

The Effect of Severe Stress on Early Brain Development, Attachment, and Emotions

A Psychoanatomical Formulation



Ricardo M. Vela, MD

KEYWORDS

- Child abuse • Child neglect • Limbic system development • Emotions • Attachment
- Amygdala • Psychoanatomical formulation

KEY POINTS

- Child abuse and neglect are the most severe forms of stress experienced by children and adolescents.
- Child abuse and neglect has severe developmental consequences to the development of the amygdala, septal nucleus, and anterior cingulate gyrus, which are rapidly developing, especially in very early infancy.
- The basic emotions of joy, surprise, sadness, anger, and fear develop in the first 6 months of life. Embarrassment, envy, empathy, pride, shame, and guilt (which requires self-consciousness) develop by 3 years of age.
- Synaptic modification and consolidation is very vulnerable during the experience-expectant, sensitive developmental periods. Child maltreatment may have severe consequences, resulting in maladaptive cell assemblies and synaptic connections.
- The psychoanatomical formulation is a theoretically based explanation used to conceptualize a clinical case by correlating the disturbed neuroanatomy with behavioral and emotional symptom expression. It provides the clinician with an added dimension in understanding a clinical case.

Child neglect and abuse are the most extreme forms of stress in children, with severe effects on social, emotional, interpersonal, and neuronal development. According to the US Department of Health and Human Services, from data submitted by 49 states, the District of Columbia, and the Commonwealth of Puerto Rico, there were 3,184,000 children who received child protective services in 2012. Overall, four-fifths (78.3%) of victims were neglected, 18.3% were physically abused, 9.3% were sexually abused,

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Child and Family Services, North Suffolk Mental Health Association, Massachusetts General Hospital, 301 Broadway, Chelsea, MA 02150, USA

E-mail address: rvela@mgh.harvard.edu

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Abbreviations	
DSM-IV	Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition
DSM-V	Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition
EBS	Electrical brain stimulation
LTP	Long-term potentiation
NIMH	National Institute of Mental Health
PAG	Periaqueductal gray matter
PTSD	Posttraumatic stress disorder

and 8.5% were psychologically maltreated.¹ Child neglect is associated with adverse psychological and educational outcomes and it is hypothesized that these outcomes may be caused by adverse brain development.² Early life trauma is associated with persistent developmental brain changes that mediate the increased diathesis not only to mood and anxiety disorders but also to depression, posttraumatic stress disorder (PTSD), schizophrenia, and bipolar disorder.³

Animal and human studies have expanded knowledge of the emotional or limbic system, and provided insight into how normal and abnormal development unfolds. This article introduces the concept of the psychoanatomical formulation, developed by the author and defined as a theoretically based explanation used to conceptualize a clinical case by correlating the disturbed neuroanatomy with behavioral and emotional symptom expression. Following the vignette of a neglected 2.5-year-old child, the development and function of limbic structures involved in emotions and attachment is discussed, with emphasis on the first year of life. Next, the emergence of basic emotions in children from birth to 3 years is reviewed, followed by a discussion of basic principles of neural and synaptic development and their implications for child abuse and neglect. In addition, the developmental neuroanatomy of child neglect is brought together in the context of the psychoanatomical formulation of the case vignette.

CLINICAL VIGNETTE: A 2.5-YEAR-OLD GIRL WITH DISINHIBITED SOCIAL ENGAGEMENT DISORDER

Amy was 2.5 years old when her adoptive parents brought her to the child psychiatry clinic for evaluation and treatment of her emotional and behavioral problems, after requesting a referral from the pediatrician. The child appeared to be oblivious of danger and very accident prone. She would fall a lot; bump into furniture and walls; scream inconsolably, sometimes for an hour; and fight with her 4-year-old and 5-year-old adoptive brothers. Amy showed difficult behavior and frequent temper tantrums at the Head Start program she attended. She had out-of-control episodes, being aggressive, biting other children and, overall, being unpredictable. Her adoptive parents were appropriately concerned because Amy often went to strangers and was very friendly with them. On several occasions, she tried to leave the house with strangers who came to the door. She did not seem to show any wariness of unfamiliar people.

Past history revealed that Amy was born to Latino parents with no perinatal complications. Her biological father had been in jail since before Amy was born. Early history revealed disruptive, unstable, and chaotic child rearing. She was under the care of her biological mother from birth until 5 months of age. During that time her mother neglected taking care of her and failed to provide basic emotional needs for affection and reliable mother-child interactions. Her mother left her with multiple caregivers. She was moved consecutively to different homes of a relative and a friend before the Department of Social Services got involved when Amy was 20 months old. She was then placed with the current adoptive parents.

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