



Early Brain and
Child Development
BUILDING BRAINS, FORGING FUTURES
A Program of the American Academy of Pediatrics

Early Brain
and Child
Development

About

A Public Health Approach to Toxic Stress

The Science

Eco-Bio-
Developmental Model
of Human Health and
Disease

Social Emotional
Safety Net Diagram

What it Means for
Pediatricians:
Translating the
Science into
Practice

Clinical Practice Transformation

Advocacy and Education

Resource Library

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What it Means for Pediatricians: Translating the Science into Practice



The basic developmental science is clear, but how do we take that science and apply it in the clinical setting? Click on the following topics to reveal how they relate to the science and how that translates into pediatric practice.

▼ Nature vs Nurture

What Developmental Science Says

Epigenetic mechanisms (like DNA methylation and histone de-acetylation) and the foundational architecture of the developing brain are exquisitely sensitive to the environment. The early childhood ecology is biologically "embedded," both in the way the child's genome is utilized and in the developing brain's basic circuitry. These epigenetic marks and foundational circuits influence lifelong learning, behavior, and health.

Actions For Pediatricians

Apply an ecobiodevelopmental framework and recognize that adverse psychosocial factors (poverty, domestic violence, parental mental illness or substance abuse) are no less biological than lead poisoning or poor nutrition.

Collaborate with families and local service providers to improve the early childhood ecology, both to improve life-course trajectories and to address the biologic mediators underlying disparities in health and education.

▼ The Foundational Nature of Early Connections & Circuits

What Developmental Science Says

Brain development is cumulative in that early, simple connections and circuits form the foundation for more complex pathways and behaviors. Much like muscles, connections and circuits that are used frequently become stronger and more efficient over time ("neurons that fire together, wire together"). However, those connections and circuits that are not utilized are pruned and eliminated ("if you don't use it, you lose it").

Actions For Pediatricians

Pediatricians need to assist families in recognizing and encouraging rudimentary yet foundational skills as they emerge. The social smile at 6 weeks sets the stage for cooing conversations, which in turn leads to babbling and, eventually, spoken language.

▼ Brain Plasticity

What Developmental Science Says

Brain plasticity declines with age. Plasticity, or the ability of the brain to rewire itself in response to changes in the environment, is waning by the time children begin kindergarten.

Actions For Pediatricians

Pediatricians must work with families and daycares to ensure that the brain's wiring is right the first time. Remediation, while possible, is much more difficult.

▼ Brain Development is Integrated

What Developmental Science Says
Brain development is highly integrated in that the areas supporting memory and learning are inextricably connected to the areas supporting social, emotional, and language development.

Actions For Pediatricians
Pediatricians must be advocates for “whole child” development and education. Efforts to improve social-emotional skills increase cognitive test scores.

▼ Brain Development is Dynamic

What Developmental Science Says
Brain development is dynamic, with different structures/functions developing at different rates and times. Specifically, structures that underlie the physiologic stress response (e.g., amygdala) appear to mature sooner than those structures that assist in modulating or turning off the stress response (e.g., prefrontal cortex).

Brain development is disrupted by chronic exposure to the mediators of the physiologic stress response (CRH, cortisol, adrenaline, etc.). Significant adversity in childhood can lead to a vicious cycle of stress that is toxic to important structures like the hippocampus and prefrontal cortex. This “toxic stress” is a “common denominator,” a biological mechanism underlying well established associations between various forms of childhood adversity (abuse, neglect, domestic violence, parental mental illness or substance abuse) and less than optimal life course trajectories (see the ACE Study).

Actions For Pediatricians
Pediatricians need to educate families that children are biologically predisposed to more physiologic stress, and that the critical brain structures that modulate this stress mature later. Young children need safe, stable, and nurturing relationships to assist them in regulating their stress.

Pediatricians must advocate for a public health approach to address toxic stress, including 1) “common messaging” to prevent or minimize toxic stress (campaigns to discourage corporal punishment and to encourage Reach Out and Read), 2) screening families and children for common precipitants of toxic stress (poverty, domestic violence, parental mental illness or substance abuse), and 3) collaborating with local resources to address the consequences of toxic stress.

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