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Research to Action: Creating Environments That Build  
the Foundation for Executive Function Life Skills  
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2019 Statewide Early Learning Conference Pre-K-3  
Confederation of Oregon School Administrators  
Mt. Hood Community College  
October 22, 2019

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Infant Mental Health  
Endoresment Core  
Competencies

1. Pregnancy and Early Parenthood
2. Infant/Very Young Child Development and Behavior



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OCCD Registry Core Knowledge Categories

1. Human Growth & Development
2. Understanding & Guiding Behavior



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Goals & Objectives

1. Describe evidence-based infant behaviors associated with maternal environment and its impact on fetal developing brains
2. Recognize evidence of developing executive function in infants and toddlers
3. Name one approach to nurture the innate capacity for empathy and perspective-taking in infants and toddlers



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Agenda

1. Review of Executive Function Life Skills
2. Executive Functions: The Deep Dive
3. Pulling It All Together



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**1.**  
Review of Executive  
Function Life Skills

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*Human development is shaped by a  
dynamic and continuous  
interaction between biology and  
experience*

Bruce Perry

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Review of Executive Function

- Top-down control of goal-oriented behaviors
- Linked to math, arithmetic, reading, verbal & nonverbal reasoning, communication, social skills, and moral competence
- Fundamental to executive function capacity is self-regulation

McClelland & Tominey 2014

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## Review of Executive Function

- A set of higher functioning mental skills coordinated in the brain's frontal lobe that work together to plan and achieve goals
- Regulation, Focus, Attention
- Perspective-taking, Empathy
- Impulse control

McClelland & Tominey 2014

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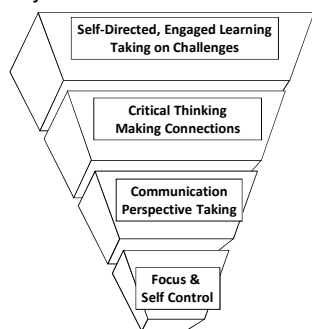
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## Galinsky Model



Galinsky 2010

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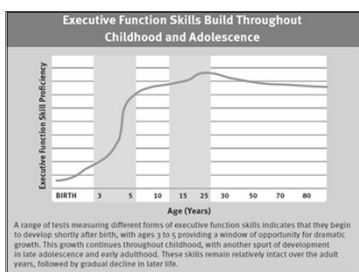
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Center on the Developing Child at Harvard University 2016

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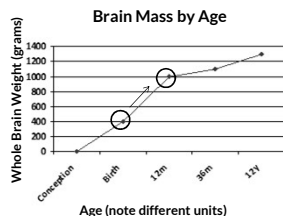
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## Neuroscience of Brain Development

- At birth, the infant's brain is the most undifferentiated organ in the body
- A newborn baby's brain will more than double in mass before the first birthday



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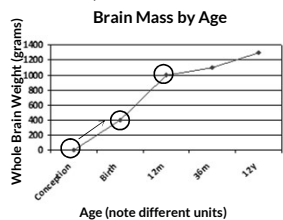
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## Neuroscience of Brain Development

- At birth, the infant's brain is the most undifferentiated organ in the body
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## 2. Executive Functions: The Deep Dive

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## Regulation, Focus, Attention

The Pen-Tapping Game



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## The Neuroscience Behind Behavior—Revisited

### What Sleeping Babies Hear

- > Interparental conflict correlates with heightened brain activity in sleeping babies exposed to very angry tone of voice
- > Rostral anterior cingulate cortex
- > Subcortical regions (caudate, thalamus and hypothalamus)
- > Rostral ACC implicated in emotional processing & regulation

Graham 2013

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## The Neuroscience Behind Behavior—Revisited

### How Newborns React to Stress

- > Higher cortisol reaction to heel stick

Davis et al. 2011

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### Fetal Programming

- The result of the influences of environment on the developing brain's architecture during gestation that creates persistent consequences of health and disease risk
- Prepares the developing fetus for the environment they are going to be born in
  - Survival
  - Increased maternal stress → high vigilant hypersensitive infant

Barker 1998  
Glover et al. 2014  
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### Fetal Programming

The placenta

- An enzyme in the placenta breaks down maternal cortisol before it reaches the fetus

cortisol  $\xrightarrow[11\beta\text{-HSD2}]{11\beta\text{-hydroxysteroid dehydrogenase}}$  Cortisone (inactive)

- Changes filtering capacity in response to maternal chemical signals
- Plays a role in regulating pregnancy
  - Maturing fetus
  - Determining timing of delivery

Davis & Thompson 2014  
Glover et al. 2014  
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### Fetal Programming

Stress during pregnancy

- Negative emotional reactivity (at 6 months)
- Higher pre-stress cortisol levels (14-19 months)
- Cognitive delay (14-19 months)
- Increased fearfulness to new situations (14-19 months)
- Higher internalizing symptoms (5 years)

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➤ **What Can We Do?**  
➤ To promote regulation, focus, and attention in infants and toddlers?

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**Mirror Neurons to Morality**

- Mirror neurons
- ↓
- Sense of self and self-efficacy
- ↓
- Empathy
- ↓
- Moral values

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**Mirror Neurons**

- Human connections at a neurological level is the process of co-regulation
- Co-regulation is the process for learning self-regulation

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### Mirror Neurons

- Motor cortex & posterior parietal cortex are activated not only during the action execution but ALSO when observing the action
- Allow for **shared goals and intentions**

Ammaniti & Ferrari 2013  
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### Mirror Neurons

- Engagement with others is essential for development of regulation, attention, perspective-taking and other executive function skills

Ammaniti & Ferrari 2013  
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### Perspective-Taking

Bloom

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### Development of Self & Self-Efficacy

- Other's behaviors, emotions, and sensations are mapped into our internal motor representation
- At about 6 months of age, babies begin development of an internal working model
- Sense of 'self' distinctively separate from and connected to 'other'

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### Development of Self & Self-Efficacy

- Understanding the impact of one's own behavior on others
- Self-efficacy
- Self-esteem

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### Empathy

- Understanding feelings of others different from one's own feelings

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**Moral Values**

- A system of values or principles of conduct that influence behavior based on perceptions of right from wrong or good from bad

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**Mirror Neurons to Morality**

- Mirror neurons  
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- Sense of self and self-efficacy  
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- Empathy  
↓
- Moral values

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**➔ What Can We Do?**

- To promote empathy and perspective-taking in infants and toddlers?
- Small group discussion

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# 4. Pulling It All Together

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## Factors for Building Resilience

- Stable, caring and supportive relationships
- A sense of mastery over one's own life circumstances
- **Strong executive function and self-regulation skills**
- Affirmed faith and cultural traditions

National Scientific Council on the Developing Child 2015  
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## Kindergarten Readiness

Self-Directed, Engaged Learning  
Taking on Challenges

Critical Thinking  
Making  
Connections

Communication  
Perspective Taking

Focus & Self Control

Kindergarten Readiness

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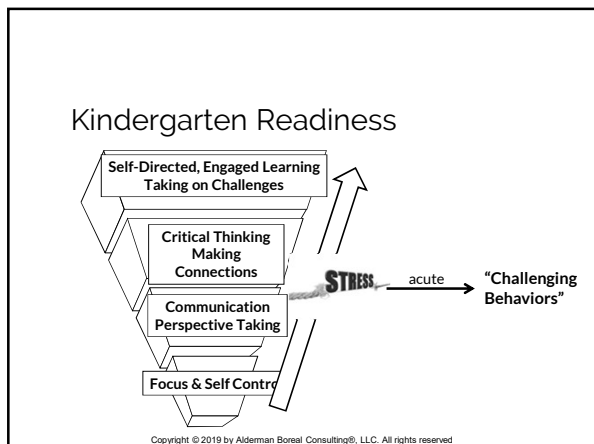
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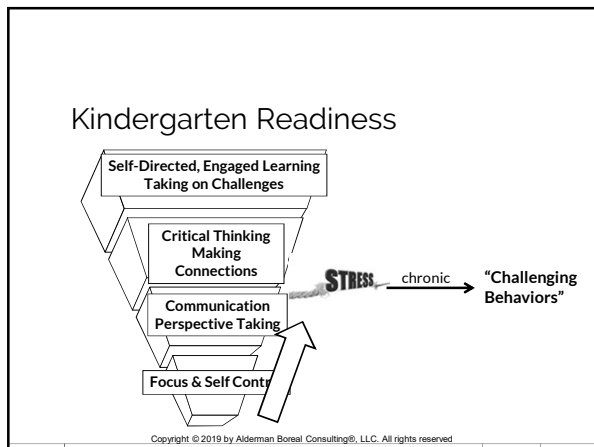
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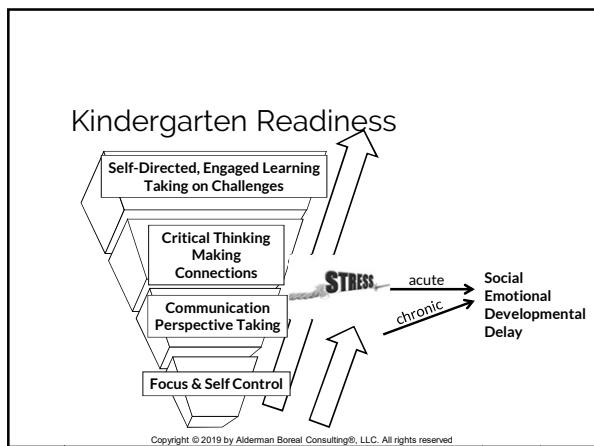
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**5.**  
**Strategies for Promoting  
 Executive Function Life Skills**

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**Motor Activities Promote  
 Executive Function Life Skills**

Efficacy of a self-regulation intervention

- RCT
- 65 preschool children, average age 54.6 months
- Half received intervention
- Intervention: circle time games
- 16 30-minute sessions (2/wk X 8 wks)

Tominey & McClelland 2011

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**Motor Activities Promote  
 Executive Function Life Skills**

Results:

Children entering preschool with low level behavioral self-regulation skills

- showed improved self-regulation skills after the intervention

AND

- significant gains in letter-word identification compared to control group.

Tominey & McClelland 2011

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## Summary

1. Executive function life skills begin developing before birth
2. Environment plays a critical role in developing executive function life skills
3. Emotional regulation is the foundation for all other executive function life skills
4. Executive function life skills are learned through relationship with a regulated adult
5. Executive function life skills build resilience



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## Thank you!

Questions:  
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## References

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