Early Brain Development: Knowledge for Social Work Practice

Terri Combs-Orme, Ph.D.
Urban Child Institute Endowed Professor
College of Social Work
University of Tennessee
tcombs-orme@utk.edu

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Take-Home Messages for Today

• Your genetics are only part of who you are.
• Your environment & experiences determine how your genes are expressed, through chemical changes in your body.
• Early adversity changes your neurophysiology.
• However—such changes can be reversible.
How We Develop

• Brain development is genetically programmed but can only occur in response to environment (PIE)
• Molecular changes occur due to exposures & experience, influencing gene expression
• *From the moment of conception*
Quick Review of Genetics: Person in Environment

• Recombination
• X-Y or X-X
• Genes do not cause traits—they make proteins
Most epigenetic tags erased; some may remain
But—it’s not the genes you have
What do these things have in common?
Basic Terminology

- Axons: projections from neurons that transmit signals to other neurons
- Dendrites: projections from neurons that receive *signals* from other neurons
- Both begin forming prenatally & continue throughout life
  (fewer new ones later)
Basic Terminology Continued

• Neurotransmitters: Chemicals that cross the connections between neurons so neurons can work together
• Examples: serotonin, dopamine
Basic Terminology

• Synapses: connections among neurons formed when they communicate with each other
• Chemical messages across gaps in synapses through neurotransmitters
• Formed by *experience*
• Begins *in utero* & continues throughout life
Synapses

• Connections between neurons (synaptic gap, neurotransmitters)
• Those that are not used weaken & die (natural process: *apoptosis*)
• Repeated experience strengthens *synapses*
Some Basic Terminology

• Neurons: Brain cells
• Must be connected to other brain cells to do their work
• *Nearly* all form prenatally & are present at birth
• How can neurons be lost?
Learning Is Synaptogenesis

• “Neurons that fire together wire together”
• Infant begins *in utero*
• Proceeds rapidly after birth based on somatosensory input
• Repetition and babies: learning by doing it again!
Neural Plasticity

• Ability of the brain to change both structure & function in response to experiences & environment
• Highest from conception up to about age 3
• But brain remains plastic throughout life!
Neuroplasticity

Our routines make routes in our brain. It’s empowering to know that we can re-route our brains with mindfulness, to make better habits and more helpful thought patterns.

1. **Mental Activity**
   This can be a thought, feeling, or action.

2. **Creation of New Neural Structures**
   Neurons fire together, forming a brief connection by communicating through gaps called synapses.

3. **Repetition of Mental Activity**

4. **Strengthening of Neural Connection**
   Neurons wire together to make more lasting circuits.

With attention, we can direct how this neural substrate is built & rebuilt! We can strengthen the pathways we want by thinking in the way we want to be.