The Effect of Early Adversity on Brain Development, Learning, and Health

Nicole Sherren, PhD

ISPCAN Webinar

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How Do Brains Get Built?

- 25 days
- 35 days
- 40 days
- 50 days
- 100 days

- 5 months
- 6 months
- 7 months
- 8 months
- 9 months
Neural Circuits are Wired in a Bottom-Up Sequence

Experience-Dependent Synapse Formation

Sensory Pathways (Vision, Hearing) - Language - Higher Cognitive Function

Conception - Birth - (Months) - (Years) - Age

Experience-Based Pruning of Synapses During Childhood and Adolescence
What Kind of Experiences Shape Development?
Infants are Hard Wired for Social Interactions

Fig. 1. Sample photographs from videotape recordings of 2- to 3-week-old infants imitating (a) tongue protrusion, (b) mouth opening, and (c) lip protrusion demonstrated by an adult experimenter.
Serve and Return Interactions With Adult Caregivers Shape Brain Architecture
Interactions With Adults Help Build Cognitive, Social, and Emotional Skills in Children
Executive Function is Like Air Traffic Control: Helps Children Navigate Their World and Succeed in Life

EF skill set is based on cognitive, social and emotional competencies:

- Attention
- Working memory
- Self–regulation
- Delayed gratification
- Planning and organization
- Perseverance
- Reasoning and evaluation
- Problem solving
- Cognitive flexibility
Serve and Return Interactions Alter Neural Circuits and Gene Expression
The Biology of Early Adversity
Stress Also Shapes Brain Architecture

Toxic Stress: Prolonged activation of the stress response system in the absence of supportive adult relationships; e.g., abuse, neglect, living with an addicted or depressed parent.

Tolerable Stress: Serious but temporary activation of stress response, can damage brain architecture if not buffered by supportive adult relationships; e.g., death in the family.

Positive Stress: Brief activation of stress response system, required for healthy development; e.g., immunization, first day of school.
Anatomy of the Stress Response

Effect of Catecholamines (Adrenalin):
• Increased heart rate, blood pressure
• Decrease in non-essential functions (e.g., digestion, reproduction)
• Blood clotting
• Mobilization of glucose stores

Effect of Glucocorticoids (Cortisol):
• Glucose metabolism
• Insulin production
• Immunosuppression
• Negative feedback on HPA axis
Early Life Stress Affects Biology, Behaviour, and Impacts Lifelong Health
Short and Long Term Outcomes Associated with Early Adversity
Disparities in Early Vocabulary Growth

Source: Hart and Risley (1995)
Significant Adversity Impairs Development in the First Three Years

Source: Barth, et al. (2008)
Sensitivity to Anger in Abused Children


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Early Adversity Increases Risk for Substance Use Disorders in Adulthood

Self-Report: Alcoholism

Source: Dube et al. (2002)

Self-Report: Illicit Drugs

Source: Dube et al. (2003)
Early Adversity Increases Risk for Depressive Disorders in Adulthood

Source: Chapman et al. (2004)
Early Adversity Increases Risk for Adult Heart Disease

Source: Dong et al. (2004)
Where Do We Go From Here?
What Determines Whether a Child’s Outcomes Will Be Good or Bad?

Resilience is a product of our genes and experiences, like a scale that can be tipped to one side or the other.
It’s NOT All Over By Age 6:
Brain Still Maturing Until ~ 25 Years

Source: Gotgay, Giedd, et al., 2004
Brain Builders Video
Alberta Family Wellness Initiative

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