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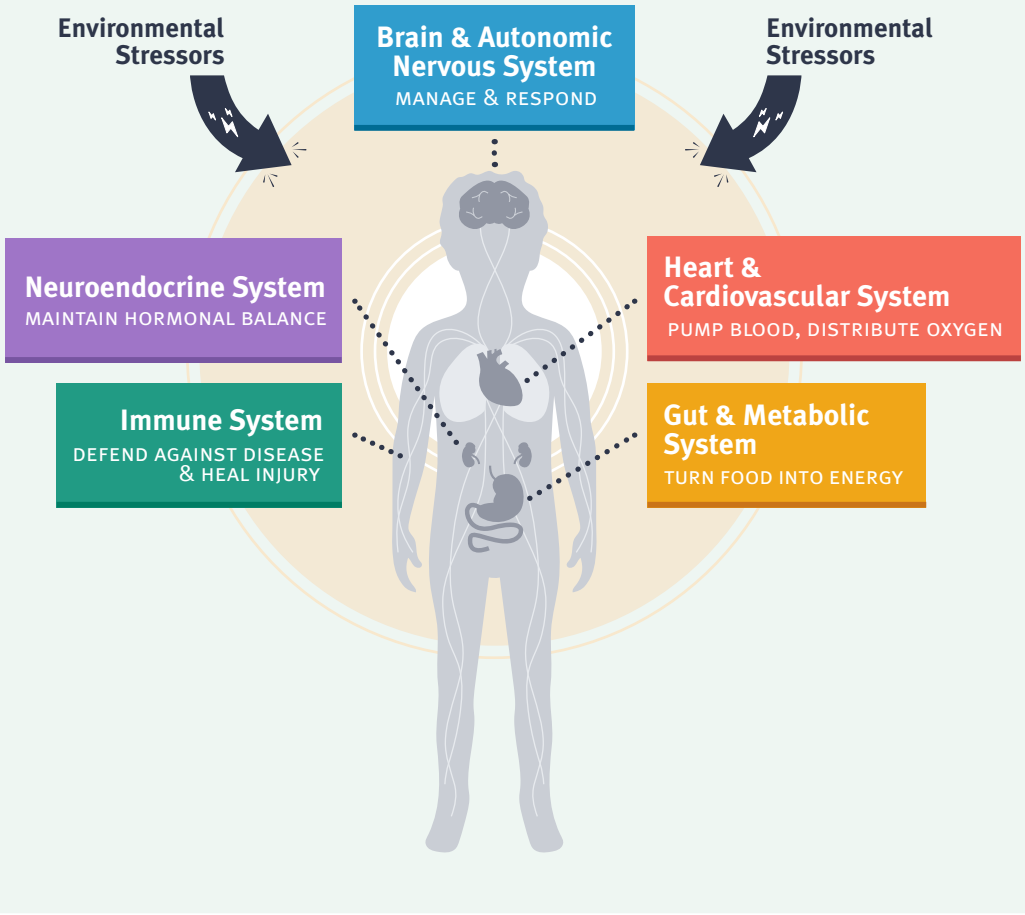
Early Brain and Childhood Development 101: Why Peekaboo Matters

Core Concepts

1. Experiences literally build brain architecture
2. Serve & return interaction shapes brain circuitry
3. Toxic stress derails healthy development

In medical school, we learn the science behind health and disease. How do nephrons filter blood that runs through the network of capillaries in the glomerulus, and what disease occurs when that process goes awry? How do myocytes conduct electricity, and how do aberrations in conduction lead to arrhythmias?

Our understanding of early brain and child development, including how the architecture of brains develops over time and the adverse events that can occur if the expected environment is disrupted, comes from a growing body of science that explains not only brain development, but also how the brain is connected to the rest of the body. Understanding this science informs not only how we can promote health in our pediatric patients, but also how we approach problems in childhood with both mental and physical health.



The three core concepts of early childhood development:

1

EXPERIENCES LITERALLY BUILD BRAIN ARCHITECTURE

The basic architecture of the brain is constructed through a process that begins early in life and continues into adulthood. Simpler circuits come first and more complex brain circuits build on them later. In the first few years of life, more than 1 million new neural connections form every second.

After this period of rapid proliferation, connections are reduced through a process called pruning, which allows brain circuits to become more efficient. Brain architecture consists of billions of connections between individual neurons across different areas of the brain. Genes provide the basic blueprint for brain architecture, but these circuits are reinforced by repeated use, and experiences influence how or whether genes are expressed.

Together, genes and experiences shape the quality of brain architecture and establish either a sturdy or a fragile foundation for all of the learning, health, and behavior that follow. Plasticity, or the ability for the brain to reorganize and adapt, is greatest in the first years of life and decreases with age.

2

SERVE AND RETURN INTERACTION SHAPES BRAIN CIRCUITRY

One of the most essential experiences in shaping the architecture of the developing brain is "serve and return" interaction between children and significant adults in their lives. Young children naturally reach out for interaction through babbling, facial expressions, and gestures, and adults respond with the same kind of vocalizing and gesturing back at them.

This back-and-forth process is fundamental to the wiring of the brain, especially in the earliest years. There is a large amount of evidence from developmental psychology about the importance of contingent, reciprocal interaction for many aspects of early childhood development. An increasing number of more recent studies, utilizing brain imaging and other new technologies, now document the impact of nurturing, supportive interaction and "sensitive caregiving" on both brain function and structure.

Because neural circuits are reinforced by repeated use, experiencing serve-and-return interactions regularly during the earliest years and beyond (with adult caregivers—whether in the family or community), strengthens these connections and builds a strong foundation for future learning.

A simple game like peekaboo with an infant or toddler is an example of serve-and-return interaction.

If an adult's responses to a child are unreliable, inappropriate, or simply absent, the developing architecture of the brain may be disrupted, and subsequent physical, mental, and emotional health may be impaired. The persistent absence of serve-and-return interaction acts as a "double whammy" for healthy development: not only does the brain not receive the positive stimulation it needs, but the body's stress response is activated, flooding the developing brain with potentially harmful stress hormones. This can ultimately lead to disparities in learning and behavior.

3

TOXIC STRESS DERAILS HEALTHY DEVELOPMENT

Learning how to cope with mild or moderate stress is an important part of healthy child development. When faced with novel or threatening situations, our bodies respond physiologically with increasing heart rate, blood pressure, and cortisol release. When a young child's stress response systems are activated in the context of supportive relationships with adults, these physiological effects are buffered and return to baseline levels.The result is the development of a healthy stress response system.

However, if the stress response is extreme or long-lasting, and buffering relationships are unavailable to the child, the result can be toxic stress, leading to damaged, weakened bodily systems and brain architecture, with lifelong repercussions.

Toxic stress refers to strong, frequent, or prolonged activation of the body's stress management system. Stressful events that are chronic, uncontrollable, and/or experienced without children having access to support from caring adults tend to provoke these types of toxic stress responses. Studies indicate that toxic stress can have an adverse impact on brain architecture.

In the extreme, such as in cases of severe, chronic abuse, especially during early, sensitive periods of brain development, the regions of the brain involved in fear, anxiety, and impulsive responses may overproduce neural connections while those regions dedicated to reasoning, planning, and behavioral control may produce fewer neural connections.

Extreme exposure to toxic stress can change the stress system so that it responds at lower thresholds to events that might not be stressful to others, and, therefore, the stress response system activates more frequently and for longer periods than is necessary, like revving a car engine for hours every day. This wear and tear increases the risk of stress-related physical and mental illness later in life.

Not all young children who have been exposed to significant early stresses will develop stress-related disorders. In both animal and human studies, interventions that provide consistent, predictable, and nurturing care help to stimulate positive adaptation and prevent poor outcomes. Science tells us that some children develop resilience, or the ability to overcome serious hardship, while others do not.

The single most common factor for children who develop resilience is at least one stable and committed relationship with a supportive parent, caregiver, or other adult. These relationships provide the personalized responsiveness, scaffolding, and protection that buffer children from developmental disruption. They also build key capacities—such as the ability to plan, monitor, and regulate behavior—that enable children to respond adaptively to adversity and thrive. This combination of supportive relationships, adaptive skill-building, and positive experiences is the foundation of resilience.

SOURCES FOR FURTHER READING

KEY CONCEPTS: BRAIN ARCHITECTURE

A GUIDE TO SERVE AND RETURN:
HOW YOUR INTERACTION WITH CHILDREN CAN BUILD BRAINS

A GUIDE TO TOXIC STRESS