

Understanding Executive Functioning in Young Children with Autism and Other Developmental Disabilities



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Our Plan Today

What is executive function?



How does executive function develop?



Why is executive function important?



Can we improve executive function?



What is Executive Function?



The number one emotional/behavioral concern in preschool is:

DISRUPTIVE BEHAVIOR/TANTRUMS



Waiting

Following directions

Coping with feelings

New things

EXECUTIVE FUNCTION

Using words when upset

Handling changes

Getting along with others

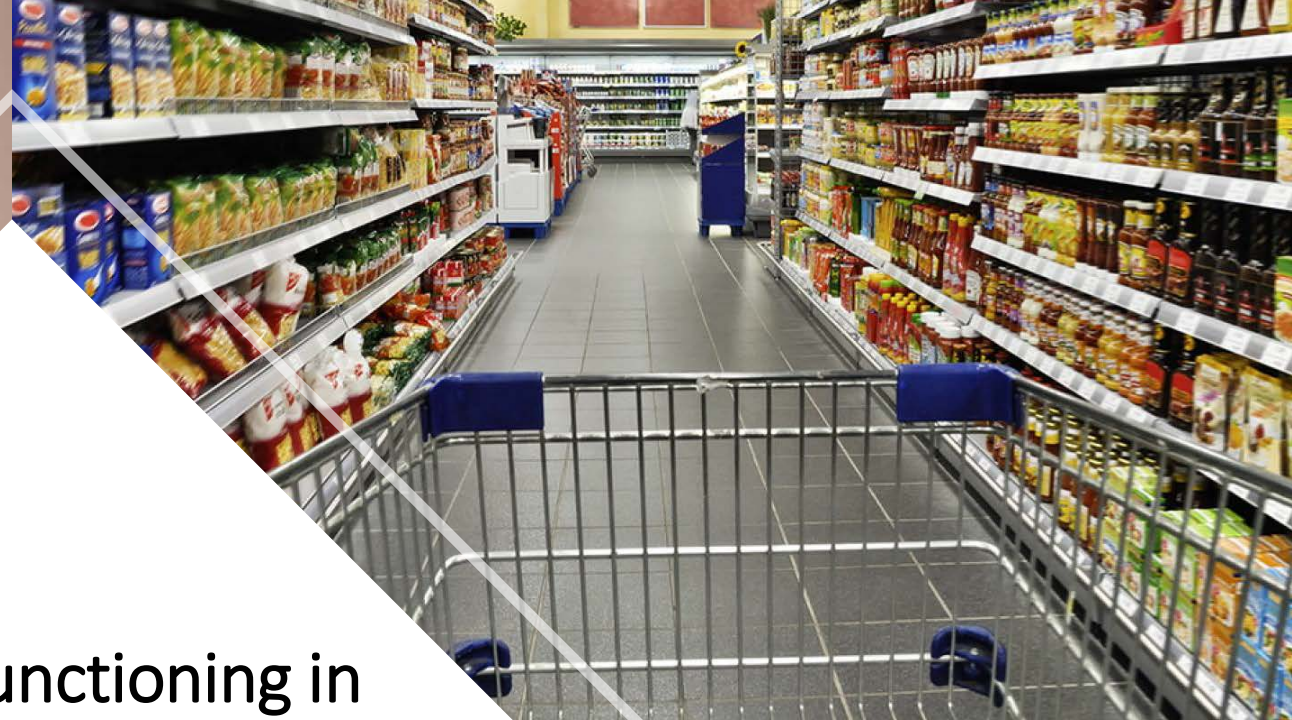


Executive Function: The “Conductor”

Brain abilities that allow us to:

- Know what is important (set a goal)
- Make plans to get to our goals
- Pay attention and do things at the right time
- Hold information in mind
- Stop doing something when told to
- Handle problems/frustration
- Cope with our feelings





Executive functioning in daily life



Cognitive Regulation

Initiate
Working Memory
Plan & Organize
Monitor

Behavior Regulation

Inhibit
Self-Monitor

Emotion Regulation

Flexibility
Emotional Control



Cognitive Regulation: Problem words to listen for

Initiate:

- Begin activity; generate ideas

“Unmotivated”
“Daydreamer”

Working Memory

- Hold information in mind to complete a task

“Doesn’t pay attention”
“Forgetful”
“Doesn’t follow instructions”

Plan/ Organize:

- Make a plan, think ahead, integrate and apply information, handle many inputs at once

“Messy”
“Gives Up”
“Tantrums over little things”

Monitor:

- Check work; assess own performance or progress

“Careless”
“Lazy”

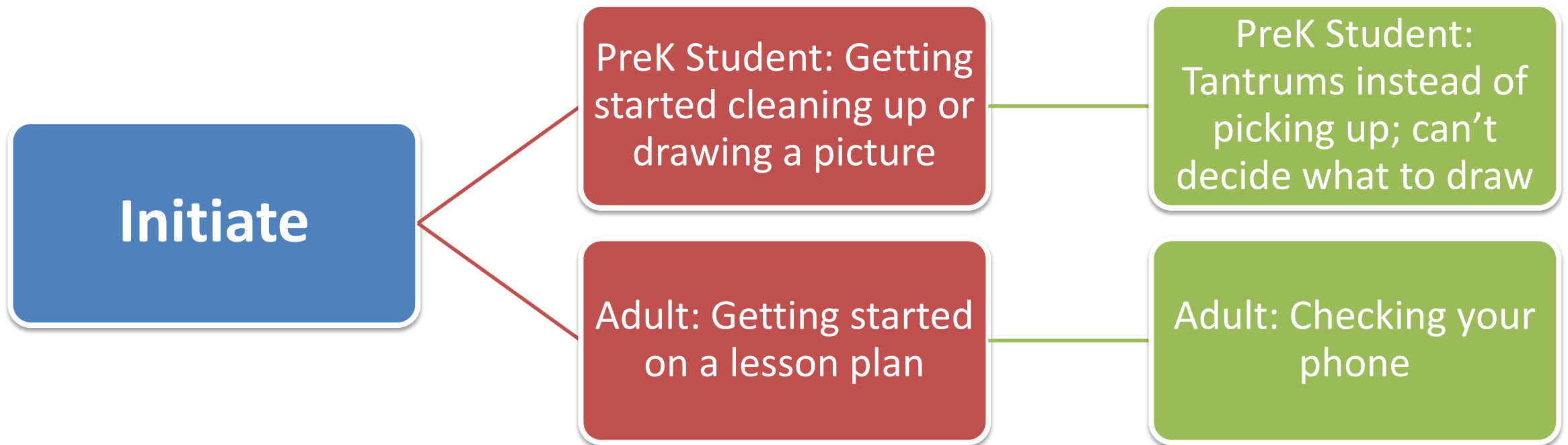


Cognitive Regulation in the Preschool Classroom

EF Domain

Task

What you see

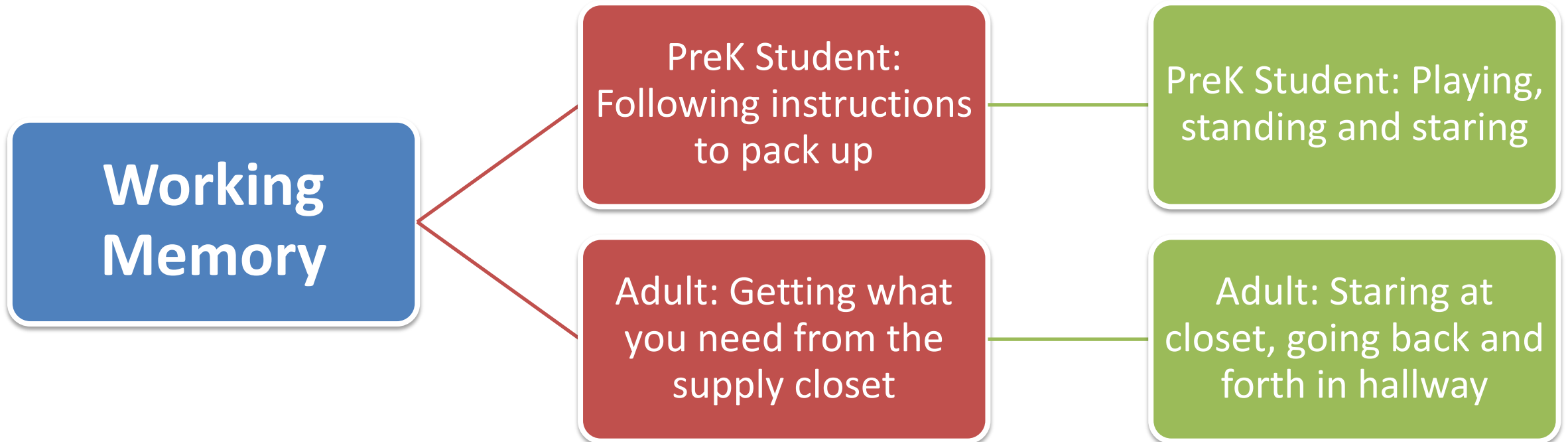


Cognitive Regulation in the Preschool Classroom

EF Domain

Task

What you see



Cognitive Regulation in the Preschool Classroom

EF Domain

Task

What you see

Plan/Organize

PreK Student:
Complete an art
project, build a
tower

PreK Student: Art
project comes out
“wrong,”
easily
overwhelmed

Adult: Setting up
classroom or office

Adult: Materials all
over, easily
overwhelmed



Cognitive Regulation in the Preschool Classroom

EF Domain

Task

What you see

Monitor

PreK Student:
Noticing how a
worksheet or craft
is going

Adult: Keeping
track of schedule,
student progress
on activities

PreK Student:
Makes the same
mistakes over and
over

Adult: Struggles to
notice problems
and problem solve



Behavior Regulation: Problem words to listen for

Inhibit:

- Control impulses; stop behavior

“Aggressive”
“Hyperactive”
“Spoiled”

Self-Monitor:

- Aware of how own behavior affects and is seen by others

“Tantrums often”
“Selfish”
“Lies/denies wrongdoing”



Behavior Regulation in the Preschool Classroom

EF Domain

Task

What you see

Inhibit

PreK Student:
Sharing with peers;
waiting in line;
staying seated

PreK Student: Can't
stay seated/wait,
grabs toys, hits

Adult: Making
healthy eating
choices,
responding to class
behavior

Adult: Acts/reacts
without thinking,
makes decisions
they regret



Behavior Regulation in the Preschool Classroom

EF Domain

Task

What you see

Self-Monitor

PreK Student: Playing with peers, circle time

PreK Student: Talks about own interests, ignore peers' ideas

Adult: Staff meeting or parent/teacher conference

Adult: Difficulty noticing & adapting if conversation not going well



Emotion Regulation: Problem words to listen for

Flexibility:

- Ability to transition, handle changes in routine, try new experiences or strategies

“Stubborn”
“Willful”
“Insists on their own way”
“Argumentative”

Emotional Control:

- Skills for communicating about feelings and using coping skills to calm

“Overreacts”
“Tantrums often”
“Easily upset”
“Irritable”



Emotion Regulation in the Preschool Classroom

EF Domain

Task

What you see

Flexibility

PreK Student:
Substitute teacher,
field trip or "fun day"

PreK Student:
Tantrums or anxiety in
response to change;
has to have things
"own way"

Adult: Adapting to the
COVID world;
unexpected
interruptions

Adult: Frozen or
overwhelmed by
change



Emotion Regulation in the Preschool Classroom

EF Domain

Task

What you see

Emotional Control

PreK Student:
Handling disappointment,
accepting consequences

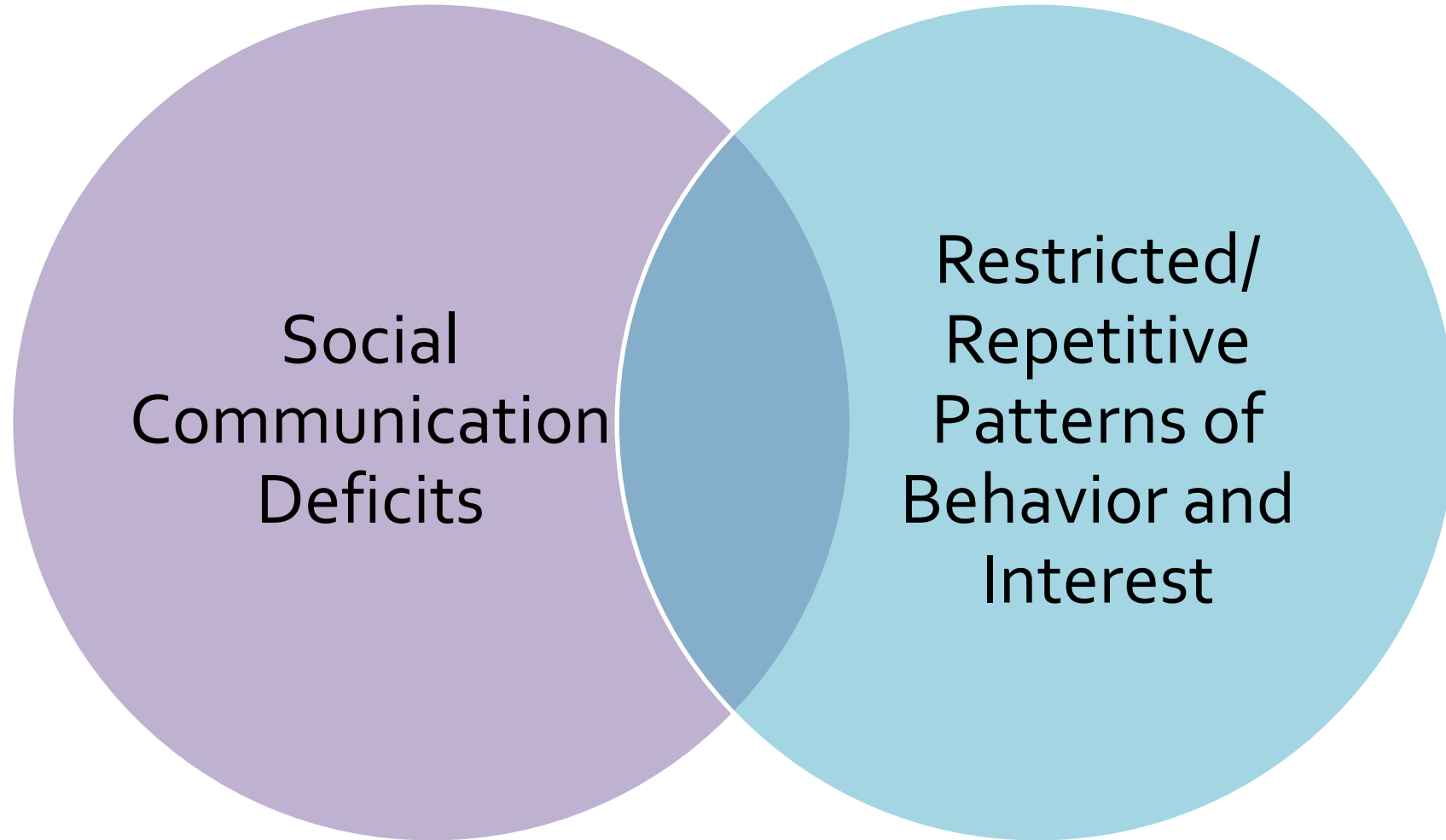
PreK Student:
Often cries or
tantrums,
aggressive

Adult: Responding
to student
emotions, working
on a stressful day

Adult: Takes out
frustration on
others, shuts down



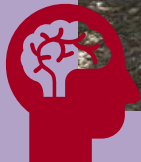
Autism Spectrum Disorder





Social Communication

- Nonverbal communication differences
- Tend to think visually, not verbally
- Difficulty with back-and-forth interactions
- Difficulties making and keeping friends
- Limited pretend play skills
- Problems adjusting behavior to social context
- Challenges reading and responding to social cues





Restricted/ Repetitive Behaviors

- Repetitive movements and language
- Intense interests
- Overwhelmed by changes in routines
- Sensory processing difficulties

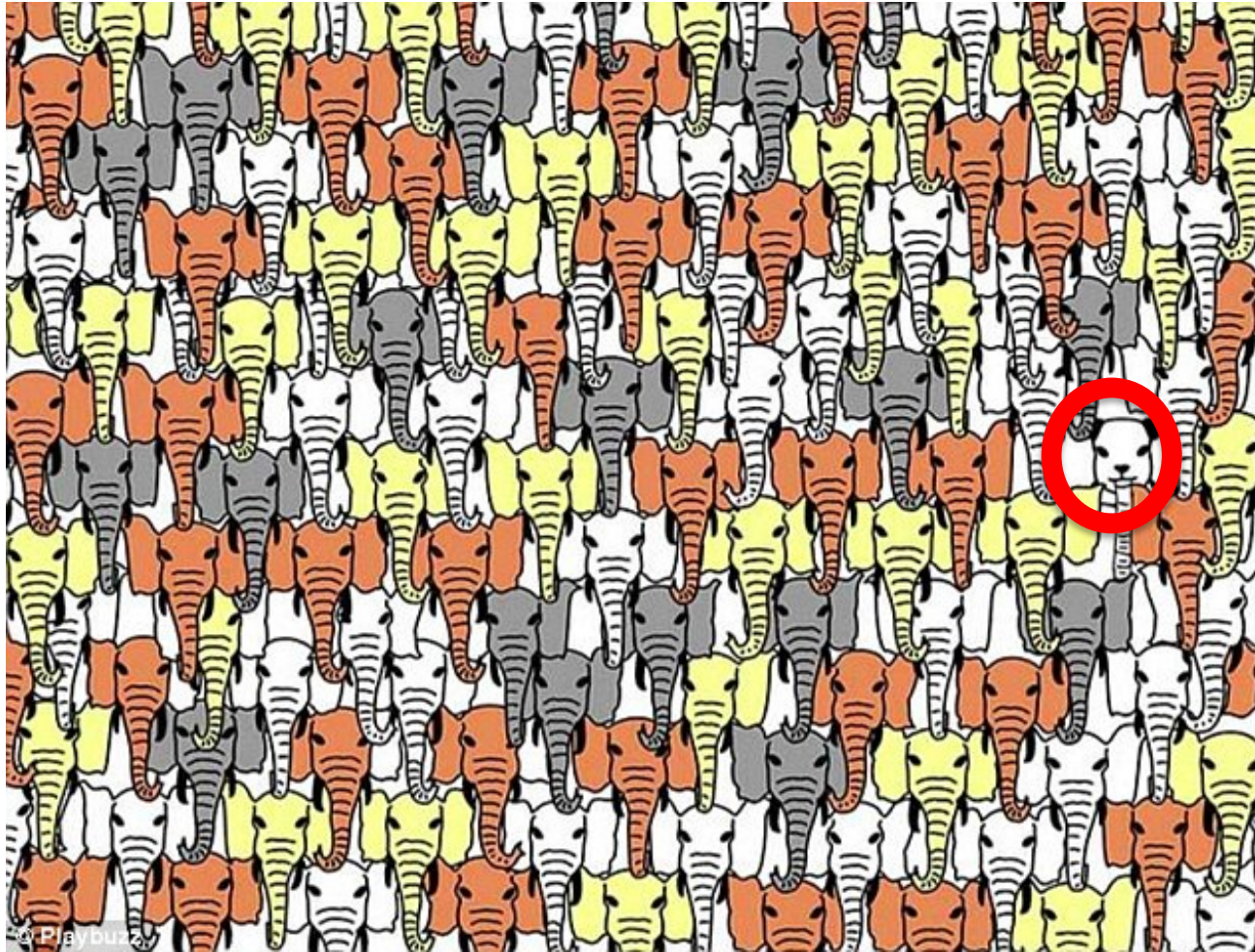




- Idea that there are a range of neurological and behavioral traits in the human population, with none more inherently “disordered” than any other
- How impairing a neurological profile is depends on the *environment* not on the *profile*
- Tend to use “identity-first” rather than “person-first” language



Strengths of Autistic Thinking



Strong eye
for details

Powerful
memory

Capacity for
intense focus

Logical
reasoning

Creative
perspective

Honesty

Do you see the panda's face?



But this way of thinking can also create challenges...



**How would you
handle cleaning
this up?**



Most Common Executive Function Challenges in ASD

Flexibility

- Transitioning from one activity to another
- Changes in routine
- Violations of expectations
- Seeing more than one way of doing things
- Easy to get stuck

(Rumsey, 1985; Hill, 2004, Kenworthy et al, 2008)

Planning/Organization

- Knowing how to accomplish a goal
- Prioritizing
- Identifying main idea and organizing thinking
- Can't see the forest for the trees

(Ozonoff, 1991; Hughes, 1994; Kenworthy, 2005; Hill, 2004)



Different Brains: Getting Stuck

“It’s like having a clamp...a vise on your brain. And each change, ...every unexpected event is like another turn on the vise...it just keeps building until you feel like you’re going to explode. Sometimes when you explode, it comes out the wrong way.”

-Child with ASD

“What purpose does inflexibility serve? For one thing, it is an effective anti-anxiety coping mechanism. It provides order in the context of a world that that is confusing and illogical for us.”

-Ari Ne’eman, Co-Founder of the Autistic Self-Advocacy Network

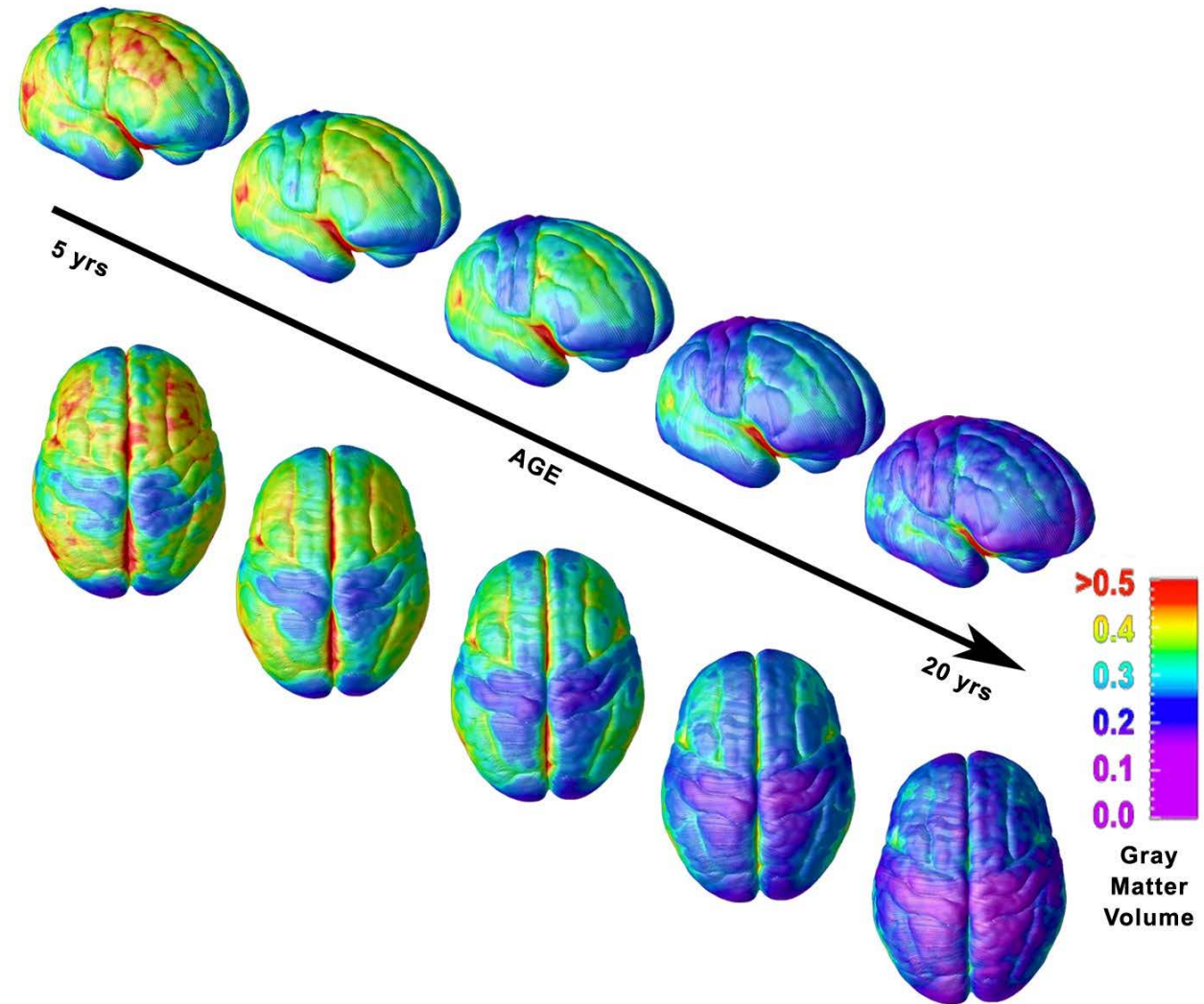


How Does Executive Function Develop?

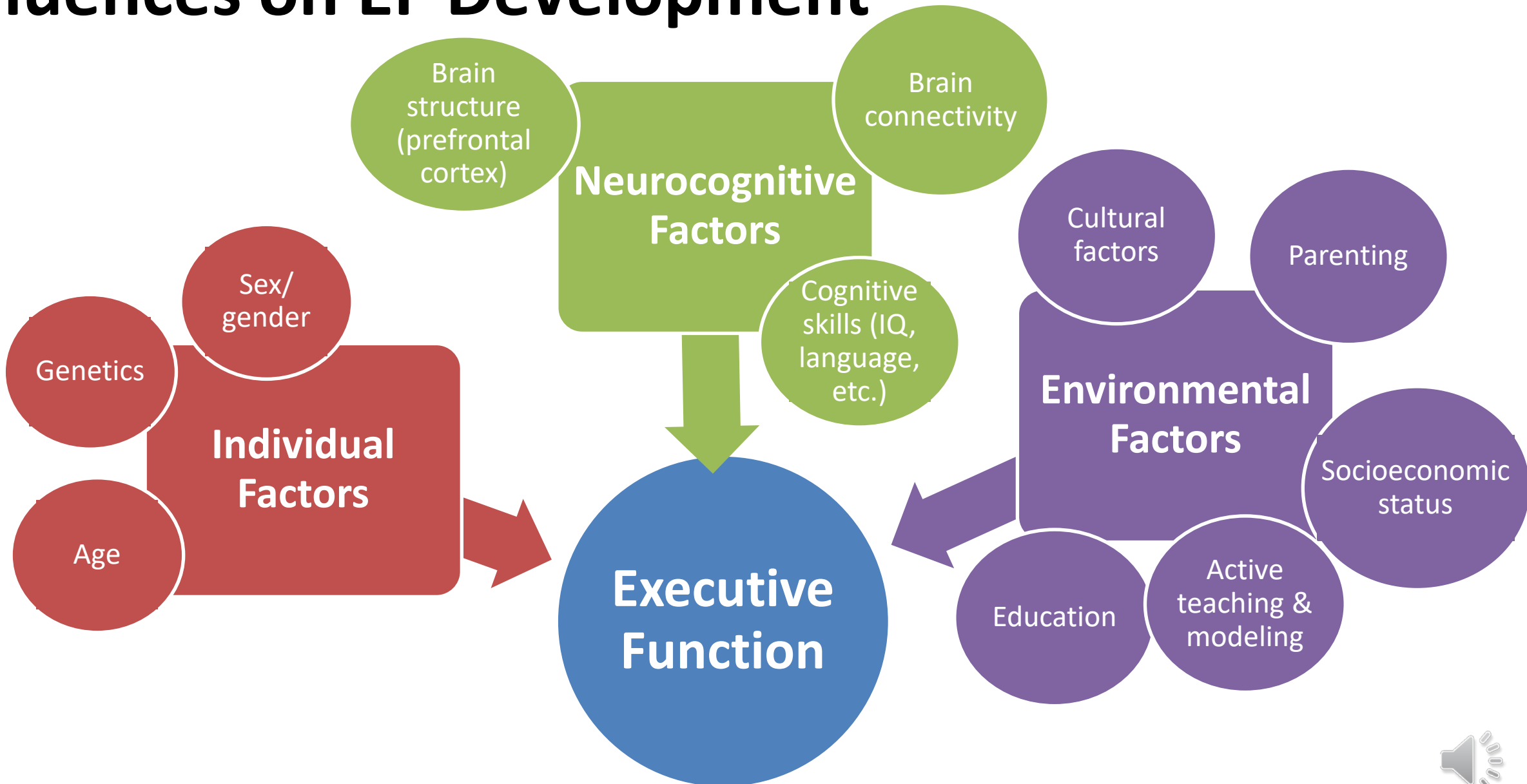


EF: The Last Skill to Develop

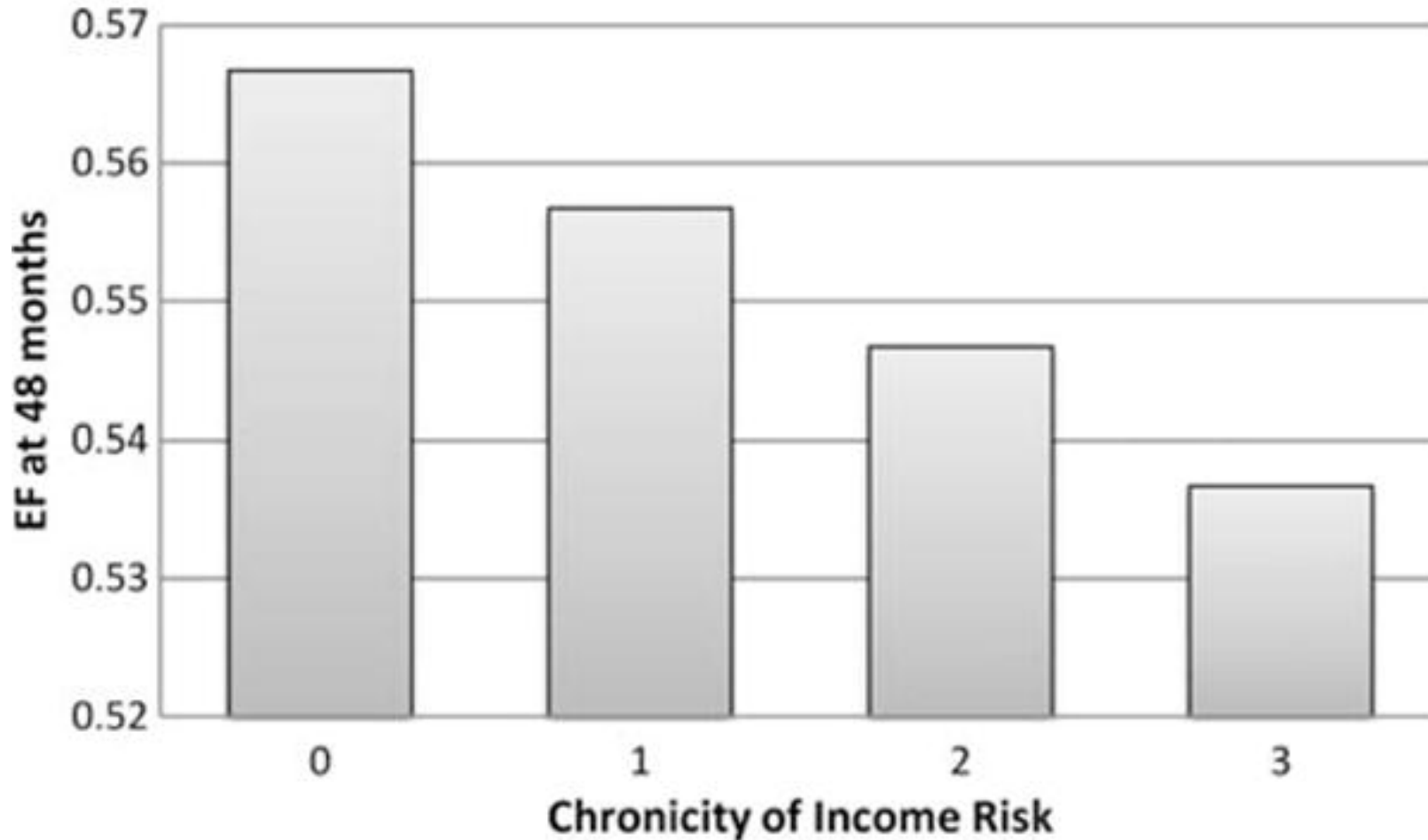
- The brain continually changes throughout our lives
- Prefrontal cortex (director of executive functioning) is the last to mature and not fully developed until young adulthood



Influences on EF Development



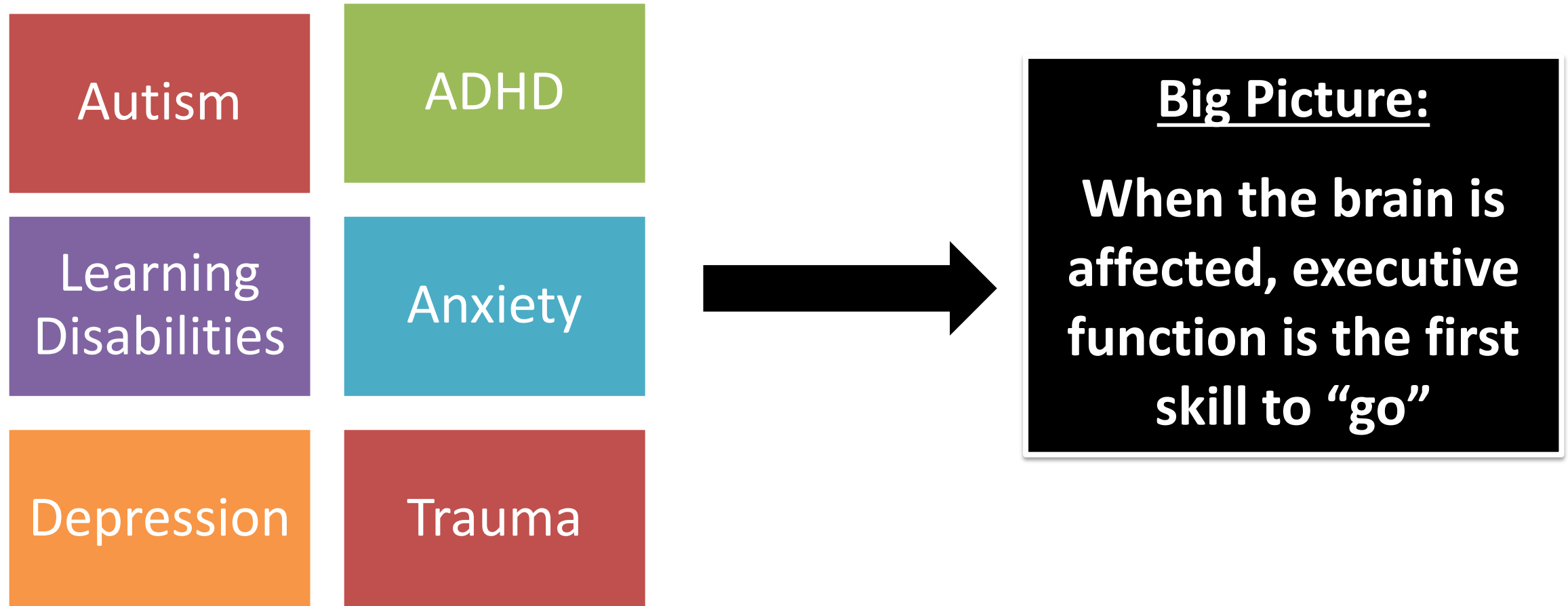
Poverty: Environmental Risk to EF Development



Direct linear relationship between time spent in poverty and declines in EF skills



Developmental and Mental Health Conditions Associated with EF Deficits



Is It a “Won’t” or a “Can’t Yet”?



“Won’t”

- Stubborn
- Never follows directions
- Won’t do things for himself
- Doesn’t use her words
- Refuses to try new things
- Tantrums

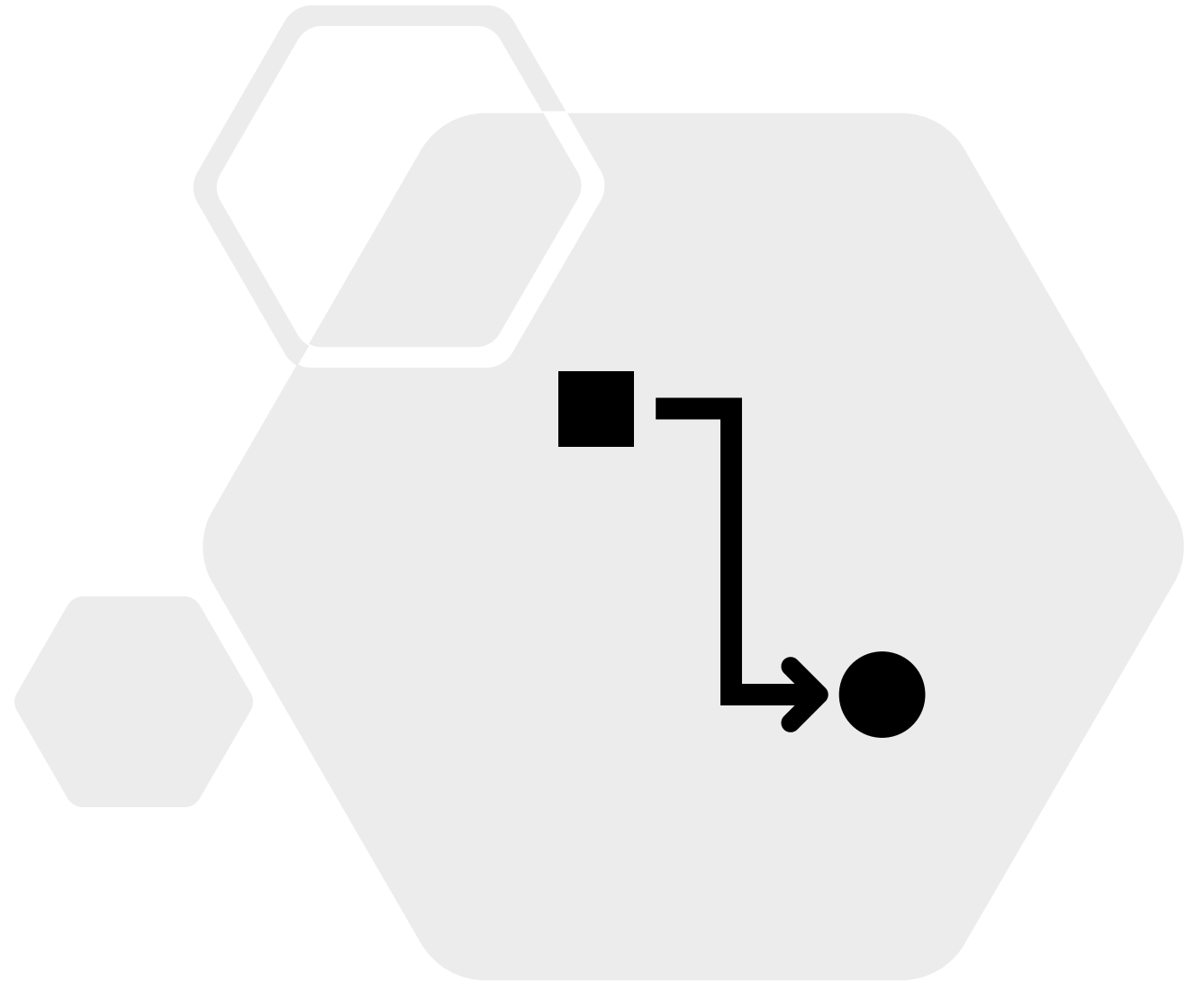


“Can’t Yet”

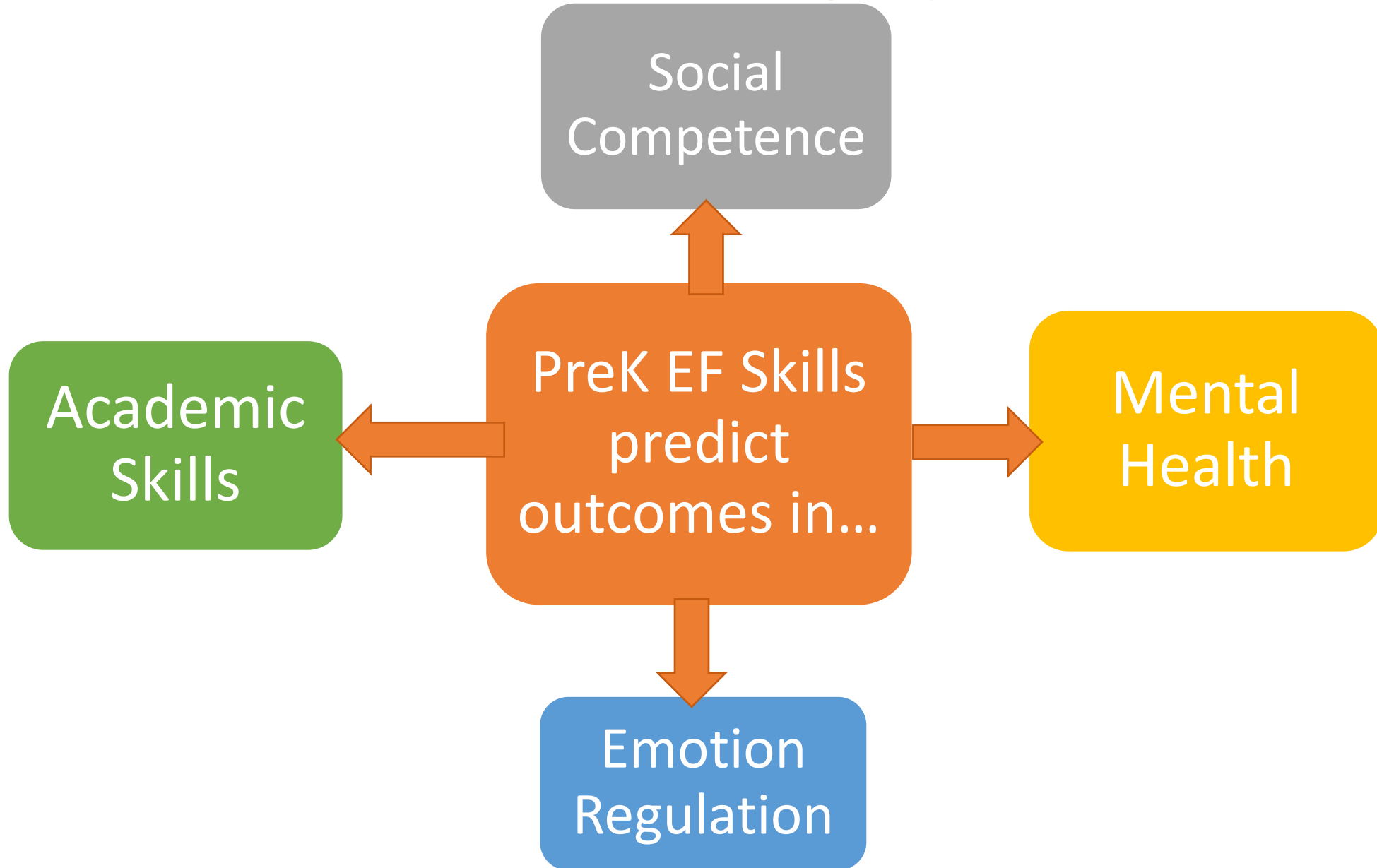
- Gets stuck
- Easily distracted
- Trouble initiating or planning
- Language deficits
- Overwhelmed
- Poor coping skills



Why is
Executive
Function
Important?

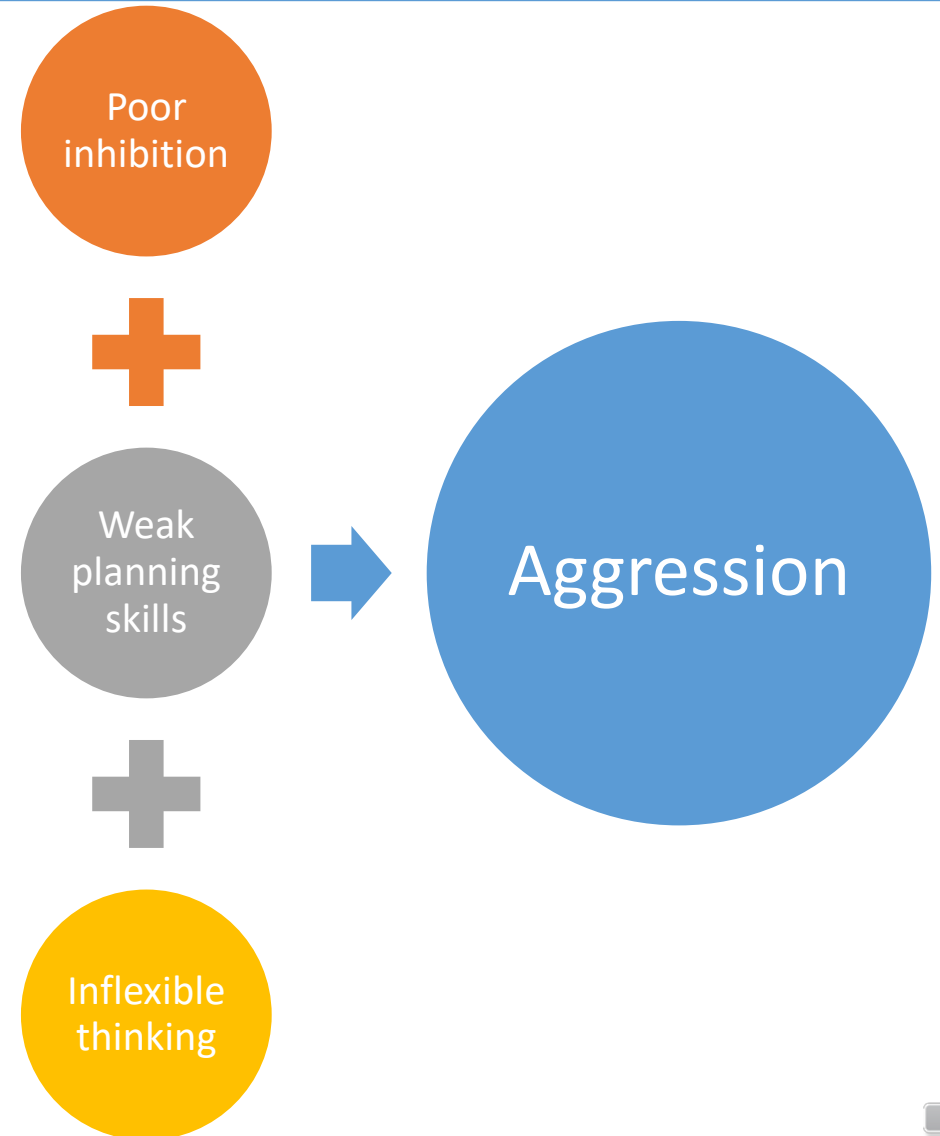


Why is Preschool Executive Functioning Important?



Emotion Regulation

- Early childhood EF deficits, particularly in flexibility, predict later negative emotionality and social withdrawal¹
- Young children's EF deficits, including working memory, inhibition, and flexibility, are associated with anger, hostility, and aggressive behavior^{2, 3, 4} both concurrently and in middle childhood
- In autism, middle childhood EF (behavior regulation) mediates relationship between early autism symptoms and adolescent aggression⁵

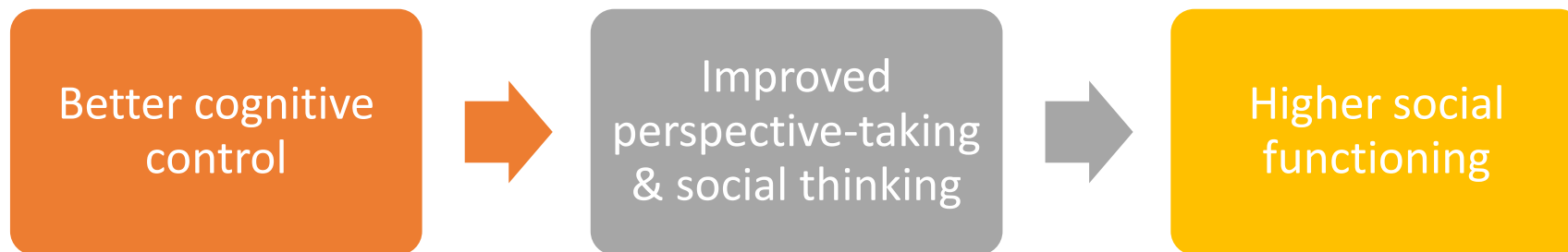


¹Ghassabian et al. (2014); ²Ellis et al. (2009) ³Sasser et al. (2015) ⁴Rohlf et al. (2018) ⁵Ameis et al. (2022)



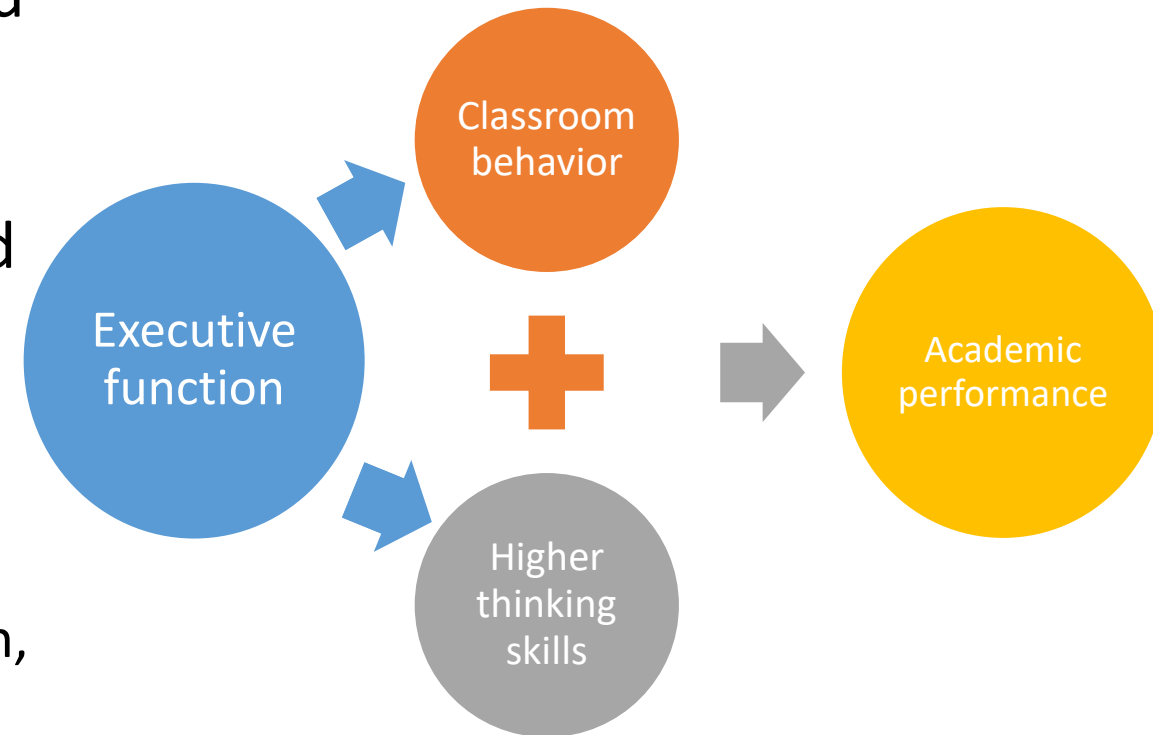
Social Competence

- EF skills overall associated with current and later social skills with peers²
- Behavior regulation (flexibility, inhibition, emotional control) are associated with social skills in middle childhood for all children³
- In autism:
 - EF skills (flexibility) predict preschool play skills¹ in those with intact language
 - Both behavior regulation and metacognitive skills (working memory, planning, monitoring) predict social skills³
 - EF skills (broadly) are associated with social skills⁴ and theory of mind⁵



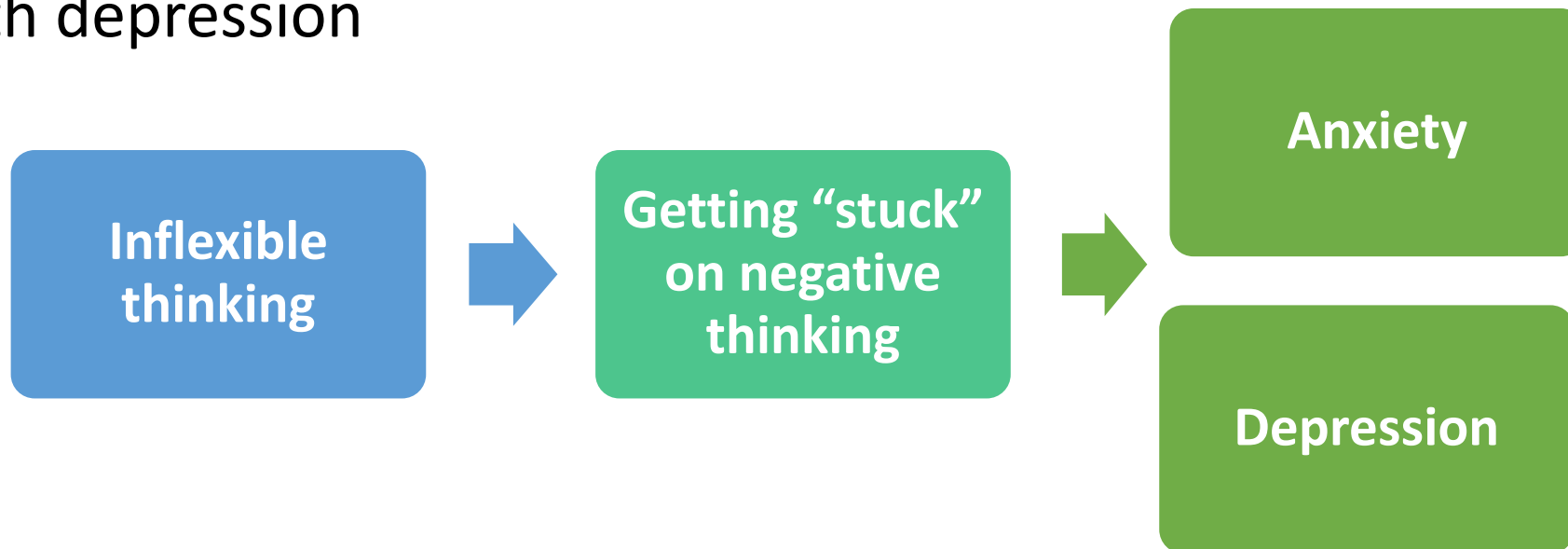
Academic Skills

- Preschool EF skills (working memory, inhibition, flexibility) predict academic performance^{2,4} and growth
- Preschool self-regulation/emotional control skills predict growth in literacy, vocabulary, and math skills over the year³
- In autism:
 - Early childhood EF skills (inhibition, working memory) predict school readiness¹ for kindergarten, even after controlling for core cognitive skills
 - Middle childhood EF (behavior regulation) mediates relationship between early autism symptoms and adolescent academic skills⁵



Mental Health Outcomes

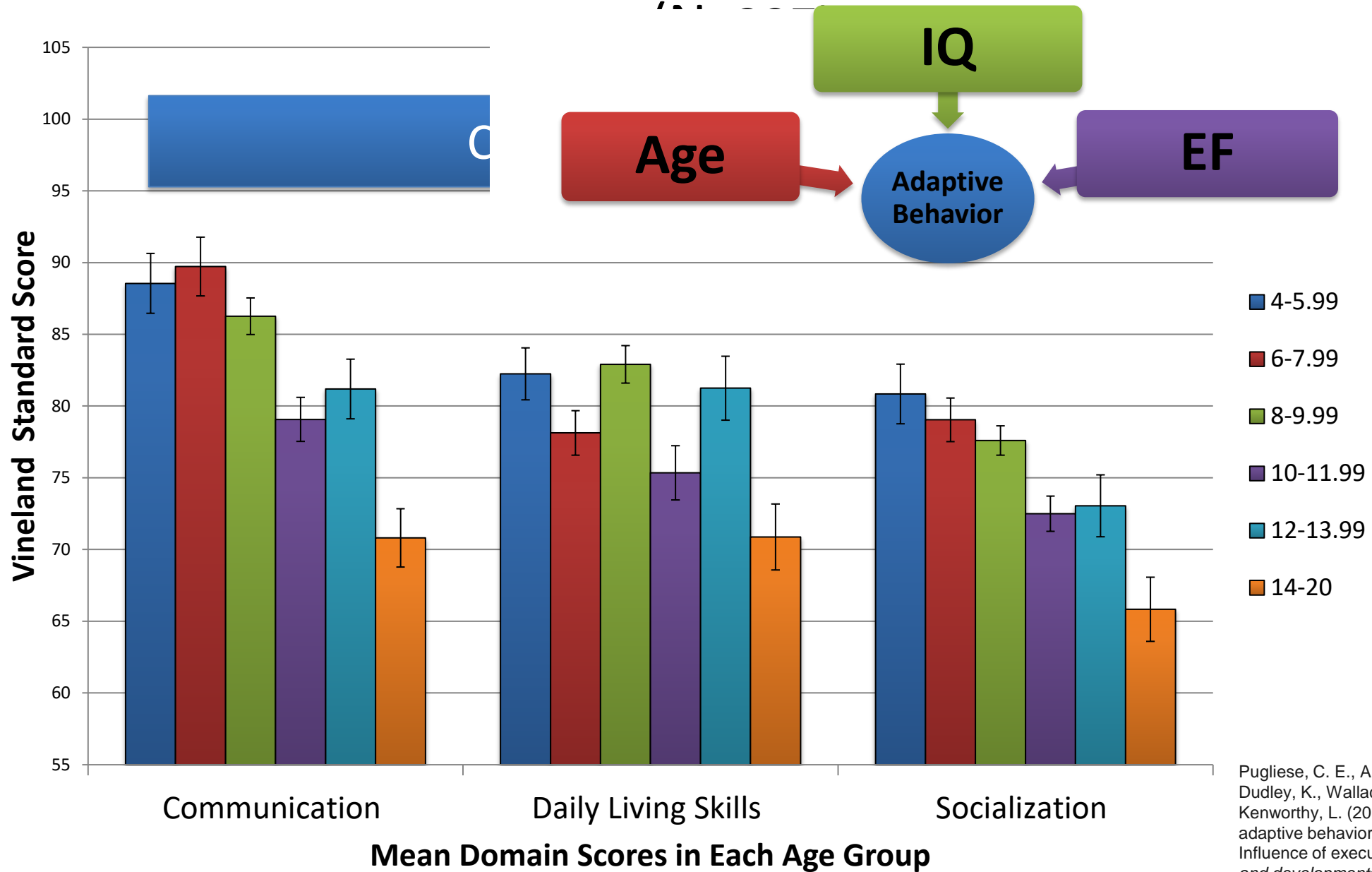
- Preschool EF skills, particularly flexibility, predict depression and anxiety in middle childhood^{1,5}
- In autism, EF deficits, particularly flexibility, are also associated with anxiety^{2, 3} and metacognitive deficits³ and inflexibility⁴ are associated with depression



¹Kertz et al. (2016) ²Zimmerman et al. (2017) ³Wallace et al. (2017) ⁴Lawson et al. (2015) ⁵Affrunti & Woodruff-Borden (2013)



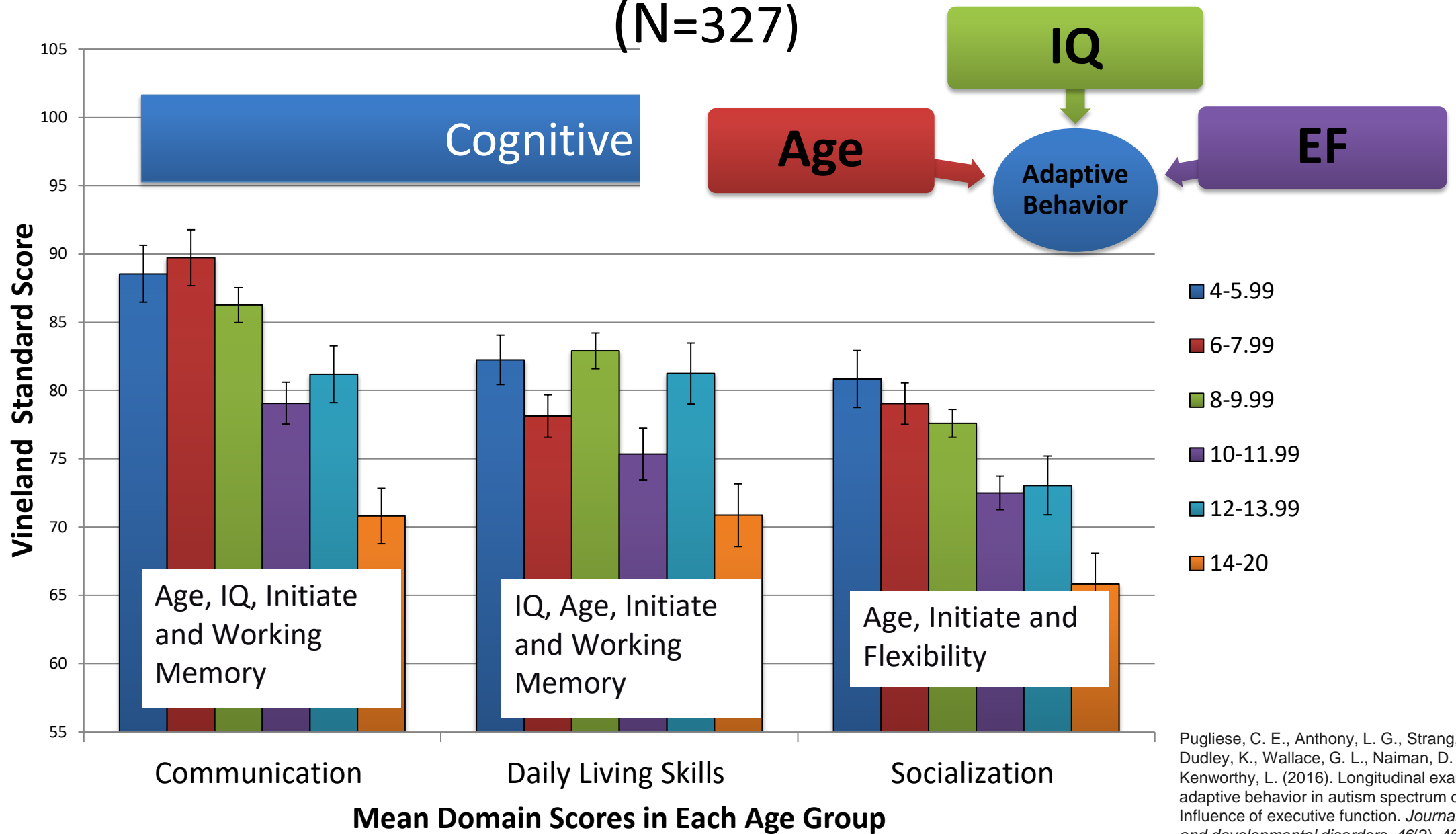
Adaptive Skills by Age Group in Autism



Pugliese, C. E., Anthony, L. G., Strang, J. F., Dudley, K., Wallace, G. L., Naiman, D. Q., & Kenworthy, L. (2016). Longitudinal examination of adaptive behavior in autism spectrum disorders: Influence of executive function. *Journal of autism and developmental disorders*, 46(2), 467-477.



Adaptive Skills by Age Group in Autism (N=327)



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Can We
Improve
Executive
Function?





Feed self



Clear dishes



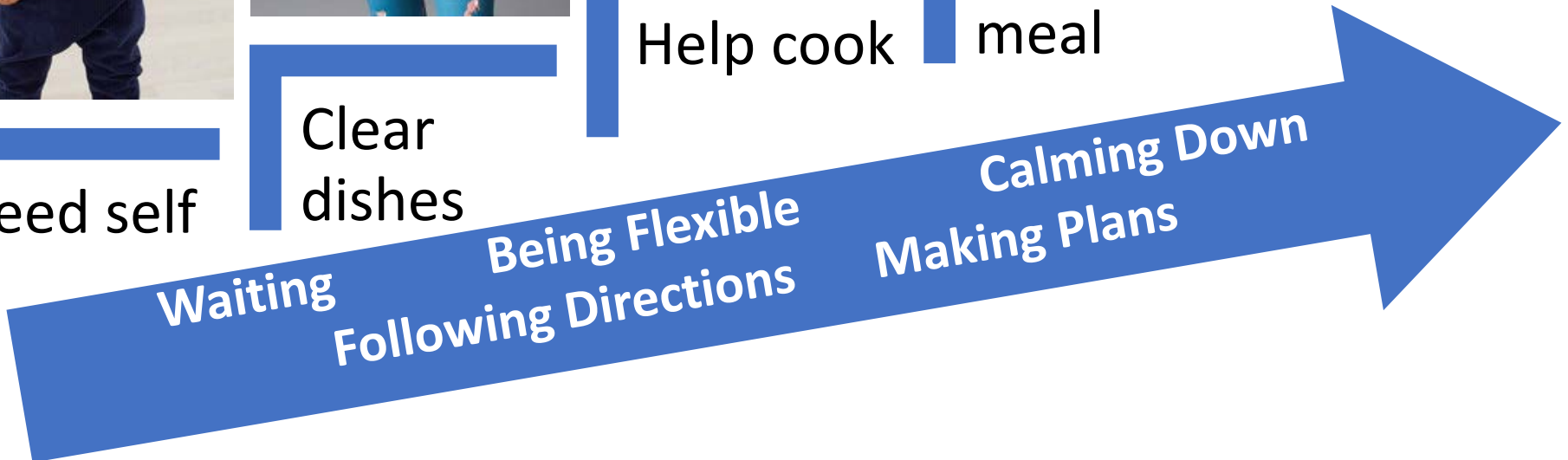
Help cook



Simple meal



Complex recipe



Evidence for EF Intervention

- Children can improve performance in working memory through computer games-based training
 - ... but less effective for inhibition; poor generalization
- Some evidence that martial arts training and mindfulness can improve EF skills broadly
- Promising Tier 1 programs exist for improving EF and self-regulation in preschool
- Evidence for Tier 2 EF intervention improving classroom behaviors and social skills for elementary school students with ASD and/or ADHD



Language Considerations in PreK Intervention

Simple sentences:

- I see a car.
- Give me the shirt.
- I want that toy.



Complex sentences:

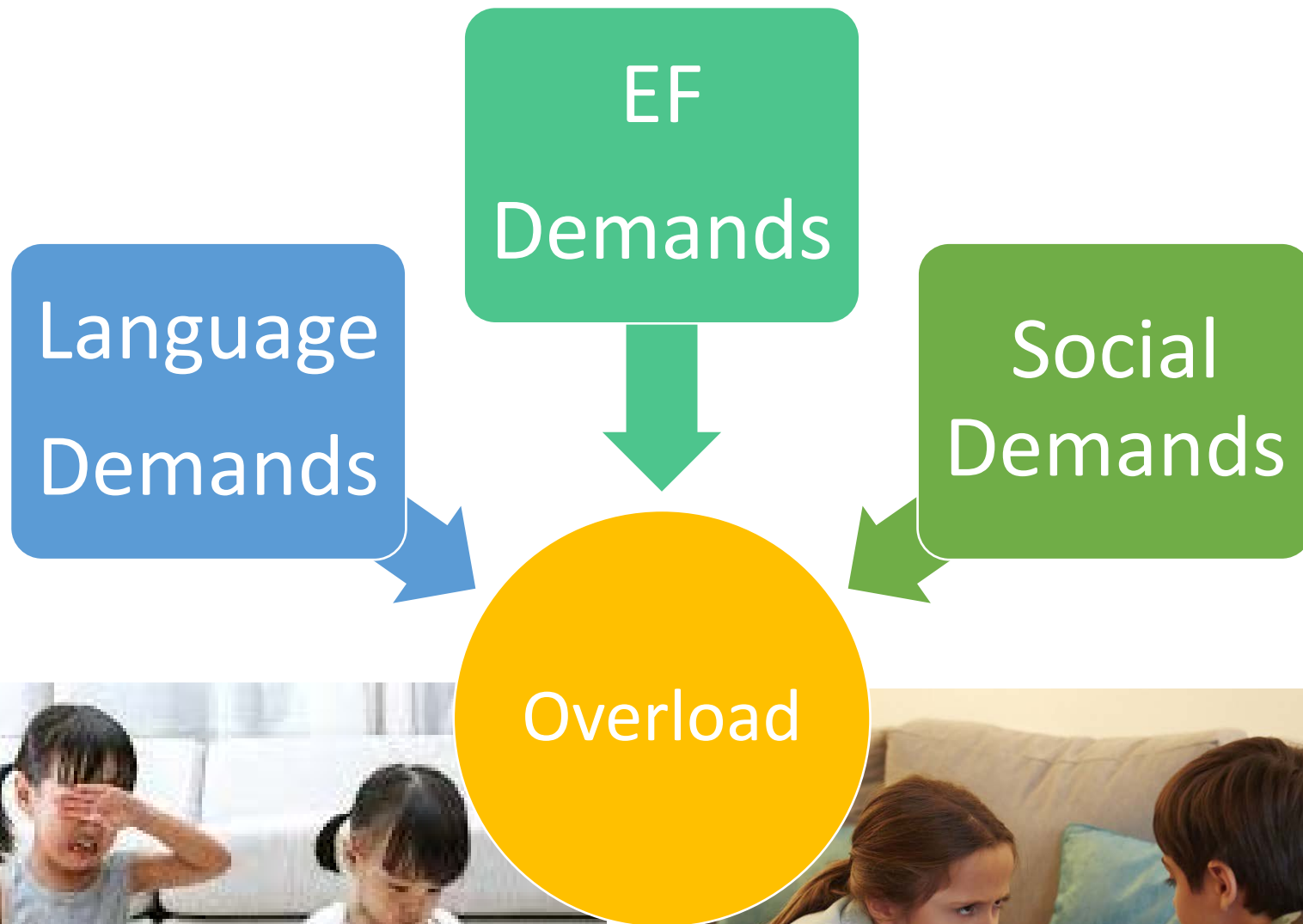
- That man is driving his car fast!
- Please pick up the shirt and put it in the basket.
- I want the blue truck because it's my turn.

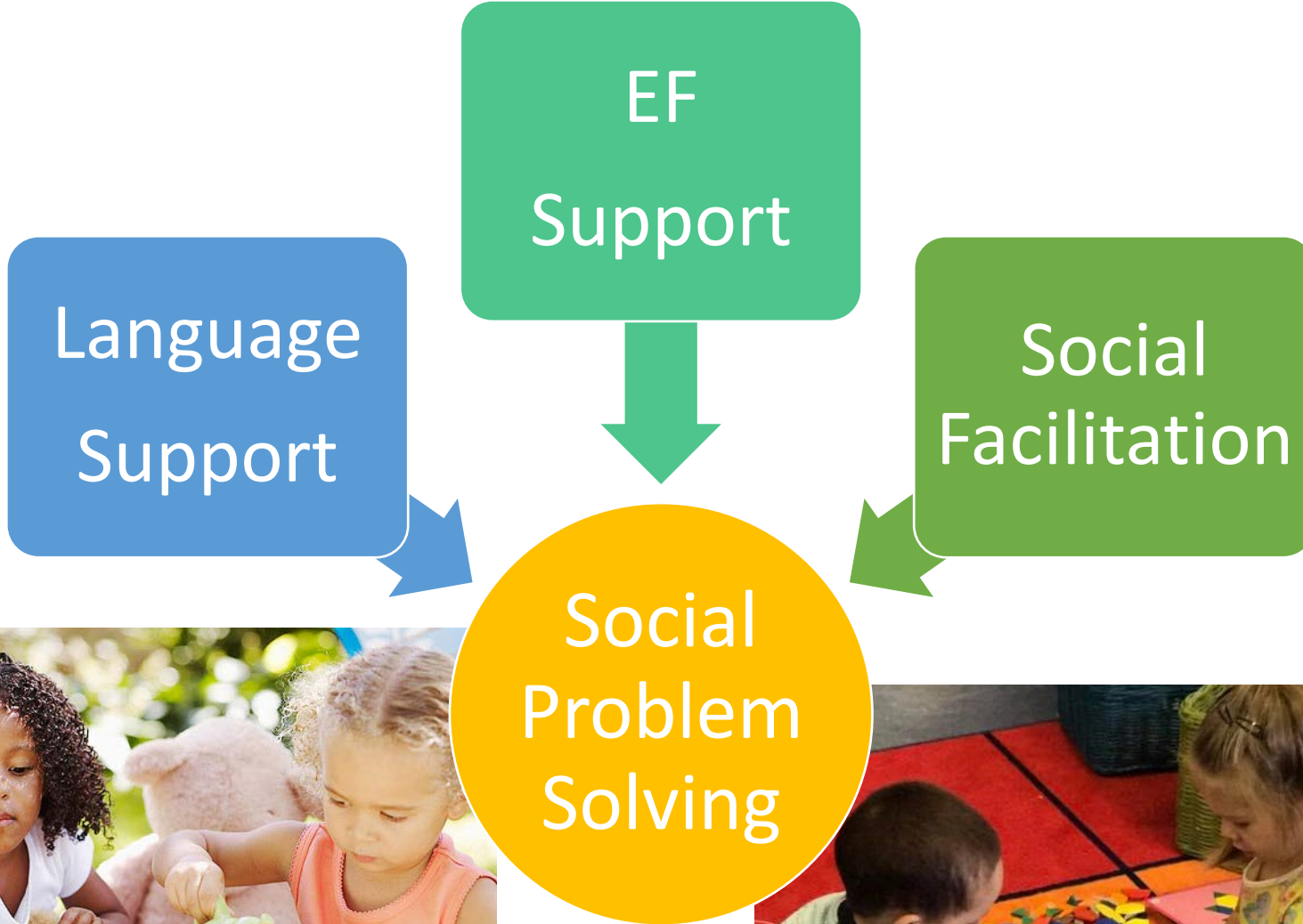
Language skills may “disappear”
when kids are upset



Make it simple and predictable







So how do we improve executive function?

Tune in next week for..

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Disabilities***

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