SELF-REGULATION AND EXECUTIVE FUNCTION: THE FOREST AND THE TREES

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Science of Self-Regulation

- To understand and support Self-Regulation, we need to understand and support the Whole Child
- Cognitive and Social-Emotional work hand-in-hand
- Self-regulation as a general goal for children’s development
- Self-Regulation is a system
The Science of Self-Regulation

- **Cognitive**
  - Executive Function and the Control of Attention
    - Working Memory, Inhibitory Control, Attention Shifting

- **Emotional**
  - Regulating the timing, duration, and intensity of emotion
    - Both positive (joy, exuberance) and negative (anger, fear)

- **Physiological**
  - Regulating the stress response
    - cortisol, heart rate, adrenalin
Executive functions are associated with prefrontal cortex (PFC)

PFC is connected with many brain areas

Some of which are associated with emotion and stress

When we experience stress, physiological systems produce chemicals that affect neural activity in PFC
Neuroscience of Self-Regulation

- Prefrontal cortex develops slowly
- Brains are built over time, starting in the earliest years of life. Simple skills come first; more complex skills after
- Stable, secure environments are important for healthy brain development
- A strong foundation in the early years improves the odds for positive outcomes
Self-Regulation develops from Other-Regulation
Attention

**FIGURE 5.4**
**INFANTS’ NUMBER SENSE.** Shown here is one of the sequences in Karen Wynn’s (1992) study of 5-month-old infants’ number sense. The experimenter was hidden behind the display and manipulated the objects through a flap door in the wall of the display. Five-month-old infants were tested in the original event that led to the possible outcome (a) and the impossible outcome (b).

1. Object placed in case
2. Screen comes up
3. Second object added
4. Hand leaves empty

**Test events**

- Possible outcome: Screen drops... revealing 2 objects
- Impossible outcome: Screen drops... revealing 1 object

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Emotion
Stress Response Physiology

The hypothalamus sends CRH to the pituitary, which responds by secreting ACTH. ACTH then causes the adrenals to release cortisol into the bloodstream.

*Source: NIDDK Image Library*
The Science of Self-Regulation

- Regulation in “lower level” systems sets the stage for the development of “higher level” regulation - Executive Function
- Healthy physiological, emotional, and attention development in the early years are indicative of the healthy development of self-regulation and executive function
- Implications
  - Importance of early parenting and early education
  - Measure activity in lower as well as higher levels of the system
  - Expectation for large effects from high quality services for children and families in highly disadvantaged contexts
Psychobiological model

- The context in which child development takes places shapes children’s self-regulation.
- Moderate, short-lived stress can build a healthy stress response system.
- Toxic stress — excessive activation of the stress response system — tunes the brain to be reactive rather than well regulated.
Family Life Project

- Longitudinal, population based sample (N = 1,292) followed from birth in predominantly non-urban, low-income communities in North Carolina and Pennsylvania
  - Program project funded by NIH
  - Data collection in the home at 7, 15, 24, 36, 48, and 60 months of age to assess aspects of parenting and family ecology with follow-up through second grade and now age 13 years
  - Child home environment, parenting, emotion, attention, cortisol from saliva, and executive functions
Chaos and Cortisol

Blair et al. (2011) *Development and Psychopathology*
Executive Function at age 3 years

Blair et al. (2011) Child Development
Parenting Quality and Cortisol

Berry et al. (2016) Development and Psychopathology
Emotion and Executive Function

- Coding negative emotional reactivity – low, medium, high
- Coding emotion regulation strategies – avoidance, self-soothing, orienting away

Ursache et al. (2013) *Developmental Psychology*
Household Chaos, Executive Function and Childcare

Berry et al. (2016) *Early Childhood Research Quarterly*

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Conclusions and Implications

- We can recognize healthy child development at multiple levels -- physiological, emotional, cognitive, cultural (parenting, schooling)

- Research and theory suggest the importance of the regulation of stress; not that stress is inherently harmful but is something to be managed – controllable vs. uncontrollable

- Relatively slow timetable for PFC development suggests a high level of malleability throughout childhood
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