

BRAIN SCIENCE - THE EARLY CHILDHOOD BRAIN

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A growing body of work, much of it from the Center on the Developing Child at Harvard, has shown that healthy brain development in the early years is critical for better outcomes later in life. Read below for a brief summary of key research findings.

- **The period between birth and five years is a time of rapid cognitive, linguistic, social, emotional, and motor development** (Center on the Developing Child, 2007).
- **The pace of brain development during this period is faster than at any other time. As a result, the brains of young children are highly vulnerable to traumatic circumstances, negative relationships, or the absence of essential experiences.** The plasticity of the early brain cuts both ways: the young child is both extremely responsive to positive experiences and extremely vulnerable to adverse experiences and deprivation. [2]
- **Critical aspects of brain architecture begin to be shaped by experience before and soon after birth**, and many fundamental aspects of that architecture are established well before a child enters school. The brain starts out with a great number of neural connections. Through a process called pruning, pathways that are not used will disappear. This loss is irreversible after the early years. Early experiences shape the number of pathways that will be retained and the quality of the connections among different parts of the brain. (Center on the Developing Child, 2007[2])
- **Toxic stress in early childhood can disrupt the development of the brain architecture, leading to cognitive, social, and psychological impairments in adulthood.** Toxic stress is a biological response to strong and frequent or prolonged adversity in the absence of adequate adult support. It can be triggered by such adverse situations as physical or emotional abuse, parents suffering substance abuse or mental illness, exposure to violence, and the burdens and stresses associated with family economic hardship. The neurobiological aftermath of toxic stress includes greater likelihood of anti-social behavior, lower achievement in school and at work, and poor physical and mental health.[3]
- **Early experiences shape the way children will respond to stress in the future.** The brain systems for coping with stress are particularly malleable during the early childhood periods. Early experiences shape how readily they are activated and how well they can be turned off. A poorly controlled stress-response system can have consequences for later physical and mental health. [4] Loman, & Gunnar, in press; National Scientific Council on the Developing Child, 2005).
- **The relationships children have with their caregivers play critical roles in regulating stress hormone production during the early years of life.** Children who experience the benefits of secure relationships have a more controlled stress hormone reaction when they are upset or frightened. In contrast, children whose relationships are insecure or disorganized demonstrate higher stress hormone levels when they are even mildly frightened (National Scientific Council on the Developing Child, 2005).

- **Early development establishes a solid foundation on which higher-level brain functions can develop.** Early experiences lay the foundation for cognitive and social skills, and the brain architecture and neurochemistry undergirding those skills. The mastery of skills needed for economic success in adulthood, and the associated brain development, proceed in a hierarchical fashion, where earlier learning serves as a foundation upon which later skills are built. The capacity for change – both in terms of developing skills and of the brain’s neural circuitry – is greatest in early life and decreases over time. [1]

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2. Shonkoff, J. P., & Phillips, D. A. (2000). *From neurons to neighborhoods: The science of early childhood development*. Washington, DC: National Academy Press.
3. Shonkoff, J. P., Siegel, B. S., Dobbins, M. I., Earls, M. F., Garder, A. S., McGuinn, L., Pascoe, J., Wood, D. L. (2011). *Early Childhood Adversity, Toxic Stress, and the Role of the Pediatrician: Translating Developmental Science Into Lifelong Health Pediatrics*.
4. Zhang, T. Y., Parent, C., Weaver, I., & Meaney, M. J. (2004). Maternal programming of individual differences in defensive responses in the rat. *Annals of the New York Academy of Sciences*, 1032, 85-103.