

The Impact of Abuse and Neglect on the Developing Brain

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Each year in the United States alone, there are over three million children that are abused or neglected. These destructive experiences impact the developing child, increasing risk for emotional, behavioral, academic, social and physical problems throughout life. The purpose of this article is to outline how these experiences may result in increased risk by influencing the development and functioning of the child's brain.

The Brain

The human brain is an amazing and complex organ. It allows us to think, act, feel, laugh, speak, create and love. The brain mediates all of the qualities of humanity, good and bad. Yet the core "mission" of the brain is to sense, perceive, process, store, and act on information from the external and internal environment to promote survival. In order to do this, the human brain has evolved an efficient and logical organization structure.

The brain has a bottom-up organization. The bottom regions (i.e., brainstem and midbrain) control the most simple functions such as respiration, heart rate and blood pressure regulation while the top areas (i.e., limbic and cortex) control more complex functions such as thinking and regulating emotions.

Brain Development

At birth, the human brain is undeveloped. Not all of the brain's areas are organized and fully functional. It is during childhood that the brain matures and the whole set of brain-related capabilities develop in a sequential fashion. We crawl before we walk, we babble before we talk.

The development of the brain during infancy and childhood follows the bottom-up structure. The most regulatory, bottom regions of the brain develop first; followed, in sequence, by adjacent but higher, more complex regions.

The process of sequential development of the brain and, of course, the sequential development of function, is guided by experience. The brain develops and modifies itself in response to experience. Neurons and neuronal connections (synapses) change in an activity-dependent fashion. This "use-dependent" development is the key to understanding the impact of neglect and trauma on children.

These areas organize during development and change in the mature brain in a "use-dependent" fashion. The more a certain neural system is activated, the more it will "build-in" this neural state: what occurs in this process is the creation of an "internal representation" of the experience corresponding to the neural activation. This "use-dependent" capacity to make an "internal representation" of the external or internal world is the basis for learning and memory. The simple and unavoidable result of this sequential neurodevelopment is that the organizing, "sensitive" brain of an infant or young child is more malleable to experience than a mature brain. While experience may alter and change the functioning of an adult, experience literally provides the organizing framework for an infant and child.

The brain is most plastic (receptive to environmental input) in early childhood. The consequence of sequential development is that as different regions are organizing, they require specific kinds of experience targeting the region's specific function (e.g., visual input while the visual system is organizing) in order to develop normally. These times during development are called critical or sensitive periods.

Traumatic Experiences and Development

With optimal experiences, the brain develops healthy, flexible and diverse capabilities. When there is disruption of the timing, intensity, quality or quantity of normal developmental experiences, however, there may be devastating impact on neurodevelopment — and, thereby, function. For millions of abused and neglected children, the nature of their experiences adversely influences the development of their brains.

During the traumatic experience, these children's brains are in a state of fear-related activation. This activation of key neural systems in the brain leads to adaptive changes in emotional, behavioral and cognitive functioning to promote survival. Yet, persisting or chronic activation of this adaptive fear response can result in the maladaptive persistence of a fear state. This activation causes hypervigilance, increased muscle tone, a focus on threat-related cues (typically non-verbal), anxiety, behavioral impulsivity — all of which are adaptive during a threatening event yet become maladaptive when the immediate threat has passed.

This is the dilemma that traumatic abuse brings to the child's developing brain. The very process of using the proper adaptive neural response during a threat will also be the process that underlies the neural pathology, which causes so much distress and pain through the child's life. The chronically traumatized child will develop a host of physical signs (e.g., altered cardiovascular regulation) and symptoms (e.g., attentional, sleep and mood problems) which make their lives difficult.

There is hope, however. The brain is very "plastic" — meaning it is capable of changing in response to experiences, especially repetitive and patterned experiences. Furthermore, the brain is most plastic during early childhood. Aggressive early identification and intervention with abused and neglected children has the capacity to modify and influence development in many positive ways.

The elements of successful intervention must be guided by the core principles of brain development. The brain changes in a use-dependent fashion. Therapeutic interventions that restore a sense of safety and control are very important for the acutely traumatized child. In cases of chronic abuse and neglect, however, the very act of intervening can contribute to the child's catalogue of fearful situation. Investigation, court, removal, placement, re-location, and re-unification all contribute to the unknown, uncontrollable and, often, frightening experiences of the abused child. Our systems, placements and therapeutic activities can diminish the fearful nature of these children's lives by providing consistency, repetition (familiarity), nurturance, predictability and control (returned to the child). Yet the poorly coordinated, over-burdened and reactive systems mandated to help these children rarely can provide those key elements.

Prevention and Policy

What we are as adults is the product of the world we experienced as children. The way a society functions is a reflection of the childrearing practices of that society. Today, we reap what we have sown. Despite the well-documented critical nature of early life experiences, we dedicate few resources to this time of life. We do not educate our children about development, parenting or about the impact of neglect and trauma on children. As a society we put more value on requiring hours of formal training to drive a car than we do on any formal training in childrearing.

In order to prevent the development of impaired children, we need to dedicate resources of time, energy and money to the complex problems related to child maltreatment. We need to understand the indelible relationship between early life experiences and cognitive, social, emotional, and physical health. Providing enriching cognitive, emotional, social and physical experiences in childhood could transform our culture.

But before our society can choose to provide these experiences, it must be educated about what we now know regarding child development. Education of the public must be coupled with the continuing generation of data regarding the impact of both positive and negative experiences on the development of children. All of this must be paired with the implementation and testing of programs dedicated to enrich the lives of children and families and programs to provide early identification of, and proactive intervention for, at-risk children and families.

The problems related to maltreatment of children are complex and they have complex impact on our society. Yet there are solutions to these problems. The choice to find solutions is up to us. If we choose, we have some control of our future. If we, as a society, continue to ignore the laws of biology, and the

inevitable neurodevelopmental consequences of our current childrearing practices and policies, our potential as a humane society will remain unrealized. The future will hold sociocultural devolution — the inevitable consequence of the competition for limited resources and the implementation of reactive, one-dimensional and short-term solutions.

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