



Nutrition | Brain | Cognition

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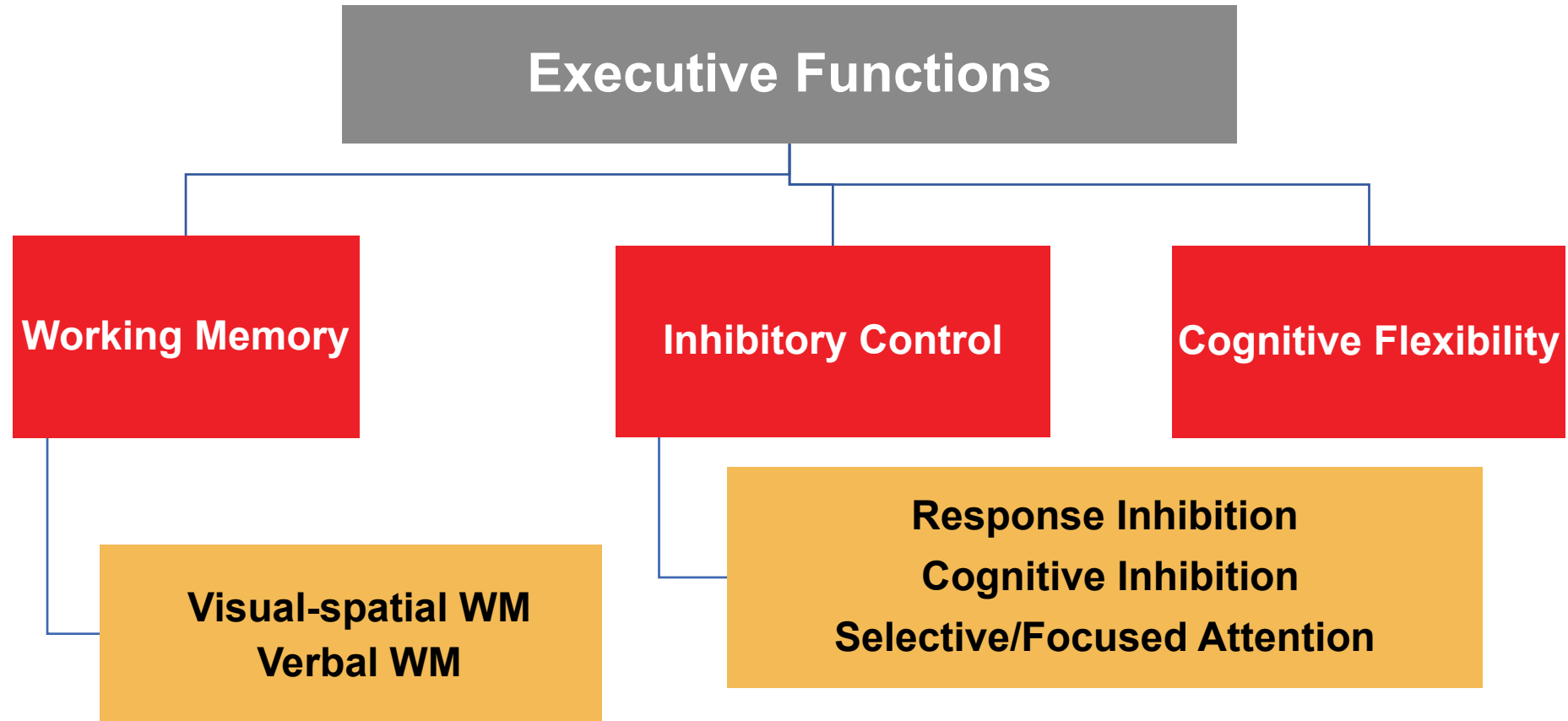


# How do you identify the signs of executive functions in infants?

# Executive Functions

- Higher-order cognitive & self-regulatory processes involved in coordinating, planning, and completing goal-directed actions
  - Prefrontal cortex (Kane & Engle, 2002; Osaka et al., 2003)

# Higher-level EFs: Reasoning, Problem-Solving; Planning



Miyake et al. (2000) *Cognitive Psychology*  
Diamond (2013) *Annual Review of Psychology*

# Infant EF Measures

Task	EF Component	Age
<b>Antisaccade</b> ( <i>Freeze Frame</i> )	IC	4 mo. +
<b>Visual Span</b>	WM (STM)	4 mo.+
<b>Delayed-memory search</b> ( <i>Delayed Response; A-not-B</i> )	WM+IC	4.5 mo. +
<b>Prohibition</b> ( <i>Forbidden Toy</i> )	IC	8 mo +
<b>N boxes/pots</b> ( <i>Stationary vs. Scrambled</i> )	WM	12 mo +

# Inhibitory Control

- Controlling our attention, behavior, thoughts, and/or emotions to override a natural tendency (strong internal predisposition or external lure; Diamond, 2012)

# Memory manipulation/maintenance

- Working Memory
  - An active system for temporarily *storing & manipulating information*
    - (Baddley, 1986, 2000; Baddley & Hitch, 1974)
  - Capability of maintaining short-term memory representations in the presence of *interference* or *response competition*
    - (Kane & Engle, 2002)

# Infant 6-9 Hz EEG & EF

EEG Power/Coherence Findings	
<b>Resting-state (baseline) EEG is associated with EF</b> <i>(task performance)</i>	Bell & Fox, 1992, 1997; MacNeill et al. 2018
<b>Changes in EEG during executive processing</b> <i>(baseline-to-task related changes)</i>	Bell, 2001, 2002; Bell & Wolfe, 2007; Cuevas & Bell, 2011; Cuevas et al., 2012a, 2012d
<b>Changes in EEG during increased inhibitory demands</b>	Cuevas et al., 2012e
<b>Executive processing-related EEG is associated with EF</b>	Bell, 2001, 2002, 2012; Cuevas et al., 2012a, 2012d
<b>Resting-state EEG is associated with future EF</b>	Broomell et al. 2019; Kraybill & Bell, 2013

# Supporting Early EF Development

- Environmental Factors
  - Stress
    - Blair et al., 2005; 2011
  - Adverse Economic Circumstances
    - Rhoades et al., 2011
  - Parenting behaviors
    - Bernier et al., 2010, 2012; Bibok et al., 2009
    - Cuevas et al., 2014; Hughes & Ensor 2009



A doctor in a white lab coat and blue tie is shown from the chest down. They are holding a smartphone in their left hand and a pen in their right hand. A network of white circles connected by lines is overlaid on the image, particularly concentrated on the right side. The background is a blurred cityscape. The text "THANK YOU" is centered in red.

**THANK YOU**