Early Ripples: The Effects of ACEs on Children 0-5

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2021

Overall Approach

- Young children from zero to five are especially vulnerable because their physical structure and functions--neuro, endocrine, and immune systems--are still developing. Therefore, this period is considered developmentally sensitive to harmful exposures (Knudsen, 2004; Marnini et al., 2020).

- This set of supplemental training intends to increase the awareness of ACEs, understand the impact of ACEs on the 0-5 population, the capacity of resilience of young children, their families, and communities.

- This training will start with young children's brain development and discuss the full impacts of ACEs and toxic stress on their physical health.

Modules & Resources

7 Modules

1. 0-5 Neurodevelopment and Stress Response Systems
2. Impact of ACEs on Children
3. ACEs in Sociocultural Contexts
4. Resilience and Protective Factors
5. Power of Relationships (ACEs Aware Certified Supplemental Training)
6. Community Support (ACEs Aware Certified Supplemental Training)
7. Secondary Trauma

Local Resources

Local resources for professionals in Humboldt County

0-5 Neurodevelopment and Stress Response Systems

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Learning Objectives

- As a result of this training, participants will be able to:
  - Understand the impact of ACEs and toxic stress on children, from the prenatal period through age 5
  - Describe the Neurosequential model
  - Describe stress response systems

Building Neural Connections

- During the first five years, neurons formed in the prenatal period continue to develop: neural fibers and synapses rapidly increase, and neural connections continue (Bhushan et al., 2020; Moore, Persaud, & Torchia, 2013).
- During the first 5 years of life, the lower parts of the brain (e.g., brainstem and diencephalon) and higher parts of the brain (e.g., cerebrum) are developed and organized (Perry, 2004, 2009).

Neural Plasticity 0-5

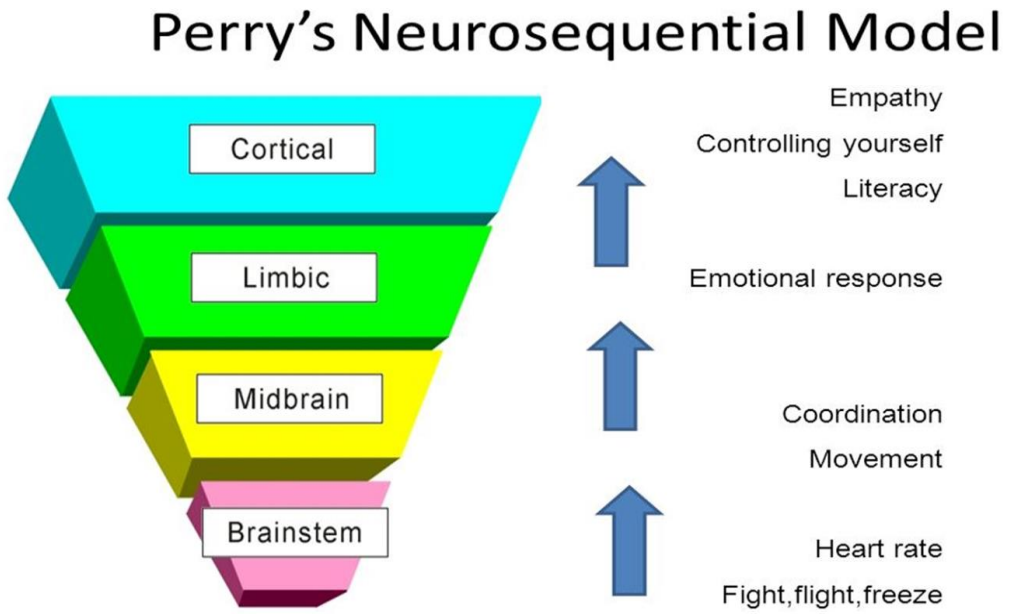
- Understanding what neural plasticity is:
  - With stimulation or lack of stimulation, synaptic connections become stronger or weaker (i.e., synaptic pruning) during early childhood (Webb, Monk, & Nelson, 2001).
    - Synapse: A tiny gap between neurons
    - Synaptic connection: A neural connection that transmits chemical information between neurons
- Early childhood (age 0-5) is a sensitive period for neural plasticity of brain development (Rutter et al., 2010)
  - A time when the brain is particularly responsive to a stimulus (Berk & Meyers, 2016)

“Use-Dependent”

- Brain development and refinement can be understood as “use-dependent”(Perry, 2004).
- *Experience-expectant brain growth:* the development of young brain depends on ordinary experiences (Greenough & Black, 1992).
- *Experience-dependent brain growth:* the development of brain continues throughout one’s life with specific learning experiences across cultures and individuals (Greenough & Black, 1992).

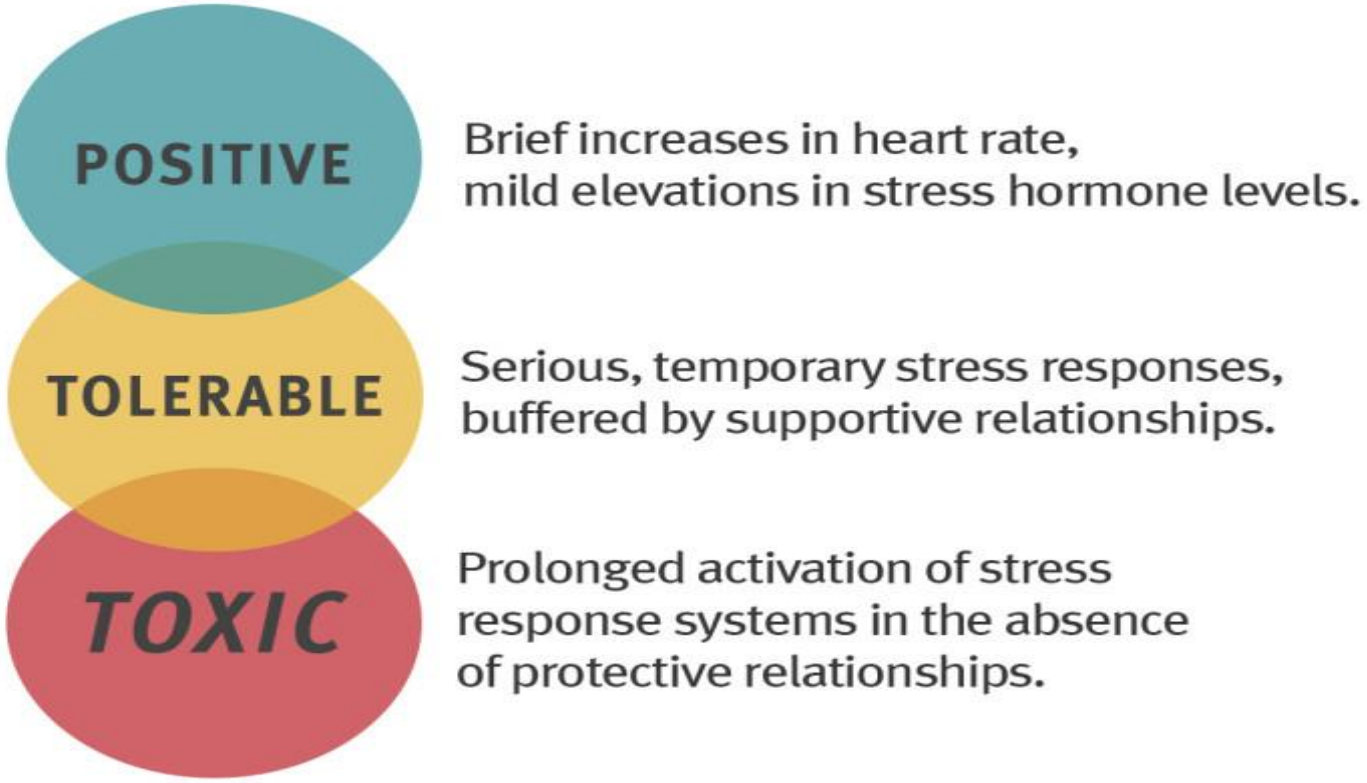
Neurosequential Model (Perry, 2004, 2009)

- The brain develops in an organized fashion, from bottom to top, starting with the lower regulatory systems in the brainstem and moving up to the higher parts of the cortex.



Perry, B.D. (2002). *Brain Structure and Function I: Basics of Organisation. Adapted in part from "Maltreated Children: Experience, Brain Development and the Next Generation (W.W. Norton & Company).*

Three Types of Stress Responses
(The National Scientific Council on the Developing Child, 2014)



The Brain Orchestrates the Stress Response

- The stress response follows a similar sequence from lower (e.g., brainstem) to higher (e.g., cerebrum) of the brain (Perry, 2004, 2009).
- The stress response system is activated for survival
  - Hyperarousal response (e.g., fight or flight) (Perry, 2004)
  - Dissociative response (e.g., freeze or immobility) (Lima, et al., 2010)
- The stress response system involves a set of neurotransmitters (e.g., norepinephrine, dopamine, serotonin) and the hypothalamic-pituitary-adrenal (HPA) axis, the overactivation of which can have long term health outcomes, such as ACE-Associated Health conditions (Bhushan, et al., 2020).

Disrupted Stress Response

- Toxic stress leads to a dysregulated stress response and can have a long-term changes in one's physiological stress system (Bhushan, et al., 2020; McEwen, 2005).
  - Hypervigilant or under-responsive
- Extended activation of the stress response system without appropriate support in early years can:
  - Affect brain development (e.g., cognitive impairment)
  - Affect physical development (e.g., obesity, psychosocial short stature),
  - Increase the risk for stress-related illnesses (e.g., asthma, allergies, infections) (Bhushan, et al., 2020; Center on the Developing Child; Felitti et al., 1998).

Summary

- With the “use-dependent” fashion of neural plasticity, the architecture of the young brain structure and function continuously evolves throughout early years (McLaughlin & Broihier, 2018; Perry, 2004).
- Brain development follows a specific sequence from lower (e.g., brainstem) to higher (cerebrum), which also influences stress response systems (fight, flight, or freeze) (Bhushan, et al., 2020; Lima, et al., 2010; Perry, 2004).
- In conclusion, prolonged activation of the stress response system can disrupt brain development, physical development, cognitive development, and result in stress-related illnesses such as respiratory illness and various infections (National Academies of Science, Engineering, and Medicine, 2019).
- Considering the uniqueness of this developmental period, routine screening for children is critical for prevention, early detection, and intervention (Bhushan, et al., 2020; https://www.acesaware.org/learn-about-screening/benefits-of-ace-screening/#).

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