

Attentional and Regulatory Issues: *early markers and relationship to executive functioning*

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Disclaimer

I have no actual or potential conflicts of interest in relation to this program/presentation.

I will not discuss any investigational or off-label use of any drugs.

Outline

- Core features of ASD and ADHD
- Role of temperament
- Executive Functioning
- Next steps

Core features

<i>ASD</i>	<i>ADHD</i>
<u>Core features</u> Social communication and social interaction impairments Restricted, repetitive patterns of behavior, interest, or activities	<u>Core features</u> Inattention Impulsivity/Hyperactivity

Developmental course



Symptom overlap

- **ASD with elevated ADHD traits** **[1 to 5.8 years of age]**
 - 17 - 50% demonstrate elevated ADHD symptoms based on parent reported
 - Strongest association for co-occurring concentration problems

(Hartley et al., 2008; Snow and Lecavlier, 2011; Matson et al., 2009)

- **ADHD with elevated ASD traits** **[3 to 5 years of age]**
 - 25% of children present with communication problems
 - Lower social competence associated with more social problems
 - Social problems include difficulties engaging in positive peer interactions

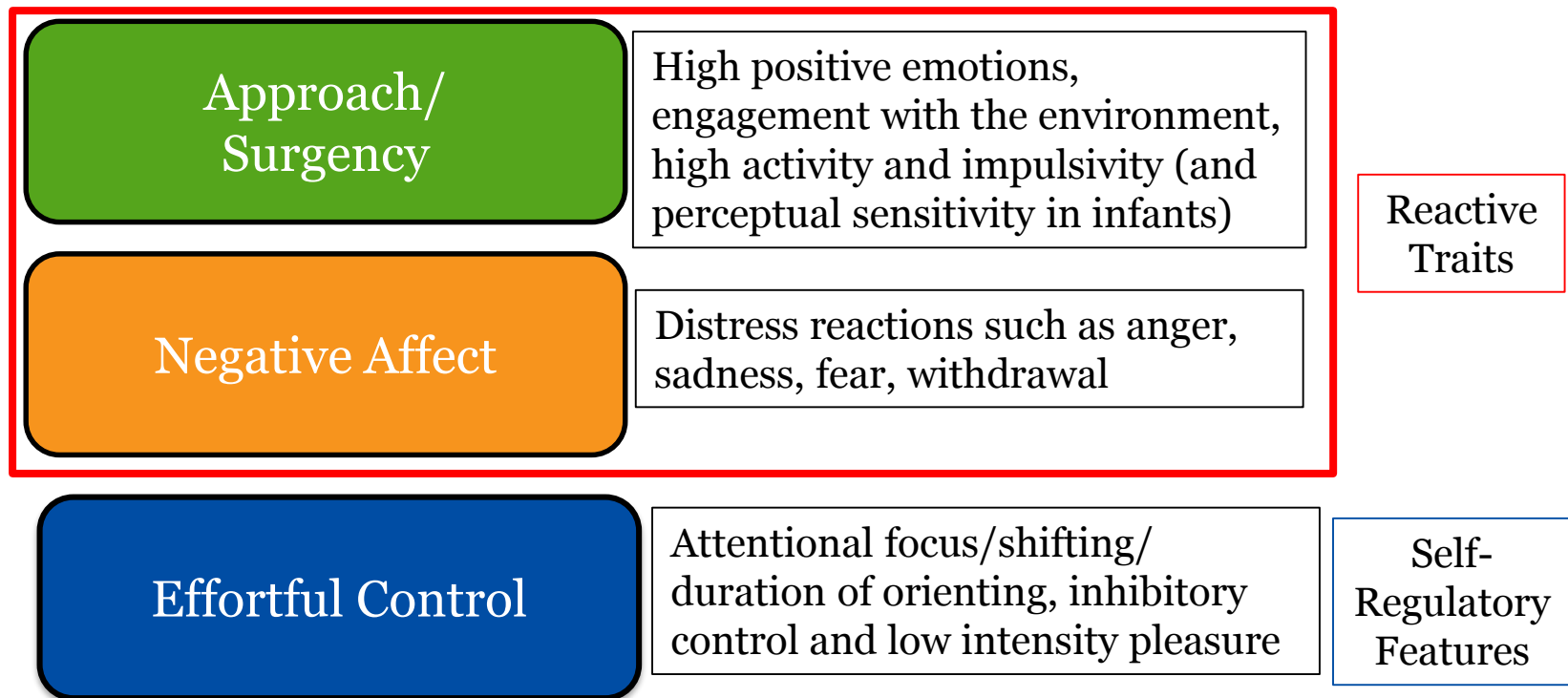
(Julvez et al., 2011, Thorell & Ryder, 2008; DuPaul et al., 2011; Posner et al., 2007)

Symptom overlap

- **ASD & ADHD** **[2.1 to 6.5 years of age]**
 - 4.5 % of toddlers with ASD (2.1 years) met criteria for ADHD
(Turygin et al., 2013)
 - 40% of preschool children with ASD (3 to 5 years) met criteria for ADHD
(Gadow et al., 2004)
 - 32% of children with ASD (4.5 – 6.5 years) had ADHD or severe hyperactivity
(Carlsson et al., 2013)
- **Summary**
 - ADHD symptoms become more evident and better distinguishable from normative behavior after toddlerhood
 - ADHD symptoms appear to increase with (preschool age)
 - ADHD symptoms are most prevalent in children with severe ASD and/or low IQ
 - Co-occurrence rates are higher for inattention problems than for hyperactivity at younger ages
(Visser et al., 2016)

Temperament

- Consists of neurobiologically based individual differences in **reactivity** (both positive and negative) as well as **self-regulation**
- Serves the foundation for subsequent personality development



Effortful Control: Attentional focus/shifting/duration of orienting, inhibitory control and low intensity pleasure

	6 – 11 months	1 – 2 years	2 – 3 years	3 – 4 years	4 -5 years
	ASD	ASD	ASD	ASD	ASD
Composite Score		↓	↓		
Low intensity pleasure			↓		
Attention shifting		↓	↓	↓	↓
Control of attention			↓		
Inhibitory Control			↓	↓	↓

adapted from J.C. Visser et al., 2016 [Table 1]

Effortful Control: Attentional focus/shifting/duration of orienting, inhibitory control and low intensity pleasure

	6 – 11 months	1 – 2 years	2 – 3 years	3 – 4 years	4 -5 years
	ADHD	ADHD	ADHD	ADHD	ADHD
Composite Score				↓	↓
Low intensity pleasure					
Attention shifting	↓	↓			
Control of attention			↓		
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Composite Score			↓		↓			↓		↓
Low intensity pleasure					↓					
Attention shifting		↓	↓	↓	↓	↓	↓		↓	
Control of attention					↓	↓				
Inhibitory Control					↓	↓	↓	↓	↓	

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Temperament Summary

Effortful Control

(Visser et al., 2016)

<i>ASD</i>	<i>ADHD</i>
<ul style="list-style-type: none">Deficits in effortful control are consistently found in ASD and ADHD	
<ul style="list-style-type: none">Problems in <u>attention shifting</u> emerge in 2nd year and persist<u>Inhibitory control</u> problems emerge between 2nd and 3rd year and persistPoor <u>attention control</u> is evident between 2nd and 3rd year	<ul style="list-style-type: none">Problems in <u>attention shifting</u> emerge in 1st year and persist through 2nd<u>Inhibitory control</u> problems emerge between the 2nd and 3rd year and persist through year 4Poor <u>attention control</u> is evident between 2nd and 3rd years

****Temperament at this age did NOT predict ADHD course, but EC predicted ADHD when combined with executive functioning**

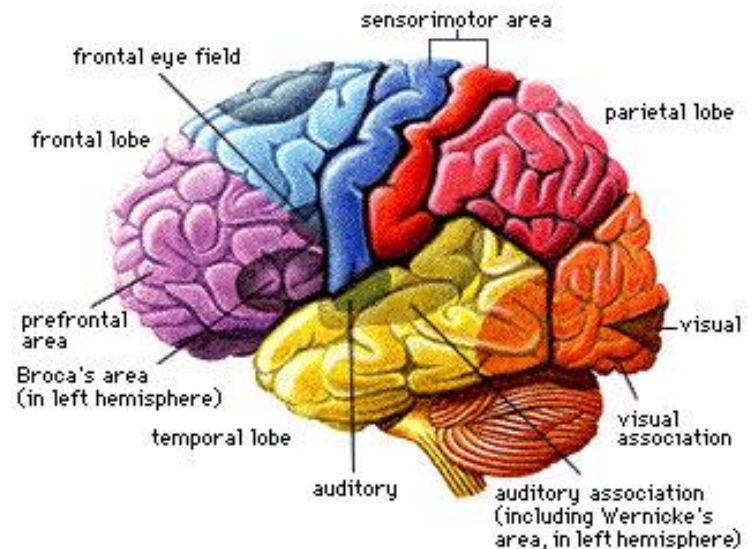
****EF referring to cognitive constructs of working memory, inhibition, and cognitive flexibility**

Executive functioning

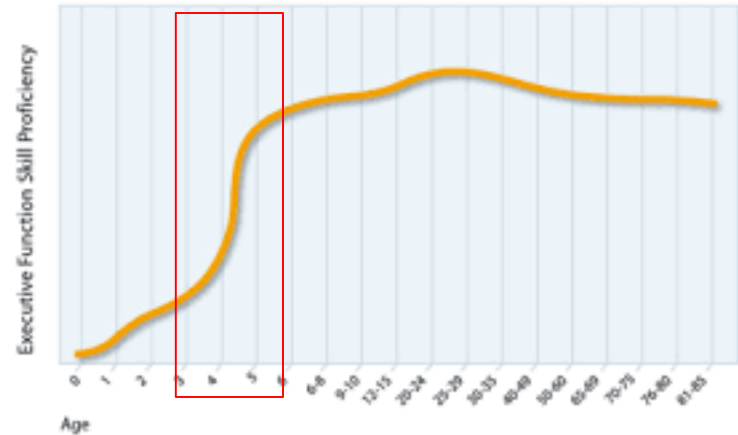
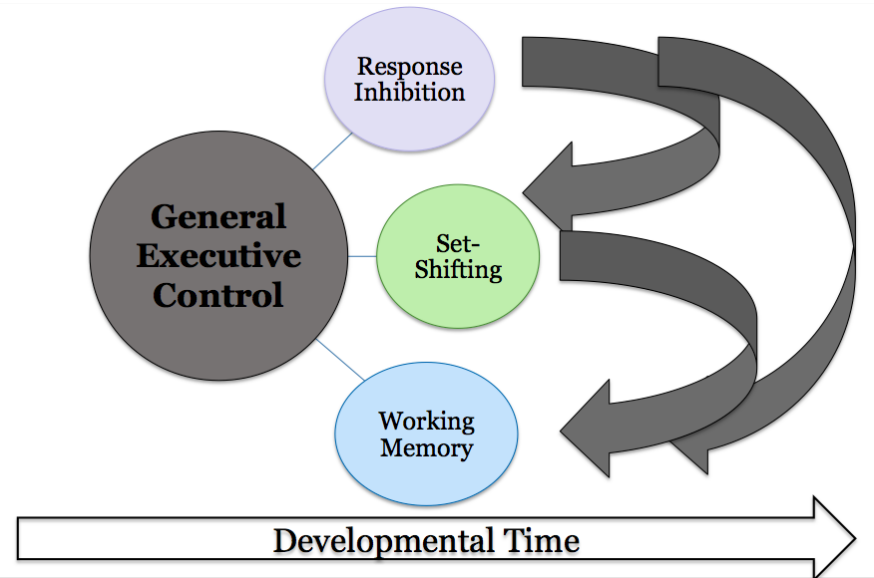
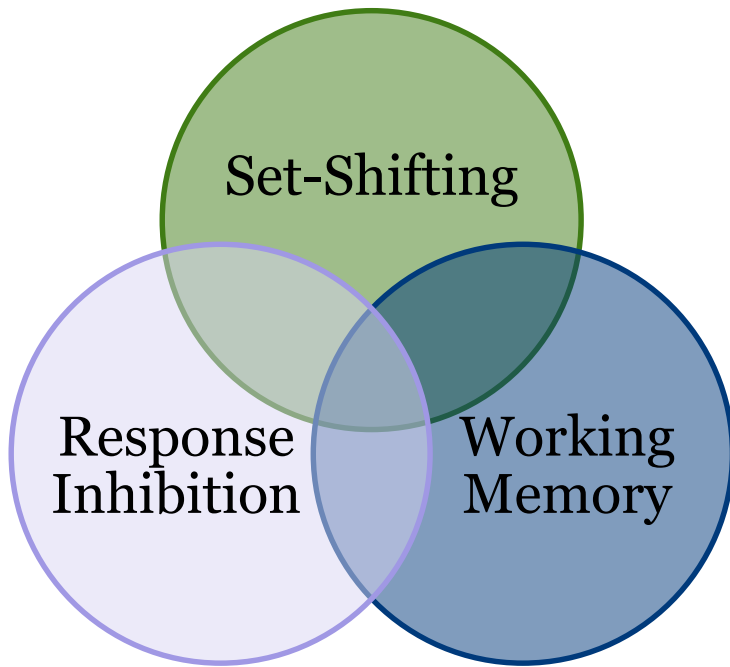
- Planning/sequencing of complex behaviors
- Ability to pay attention to several components at once
- Capacity for grasping the gist of a complex situation
- Resistance to distraction and interference
- Inhibition of inappropriate responses
- Ability to sustain behavioral output

Stuss & Benson (1984)

Regulating
and
Controlling Behavior

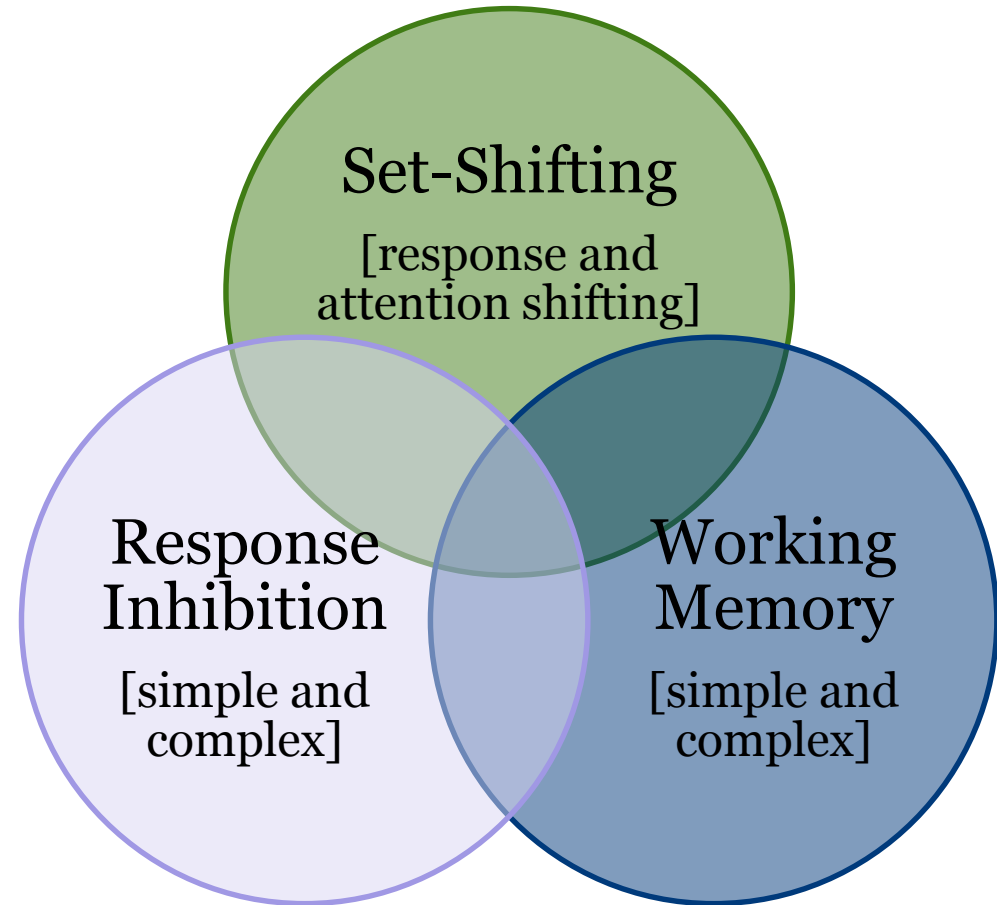


Development of executive functioning



Development of executive functioning

- Emerging < 12 months
 - Simple WM
 - Simple response inhibition
- Emerging 1-2 years
 - Complex WM
 - Complex response inhibition
- Emerging 2-4 years
 - Attention shifting



Executive functioning in ASD

	3 years (36 – 47 months)	4 years (48-49 months)	5 years (60+months)
A not B	ns		ns
A not B with variable delay	ns (less perseverative errors for ASD)	ns	ns↓ Deficits in working memory and response inhibition
A not B with invisible displacement	ns		
Delayed Non-Matching to Sample			↓ Deficits in rule learning
Spatial Reversal	ns (less perseverative errors for ASD)	↑ Strength in flexibility	↓ Deficits in flexibility
Alteration Task			ns- few children reached basal
Boxes		ns	

Executive functioning in ADHD

- More research but studies use different EF tasks [2.5 to 6 years]
- Inhibition:
 - medium effect size for inhibition
 - medium to large effect sizes for response inhibition and delay aversion
- Working Memory:
 - weakly related to ADHD symptoms
- Shifting/cognitive flexibility:
 - Least explored EF domain in ADHD in young children
 - Lowest effect size compared to other EF domains

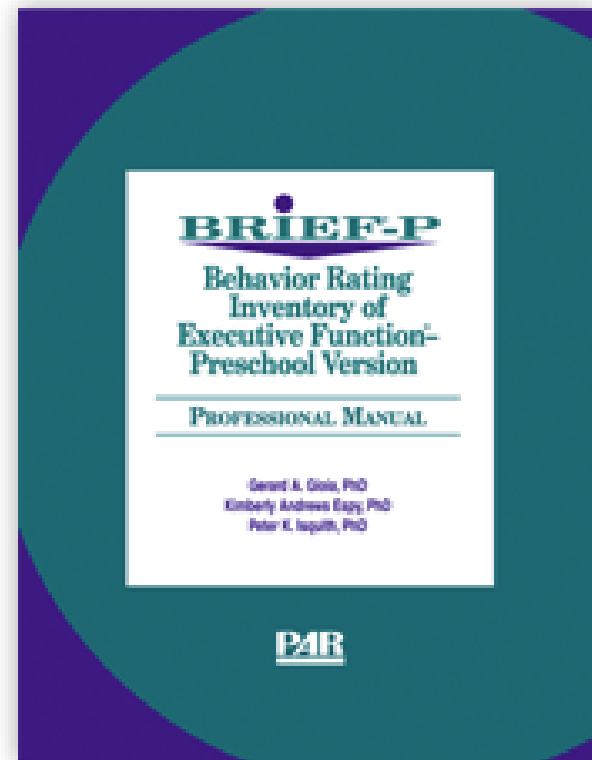
Executive functioning summary

- For ASD
 - Deficits in shifting are first to appear at 5 years of age
- For ADHD
 - Deficits emerge by 2.5 years, particularly as it relates to delay aversion and inhibitory control and then later working memory and shifting

The earlier appearance of EF deficits in ADHD suggests different processes involved in the early development of EF in ADHD vs ASD.

Ecologically valid measures of Executive Functioning

Behavior Rating Inventory of Executive Function



Behavior Rating Inventory of Executive Function - Preschool

Inhibitory Self-Control

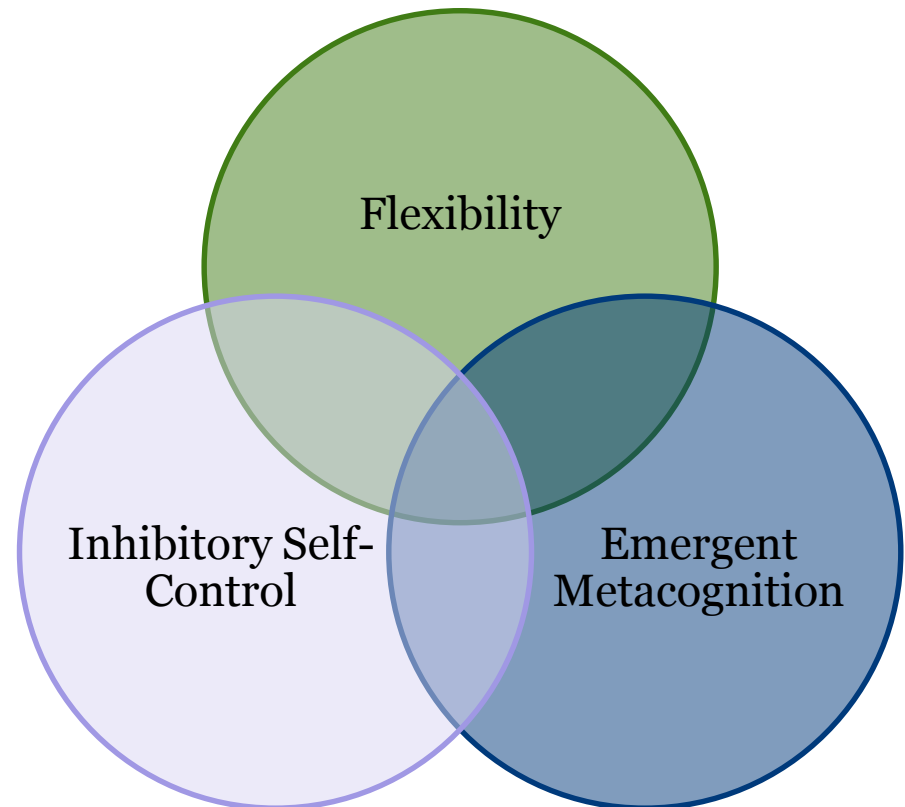
- ability to modulate actions, responses, emotions, and behavior via appropriate inhibitory control

Flexibility

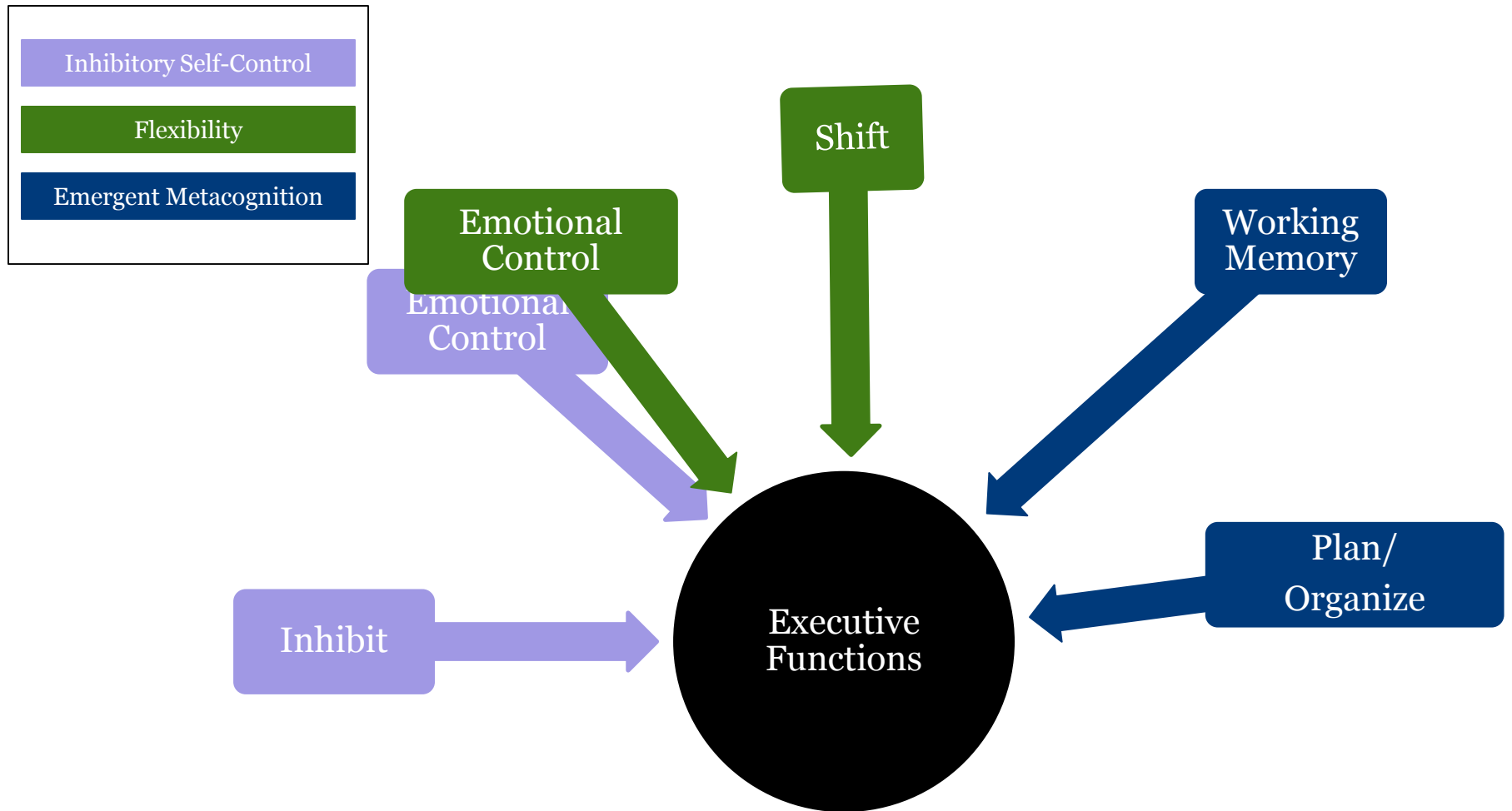
- ability to move flexibly among actions, responses, emotions, and behavior

Emergent Metacognition

- ability to sustain ideas and activities in working memory and to plan and organize problem solving approaches



BRIEF-P



Next steps

- Longitudinal investigations using HR-ASD and HR-ADHD samples
- Multimethod assessment approach
- Development of novel assessment tools
 - Eye tracking
 - “real world” lab-based EF tasks
- Examine the role of anxiety
- Development of treatment approaches

Thank you!



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