

Brain Development



The basic development of the brain happens over time beginning before birth and continuing into adulthood. It is through the interactive influences of genetics and experiences that the actual physical development of the brain occurs. There are specific, sensitive periods of time during which some parts of the brain grow and develop the best. Genetics determine when the different electrical and chemical “circuits” of the brain are formed and our experiences shape how those circuits are built.¹

While there are many parts of the brain that perform different functions, there are three main parts that are important to understand when addressing trauma: the brainstem, the limbic region and the cortex.

Brainstem

Brain development occurs from the bottom up. The brainstem is located at the very bottom of the brain. This is where basic biologic functions are controlled including heart rate, breathing and body temperature regulation. It also controls states of arousal like hunger; relaxation; sleep; wakefulness; and the fight, flight and freeze responses that are responsible for survival during times of danger.

Limbic Region

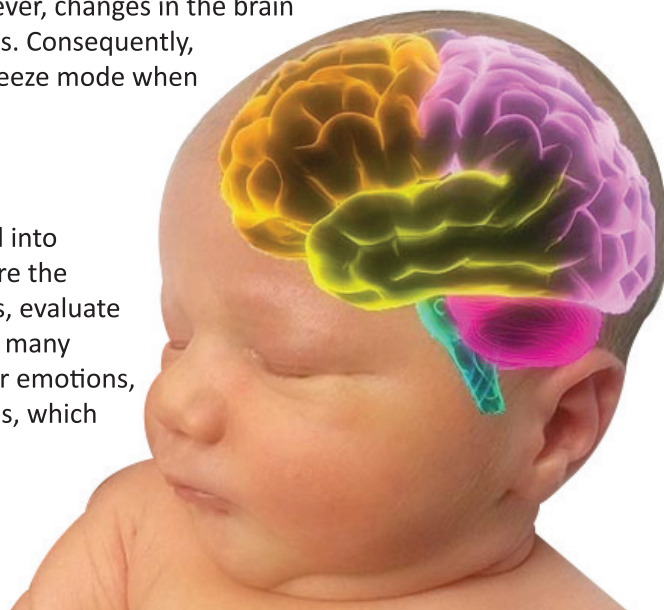
Directly above the brainstem is the limbic region. This part of the brain works closely with the brainstem to create and manage emotions and is responsible for making decisions about whether something is good or bad. It also plays a critical role in how we become emotionally attached to others and thus form relationships. The need for attachment is “hardwired” into the brain and causes us to seek connection with one another. This hardwiring actually means that being in relationship with others is critical not only to healthy growth and development but also to survival itself.

The limbic area also controls stress hormones. When faced with overwhelming situations with which we cannot adequately manage or cope, stress hormone levels often stay elevated over time. Traumatic experiences can cause changes to this area of the brain resulting in stress hormone levels that not only interfere with the proper growth and development of the brain, but may actually become toxic. Once these changes occur, the brain becomes overly sensitive to danger, resulting in difficulty determining which situations are “real danger” and which are not. Because of this, the traumatized brain often perceives danger in situations where none exists.

Another function of the limbic region is the creation of different forms of memory. These memories help us recognize danger at an instinctual level. This is important for survival. However, changes in the brain due to trauma can cause it to “misread” or misinterpret situations. Consequently, memories of past experiences can push us into a fight-flight-or freeze mode when there is no danger.

Cortex

The cortex makes up the outer layer of the brain and is separated into two different parts: the cortex and the prefrontal cortex. These are the brain’s “thinking” parts and allow us to plan, anticipate outcomes, evaluate situations and experiences, and coordinate interactions between many areas of our brain. This area also helps us thoughtfully control our emotions, giving us the ability to manage frustrations and build relationships, which helps us be more successful in school, work, and life.



¹ National Center for Infants, Toddlers, and Families. “Zero To Three Brain FAQ.” Accessed Aug. 31, 2015. http://main.zerotothree.org/site/PageServer?pagename=ter_key_brainFAQ

The Brain on ACEs

Adverse Childhood Experiences (ACEs) are the “not ok” events that sometimes happen in our lives. These events can adversely or negatively affect our brain growth and development and often have long term negative health outcomes. In fact, research shows that there is a direct correlation between the number of ACEs a person experiences and the ability to form healthy relationships as well as how memory works and consequently the ability to learn. ACEs are common and tend to occur in clusters rather than as a single experience, thereby increasing the risk for adverse effects on the brain and other body systems, as well as social, emotional, and intellectual impairments. These experiences can have lasting effects on both the structure and function of the brain.

Since the brain functions on a “use it or lose it” basis, the parts of the brain that are most stimulated are the parts that are the most developed or “strongest.” Consequently, when ACEs are prevalent in our lives those most primitive parts of our brain (brain stem and limbic systems) grow stronger while our cortex and prefrontal cortex become underdeveloped. Radiologic studies show that brains exposed to a high number of ACEs are actually smaller than brains that have had fewer ACEs (or none). There is also less activity in the higher brain structures as opposed to the limbic and brain stem regions.

Resiliency

The good news is that the negative effects of ACEs can be minimized as resiliency is increased. This is true across the age spectrum. Resiliency is what helps us to bounce back when bad things happen and overcome the negative effects that ACEs can have. By working on building safe, nurturing relationships and learning to regulate emotions we can help the brain to heal, opening the opportunity to live rich, successful and fulfilling lives while minimizing the long term negative effects of the adverse events in our lives (see toolkit section titled Resilience).



MORE INFORMATION



Stress and Early Brain Development: Understanding Adverse Childhood Experiences (ACEs) handouts

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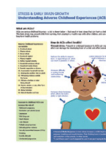
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Stress and Early Brain Development: Understanding Adverse Childhood Experiences (ACEs) handouts



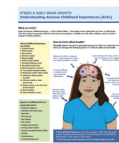
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