



# Early Experiences Shape the Brain

Science can inform how we build a strong foundation for a prosperous society. The following set of core developmental concepts emerged from decades of rigorous research in neuroscience, developmental psychology, and the economics of human capital formation.

## Four Numbers to Remember about Early Childhood

# 700

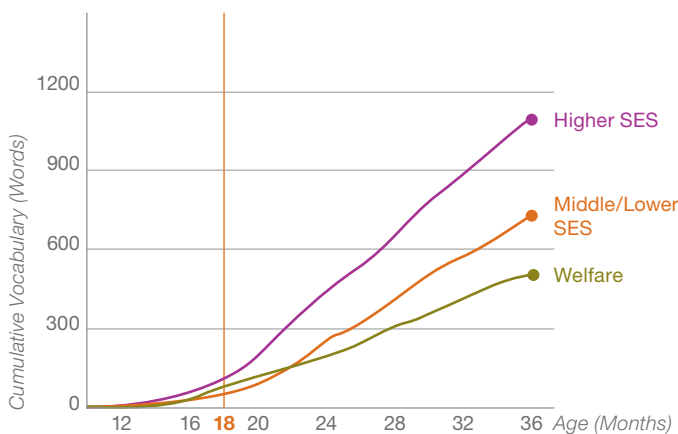
**new neural connections are formed every second**

In the first few years of life, 700 new neural connections are formed every second. Neural connections are formed through the interaction of genes and a baby's environment and experiences, especially "serve and return" interaction with adults, or what developmental researchers call contingent reciprocity. For better or worse, these are the connections that build brain architecture—the foundation upon which all later learning, behavior, and health depend.

Source: National Scientific Council on the Developing Child, 2009.

## Disparities in Early Vocabulary Growth

Differences in vocabulary growth between children in low and high socio-economic households begin to appear as early as 18 months. And, as children grow toward school age, and enter school, the differences only get larger in the absence of intervention.



# 18 Months:

**age at which vocabulary disparities begin to appear**

Differences in the size of children's vocabulary first appear at 18 months of age, based on whether they were born into a family with high education and income or low education and income. By age 3, children with college-educated parents or primary caregivers had vocabularies two to three times larger than those whose parents had not completed high school.

Source: Hart, B., & Risley, T. (1995). Meaningful Differences in the Everyday Experiences of Young American Children. Baltimore, MD: Brookes.

# 90–100%

**chance of developmental delays when children experience 6 or 7 risk factors**

Significant adversity impairs development in the first three years of life—and the more adversity a child faces, the greater the odds of a developmental delay. In fact, risk factors such as poverty, caregiver mental illness, child maltreatment, single parenthood, and low maternal education have a cumulative impact: children exposed to six or seven of these risks face a 90–100 percent likelihood of having one or more delays in their cognitive, language, or emotional development.

Source: Barth, et al. (2007). Developmental Status and Early Intervention Service Needs of Maltreated Children. Washington, DC: U.S. Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation.

# 3:1

**odds of adult heart disease after 7 or 8 adverse childhood experiences**

Early experiences carry lifelong effects—not just on cognitive and emotional development, but on long-term physical health as well. A growing body of evidence now links significant adversity in childhood to increased risk of a range of adult health problems, including diabetes, hypertension, stroke, obesity, and some forms of cancer. Adults who recall having seven or eight serious adverse experiences in childhood are three times more likely to have cardiovascular disease as an adult.

Source: Edwards, et al. (2005). "The wide-ranging health consequences of adverse childhood experiences." In Kathleen Kendall-Tackett and Sarah Giacomoni (eds.) Victimization of Children and Youth: Patterns of Abuse, Response Strategies, Kingston, NJ: Civic Research Institute.

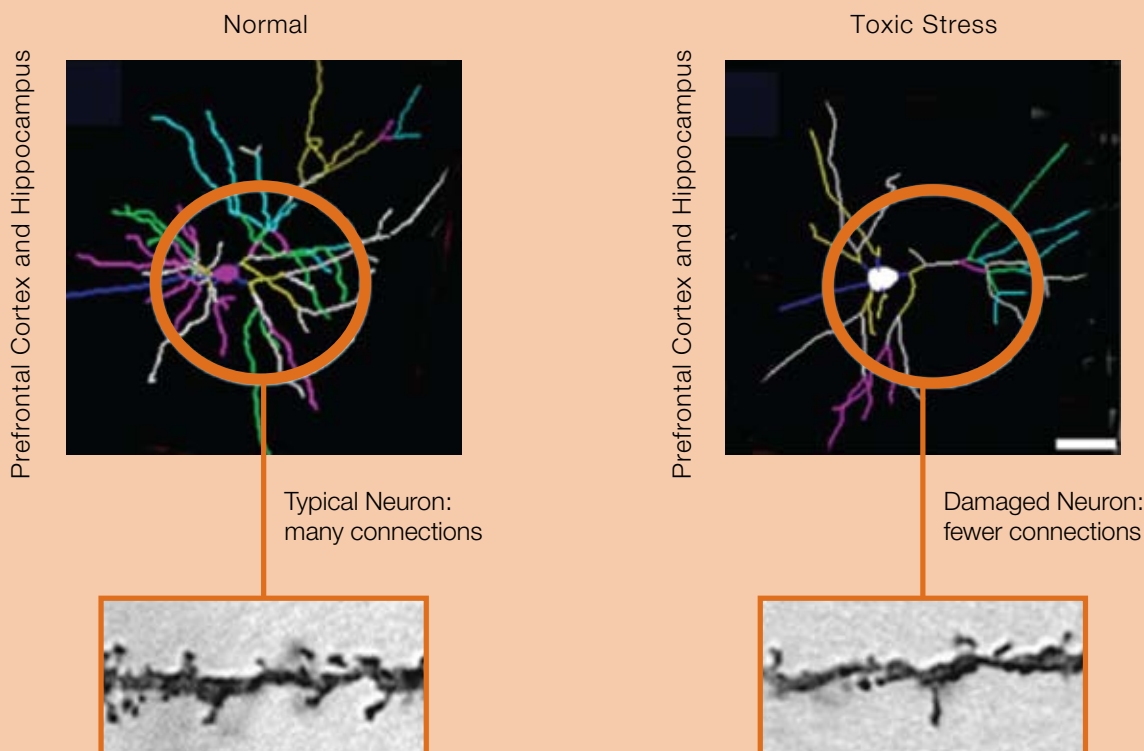
## What these four numbers tell us:

- Getting things right the first time is easier and more effective than trying to fix them later.
- Early childhood matters because experiences early in life can have a lasting impact on later learning, behavior, and health.
- Highly specialized interventions are needed as early as possible for children experiencing toxic stress, which occurs when prolonged exposure to adverse experiences triggers abnormal levels of stress hormones that can disrupt developing brain circuits.
- All of society benefits from investments in early childhood programs.



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## Persistent Stress Changes Brain Architecture



Source: Radley et al. (2004) and Bock et al. (2005)

**Brain architecture is constructed through an ongoing process** that begins before birth and continues into adulthood. The early years are the most active period for establishing the neural connections that comprise our brain architecture. As it emerges, the quality of that architecture establishes either a sturdy or a fragile foundation for all the capabilities and behavior that follow.

**Skill begets skill as brains are built** from the bottom up. Increasingly complex circuits and skills build on simpler circuits and skills over time.

**The interaction of genes and experience shapes the circuitry of the developing brain.** Young children serve up frequent invitations to engage with adults, who are either responsive or unresponsive to their needs. This “serve and return” process is fundamental to the wiring of the brain, especially in the early years. Children develop in an environment of relationships that begin in the home but also includes adults and peers in the extended family, providers of early care, education, and other services for families, and members of the community.

**Cognitive, emotional, and social capacities are inextricably intertwined.** Learning, behavior, and both physical and mental health are highly interrelated. One domain cannot be targeted without affecting the others.

Although manageable levels of stress are normative and growth-promoting, **toxic stress in the early years can damage developing brain architecture** and lead to problems in learning and behavior, as well as increased susceptibility to physical and mental illness. Toxic stress refers to the damaging, sustained activation of the body’s stress response system, which can occur when a child is exposed to such experiences as severe poverty, violence, maltreatment, neglect, or parental mental health impairments in the absence of stable, nurturing relationships with adults.

**Brain plasticity and the ability to change behavior decrease over time.** The brain is remarkably adaptable throughout life, but getting it right early is more effective and less costly—to society and to individuals—than trying to fix it later.

Source: Center on the Developing Child, Harvard University, [www.developingchild.harvard.edu](http://www.developingchild.harvard.edu)



HOW EARLY LEARNING BENEFITS CHILDREN AND THE NATION