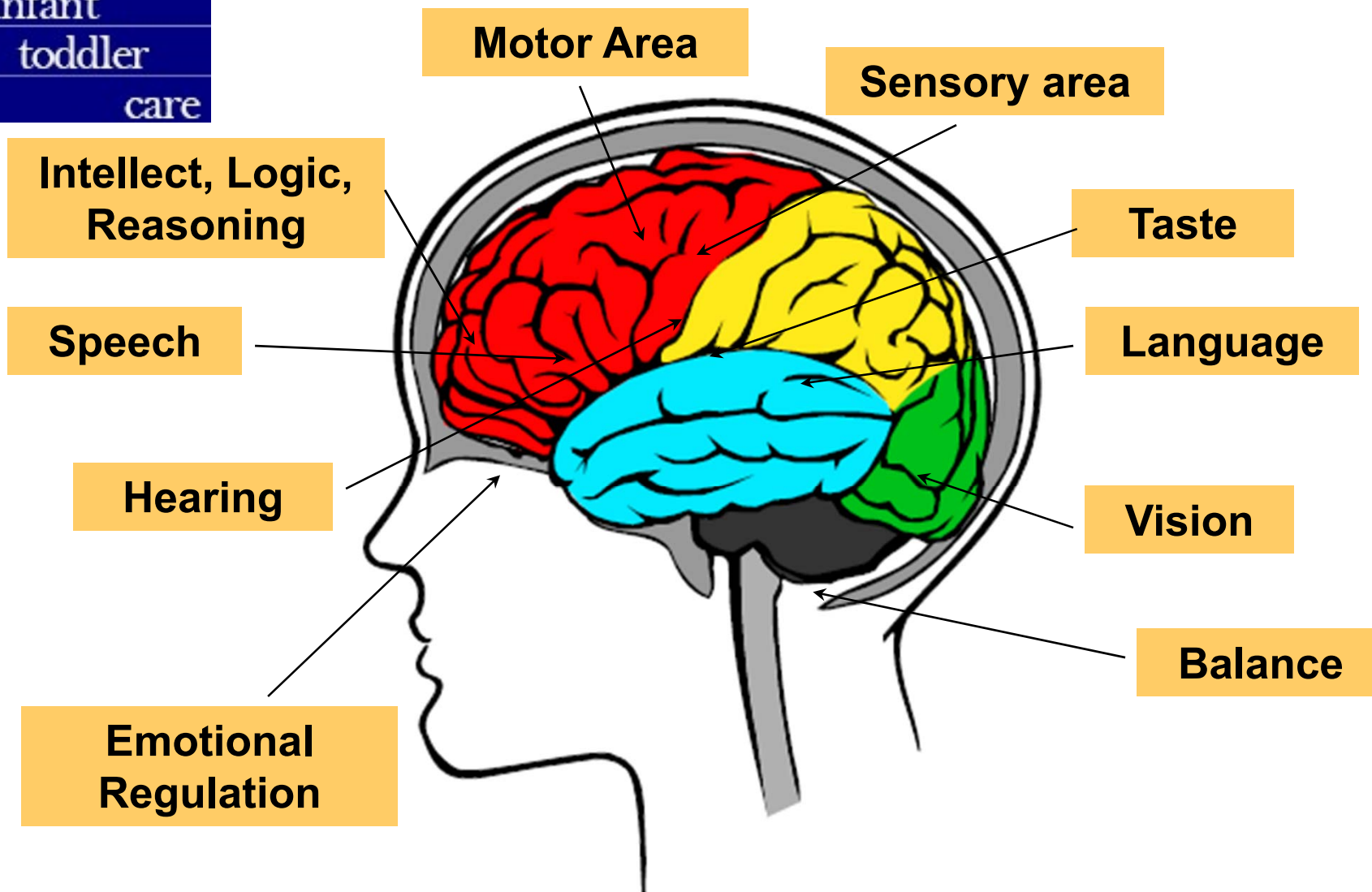




Brain Development in Infants and Toddlers

Developed by J. Ronald Lally. © 2018, WestEd, The Program for Infant/Toddler Care.
This document may be reproduced for educational purposes.



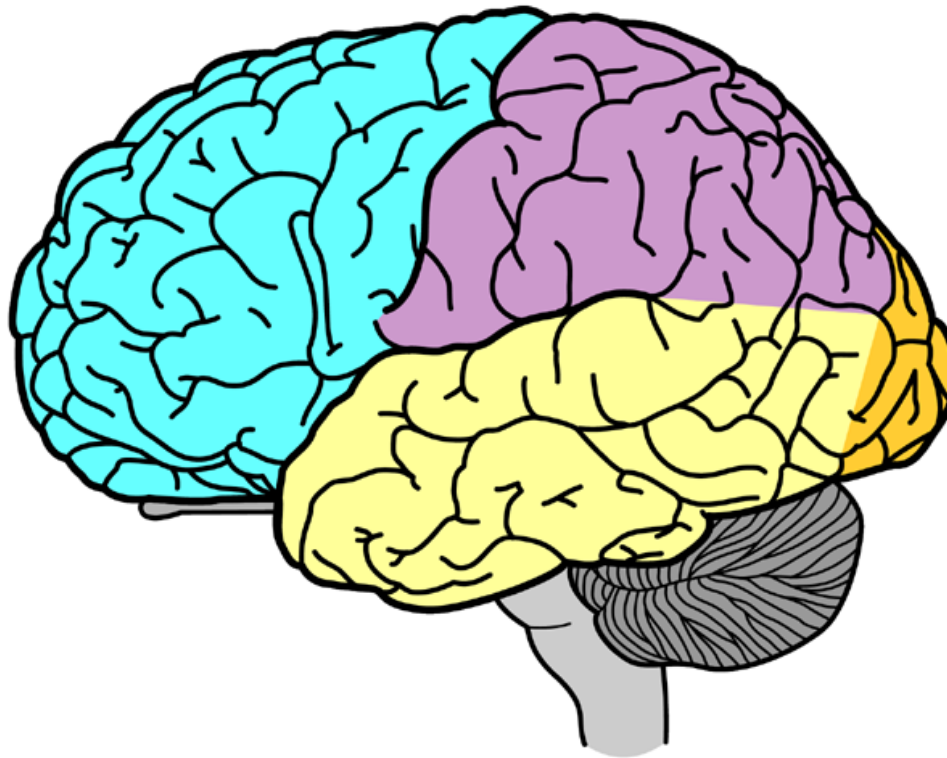


Small Group Question:

What do you think would be most important for infant care teachers and families with infants and toddlers to know about early brain development?

Please write one statement.

Section One: Brain Architecture



Three Core Concepts in Early Development

1 Experiences Build Brain Architecture

NATIONAL SCIENTIFIC COUNCIL ON THE DEVELOPING CHILD

Center on the Developing Child  HARVARD UNIVERSITY

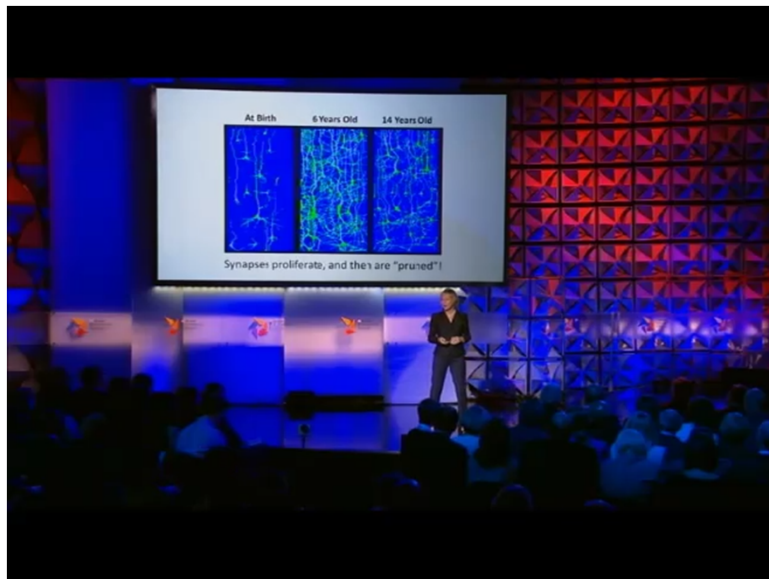
Clip: Food for Thought and Ten Things Every Child Needs





Clip: 2011 Brain Panel Education Nation Summit

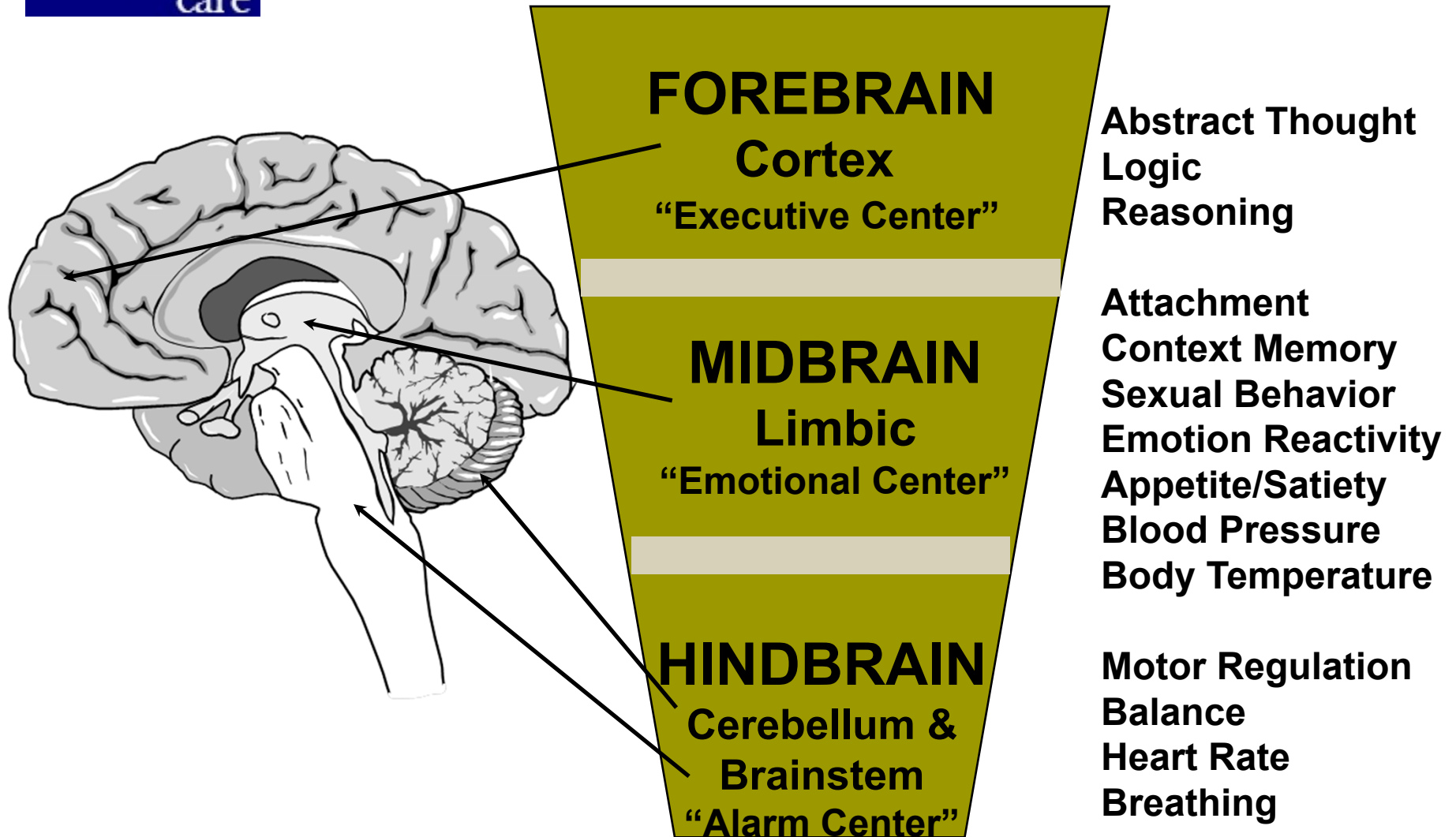
(<http://www.nbcnews.com/feature/education-nation/>)



Gene/Environment Interaction

- Environments can influence genes as they release. Their intensity can either reduce or increase genetically based risks.

Hierarchy of Brain Development



Brain Architecture is Built Over Time

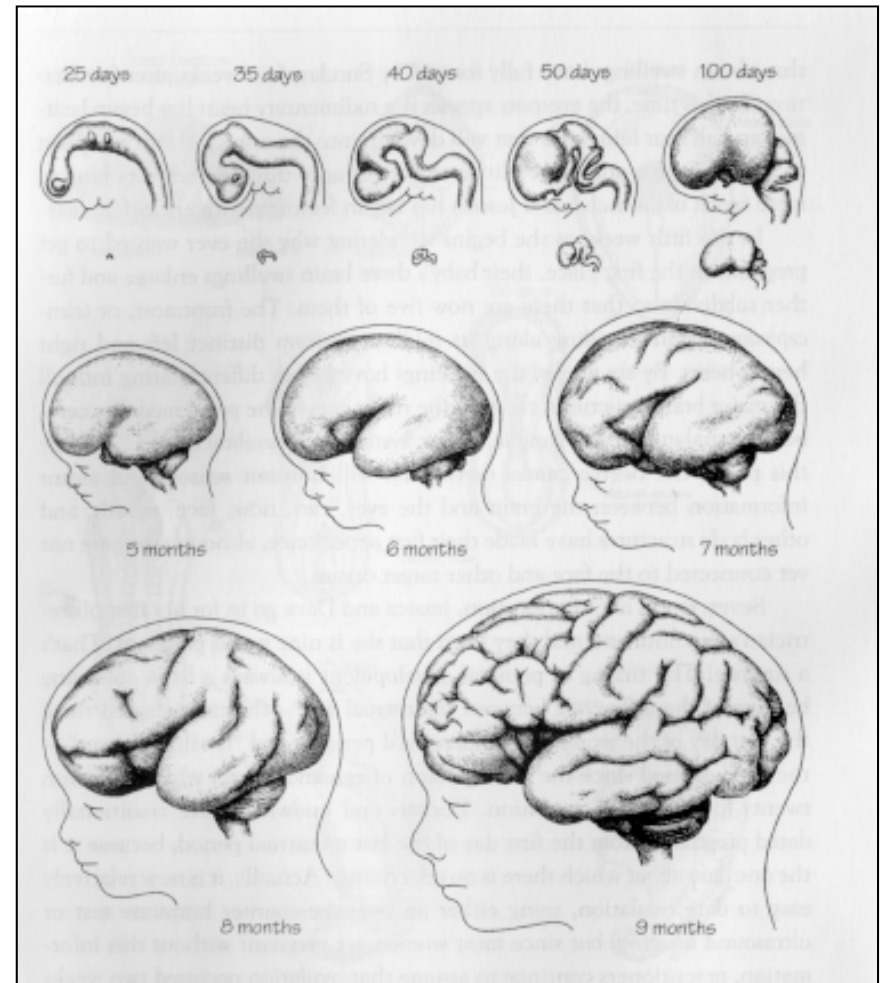
- Brain development progresses in a hierarchical, “bottom-up” sequence, with advanced skills built on more basic capabilities.
- As it develops, the quality of brain architecture establishes a sturdy or weak foundation for learning and behavior.
- Brain circuits consolidate with increasing age, making them more difficult to rewire.
- The timetable of brain plasticity varies: it is narrow for basic sensory abilities, wider for language, and broadest for cognitive and social-emotional skills.

Prenatal Development

The nervous system begins to develop just before the third week of gestation.

Cell creation and movement to the right spots occur during the first five prenatal months.

Brain Size: 25% at Birth;
90% at Age 5



Early Risk Factors

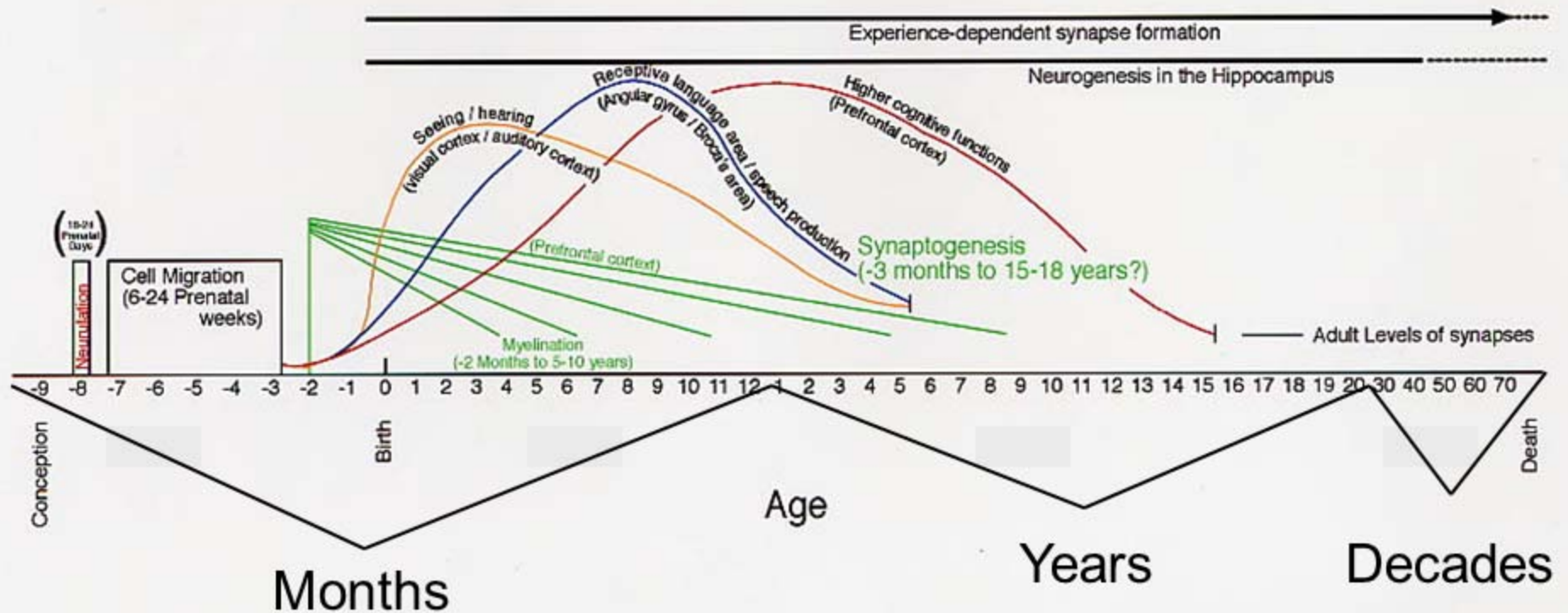
➤ Prenatal:

- Poor nutrition
- Pregnancy complications
- Alcohol
- Prescription, O-T-C, and illegal drugs
- Exposure to toxins
- Stress
- Parental depression

➤ Birth & First Months

- Poor nutrition
- Delivery complications
- Neurological insult
- Exposure to toxins
- Difficult temperament/hyperactivity/attention/impulsivity problems
- Stress
- Parental depression

Human Brain Development



Thompson, R. A., & Nelson, C. A. (2001). Developmental science and the media: Early brain development. *American Psychologist*, 56(1), 5-15.

Experience
creates

Expectation
which alters

Perception

Three Core Concepts in Early Development

2 Serve & Return Interaction Shapes Brain Circuitry

NATIONAL SCIENTIFIC COUNCIL ON THE DEVELOPING CHILD

Center on the Developing Child  HARVARD UNIVERSITY

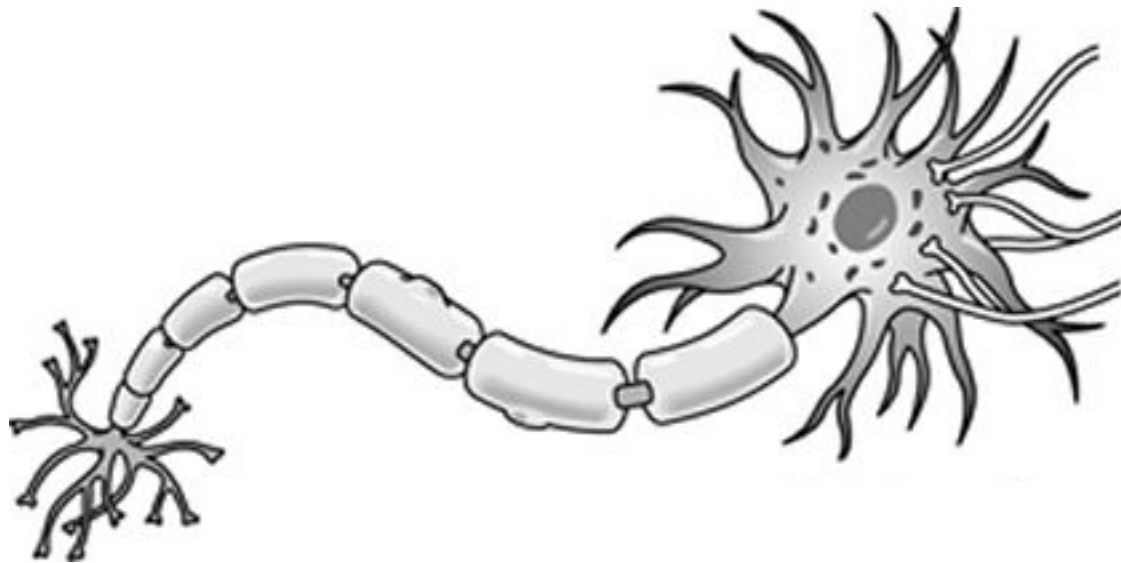
“Culture influences every aspect of human development and is reflected in childrearing beliefs and practices designed to promote healthy adaptation.”

Core Concept #2 “From Neurons to Neighborhoods”
National Academy of Sciences, 2000

Key Issues Often Misinterpreted

- What synapse loss means
- “Learning windows”
- Impact of emotional and intellectual experiences
- Proven ways to facilitate learning
- Early and second language learning in U.S.

Section Two: Understanding and Dealing with Stress



Three Core Concepts in Early Development

3 Toxic Stress Derails Healthy Development

NATIONAL SCIENTIFIC COUNCIL ON THE DEVELOPING CHILD

Center on the Developing Child  HARVARD UNIVERSITY

Positive Stress

- Refers to moderate, short-lived stress responses, such as brief increases in heart rate or mild changes in stress hormone levels. Learning to adjust to it is an essential feature of healthy development.
Examples: meeting new people, getting an immunization, entering child care.
- Events that provoke positive stress tend to be those that a child can learn to control and manage well with the support of caring adults and which occur against the backdrop of generally safe, warm, and positive relationships.

Tolerable Stress

- Refers to stress responses that could disrupt brain architecture, but generally occur within a time-limited period and are buffered by supportive relationships that facilitate adaptive coping. These conditions usually give the brain an opportunity to recover from potentially damaging effects.
- Examples of stressors include death, a serious illness of a loved one, a frightening injury, divorce.

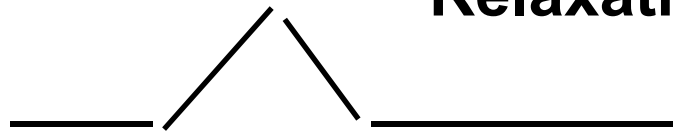
Toxic Stress

- Refers to strong and prolonged activation of the body's stress management systems in the absence of the buffering protection of adult support, disrupts brain architecture and leads to stress management systems that respond at relatively lower thresholds, and increases the risk of stress-related physical and mental illness.
- Examples of stressors include extreme poverty, physical or emotional abuse, chronic and serious neglect, enduring maternal depression, family violence.

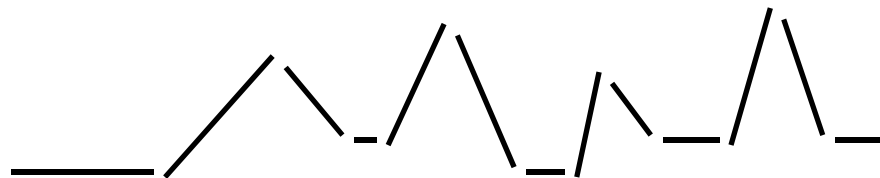
Tolerable and Toxic Stress

Alarm

Relaxation



Alarm, Alarm



Under Any Type of Perceived Threat

(physical, intellectual or emotional)

The Brain:

loses ability to take in subtle clues

reverts to “tried & true” behaviors

becomes more automatic & over-reactive

is less able to use “higher order” thinking skills

loses some memory capacity

The Body's Response to Stress

Increase in heart rate

Increase in blood pressure

Increase in breathing rate

Increase in muscle tone

Release of stored sugar

Hyper-vigilance

Tuning out of all non-critical information

Chemicals in the Brain

- The capacity to deal with stress is controlled by a set of highly interrelated brain circuits and hormonal systems that are specifically designed to deal adaptively with environmental challenges. When an individual feels threatened, stress hormones are produced that convert the physical or emotional stress into chemical signals that are sent throughout the body as well as to the brain.

Cortisol

- Kills brain cells
- Reduces number of cell connections
- Shrinks hippocampus
- Impairs selective attention
- Impairs thinking
- Creates anxious behavior

Noradrenalin: An Alarm Hormone

High levels trigger over-arousal and tendency toward impulsive, hot-blooded acts of violence.

Serotonin: An Impulse Modulator

Low levels = an adaptation to a threatening environment - *impulsive, aggressive behavior*

Normal levels = clear thinking, social success

Small Group Questions:

1. How can child care programs (center-based and FCC) support the experience of positive stress?
2. How can child care programs help children cope with tolerable stress?
3. How can child care programs avoid exposing infants to toxic stress while in care?
4. How can your program support infants who are experiencing toxic stress outside the child care program?



Section Three: Nurturing Relationships and the Brain

Neurodevelopmental Disorders: When To Be Watchful

- Social isolation
- Lack of eye contact
- Absence of empathy
- Poor language capacity
- Lack of sensitivity to social surrounding
- Frequency of extreme aversion to certain stimuli – sounds, temperatures, lights, etc.



Infant Needs

- Nurturance
- Support
- Security
- Predictability
- Focus
- Encouragement
- Expansion

Hardwired to Connect

- Mechanisms by which we become and stay attached to others are biologically primed and increasingly discernable in the basic structure of the brain.
- Nurturing environments, or the lack of them, affect the development of brain circuitry.
- Nurturing touch promotes growth and alertness in babies.
- Presence of a secure attachment protects toddlers from biochemical effects of stress.

Responsive Care

- Watch child's cues for signs of interest
- Ask what the child wants
- Adapt your behavior to child's signals
- Bathe child in language
- Concern yourself with identity messages

Section Four: Infant Care Policies and Practices That Foster Brain Development

The Context for Quality

Care provided in safe, interesting, and intimate settings where children have the time and opportunity to establish and sustain secure and trusting relationships with other children and with knowledgeable caregivers who are responsive to their needs and interests.



Recommended Policies for Quality Child Care

- Primary Care
- Small Groups
- Continuity of Care
- Personalized Care
- Cultural Responsiveness
- Attention to Their Special Needs



Effective Intervention Program Elements

- Developmentally based guidance and discipline
- Consideration of temperamental differences
- Modeling and sharing a responsive process
- Focus on intellectual interests of child
- Development of individual intervention strategies
- Reflective supervision
- Linked home visit, health, mental health and special education services



Section Five: Points to Remember

Points to Remember

- There are learning windows, but for humans most windows never close completely
- Synapse loss is a natural occurrence based on the pruning of seldom used connections
- Early emotional and social experiences are as important to the wiring of the brain as intellectual experiences
- Healthy early development depends on nurturing and dependable relationships
- Experiences create expectations which alter perceptions

Small Group Question:

What has worked for you?

Please share with your group a successful strategy you have used to teach about brain development of infants and toddlers.