

# INTERVENTIONS IN EXECUTIVE FUNCTIONING

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# Core Story: Redux

- Experiences build brain architecture



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- Serve and return interaction shapes brain circuitry (environment of relationships)



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- Experiences build brain architecture
- Serve and return interaction shapes brain circuitry (environment of relationships)
- Toxic stress derails healthy
- development



# An “Air Traffic Control System” in the Brain



Executive functioning is group of skills that help us to focus on multiple streams of information at the same time, set goals and make plans, make decisions in light of available information, revise plans, and resist hasty actions.

➤ a key biological foundation of school readiness

# What are Executive Function Skills?

**Inhibitory (“Effortful”) Control** — filter thoughts and impulses to resist temptations and distractions



**Working Memory** — hold and manipulate information in our heads over short periods of time



**Mental flexibility** — adjust to changed demands, priorities, or perspectives

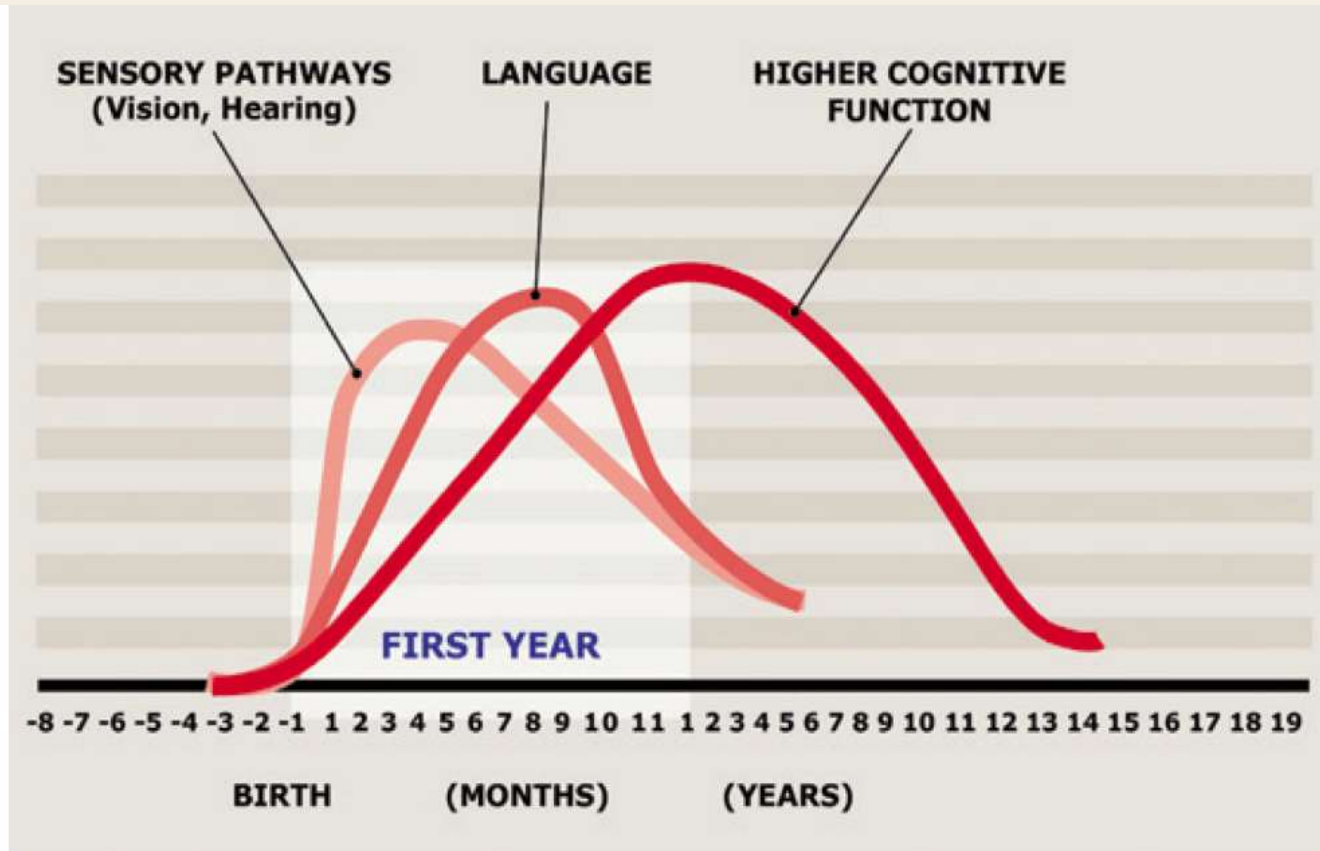


# Where Does EF Fit Into Core Story?

- Brain architecture
- Environment of Relationships
- Toxic stress



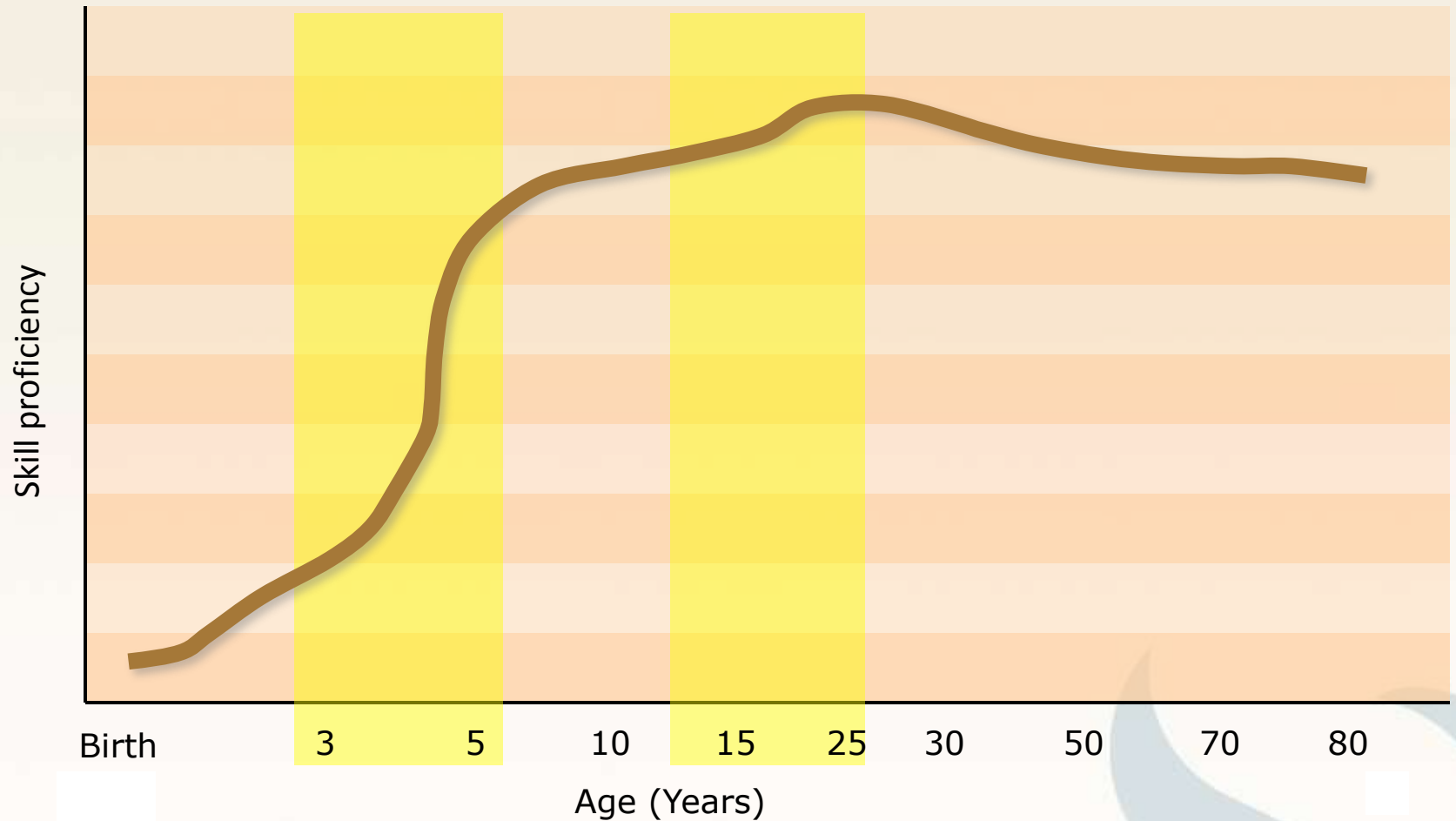
# Course of Brain Development



Source: C.A. Nelson, 2000

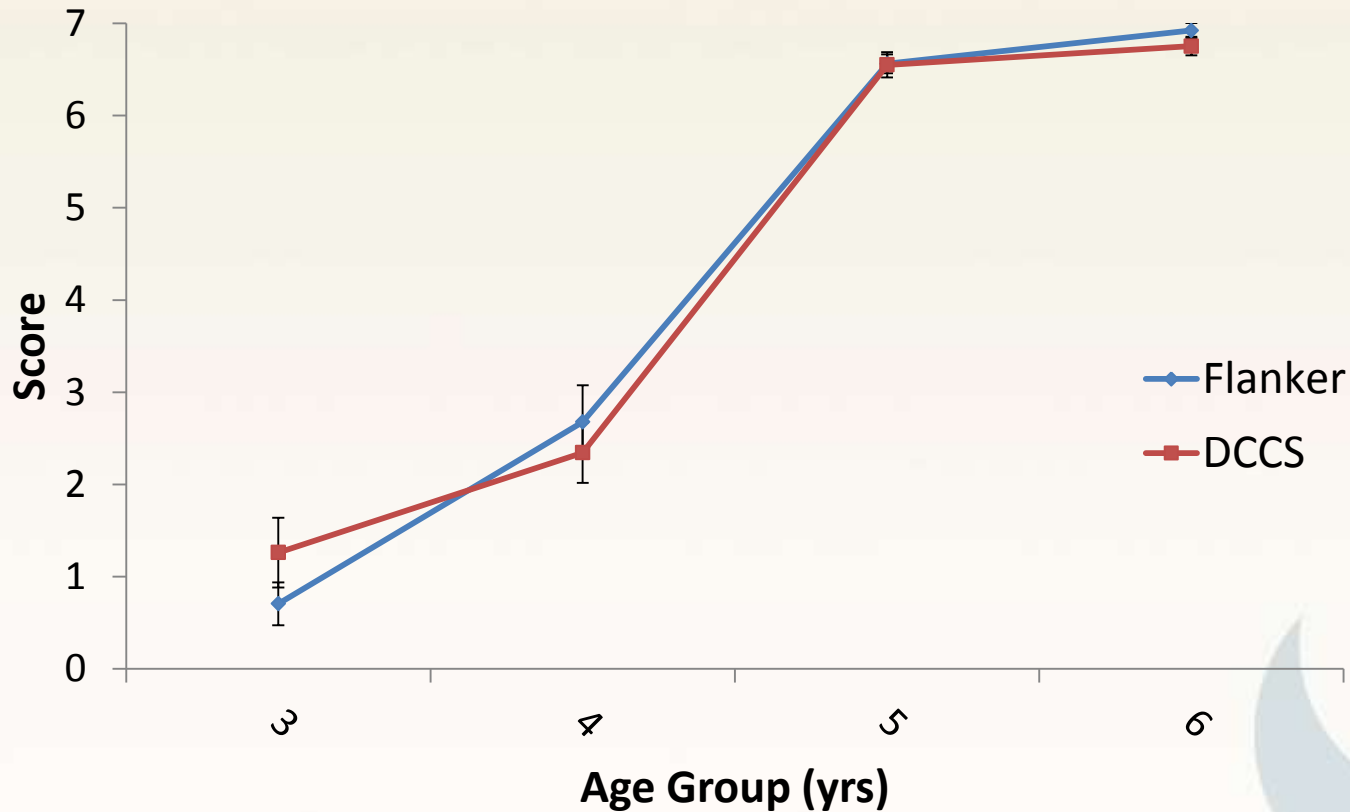


# Extended Development of EF Maps onto Development of Prefrontal Cortex

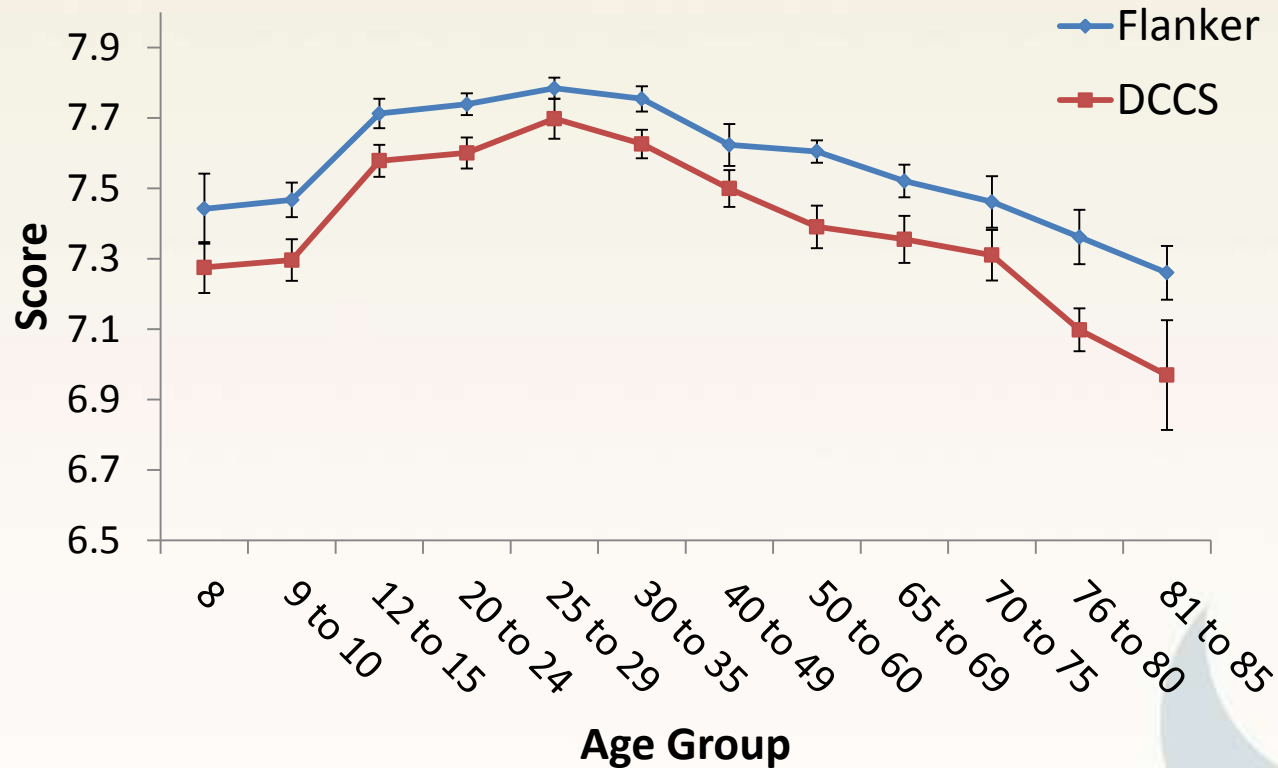


Weintraub, et al., (2011)

# NIH EF Toolbox: 3 – 6 Years



# NIH EF Toolbox: 8 – 85 Years





# Building an “Air Traffic Control System” in the Developing Brain

	<b>Working Memory</b>	<b>Inhibitory Control</b>	<b>Cognitive Flexibility</b>
<b>Adult</b>	Remember multiple tasks, rules & strategies that may vary	Self-control, situationally appropriate responses	Revise actions & plans in changing circumstances
<b>2-5 years</b>	Remember 2 rules (shoes here, coats there)	Delay eating a treat, follow arbitrary rule	Shift actions as rules change
<b>9-16 months</b>	Execute simple 2-step plan (means-to-end tasks)	Begin to maintain focus despite distractions	Seek alternate methods when 1 <sup>st</sup> attempt fails

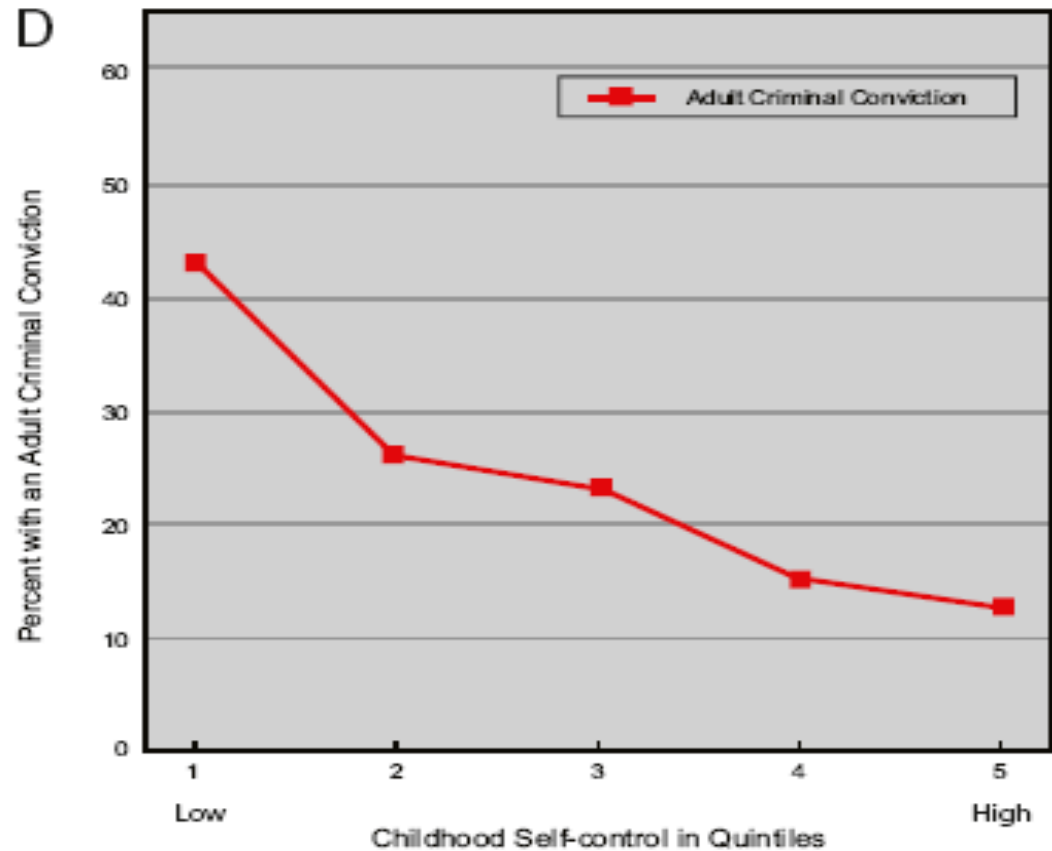
# Outcomes at Age 32

EF in childhood predicts outcomes at age 32:

Physical health  
Drug dependence  
SES  
Criminal convictions

*Controlling for SES, IQ  
when a child*

Moffitt et al. (2011)



# Environment of Relationships

- Scaffolding of pertinent skills
  - Sustained joint attention
  - Support for emotion regulation
  - Give and take interactions
- Ordered and predictable environments
  - Routines
  - People
  - Rules and consequences



# Toxic Stress

- Threat and chaos undermine EF
- Fight or flight
- Brain circuits underlying stress responses connect to those underlying attention
- Memory highly damaged by stress



# Assessing EF In Children

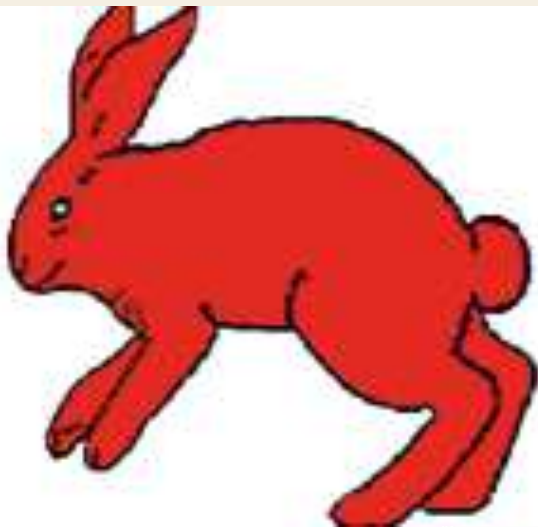
- Working Memory (WM)
  - Based on Woodcock-Johnson Auditory Working Memory
  - Example:
    - Tree – 4 – 8 – Mouse → Tree – Mouse – 4 – 8
- Inhibition
  - Woodcock-Johnson Pair Cancellation
  - 3 minutes to circle dog-ball pairs
- Cognitive Flexibility
  - Dimensional Change Card Sort (Zelazo, 2006)
  - Flexibly change between sorting rules



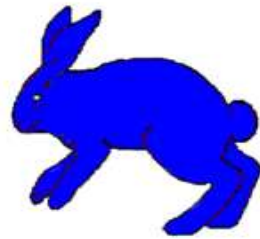
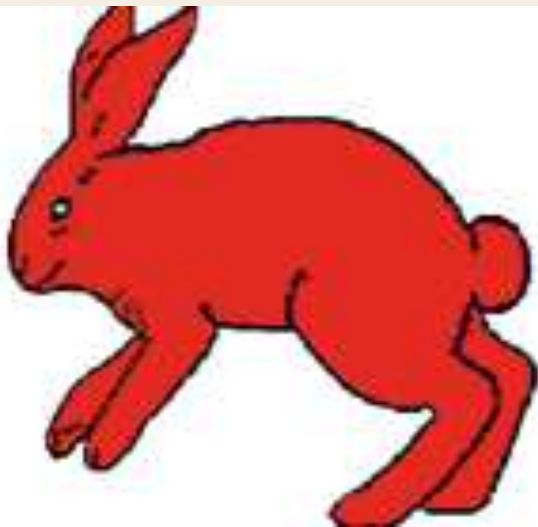
# Pair Cancellation



# Card Sort



# Card Sort



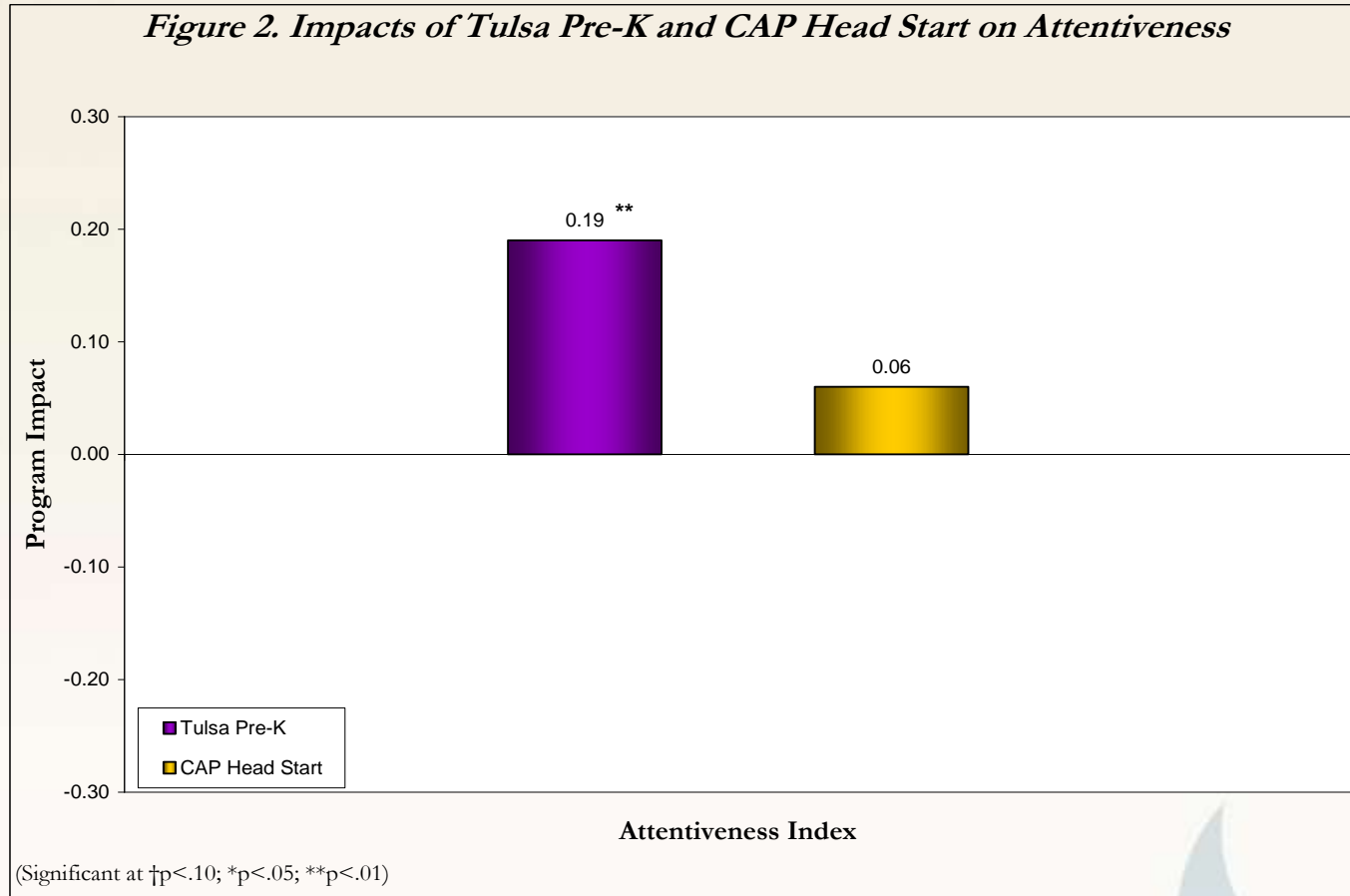


# EF in the Classroom

- Oklahoma Evidence
- EF Curricula
- Brain Training

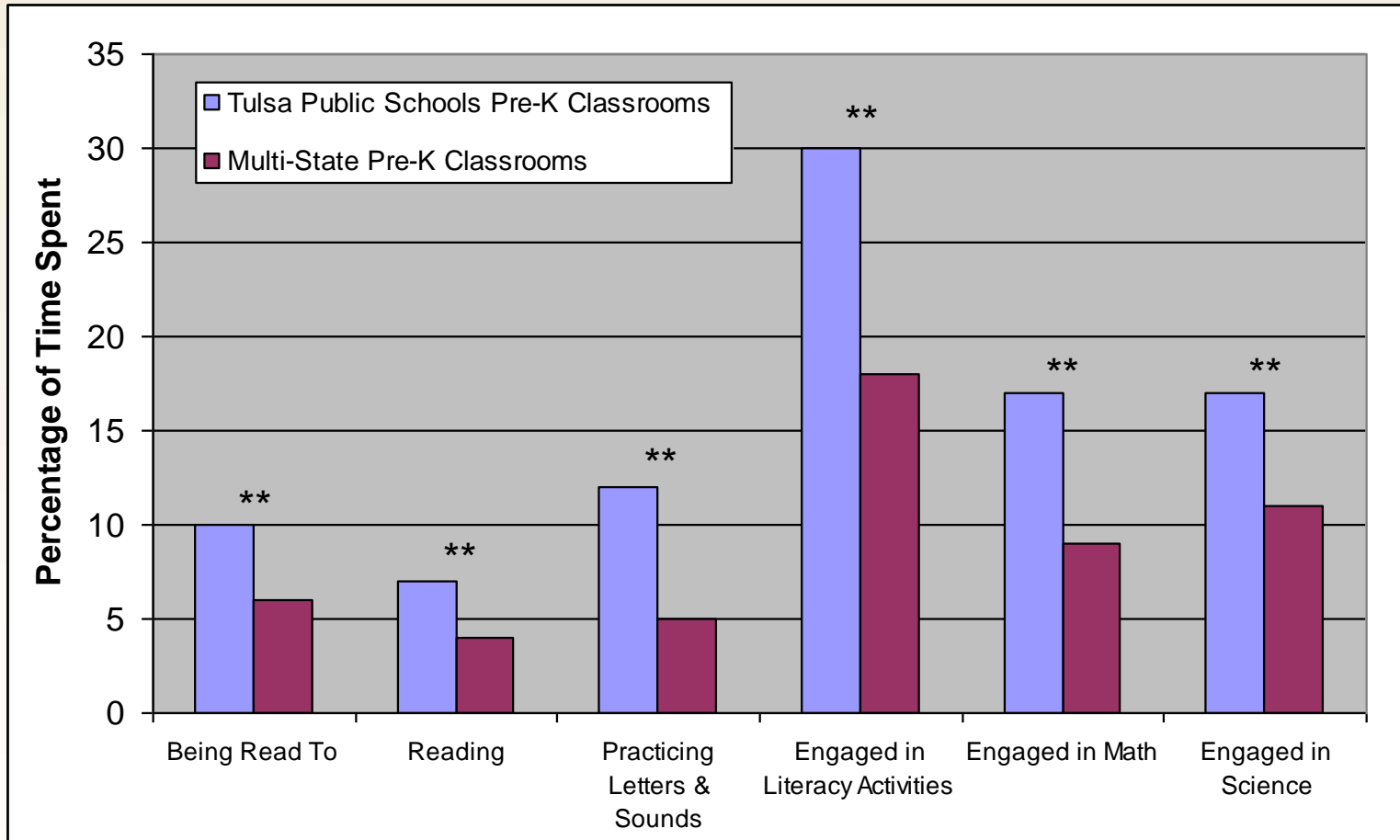


# Child Attentiveness in Tulsa Classrooms



Source: Gormley, Phillips, Newmark, Welti, Adelstein, 2011

# Child Engagement in Learning in Tulsa Classrooms



# EF “Curricula”

- Behavioral Management in the classroom
- Building EF Development through lessons and supports
  - Turn-taking: listening and talking
  - Inhibiting strong impulses to “keep going”
  - Making plans and following-through, especially with peers (reflection)
  - Building language as a regulatory tool
  - Practice, practice, practice



# Buddy Reading



# Play Plans



# Scaffolded Writing



# Freeze Game



# EF in State Policy

- Washington State Early Learning and Development Guidelines
- 3-5 year olds can:
  - Remember and cooperate in daily routines, such as getting into a car seat, and changes from one activity to another, with occasional reminders.
  - Can manage changes in routines and learn new behaviors with a little practice.
  - Will sometimes turn down a treat now if a better treat will be available later (one cookie now or two cookies later).
  - Recognize when making a mistake and sometimes adjust behavior to correct it.
  - Begin to remember and follow multistep directions
  - Can plan play by identifying different roles needed, who will fill these roles and consider changing roles to fit the interests of children playing
- Linked to professional development modules

