

Class 5
Brain Development

Readings:

Healy: Preface, Chapters 1, 2, 3

Article:

What Have We Learned from Recent Brain Research?

Discussion Questions:

What is the basic structure of the brain?

What is the triune brain?

What are neurotransmitters and what is their function?

What are the best toys for brain-building?

What are synapses?

What is cortisol?

What helps healthy brains develop?

What Have We Learned from Recent Brain Research?

Compiled by Alice Nakahata

1. The brain is the most immature of all organs at birth. This enables it to develop in response to the demands of the environment.
2. It is believed that most of the neurons or nerve cells that make up the brain are formed before birth. Growth comes primarily from the connections or synapses that are formed in response to sensations and actions of the infant after birth. Synapse formation is ongoing and is especially rapid in the early months so that by 8 months, there are thought to be 1,000 trillion synapses in the baby's brain.
3. Experiences determine the connecting or "wiring" of the brain. Connections are broken when they are not used; connections that are used become stronger. For the growing child, this means that a variety of experiences that use all the senses, create positive emotions, and give opportunities to master physical skills are needed for developing a rich network of connections.
4. During early childhood, there is a pruning of synaptic connections that promote efficiency and determine useful organization.
5. The brainstem is the most developed at birth, followed by development in the limbic area and the sensory-motor areas of the cortex, thus bottom-to-top. In the cortex, the prefrontal area is the last to develop, this general direction of development is back-to-front.
6. The foundation for forming a rich network of connections is a sense of security and predictability. Uncertainty about the ability to get needs met make a child more susceptible to feelings of anxiety and stress, resulting in the more primitive parts of the brain (whose responsibility it is to ensure survival) becoming over-active, thus impeding learning.
7. Recent findings indicate that *cortisol*, a hormone produced when the body is stressed, can destroy neurons and synaptic connections. Research also shows that young children are buffered from the destructive effects of *cortisol* by secure emotional relationships with a responsive, nurturing caregiver.
8. Studies of children subjected to long term stress and trauma indicate that brains become organized for a state of "high alert" so that bodily response, perception, and reaction are focused for self-protection, thus obstructing the ability to learn.

These findings tell us that the early years are a particularly sensitive time for healthy brain development. It also tells us that learning occurs when young children have caring, responsive adults and an organized environment rich in sensory and exploratory experiences.