponsivity to relative novelty, whereby the maltreated infants had greater amplitude in response to happy facial affect, whereas nonmaltreated infants had greater responsivity to angry faces. The results provided further support for the hypothesis that the experience of maltreatment and the predominately negative emotional tone in maltreating families alter the functioning of neural systems associated with the processing of facial emotion. In particular, the findings suggest that at this early stage in the development of facial affect recognition, novelty of facial emotion is especially salient. These results exemplify the importance of early preventive interventions focused on emotion for children who have experienced maltreatment early in life.

An increased sensitivity to anger might be adaptive for physically abused children, as it would allow for hypervigilant detection of imminent harm; however, successful regulation includes the capacity for flexibility and control over attention. The failure of regulatory capacities that enable flexibility and control makes what is adaptive in the maltreating home maladaptive when generalized to more normative social contexts (Pollak 2008). Pollak & Tolley-Schell (2003) posited that early experiences of abuse may alter the development of perceptual systems by decreasing the minimum amount of threat-related stimulation needed to engage focused attention on the threat-inducing stimuli. If physically abused children respond more quickly and/or strongly to signals of threat, then disengaging attention away from anger may be problematic. Using a selective attention paradigm with an emotional component, Pollak & Tolley-Schell (2003) employed both physiological and behavioral measures to assess 8- to 11-year-old children's orienting reaction and

response time during valid trials, and children's disengagement reaction and response time during invalid trials. Psychophysiological data confirmed the hypothesis that physically abused children demonstrate a selective increase in ERP response (as measured by P3b) on invalid angry trials, providing evidence that increased attentional resources are required to disengage from previously cued angry faces only. Physically abused children also demonstrated faster reaction times in the valid angry condition, consistent with the notion that abused children orient rapidly to cues primed by anger. There were no differences, however, in physically abused children's psychophysiological responses or reaction times to happy trials, providing further support for a specific or differential deficit involving attentional processing of anger.

At subsequent developmental periods, physically abused children may manifest social information-processing deficits and difficulties with peer relationships. Social information-processing biases that are prevalent among abused children's relations with peers indicate that maltreated children are more, rather than less, likely to respond to angry or aggressive emotional cues (Dodge et al. 1997, Teisl & Cicchetti 2008). Such social information-processing biases are consistent with the attentional biases exhibited by abused children in response to expressions of anger (Pollak & Tolley-Schell 2003).

Behavioral and psychophysiological evidence of maltreated children's differential processing of affective information suggests that early experiences influence subsequent emotional development and shape the implicated brain circuitry. The effects observed among maltreated children may reflect experience-dependent processes that involve the fine-tuning of attention, learning, perceptual, and memory systems that facilitate the rapid identification of anger (Pollak 2008).

Emotion regulation is a developmentally acquired process that emerges from increasing differentiation and hierarchical integration of biological and psychological systems. Emotion regulation evolves as a function of both intrinsic features and extrinsic socioemotional experiences within the context of early parent-child interactions. At the biological level, important intra-organismic factors for the development of emotion regulation include individual differences in genotypic variation, organizational changes in the structure and function of the central nervous system, cerebral hemispheric lateralization, and the development of neurotransmitter systems. Extra-organismically, children's emotional experiences, expressiveness, and arousal are influenced by caregivers' response to and tolerance of affect (Sroufe 1996). Parents' socialization of affect displays during early interpersonal exchanges serves as the model through which aspects of emotion regulation may be learned.

Defined as the monitoring, evaluating, and modifying of emotional reactions for the purpose of attaining individual goals, emotion regulation optimizes one's adaptive engagement with the environment (Thompson et al. 2008). Because the ability to autonomously regulate one's emotions is thought to emerge from early parent-child relations (Sroufe 1996), maltreatment poses a serious risk to children's development of emotion regulation. An unpredictable and disorganized environment, such as the one found in maltreating homes (Cicchetti & Toth 2005), would make children particularly vulnerable to frequent negative emotional experiences, including anger, frustration, reactivity, and irritability from caregivers. Consequently, maltreated children are likely to experience overwhelming emotional arousal that leads to difficulties managing and processing negative emotions.

Thus, child maltreatment represents a significant threat to the optimal development of affective processing abilities. Given the severe disturbances in the average expectable environment provided by maltreating caregivers, considerable evidence has mounted to demonstrate the detrimental effects of maltreatment on children's emotional development and regulation. Moreover, in accord with the organizational perspective on development, adequate emotion regulation serves as a foundation for the successful development of the subsequent stage-salient issues of forming secure



attachment relationships, an autonomous and coherent self-system, and effective relationships with peers. By contrast, early failures of emotion regulation increase the probability that a child will develop insecure and disorganized attachment relationships, self-system impairments, and difficulties with peers. These repeated developmental disruptions create a profile of relatively enduring vulnerability factors that places maltreated children at high risk for future maladaptation (Cicchetti & Toth 2015).

The early maladaptive processing of stimuli that contributes to affective regulatory problems may lay the foundation for future difficulties in modulating affect. A number of cross-sectional investigations have corroborated the prediction, emanating from the organizational perspective, that maltreated children are at increased risk of a developmental progression from affect regulation problems to behavioral dysregulation.

In an investigation of 4- to 6-year-old children, approximately 80% of maltreated preschoolers exhibited patterns of emotion dysregulation (i.e., undercontrolled/ambivalent and overcontrolled/unresponsive types) in response to witnessing interadult anger, compared to only 37% of the nonmaltreated comparison children. Undercontrolled/ambivalent emotion regulation patterns were associated with maternal reports of child behavior problems and were found to mediate the link between maltreatment and children's symptoms of anxiety or depression (Maughan & Cicchetti 2002). Findings such as these support a sensitization model whereby repeated exposure to anger and familial violence results in greater emotional reactivity.

During the school-age years, children continue to develop emotion regulation skills as they encounter increasing socialization demands from peers as well as from family. Shields & Cicchetti (1998) found that maltreated children were more verbally and physically assaultive than were the nonmaltreated comparison children, with physical abuse placing children at heightened risk for aggression. Maltreated children were also more likely than comparison children to exhibit the distractibility, overactivity, and poor concentration characteristic of children who experience deficits in attention modulation. Physically and sexually abused children also displayed attention disturbances suggestive of subclinical or nonpathological dissociation, including daydreaming, blank stares, and confusion. Deficits in emotion regulation were also evident, in that maltreated children were less likely than comparison children to show adaptive regulation and more likely to display emotional lability-negativity and contextually inappropriate expressions of emotion. Such pervasive deficits in maltreated children's regulatory capacities are cause for special concern, because the ability to modulate behavior, attention, and emotion underlies children's adaptive functioning in a number of key domains, including self-development, academic achievement, and interpersonal relationships (Cicchetti 1991, Shonk & Cicchetti 2001).

Shields & Cicchetti (1998) also demonstrated that impaired capacities for attention modulation contribute to emotion dysregulation in maltreated children. Specifically, attention deficits mediate maltreatment's effects on emotional lability-negativity, inappropriate affect, and attenuated emotion regulation. Attention processes that suggest subclinical or nonpathological dissociation also contribute to maltreated children's deficits in emotion regulation. Thus, abuse seems to potentiate disruptions in attention that result in a relative detachment from and unawareness of one's surrounding, as well as in hyperattunement and hyperreactivity to the social surrounding (Pollak & Tolley-Schell 2003, Rieder & Cicchetti 1989). Together, these deficits appear to compromise maltreated children's ability to regulate behavior and affect in social settings.

Romens & Pollak (2012) conducted an investigation of attention patterns for sad, depression-relevant cues in children with and without maltreatment experiences. They also assessed individual differences in attention related to reactivity to and regulation of a sad emotional state. The maltreated children exhibited an attention bias toward sad faces after experimental initiation of a sad emotional state. The subgroup of maltreated children who were ruminative manifested a relatively

stable pattern of heightened attention to sad faces, regardless of emotional state. Consequently, it is conceivable that individual difference in emotion regulation may be utilized to identify which maltreated children may have an increased risk for depression (Romens & Pollak 2012). Relatedly, Shackman & Pollak (2014) found that physically abused children exhibited greater negative affect and more aggressive behavior compared to nonmaltreated children, and this relationship was mediated by children's allocation of attention to angry faces. These findings suggest that physical abuse leads to the dysregulation of both aggression and negative affect and that this increases the likelihood that physically abused children will develop externalizing behavior disorders.

Additional evidence suggests that emotional dysregulation may mediate the increased risk for bullying and victimization that has been noted among maltreated children (Shields & Cicchetti 2001), highlighting how the internalization of salient aspects of the early caregiving relationship may have maladaptive implications among these children. As maltreated children are victimized by parents, they may develop a working model of relationships as dangerous and malevolent that incorporates the roles of both bully and victim. These cognitive-affective structures may then guide behaviors and peer interactions, promoting atypical emotional responsiveness and coloring children's interpretations of the behavior of social partners. Supporting this hypothesis, Shields et al. (2001) found that 8- to 12-year-old maltreated children's narrative representations of their caregivers were more negative-constricted and less positive-coherent than those of nonmaltreated children. Maladaptive caregiver representations were associated with greater emotion dysregulation, aggression, and peer rejection, whereas positive-coherent representations were related to prosocial behaviors and peer preferences as indexed by peer rating and adult observation.

Furthermore, Kim-Spoon et al. (2013) investigated the longitudinal contributions of emotion regulation and emotional lability-negativity to internalizing symptomatology. A sample of over 300 maltreated ( $N = 171$ ) and nonmaltreated ( $N = 151$ ) children were followed from age 7 to 10 years. For both maltreated and nonmaltreated children, emotion regulation was a mediator between emotional lability-negativity and internalizing symptomatology, whereas emotional lability-negativity did not mediate the relation between emotion regulation and externalizing symptomatology. Early maltreatment was associated with high emotional lability-negativity (at age 7) that contributed to poor emotion regulation (at age 8), which in turn was predictive of increases in internalizing symptomatology (from age 8 to 9).

These findings suggest that emotion regulation and emotional lability-negativity may be important factors in identifying distinct pathways to child psychopathology. Specifically, low emotional lability-negativity and adaptive emotion regulation appear to play protective roles in the development of internalizing symptomatology. These findings also suggest that emotion regulation is an important mediational process between emotional lability-negativity and internalizing symptomatology. Therefore, improving emotion regulation skills in children is likely to be an effective strategy to impede the subsequent development of internalizing symptomatology. The results also imply that emotion regulation can be targeted to reduce the deleterious effects of increased emotional lability-negativity after early maltreatment experiences, thus preventing internalizing symptomatology.

## FORMATION OF ATTACHMENT RELATIONSHIPS

The establishment of a secure attachment relationship between an infant and his or her caregiver represents a primary task during the first year of life. Attachment theorists have posited that as development proceeds, a secure attachment relationship provides a base from which to explore and, ultimately, contribute to the integration of cognitive, socioemotional, and behavioral capacities that influence ongoing and future relationships as well as the understanding of the self (Bowlby

1969, Sroufe 1990). Children construct internal working models of their attachment figures out of their interactions with their caregiver, their own actions, and the feedback they receive from these interactions. Once organized, these internal working models tend to operate outside of conscious awareness and are thought to be relatively resistant to change. Children formulate their conceptions of how acceptable or unacceptable they are in the eyes of their attachment figures (i.e., their self-image) based on their interactional history with their primary caregivers. Maltreated children experience distortions of the caregiving environment in which internal working models develop. Exposed to insensitive and pathological care, maltreated children develop negative expectations regarding the availability and trustworthiness of others, as well as mental representations of the self as incompetent and unworthy (Stronach et al. 2011).

Maltreated children are especially at risk for developing insecure disorganized (Type D) attachments (see Cyr et al. 2010 for a meta-analysis). Estimates of the manifestations of disorganized attachment among maltreated children range from 80% to over 90%. In the strange situation paradigm (Ainsworth et al. 1978), Type D infants demonstrate inconsistent and disorganized strategies for coping with separations from and reunions with their caregivers (Hesse & Main 2006). In addition, infants with disorganized attachments display bizarre behaviors such as freezing, stilling, and stereotypies, as well as contradictory behavior directed toward their attachment figures (e.g., approaching their parents with head averted).

A number of explanations have been proffered to account for the preponderance of disorganized attachment relationships between maltreated children and their primary caregivers. Because inconsistent care is a hallmark of maltreating families, some investigators have hypothesized that the combination of insensitive overstimulation and insensitive understimulation may lead to the contradictory behaviors observed among maltreated infants classified as Type D. According to Hesse & Main (2006), attachment disorganization is caused by frightened and frightening parental behavior, which is thought to have its origins in unresolved parental trauma. Maltreating behaviors are arguably among the most frightening parenting behaviors, placing children in an irresolvable paradox in which their attachment figures are simultaneously their source of safety and their source of fear.

Genetic variation also has been explored as a contributor to the development of disorganized attachment; however, little consistent evidence has emerged for a candidate gene main effect on attachment disorganization (see Lujik et al. 2011). For example, among maltreated children, Cicchetti et al. (2011) found that neither the serotonin transporter gene (*5-HTT*) nor the dopamine receptor *D4* gene (*DRD4*) were associated with disorganized attachment. They concluded that the anomalous aspects of maltreating parents may be so robust that they overpower the potential effect of genetic variation in the etiological pathway to attachment disorganization (Cicchetti et al. 2011). In contrast, a recent investigation of over 700 Norwegian children who were not maltreated revealed that the *catechol-O-methyltransferase Val158Met* genotype moderated the effect of disorganized attachment on the social development of 4- to 6-year-old children.

Although attachment is conceptualized as an important stage-salient developmental task during the first year of life, attachment security continues to exert its influence on development across the life span. First, substantial stability in insecure and disorganized patterns of attachment has been observed among maltreated children (Barnett et al. 1999). Second, disorganized attachment initiates a maladaptive trajectory that heightens the risk for future relational dysfunction as well as various forms of psychopathology (Hesse & Main 2006). Finally, in a recent 22-year longitudinal investigation of the influence of early infant attachment to the mother on emotion regulation in adulthood, attachment status at 18 months predicted neural responding during the regulation of positive affect 20 years later (Moutsiana et al. 2014). These findings demonstrate the powerful influence that early disturbances in attachment can exert across the life span.

## DEVELOPMENT OF AN AUTONOMOUS SELF

The development of an integrated sense of self typically occurs in the toddler years, arising from the successful resolution of previous stage-salient tasks, such as early emotion regulation and the formation of a secure attachment relationship. Early caregiving experiences serve as the basis for the development of representational models of the attachment figure as well as corresponding and coherent representational models of the self and of the self in relation to others (Fonagy et al. 2007). As discussed above, many maltreated infants fail to develop an organized pattern of attachment, increasing the probability of subsequent perturbations in representational development. Indeed, maltreated children show disruptions in many aspects of the self-system.

Aberrations in self-development have been observed as early as in children 18 months of age, as demonstrated by investigations of visual self-recognition. On the mirror-rouge paradigm, infants and toddlers examine their rouge-altered noses in a mirror. Maltreated and nonmaltreated children are comparable in their capacity to recognize themselves; however, differences emerge with respect to their affective responses. Specifically, maltreated toddlers are more likely than nonmaltreated comparison children to display neutral or negative emotions upon viewing their images in a mirror (Schneider-Rosen & Cicchetti 1991). This finding may be interpreted as reflecting negative feelings about the self in maltreated youngsters. Negative self-system processes continue to be evident in the preschool period. Additionally, maltreated children's narrative representations of parents and of self are more negative than those of nonmaltreated children (Toth et al. 2013). Moreover, physically abused children possess more grandiose self-representations. These variations by subtype may reflect differences in maltreating experiences. For example, grandiose self-representations may reflect a coping process to maintain personal control in an adverse and threatening home environment, whereas negative self-representations may develop from the chronic absence of attention and validation in a neglecting home.

A recent investigation of the mediating role of self-system processes in physically abused 4- to 7-year-old children identified subgroups of abused children that differed in their internal working models of relationships (Hawkins & Haskett 2014). These differences were related to child adjustment, with children who had more positive and fewer negative representations evidencing fewer internalizing or externalizing behavior problems.

Research among school-age maltreated children provides further evidence of self-system deviation. Relative to teacher ratings, younger maltreated children overestimate their own sense of social competence and peer acceptance. These children may be engaging in defensive processing in order to increase their sense of competence (Cicchetti & Toth 2015). In fact, research indicated that the development of a grandiose self, as reflected by inflated social self-efficacy, may serve as a protective factor in the link between maltreatment and internalizing symptomatology. However, as maltreated children mature, they tend to underestimate their competence and are rated by teachers as having lower self-esteem (Cicchetti & Toth 2015).

In another examination of self-system processes in maltreated children, Bennett et al. (2010) studied shame proneness in child neglect. Shame is a highly negative and psychically painful state in which the individual perceives the entire self as defective (Lewis 1995). Bennett et al. (2010) found that neglected children reported more shame proneness and more depressive symptomatology than nonmaltreated comparison children. Prior investigations of heterogeneous groups of physically abused, sexually abused, and neglected children found elevated levels of shame. Thus, the findings of Bennett et al. (2010) extended work on shame to a group of neglected children and are consistent with the results of these earlier studies.

Finally, maltreated children are at risk for developing dissociative features and dissociation, perhaps the most severe deficit in the integration of the self (Macfie et al. 2001a,b; Toth et al.

2011; Valentino et al. 2008). Dissociation is a disruption in the normal integration of consciousness, memory, identity, emotion, perception, body representation, motor control, and behavior (Am. Psychiatr. Assoc. 2013). Dissociation interferes with the normal development of the self and healthy functioning in core areas of development, predicting lack of sense of self-agency; low self-esteem; poor abilities in symbolic thinking, peer competence, and affect modulation; and attention problems (Carlson et al. 2009).

The link between maltreatment and dissociation has been observed across a wide age range, from preschoolers to adults. Among preschoolers, physical and sexual abuse appear to be the most robustly related to dissociative features, with physical abuse emerging as particularly salient for the development of dissociation at clinical levels. From a developmental perspective, the timing and chronicity of traumatic experiences are key to understanding their impact on self-system functioning (Carlson et al. 2009). Furthermore, longitudinal research indicates that fragmentation in self-organization has been found in sexually abused adolescent girls, who demonstrated deviant splitting between positive and negative self-references (Calverley et al. 1994).

## PEER RELATIONSHIPS

Theories inspired by an organizational perspective on development have suggested that the negative relational patterns acquired in a maltreating environment become incorporated into the structures that are pertinent for successful peer relations. Within the context of their early caregiving experiences, maltreated children may develop negative expectations regarding the self and others, as well as a concept of relationships as involving victimization and coercion. These internalizations lead to the selection and structuring of later social interactions so that they recreate and validate familiar relationship patterns. Research supports this conceptualization of continuity in relational functioning, because maltreated children have been shown to exhibit a broad range of difficulties in the peer domain.

With regard to peer relations, maltreated children appear to traverse one of two general developmental pathways: (a) withdrawal from peer interactions or (b) heightened aggression toward peers. In addition to these two generally diverging pathways, a subgroup of maltreated and non-maltreated children has been identified who demonstrate both aggressive and withdrawn behaviors (Cicchetti & Toth 2015). Among maltreated children, those who evidence high aggression and high withdrawal demonstrate lower social effectiveness than nonmaltreated youngsters. This unusual pattern of interaction with peers is consistent with the attachment history of maltreated children, which may be related to disorganized representational models and may result in disturbances in social encounters. By revealing indications of a response predisposition to both fight and flight, maltreated children's interactions with peers lend support to the notion that these children have internalized both sides of their relationships with their caregivers. Thus, maltreated children's representational models may have elements of both the victim and the victimizer, and these models may be enacted in peer relationships (Banny et al. 2013).

The effects of maltreatment on disrupted peer group functioning may be explained by perturbations in cognitive and emotional processes. With regard to social information processing, physically abused children make errors in encoding social cues, exhibit biases toward attributing hostile intent, generate more aggressive responses, and positively evaluate aggression as an appropriate response (Teisl & Cicchetti 2008). These deficits, in turn, mediate the association between physical abuse and aggression in the peer context. Whereas maladaptive social cognition emerges as a salient explanatory factor for physically abused children, emotion dysregulation appears to play an integral role in the link between maltreatment and aggression for all maltreated groups. Poor emotion regulation also mediates the association between maltreatment and victimization by peers.

## PERSONALITY ORGANIZATION AND PERSONALITY DISORDERS

Maltreatment has also been implicated in the etiology of personality disorders. Given that personality disorders do not emerge spontaneously at the age of 18, the cut-off established in the psychiatric nomenclature, researchers have begun to adopt a developmental psychopathology approach to identify early precursors and processes that confer vulnerability to later personality pathology (Cicchetti & Crick 2009a,b).

Consistent with this approach, Rogosch & Cicchetti (2005) found that maltreated children exhibit higher mean levels of potential precursors to borderline personality disorder (e.g., emotional lability, conflictual relationships with adults and peers, relational aggression, self-harm) than do nonmaltreated children comparisons. In a prospective investigation of personality organization, Rogosch & Cicchetti (2004) found that 6-year-old maltreated children exhibited lower agreeableness, conscientiousness, and openness to experience as well as higher neuroticism than did nonmaltreated children. Analysis of personality clusters revealed that the majority of nonmaltreated children were represented in the adaptive gregarious and reserved personality clusters, whereas maltreated children largely accounted for the makeup of less adaptive personality profiles (i.e., undercontroller, overcontroller, and dysphoric). Furthermore, longitudinal stabilities were observed across ages 7, 8, and 9, suggesting continuity in maltreated children's personality liabilities.

In a longitudinal investigation of the effects of child maltreatment on subsequent personality processes, Kim et al. (2009) followed maltreated and nonmaltreated children between the ages of 6 and 10 years:

Growth mixture modeling indicated multifinality in personality development depending on the risk status (i.e., maltreated versus nonmaltreated). Two trajectory classes of ego resiliency were identified for maltreated children; those who showed a declining trajectory exhibited greater maladjustment. In contrast, three trajectory classes of ego control were identified for nonmaltreated children; the subgroups showing increases in ego undercontrol or dramatic changes from high ego undercontrol to high ego overcontrol exhibited poor adjustment. Experiencing multiple maltreatment subtypes and physical/sexual abuse were related to higher levels of ego undercontrol and externalizing symptomatology, whereas early onset of maltreatment was associated with the low and decreasing trajectory of ego resiliency and higher levels of internalizing symptomatology. The findings suggest that ego resiliency and ego control, personality processes related to self-regulation, may be important factors in identifying distinct pathways to later personality disorders as well as pathways to resilient functioning. (Kim et al. 2009, p. 889)

In a landmark epidemiological study, Caspi and colleagues (2002) followed a large sample of male children from birth to adulthood to ascertain why some maltreated children grow up to develop antisocial personality disorder, whereas others do not. Results revealed that a functional polymorphism in the promoter region (where gene transcription is initiated) of the monoamine oxidase A (*MAOA*) gene moderated the effect of child maltreatment. The *MAOA* gene is located on the X chromosome and encodes the *MAOA* enzyme, which metabolizes neurotransmitters such as norepinephrine, serotonin, and dopamine, rendering them inactive. Maltreated children with the genotype conferring high *MAOA* activity were significantly less likely to develop antisocial behavior problems than maltreated children with the low-activity *MAOA* genotype. In addition, maltreatment and nonmaltreatment groups did not differ on *MAOA* activity, suggesting a lack of an evocative  $G \times E$  correlation as an explanation for their findings. Many, but not all, subsequent studies have been successful in replicating Caspi and colleagues' original findings and in extending them downward to samples of children and adolescents (Kim-Cohen et al. 2006).

Weder et al. (2009) examined a  $G \times E$  interaction of *MAOA* genotype and maltreatment in children residing in foster care. The maltreated children represented the extreme on a continuum of adversity. They were assessed at a highly stressful time, shortly after they had been removed from their parents' care because they had been physically abused. A total trauma index score was derived based on exposure to physical abuse, sexual abuse, domestic violence, multiple out-of-home placements, and community violence. Scores were rated from mild to moderate to extreme. Weder et al. (2009) detected a significant interaction between exposure to moderate levels of trauma and the low-activity *MAOA* genotype in conferring increased risk for aggression. Children who were exposed to extreme levels of trauma had high aggression scores regardless of *MAOA* genotype. Extreme levels of aggression appear to overshadow the effects of *MAOA* genotype, especially when traumatized children are experiencing acute stress. The findings of Weder and colleagues are consistent with those of Caspi et al. (2002).

As in Caspi et al.'s (2002) original study, Cicchetti et al. (2012) conducted an investigation to examine a  $G \times E$  interaction of *MAOA* genotype and maltreatment in school-age boys showing early signs of antisocial behavior. For lifetime antisocial behaviors, Cicchetti et al. (2012) did not find *MAOA* to contribute to models of antisocial behavior as reported by peers or adults beyond the influence of maltreatment effects. The  $G \times E$  interaction effect was significant. Among nonmaltreated boys, those with low-activity *MAOA* genotypes had significantly higher observer-reported symptoms of antisocial behavior than those with high-activity *MAOA* genotypes. Moreover, maltreated boys in the low-activity *MAOA* group had higher self-reported antisocial behavior than nonmaltreated boys. A similar pattern of findings was observed for child self-report of antisocial behavior in the past six months, as the  $G \times E$  interaction was significant. Specifically, maltreated boys with low-activity *MAOA* genotypes had higher recent antisocial behavior than those with high-activity genotypes. No significant differences were found among nonmaltreated boys based on the *MAOA* genotype group. Furthermore, maltreated boys with low-activity *MAOA* genotypes had higher-level self-reported antisocial symptoms than nonmaltreated boys. The risk for antisocial behavior associated with child maltreatment was reduced among boys with high-activity *MAOA* genotypes. The findings of Cicchetti et al. (2012) are consistent with those reported by Caspi et al. (2002) and Weder et al. (2009).

Byrd & Manuck (2014) conducted a meta-analysis of studies testing the interaction of *MAOA* genotype and childhood adversities/maltreatment on antisocial outcomes in predominately non-clinical samples. Consistent with the findings of Caspi et al. (2002), for males early maltreatment predicted antisocial outcomes more strongly for low-activity, relative to high-activity, *MAOA* genotype. For females, in contrast, *MAOA* did not interact with early life adversities, and maltreatment alone predicted antisocial behavior in females who had the high-activity *MAOA* genotype.

In a related study, Cicchetti et al. (2014) conducted an investigation in which

...gene-environment-gender effects in predicting child borderline personality disorder among maltreated and nonmaltreated low-income children ( $N = 1,051$ ) were examined. Adult-, peer-, and self-report assessments of borderline precursor indicators were obtained, as well as child self-report on the Borderline Personality Features Scale for Children. Genetic variants of the oxytocin receptor genotype (*OXTR*) and the *FK505* binding protein 5 gene *CATT* haplotype were investigated. Children who self-reported high levels of borderline personality symptomatology were differentiated by adults, peers, and additional self-reports on indicators of emotional instability, conflictual relationships with peers and adults, preoccupied attachment, and indicators of self-harm and suicide ideation. Maltreated children also were more likely to evince many of these difficulties relative to nonmaltreated children. A series of analyses of covariance, controlling for age and ancestrally informative markers, indicated significant Maltreatment  $\times$  Gene  $\times$  Gender three-way interactions. Consideration of the maltreatment parameters

of subtype, onset, and recency expanded understanding of variation among maltreated children. The three-way interaction effects demonstrated differential patterns among girls and boys. Among girls the gene-environment interaction was more consistent with a diathesis-stress model (Gottesman & Shields 1972), whereas among boys a differential-sensitivity to the environment (Belsky et al. 2007, Ellis et al. 2011) interaction effect was indicated. Moreover, the genetic variants associated with greater risk for higher borderline symptomatology, dependent on maltreatment experiences, were opposite in girls compared to boys. The findings have important implications for understanding variability in early predictors of borderline personality pathology. (p. 831)

## **EFFECTS OF MALTREATMENT ON NEUROBIOLOGICAL DEVELOPMENT AND FUNCTIONING**

There has been a burgeoning of interest in conducting neuroimaging research to comprehend how early adverse experiences such as child maltreatment exert their effects on the developing brain (Hostinar et al. 2014). Multiple brain regions and neural circuits are disrupted by the experience of child abuse and neglect (Cicchetti & Toth 2015). The aberrant neural circuitry most likely contributes to the variability in phenotype (i.e., multifinality) observed in maltreated individuals. Scholars have conducted research on the effects of child maltreatment on neurobiological development for nearly two decades. There is now growing evidence that child maltreatment affects specific regions of the brain (Hart & Rubia 2012, McCrory et al. 2010). The pathways most affected in maltreated children and adolescents are predominately in fronto-limbic networks. These comprise the prefrontal cortex (PFC), including the orbitofrontal cortex and anterior cingulate cortex, and the amygdala (but not the hippocampus, which may show a volume reduction in emerging adulthood) (Hart & Rubia 2012, McCrory et al. 2010, Teicher et al. 2012). A recent investigation provides preliminary evidence that the amygdala may have a sensitive period in adolescence (Pechtel et al. 2014). A very consistent finding in maltreated children and adolescents is structural abnormalities of the corpus callosum and the cerebellum (Rinne-Albers et al. 2013, Teicher et al. 2004); most typically these are volume and area reductions. Additionally, diffusion tensor imaging studies have revealed deficits in structural connectivity between the anterior cingulate cortex and the dorsolateral, orbitofrontal, and ventromedial PFC (Hart & Rubia 2012), thereby suggesting abnormalities in prefrontal brain networks.

In terms of functional MRI, investigations suggest that maltreatment experiences are associated with hypoactivity in the PFC of the dorsolateral and ventromedial PFC. The atypical activation in these brain regions occurs during response inhibition, working memory, and emotion processing tasks (Hart & Rubia 2012).

## **CHILD MALTREATMENT AND RESILIENCE**

In some individuals, deviations from the average expectable environment increase the likelihood to develop maladaptive functioning, whereas other individuals demonstrate positive adaptation in the face of the same challenges. Resilience is conceived as a dynamic developmental process encompassing the attainment of positive adaptation despite exposure to significant threat, severe adversity, or trauma, which typically constitute major assaults on the processes underlying biological and psychological development (Luthar et al. 2000, Masten & Cicchetti 2015, Southwick et al. 2014). Resilience is not a magical phenomenon (Masten 2014). The same developmental cascades that can amplify maladaptive outcomes over time can perpetuate or amplify positive outcomes when the individual benefits from some combination of experiences and/or biological propensities that tip the initial balance toward adaptive outcomes (Cicchetti 2013).



The occurrence of resilient outcomes in maltreated children points out that self-righting tendencies in human development may be strong, even in the face of deviance and failure in the environment (Cicchetti 2013, Masten 2014). At one level, different parts of the brain may attempt to compensate for the negative influences; at another, maltreated individuals may seek out new experiences in areas where they possess strengths. Because plasticity is a central feature of the mammalian brain, early neurobiological anomalies or aberrant experiences should not be considered as determining the ultimate fate of the maltreated child (Cicchetti & Curtis 2006). Discovering how maltreated children develop and function resiliently despite their multitudes of adverse experiences offers promise for informing the design, implementation, and multilevel evaluation of prevention and intervention trials (Luthar & Cicchetti 2000).

To provide an illustration of socioemotional and personality pathways to resilience in maltreated children, a three-year longitudinal study conducted in a summer camp context (Cicchetti & Rogosch 2012) found that ego resiliency and moderate ego control, as well as self-system variables, predicted resilient functioning in maltreated children; in contrast, ego resiliency, perceived emotional availability of the mother, and relationship quality with camp counselors were significantly more likely to be predictive of resilient functioning in nonmaltreated children from comparably low socioeconomic backgrounds. This study utilized a composite measure of resilience that included multimethod, multi-informant assessments of competent peer relations, school success, and low levels of internalizing and externalizing psychopathology. Relationships were more central to developing resilient outcomes in nonmaltreated children, whereas self-system processes and personality characteristics were more central to resilient outcomes in maltreated children. Thus, self-reliance, personal conviction, and self-confidence, in concert with interpersonal reserve, may bode well for the development of resilient adaptation in maltreated children.

In addition to psychosocial predictors of resilience, a number of biological variables also have been shown to be predictive of resilient functioning. These include neuroendocrine regulation and left hemispheric activation asymmetry (see Cicchetti 2013 for an elaboration). To our knowledge, there has been only one molecular genetic study of resilient functioning in maltreated children. To examine the processes underlying the development of resilience at the molecular genetic level of analysis, Cicchetti & Rogosch (2012) identified a multicomponent index of resilient function. They selected four theoretically and empirically informed candidate genes that have been found to be related to behaviors associated with resilient functioning—*5-HTTLPR*, *CRHR1*, *DRD4-521C/T*, and *OXTR*—and investigated genetic variants in each of these genes.

Maltreatment consistently exerted a strong, adverse main effect on resilient functioning; however, more of the gene variants of the four respective genes were shown to have a main effect on resilience. In contrast,  $G \times E$  effects were obtained and a similar pattern emerged for all four genes: A particular genotype was found to differentiate strongly between levels of resilient function in maltreated and nonmaltreated children. Contrary to the typical  $G \times E$  studies on psychopathology, the results of the Cicchetti & Rogosch (2012) investigation revealed that genetic variation had a negligible effect in predicting resilient functioning in the maltreated group, whereas genotypic variation was shown to contribute to higher resilient functioning in nonmaltreated children when they possessed a particular genotype relative to maltreated children with the same genotype.

Cicchetti & Rogosch's (2012) findings suggest that the genes included in their investigation appear to be minimally related to resilient functioning in maltreated children for each of the genes examined. Genetic variation had a stronger impact on resilient functioning among the nonmaltreated children who also resided in stressful poverty-laden environments. Accordingly, it appears that the powerful main effects of maltreatment on resilience may have overshadowed any potential contribution of genetics to resilient functioning in abused and neglected children.

## TRANSLATIONAL IMPLICATIONS

The quintessential goal of the field of prevention science is to intervene in the course of development to ameliorate or eliminate the emergence of maladaptation or psychopathology. Developmental psychopathology, with its focus on the dialectic between the study of normality and pathology, is in a unique position to provide an important theoretical foundation for prevention science (Ialongo et al. 2006, Inst. Med. 1994).

Developmental psychopathologists who adhere to an organizational perspective direct prevention science to focus on the progressive organization of developmental competencies and incompetencies in the course of epigenesis, with the goal of structuring preventive interventions (Ialongo et al. 2006). To effect change in the course of development and avert psychopathological outcomes, preventive interventions informed by an organizational perspective should focus on promoting competence and reducing ineffective resolution of the stage-salient issues that emerge at different developmental periods in ontogenesis. Adopting the approach emphasized by organizational theorists may help achieve the deflection of maladaptation onto more adaptive developmental pathways, thereby enhancing the individual's greater likelihood of subsequent successful adaptation (Masten 2014, Masten & Cicchetti 2016). Inherent in the organizational perspective is the importance of early intervention, before developmental liabilities may become consolidated (Toth et al. 2013).

The findings of randomized control trial (RCT) interventions also possess important implications for developmental theory. As developmental experiments, randomized control prevention trials provide a wealth of information about the processes of typical and atypical development (Howe et al. 2002, Ialongo et al. 2006). The translation of developmental theory into the design and implementation of preventive interventions and the results of these trials must form a circular link back to the conceptual framework to advance both developmental theory and future randomized intervention trials. If a randomized prevention trial is able to alter the developmental course and to reduce the risk of the disorder or negative outcome, its results can contribute to our understanding of developmental processes (Howe et al. 2002). Conversely, if the reduction of a targeted risk factor does not appear to have altered the pathogenic process, then that risk factor should not be viewed as a causal agent but may be a marker of atypical development (Kraemer et al. 1997).

Cicchetti et al. (2006) conducted a theoretically informed RCT for maltreating mothers and their 1-year-old infants. One-year-old infants from maltreating families ( $N = 137$ ) and their mothers were randomly assigned to one of three intervention conditions: (a) child-parent psychotherapy (CPP), (b) psychoeducational parenting intervention (PPI), and (c) community standard (CS) controls. A fourth group of infants from nonmaltreating families ( $N = 52$ ) and their mothers served as an additional low-income normative comparison (NC) group. At baseline, mothers in the maltreatment group, relative to mothers in the nonmaltreatment group, reported greater abuse and neglect in their own childhoods, more insecure relationships with their own mothers, more maladaptive parenting attitudes, more parenting stress, and lower family support, and they were observed to evince lower maternal sensitivity. Infants in the maltreatment groups had significantly higher rates of disorganized attachment than infants in the NC group. In a postintervention follow-up at age 26 months, children in the CPP and PPI groups demonstrated substantial increases in secure attachment, whereas increases in secure attachment were not found for the CS and NC groups. Moreover, disorganized attachment continued to predominate in the CS group. These results were maintained when intent-to-treat analyses were conducted.

Interestingly, and somewhat surprisingly, both CPP, a relational intervention, and PPI, a nonrelational intervention, were found to be equally efficacious in fostering secure attachment and in reducing disorganized attachment in infants from maltreating families (Cicchetti et al. 2006). However, in a one-year longitudinal follow-up examining the sustained efficacy of these intervention models, only CPP was found to be efficacious in continuing to promote security of

attachment over time (Pickreign-Stronach et al. 2013). These findings suggest that, in cases of extremely maladaptive parenting, more intensive models of interventions that go beyond parent skills training (such as CPP) may be necessary.

The translation of knowledge from the field of developmental psychopathology into the conduct of this clinical trial underscores the importance of broadening such efforts. The results of this RCT are both gratifying and sobering. The fact that plasticity is possible during infancy and that even the most disorganized form of attachment is modifiable in extremely dysfunctional mother-child dyads offers significant hope for thousands of young children and their families. By fostering secure attachment, costlier interventions such as foster care placement, special education services, residential treatment, and incarceration can be averted. Unfortunately, these results also shed light on the harsh reality of the ineffectiveness of services currently being provided in many communities.

An area of paramount importance to move the field forward involves the elucidation of underlying biological processes that are influenced by child maltreatment and of how they may be affected by intervention or moderate treatment effects (Cicchetti & Toth 2015). Given the presence of diverse forms of psychopathology in individuals with histories of child maltreatment (Cicchetti & Valentino 2006), future research will need to disentangle the effects of maltreatment from psychiatric comorbidity when evaluating structural and functional brain anomalies. Although considerably more basic research on neuroimaging in maltreated populations, particularly children and adolescents, is needed, the importance of neuroimaging assessments into RCTs could provide information on the potential malleability of the brain to psychosocial interventions.

Determining the multiple levels at which change is engendered through RCTs will provide insight into the mechanisms of change, the extent to which neural plasticity may be promoted, and the interrelations between biological and psychological processes in the development of maladaptation, psychopathology, and resilience in maltreated children. It would thus be possible to conceptualize efficacious resilience-promoting interventions as examples of experience-dependent neural plasticity (Cicchetti & Curtis 2006). If assessments of biological systems are routinely incorporated into the measurement armamentaria employed in resilience-promoting interventions, then we will be in a position to discover whether the nervous system can be modified by experience (Cicchetti & Gunnar 2008).

## FUTURE ISSUES

1. It is of paramount importance that rigorous and precise definitions of maltreatment experiences be incorporated into all investigations of child maltreatment etiology, sequelae, and intervention.
2. Most investigations of the consequences of child maltreatment have examined neurobiological and psychological systems separately. The time has come to conduct longitudinal research that examines biological and psychological systems concurrently over developmental time.
3. It remains to be discovered whether the neurobiological structural and/or functional difficulties displayed by many abused and neglected children are irreversible or, if reversible, whether there are sensitive periods when neural plasticity is more likely to occur. Because the brain is a dynamic, self-organizing system that is mutable, future neuroimaging research should strive to ascertain whether the brain structure and functioning of resilient maltreated children differ from those of resilient nonmaltreated children.

4. Although some progress in this area has occurred, it is imperative that future research continues to examine mediators that contribute to our understanding of the mechanisms that underlie both the developmental sequelae of maltreatment and intervention efficacy.
5. Despite rapid, promising advances, our understanding of the genetic moderation of intervention outcome, particularly for maltreated children, remains in its infancy. Most interventions have strived to change the environment with no consideration for genetic involvement. Thus, interventions targeting both gene and environment are in a nascent state, and such work must occur more frequently in the future.
6. Research on  $G \times E$  and on epigenetics needs to incorporate, as well as emphasize, a developmental perspective (i.e.,  $G \times E \times D$ ). Genes may influence how environmental experience affects the developmental process, and this may operate differently at various developmental periods. Moreover, the effects of genes and experience at a particular period may be influenced by the effects of prior development. Environments may affect the timing of genetic effects and gene expression. In addition, there are experience effects on the epigenome, and these also may operate differently across the course of development.
7. Prevention and intervention strive to alter the environment in order to bring about positive outcomes. Research on epigenetics suggests that prevention and intervention may also change the epigenome and that this could result in improved outcomes. If researchers are to understand the processes through which early adverse experiences such as child maltreatment impart maladaptation, psychopathology, or resilience, then it is critical that genetic variation (functional polymorphisms) and epigenetic modifications be examined.
8. Genetic effects on intervention efficacy may happen in a number of ways (Belsky & van IJzendoorn 2015). Are some individuals, based on genetic variation, more susceptible to the positive effects of intervention? Are particular interventions more effective on particular individuals based on genetic differences (i.e., should interventions match genotype groups)? Does intervention affect DNA methylation, resulting in changes in gene expressions? DNA methylation changes in response to experience could lead to the design of both prevention and intervention strategies that alter the expression of genes to promote healthy physical and mental outcomes. Given that the demethylated epigenome is transmitted to the next generation, it will be important to determine if decreased child maltreatment risk through efficacious intervention would alter the epigenome, which in turn would result in a less risky epigenome being transmitted to the next generation.

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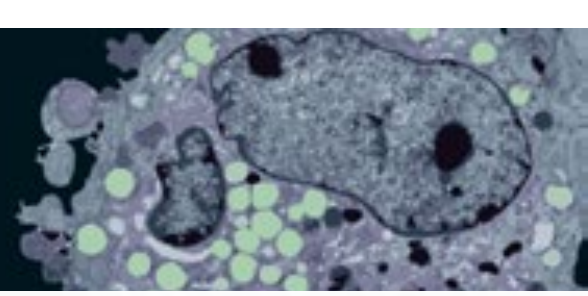
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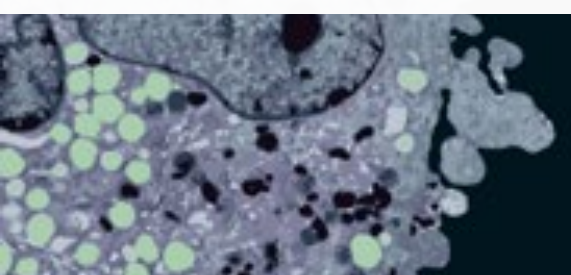
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