The Quiet Impact of Executive Dysfunction on Classroom Participation in Autism

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Objectives

1. Participants will be able to define executive dysfunction and understand how it presents in autism.

2. Participants will be able to distinguish unique and overlapping features of autism and attention deficit/hyperactivity disorder.

3. Participants will be able to identify effective strategies to support academic, social, and behavioral functioning of autistic students without accompanying intellectual disability.

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Autism Spectrum Disorder

DSM-5 (TR)

A. Social Communication

B. Restricted and Repetitive Patterns of Behavior

Other Childhood Conditions can *Look Like* Autism (Rule-outs)

- Receptive/Expressive Language Disorder
- Attention Deficit/Hyperactivity Disorder
- Anxiety
- Intellectual Disability
- Learning Disability
- Tourette Syndrome
- Giftedness
- Many more...

http://drashokakela.blogspot.com/2015/05/zebra-colour-pattern-in-livestock.html

Other Childhood Conditions that *Come Along* with Autism (Co-occurring)

- Receptive/Expressive Language Disorder
- Attention Deficit/Hyperactivity Disorder
- Anxiety
- Intellectual Disability
- Learning Disability
- Tourette Syndrome
- Giftedness
- Many more…

http://drashokakela.blogspot.com/2015/05/zebra-colour-pattern-in-livestock.html

Attention Deficit/Hyperactivity Disorder (ADHD)

DSM-5 (TR)

A.   6 or more symptoms of Inattention

(e.g., careless mistakes, poor attention to detail, limited sustained attention, trouble following-through with instructions, distracted, forgetful, loses important items)

B.   6 or more symptoms of Hyperactivity/Impulsivity

(e.g., fidgety, overly active- out of seat, always on the move, cannot play quietly, talks excessively, difficulty waiting turn, interrupts others)

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How does Co-Occurring ADHD with ASD impact behavioral presentation?

- N=25,078
  - o Ages 6-18
  - o Males n = 19,681
  - o Females n = 5,397

- Developmental and medical history

- Looked at social, RRBs, and motor

Co-occurring attention-deficit/hyperactivity disorder and anxiety disorders differentially affect males and females with autism

Ericka L. Wodka[a,b], Julia Parish-Morris[c,d], Robert D. Annett[e], Laura Carpenter[f], Emily Dillon[g], Jacob Michaelson[h], So Hyun Kim[i], Rebecca Landa[a,b], the SPARK Consortium[#] and Stephen Kanne[i]

Scan to learn more about or join SPARK!

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# Demographic differences

	Overall	ASD Only	ASD+ADHD	ASD+Anx	ASD+ADHD+Anx	Subgroup Difference
Sex distribution	N=25,078	N=10,804	N=7,707	N=2,045	N=4,522	
Female – N (%)	5,397 (21.5%)	2,536 (23.5%)	1,268 (16.5%)	595 (29.1%)	998 (22.1%)	X^2 = 211.87*
Male – N (%)	19,681 (78.5%)	8,268 (76.5%)	6,439 (83.5%)	1450 (70.9%)	3,524 (77.9%)	
Sex ratio vs. ASD Only		Reference	More males*	More females*	ns	

Wodka et al., 2022

ADHD Impacts Age of Diagnosis and Motor Skills

Increases the age of diagnosis
From 4 to 6-8 years
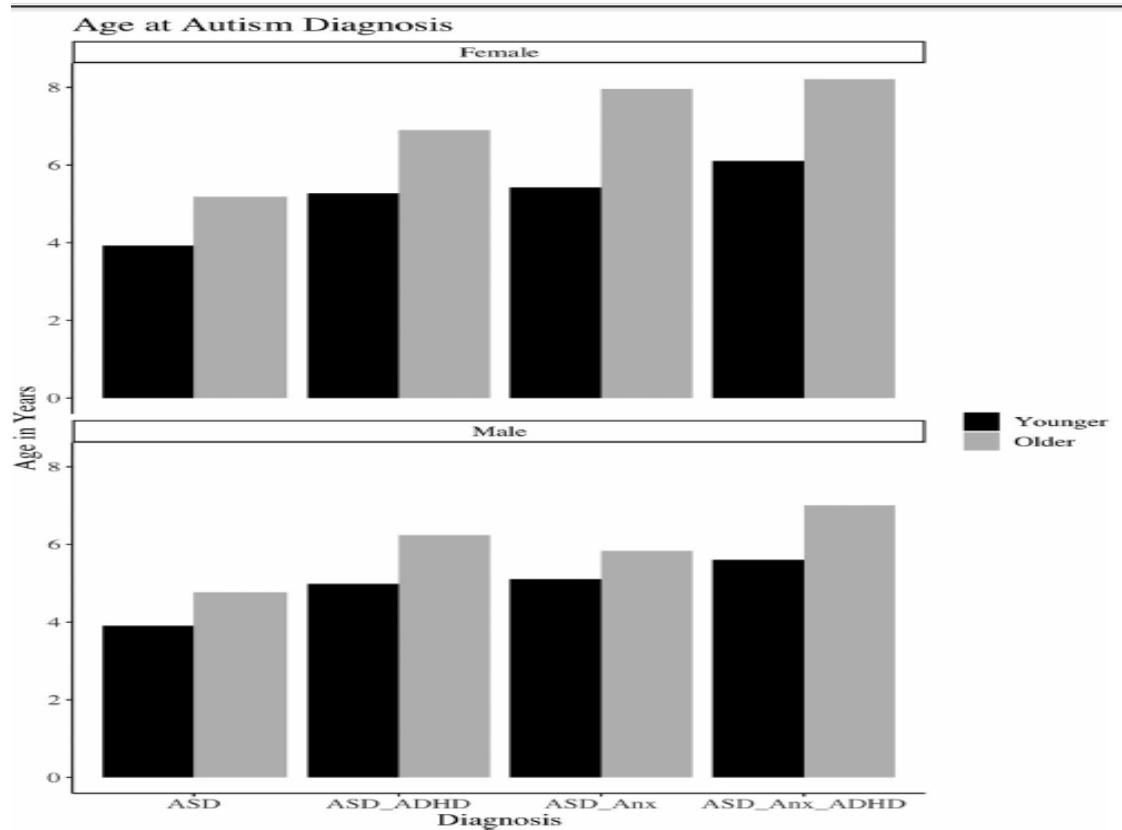
Increases concerns for
motor and coordination
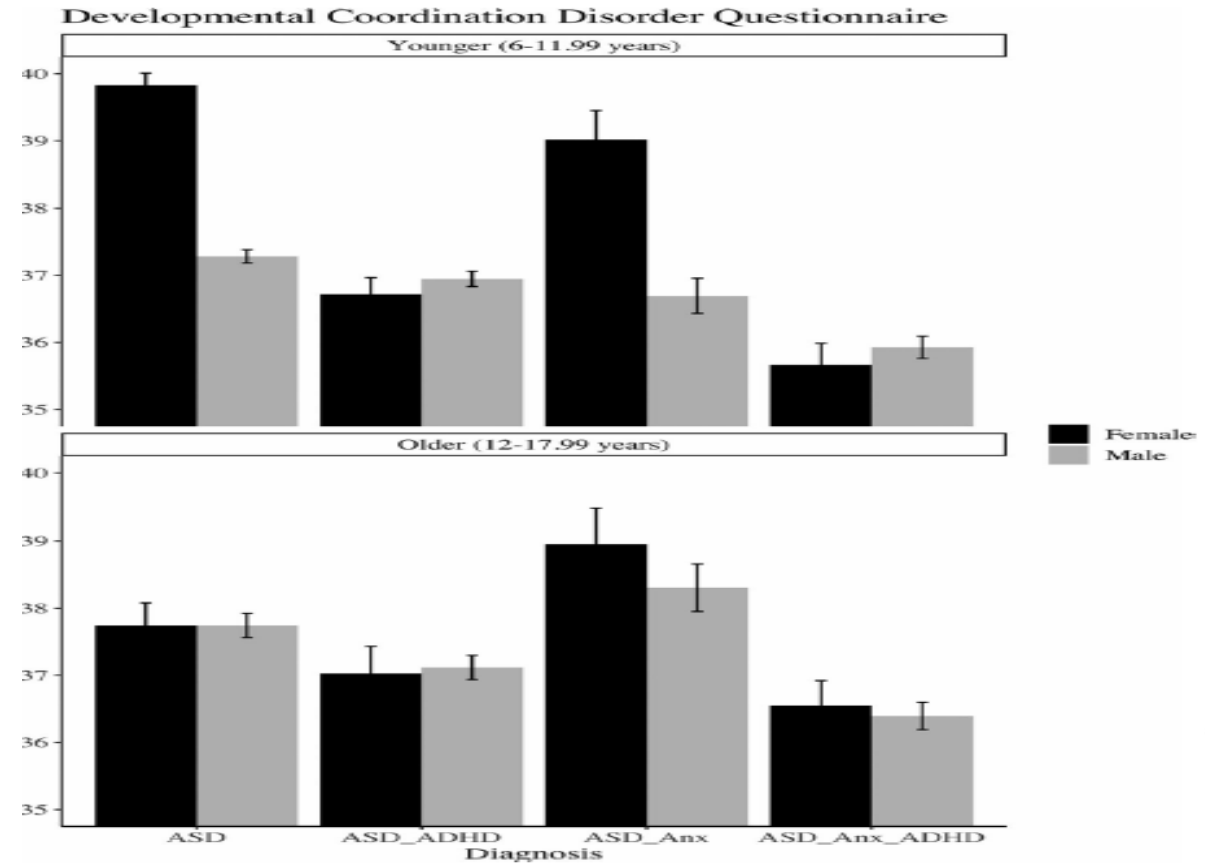
The co-occurrence of autism and attention deficit hyperactivity disorder in children – what do we know?

Yael Leitner[1,2]*

[1] Child Development Center, Dana-Dwek Children's Hospital, Tel Aviv Sourasky Medical Center, Tel Aviv, Israel
[2] Sackler School of Medicine, Tel Aviv University, Tel Aviv, Israel

Research suggests that individuals with ASD + ADHD demonstrate greater challenges than a single diagnosis.

There is also preliminary evidence that ASD + ADHD may be less responsive to standard treatments for either disorder.
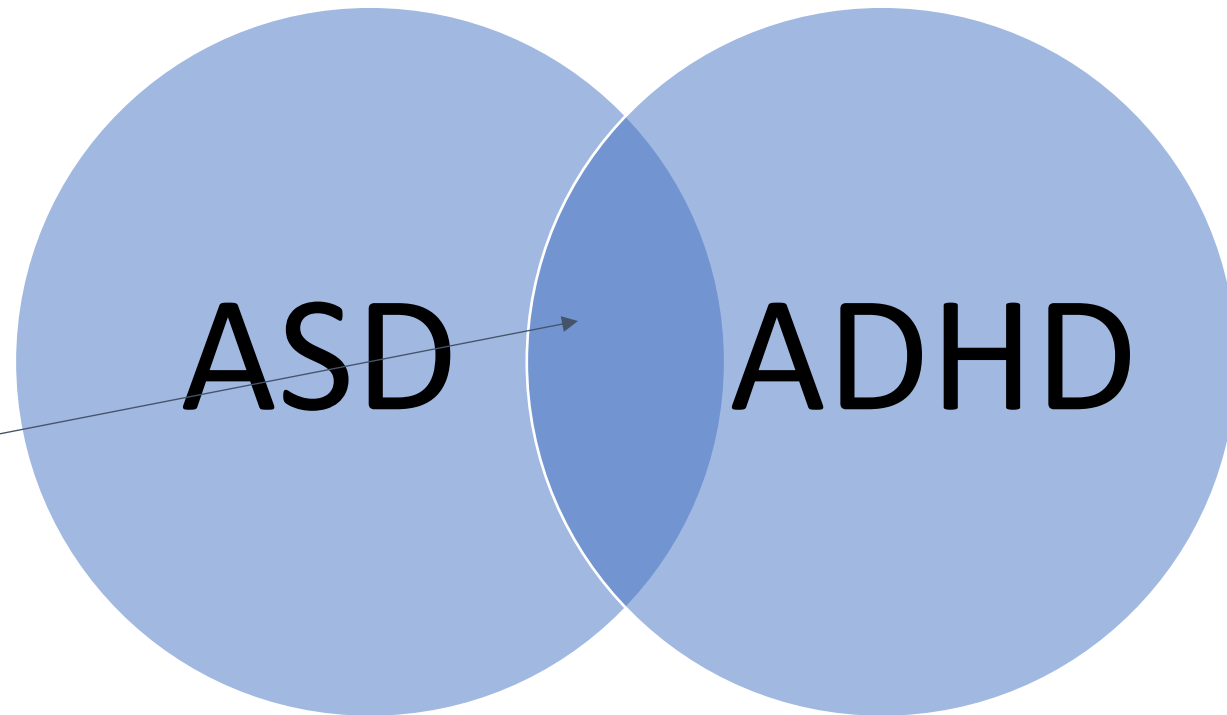
Similar and Shared: Biological Factors

- Sex distribution (predominantly male)

- Genetics

- Brain involvement

ASD ADHD

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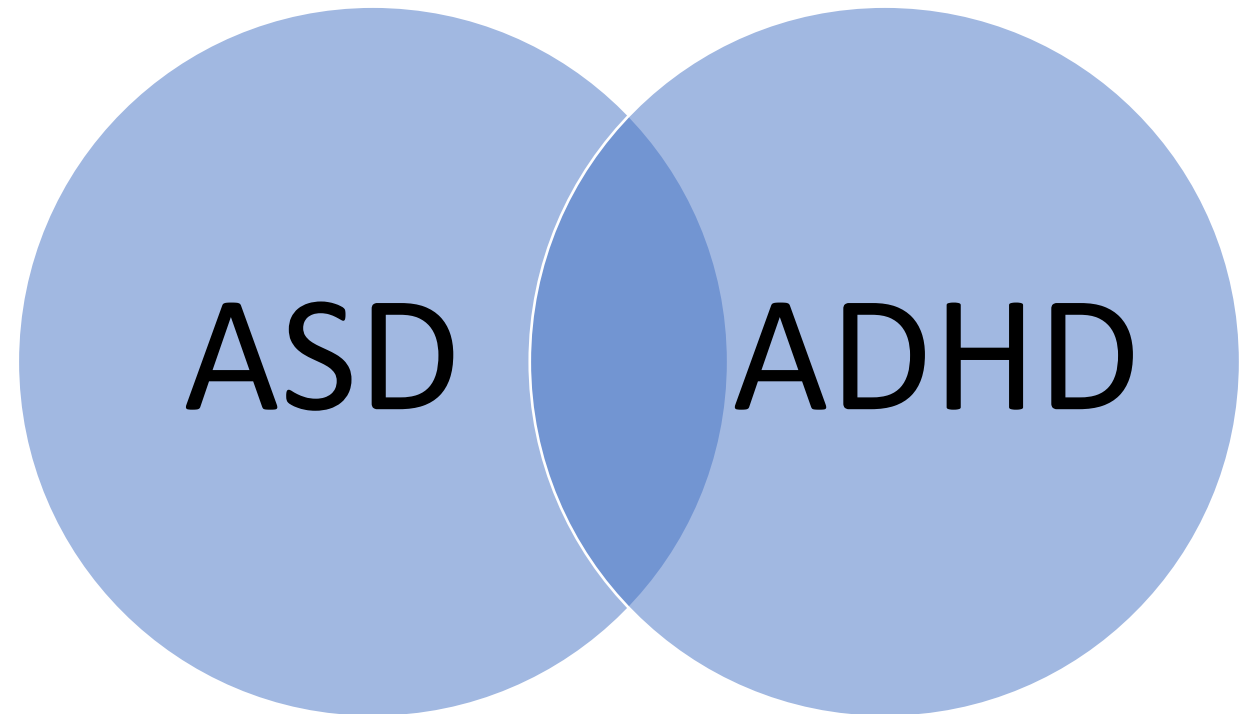
Similar & Shared: Behavioral Factors

- Social Difficulties

- Sensory & Repetitive Behaviors

- Executive Dysfunction

- Inattention

- Hyperactivity

ASD   ADHD

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Social Difficulties: Similar but Different…

Autism

- Limited nonverbal communication

- Limited spontaneous seeking to share enjoyment

- Limited social reciprocity

- Limited reciprocal play

ADHD

- Interrupts and intrudes on others

- Difficulty listening when spoken to directly

- Talks excessively

- Difficulty playing quietly

- Difficulty sustaining attention to tasks or play

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Repetitive Behaviors: Similar but Different...

Autism

- Stereotyped motor movements
- Lining up toys
- Flipping objects

ADHD

- On the go, as if driven by a motor
- Taps hands or feet
- Trouble sitting still
- Messy or disorganized work

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Executive Functioning (EF)

It requires the ability to plan and sequence complex behaviors, simultaneously attend to multiple sources of information, grasp the gist of a complex situation, resist distraction and interference, inhibit inappropriate responses, and sustain behavior for prolonged periods

(Denckla, 1996).

"The curious dissociation between knowing and doing" (Teuber, 1964)

careersinmusic.com

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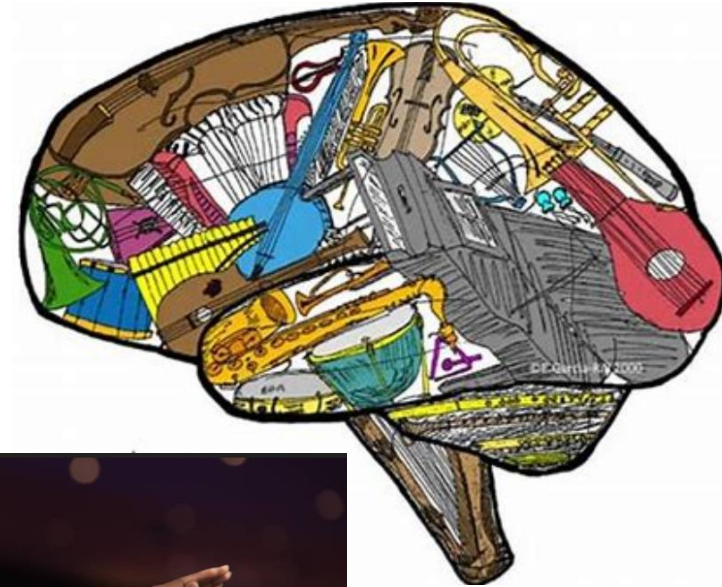
EF Subdomains (Powell & Voeller, 2004)

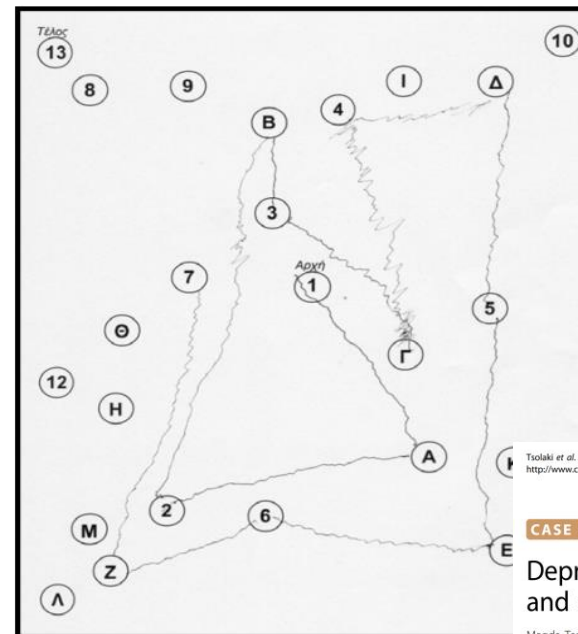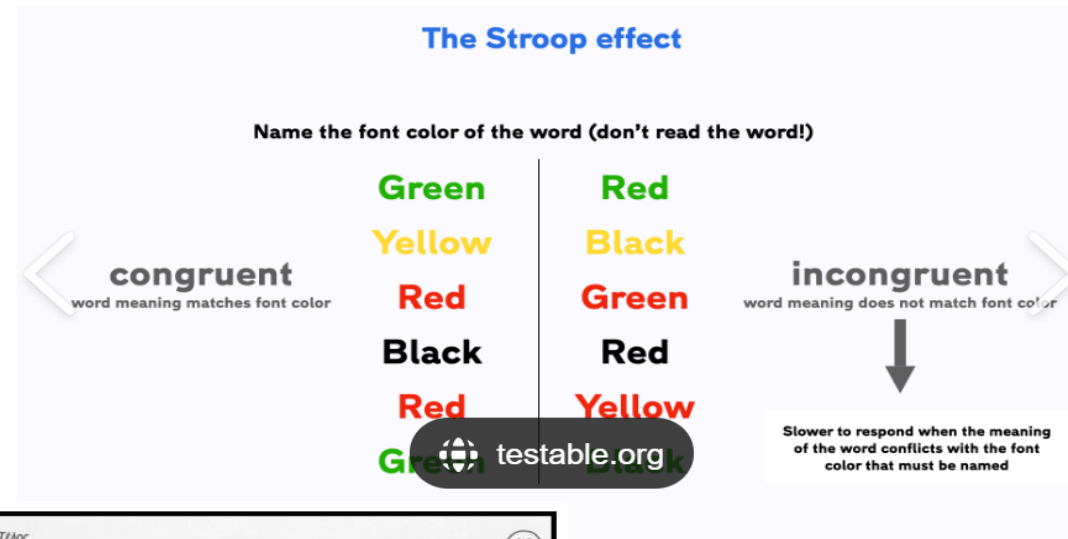| Cognitive Regulation	Behavioral Regulation	Emotional Regulation
• Attention regulation • Goal setting/planning • Organization • Time management • Novel problem solving • Flexible thinking • Judgment	• Task initiation • Inhibition of automatic responses • Sustaining effort • Impulse control/delayed gratification • Anticipation of future consequences of actions	• Modulation of emotional arousal • Modulation of mood • Self-soothing strategies

Book Report" from "You're a Good Man, Charlie Brown!" Trimmed

How is EF measured?- Structured tasks

Tasks with clear rules that provide some degree of structure, often performance WNL

- **Verbal Inhibition:** Stroop tasks (e.g., D-KEFS Color-Word Interference, NEPSY-II Inhibition)

- **Verbal Fluency:** Word generation from category and letter cue (e.g., D-KEFS Verbal Fluency/Switching, NEPSY-II Word Generation)

- **Cognitive Flexibility:** Tasks where child has to switch between task demands (e.g., D-KEFS Verbal Fluency Switching, Inhibition Switching; Trail Making Tests)

The Stroop effect

Name the font color of the word (don't read the word!)

congruent word meaning matches font color

Green	Red
Yellow	Black
Red	Green
Black	Red
Red	Yellow
Green	Black

incongruent word meaning does not match font color

Slower to respond when the meaning of the word conflicts with the font color that must be named

testable.org

Tsolaki et al. Cases Journal 2010, **3:**47
http://www.casesjournal.com/content/3/1/47
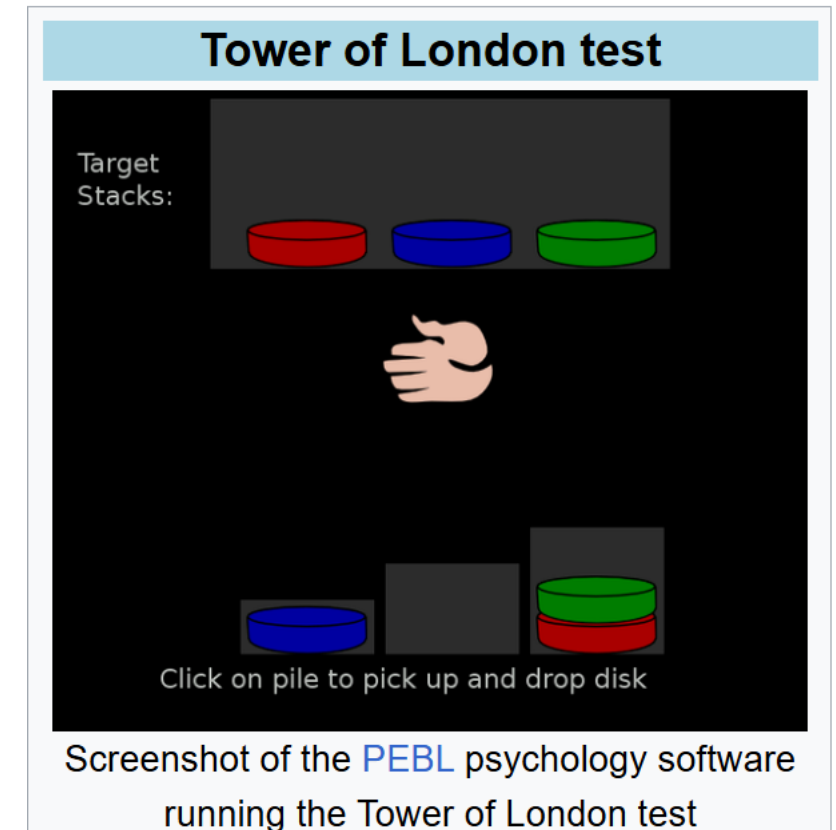
CASES JOURNAL

CASE REPORT — Open Access

Depression, extrapyramidal symptoms, dementia and an unexpected outcome: a case report

Magda Tsolaki[1,2*], Chaido Z Messini[2], Marianna Siapera[2], Foteini Fotiadou[2], Dionysia Delaporta[2], Athanasios Karatolias[2]

How is EF Measured?- Unstructured tasks

Tasks with fewer rules/structure are more difficult for autistic youth and often they may arrive at the correct answer, but take a very inefficient approach. Providers of rely on interpretation of errors or process assessment to capture challenges.

- **Planning/Organization:** Rey Complex Figure, Tower tests

Tower of London test

Target Stacks:

Click on pile to pick up and drop disk

Screenshot of the PEBL psychology software running the Tower of London test

Tower of London test - Wikipedia

How is EF Measured?- Parent report

Parent report measures assess multiple aspects of daily executive functioning and often identify multiple challenges

- **Detailed Assessment of Cognitive and Behavioral Daily Executive Functioning:** Behavior Rating Inventory of Executive Functioning (BRIEF-2)

- **Global Assessment of Executive Functioning within Broader Assessment of Behavioral/Emotional Functioning:** Conners-3, Conners Behavioral Rating Scales
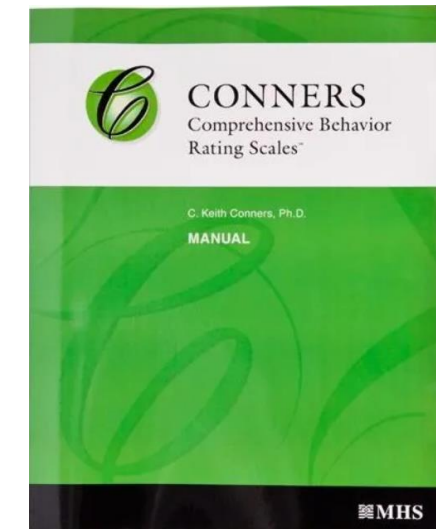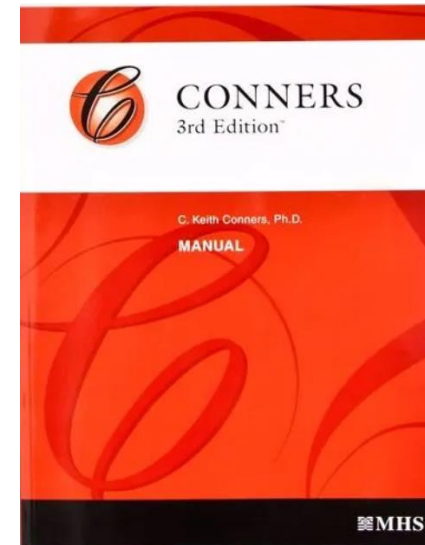
Why are Executive Functions important?

- Developing

- Critical to Learning and Independence

- Teachable

- Impact social and adaptive skills (functional outcomes)

- Often defines the line between can't and won't that parents/teachers try and understand. Where disability begins and ends.

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EF is controlled by the frontal lobes of the brain and dispersed functional networks throughout the brain
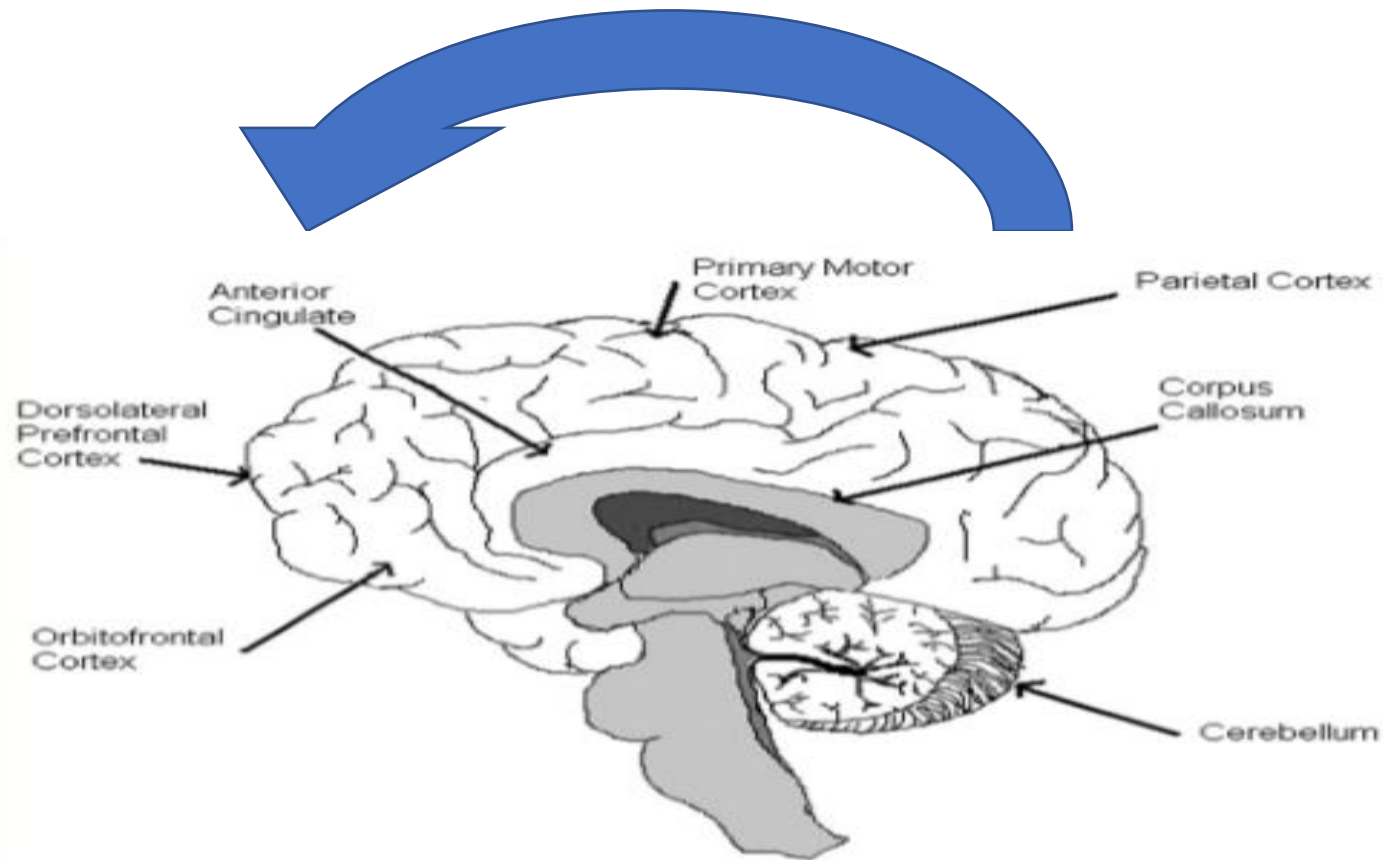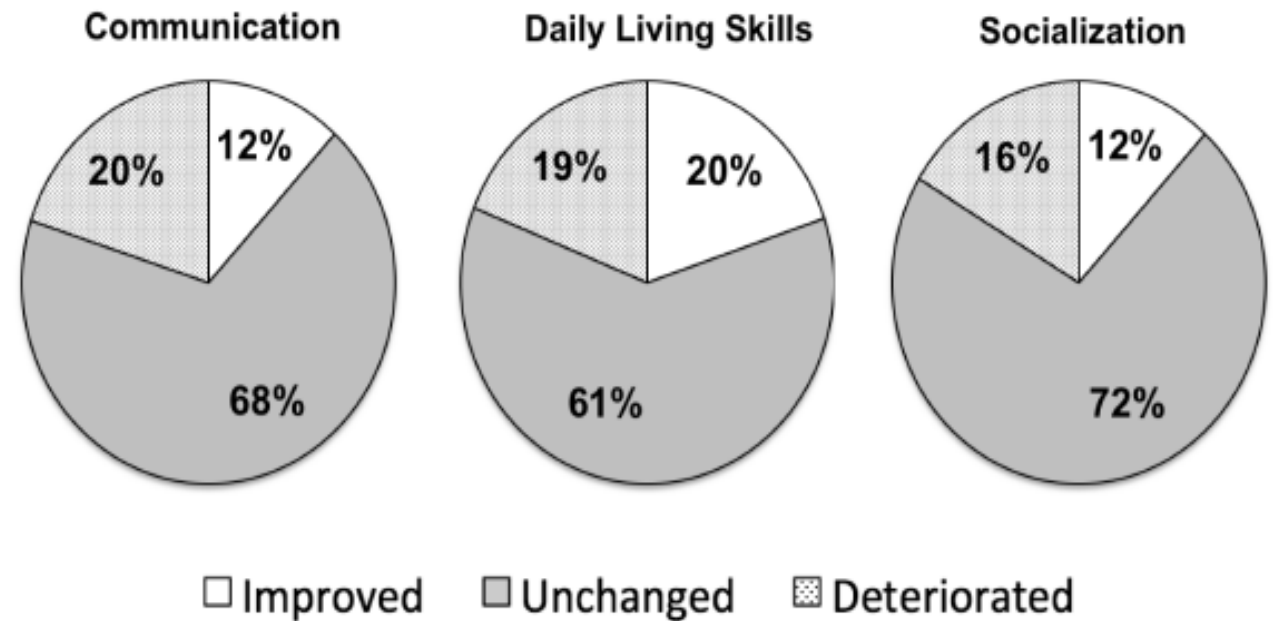

Figure 1. Diagram of prefrontal cortex and related structures.
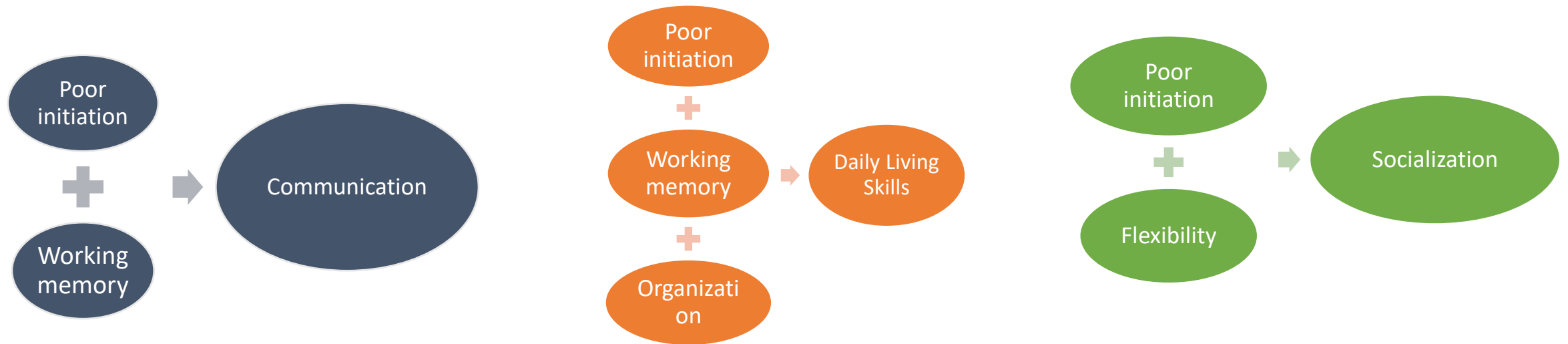
Powell & Voeller 2004

ASD and Adaptive Functioning

- Based on higher IQ, positive outcome is expected for autistic individuals without ID
  - Less than 20% of all adults with ASD live independently
  - ~ 33% are employed

- Adaptive behaviors stagnate, as children move into young adulthood

Communication

20% 12% 68%

Daily Living Skills

19% 20% 61%

Socialization

16% 12% 72%

☐ Improved   ☐ Unchanged   ⊞ Deteriorated

Pugliese et al. 2016

ASD and Adaptive Functioning

Poor initiation + Working memory → Communication

Poor initiation + Working memory + Organization → Daily Living Skills

Poor initiation + Flexibility → Socialization

Pugliese et al. 2015, 2016

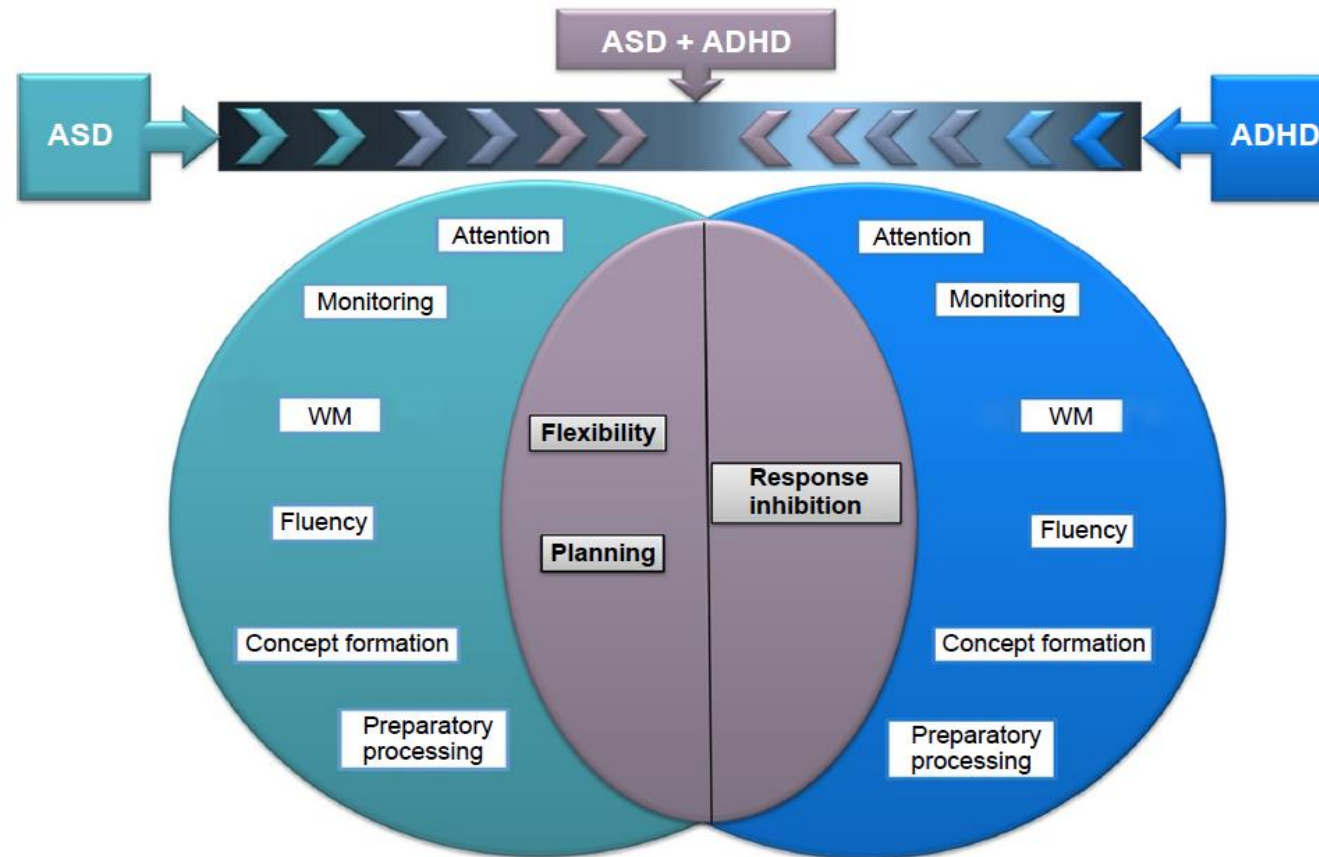# How EF presents in ASD +/- ADHD


Figure 1 Similarities and differences in executive functioning between ASD, ADHD, and ASD + ADHD groups.

Craig et al., 2016

Impact of EF in ASD

- Rigid and routine bound ways of thinking

- Hyperfocused interests

- Behavioral inflexibility/preferred activities

- Rigidity in social dynamics

- Efficient and abstract reasoning (vs. getting stuck in the details)

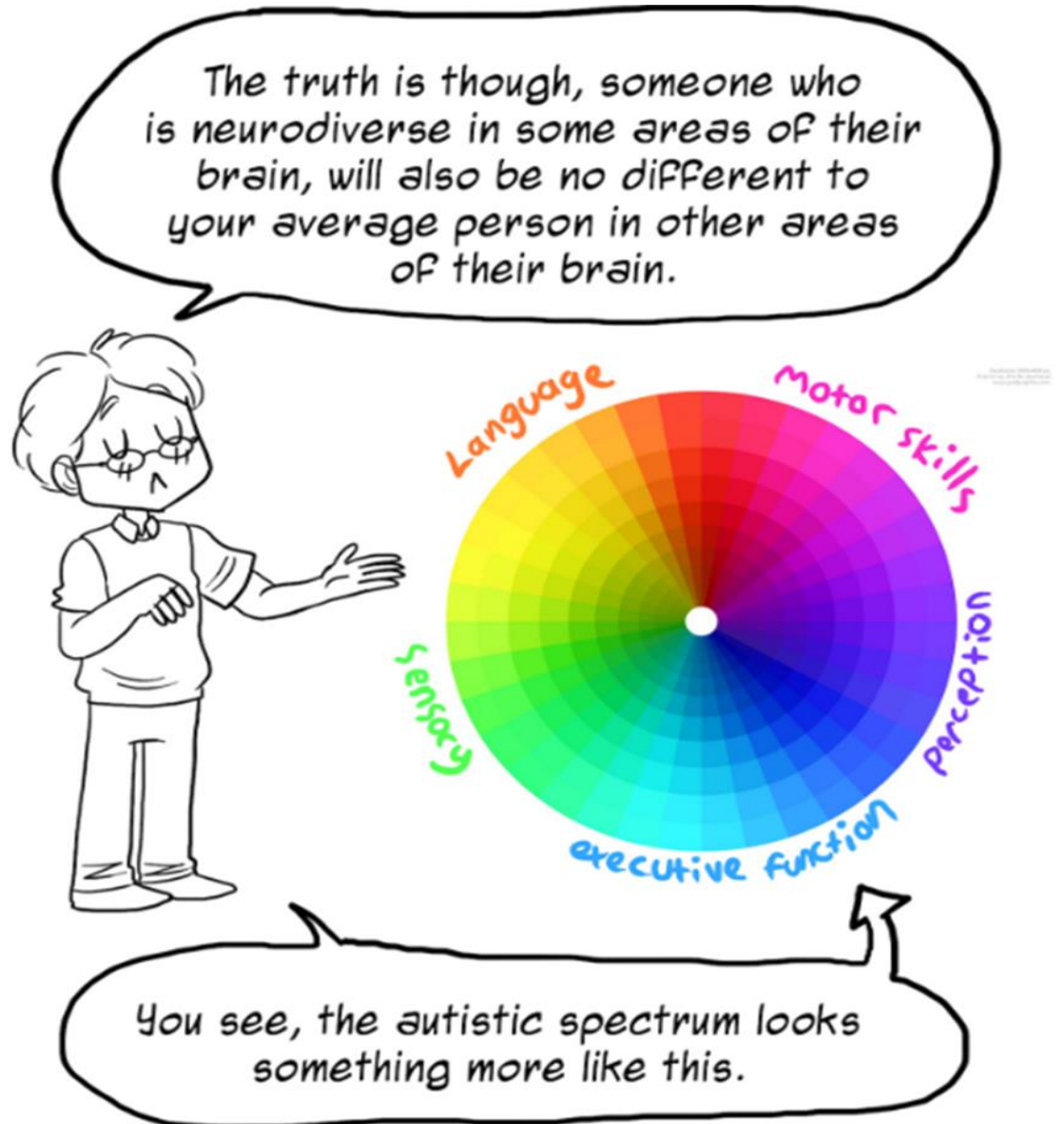# So, what does this mean for our kids with multiple diagnoses and executive functioning challenges?

ASD EF ADHD

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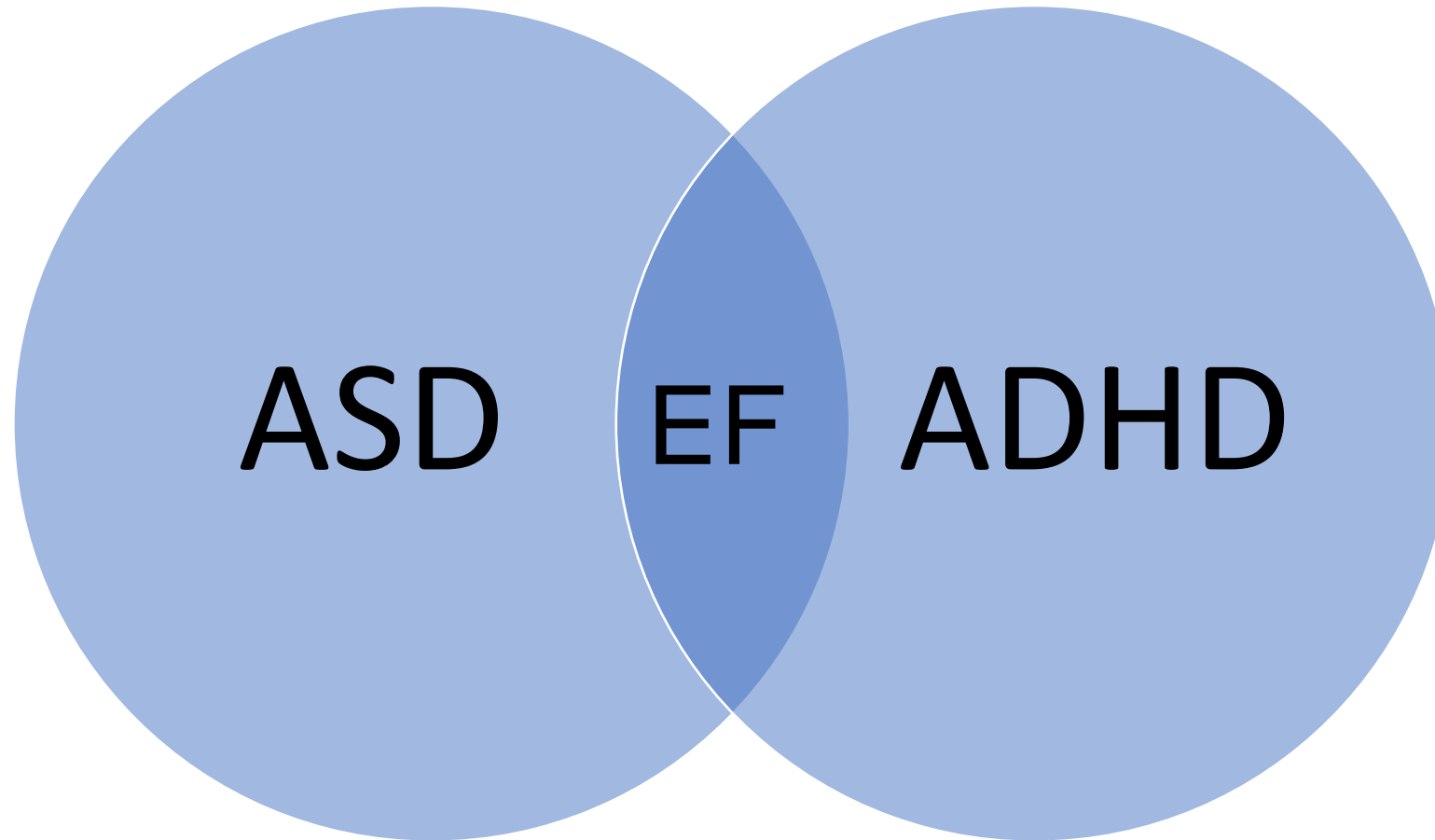
Strengths

Attention to detail

Memory

Analytical Thinking

Consistency

Reliability

Passion/dedication

Focus/perseverance

The truth is though, someone who is neurodiverse in some areas of their brain, will also be no different to your average person in other areas of their brain.

You see, the autistic spectrum looks something more like this.

Language

Motor skills

Sensory

Perception

executive function

Understanding the Spectrum - a comic strip explanation | The Art of Autism (the-art-of-autism.com)

What to do…

Research into behavioral interventions targeting EF in ASD is ongoing.

There is some initial evidence that there are methods for both supporting and improving EF.

Given that a child's "job" is going to school, it is important that they be provided with support and reinforcement of techniques both at home and in the school setting.

Educational Impact: Strategies and Interventions

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# EF Impact and Strategies for Educational Settings
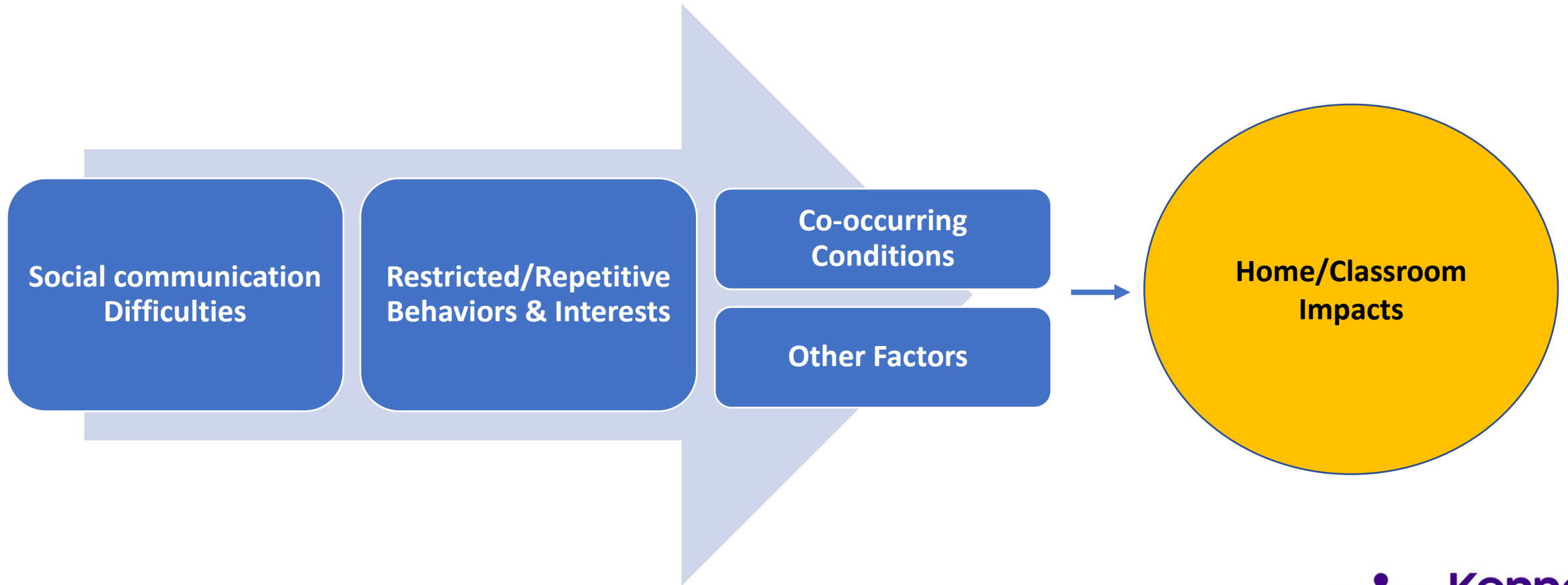
EF and School Outcomes

- Link between EF and **academic achievement**
  - Reading, spelling, and math
- EF predicts **math and reading competence** throughout school.
- EF is more a significant indicator for **school readiness** than IQ or foundational reading or math skills.
- Executive dysfunction can lead to **social challenges** (emotional outbursts, troubling behaviors, later crime, etc.)

(e.g., Borella et al, 2019; Broidy et al., 2003; Denson et al., 2011; Duncan et al., 2007; Morrison et al., 2010)

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EF & Classroom Impact
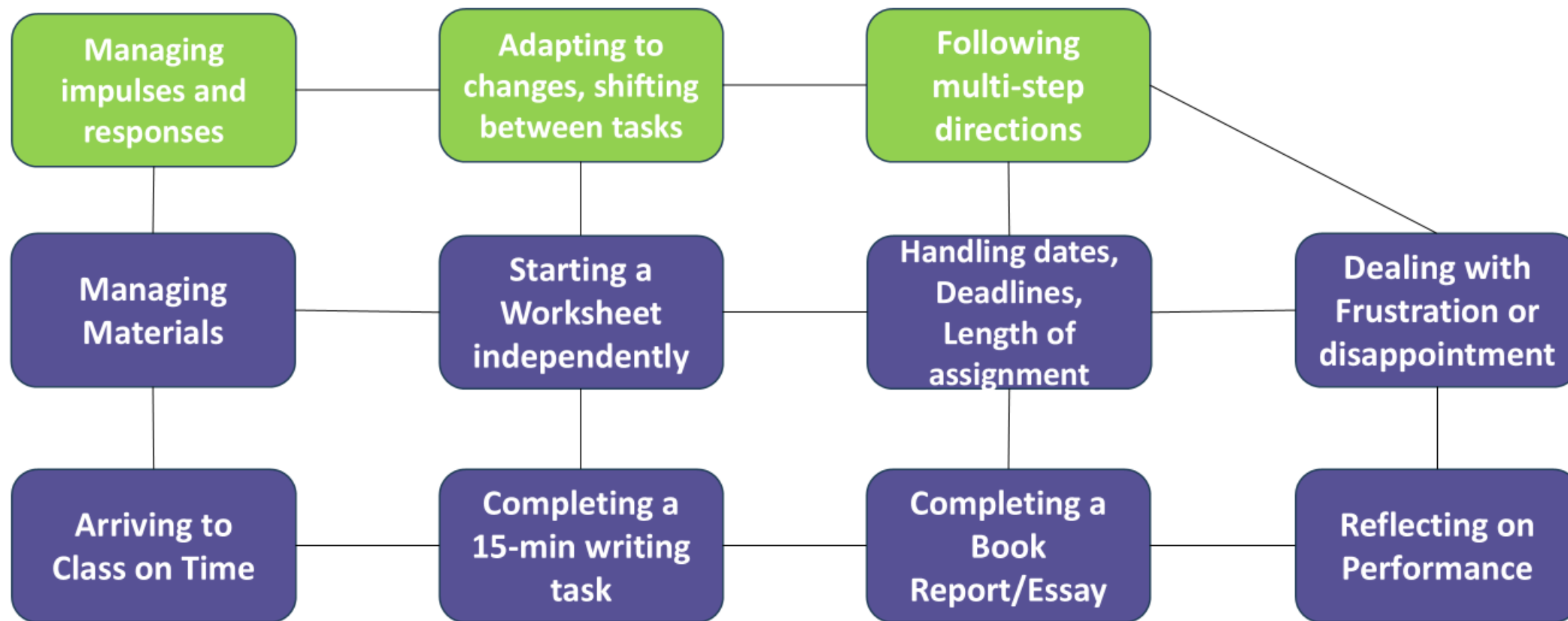
EF, School, & Autistic Students

- EF is a <u>critical predictor</u> of multiple outcomes: **school readiness**, **academic functioning**, language skills, adaptive functioning

- <u>Stronger EF skills</u> predict **better adjustment** (transition from elementary to middle school)

(e.g., Friedman & Sterling, 2019; Hume et al., 2009; Pellicano et al., 2007, Pugliese et al., 2015; Wei et al., 2014)

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The Good News about EF

- EF referred to as part of the "Hidden Curriculum" in schools

- **EF is teachable, and malleable! Can be improved!**

EF Interventions: Where to Start?

Image: https://accesswdun.com/article/2020/4/897388/the-maze-made-more-amazing

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EF Interventions & Programs

- **SMARTS (Strategies, Motivation, Awareness, Resilience, Talents, Success)**
  - Curriculum for elementary & secondary students
  - Focus on cognitive flexibility, organizing & prioritizing, self-checking and monitoring, goal setting, memorizing

  - SMARTS Elementary EF Curriculum
  - SMARTS Secondary EF Curriculum
  - SMARTS@Home
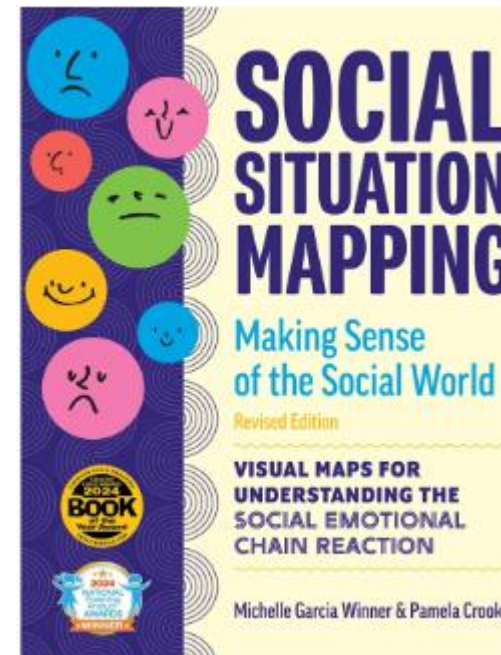 - MetaCOG Suveys & Toolkit

Meltzer, 2004

EF Interventions & Programs

- **Social Thinking Curriculum**
    - Focus on teaching complex social EF concepts (e.g., perspective taking)
    - Teachings are applicable across settings

Core Areas:
- Executive Functioning
- Conversation & Social Connection
- Friendship & Relationship Development
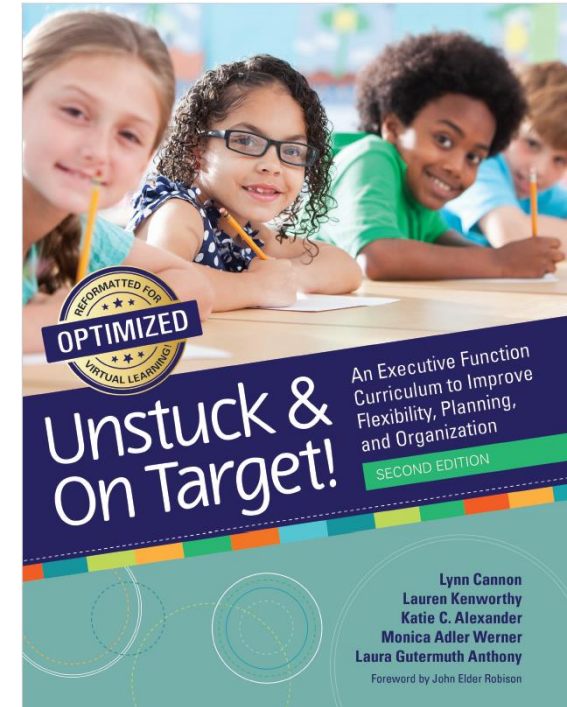- Self-regulation
- Social Thinking Vocabulary

(Winner, 2007)

EF Interventions & Programs

- **Unstuck & On Target Curriculum**
  - Focus on improving organization, planning, and flexibility
  - Lesson plan with home and classroom practice handouts
  - Developed for 8–11-year-olds with difficulties in EF
  - Autism, ADHD, anxiety, average IQ, ≥ 2nd grade language & reading
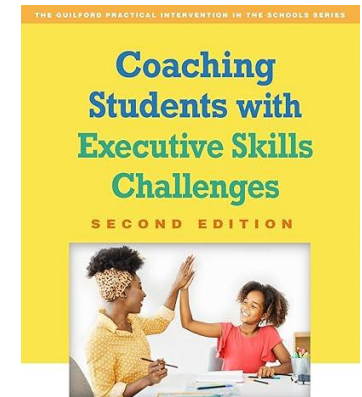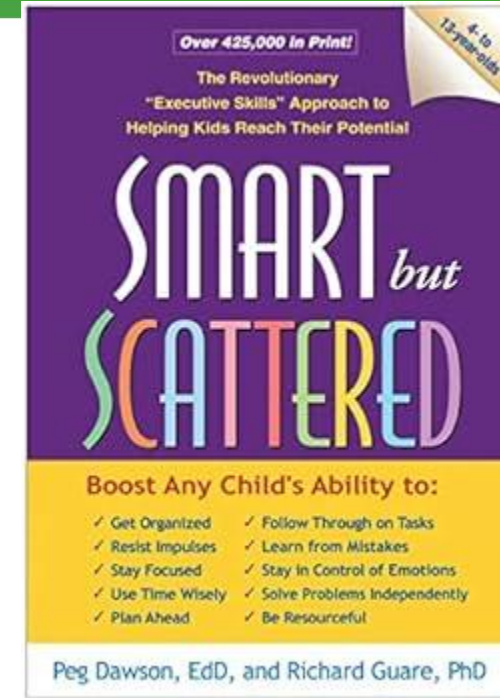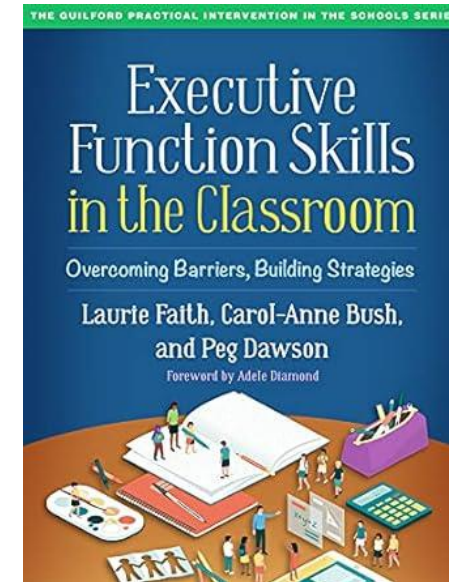

Cannon et al., 2018

EF Interventions & Programs

- **Smart but Scattered**
  - Comprehensive framework addressing EF challenges
  - Series of EF Books and Resource Hub
  - Emphasis on teaching strategies using strength-based approach
  - Assessment & intervention strategies, practical tools & resources

Dawson & Guare, 2009
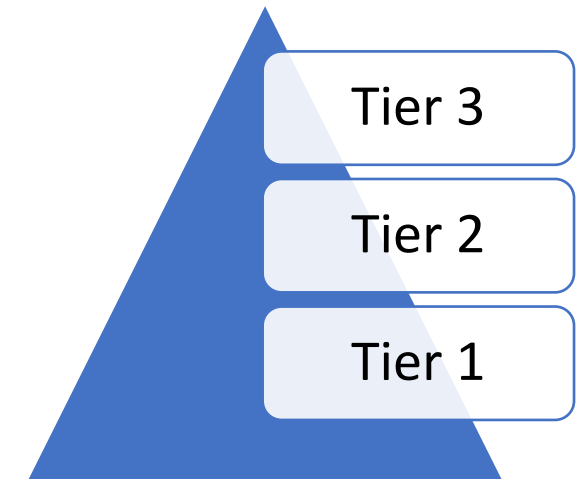
Additional Options

- May be barriers in implementing or adopting comprehensive curricula (time, money, buy-in)

- There are a range of evidence-based strategies to utilize

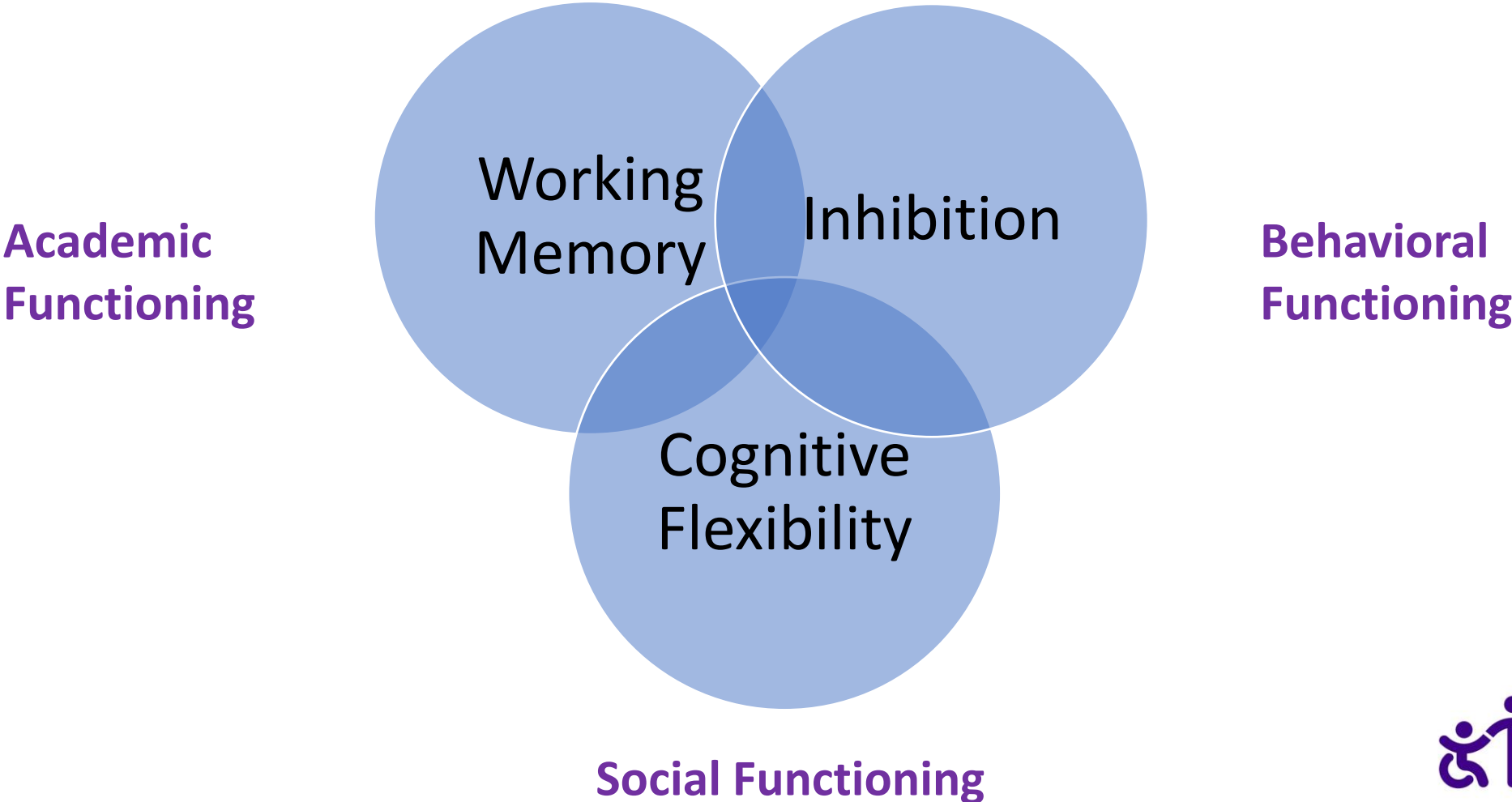Image: https://massolutions.biz/the-costs-of-doing-it-yourself/

Approach to EF Strategies and Interventions

- Consider a tiered approach (MTSS)

- Be strategic (ask the Wh- questions)

- Link assessment information (formal or informal) to the strategy

Tier 3

Tier 2

Tier 1

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Strategy and Intervention Framework

Academic Functioning

Working Memory

Inhibition

Cognitive Flexibility

Behavioral Functioning

Social Functioning

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Working Memory

Reminder

Holding and manipulating information in the mind

(verbal and non-verbal)

Working Memory & <u>Academic</u> Strategies

EF Difficulty	Possible Impact (Difficulty with…)	Potential Strategies
WORKING MEMORY	• Remembering new words or vocabulary/content or procedures • Multi-step directions or Verbal instructions • Writing assignments, reading comprehension • Mental Math • Note-taking • Transferring concepts or generalizing	• Visual Supports • Written Instructions • Chunking Information • Review and Repeated Practice

Working Memory & <u>Academic</u> Strategies

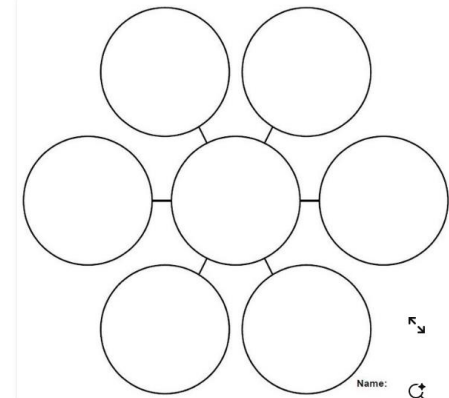
Chunking a Math Assignment

Visual Supports
(graphic organizers)

Working Memory & <u>Behavior</u> Strategies

EF Difficulty	Possible Impact (Difficulty with...)	Potential Strategy
WORKING MEMORY	• Maintaining attention & focus • Managing time • Remembering where belongings are, organizing materials • Task Completion • Regulating overwhelm or overload	• Structured Routines • Task Analysis • Environmental Arrangements

Working Memory & <u>Social</u> Strategies

EF Difficulty	Possible Impact (Difficulties with…)	Potential Strategy
WORKING MEMORY	• Following Conversations & sequence of interactions (notably in group settings) • Processing & retaining social cues (tone, facial expressions, body language) • Perspective taking (holding on to others' thoughts/feeling and one's own)	• Social Scripts and Role-Playing • Peer Modeling • Visual Supports for Social Interactions

Inhibition (Inhibitory Control)

Reminder

The ability to control one's thoughts, behavior, attention, and emotions. Inhibitory control allows one to override strong internal and external impulses.

Inhibition & Academic Strategies

EF Difficulty	Possible Impact (Difficulty with…)	Potential Strategy
INHIBITION	• Impulsive Responses • Task Persistence • Focusing on Tasks	• Explicit Teaching (self-regulation) • Time Management Tools • Clear and Concise Directions • Self-Monitoring Checklists

Inhibition & **Behavior** Strategies

EF Difficulty	Possible Impact (Difficulty With…)	Potential Strategy
INHIBITION	• Impulsivity, Disruptive Behaviors • Self-Regulation • Following Directions (non-compliance)	• Antecedent-Based Interventions • Behavior Reinforcement Systems • Mindfulness

Inhibition & <u>Social</u> Strategies

EF Difficulty	Possible Impact (Difficulty with…)	Potential Strategy
INHIBITION	• Interrupting Others (conversations, interactions) • Waiting/Turn-Taking • Impulsivity with Social Behaviors or Comments (unfiltered)	• Social Skills Training • Social Narratives • Role-Playing & Video Modeling

Cognitive Flexibility

Reminder

The ability to change perspectives or strategies to adapt to new information, situations, or shifting demands.

Cognitive Flexibility & <u>Academic</u> Strategies

EF Difficulty	Possible Impact (Difficulty With…)	Potential Strategy
COGNITIVE FLEXIBILITY	• Adapting to Changes (shifting between subjects, tasks) • Integrating New Learning Techniques and Strategies • Problem Solving (patterns of thinking)	• Visual Supports and Schedules • Transition Cues • Varying Instructional Methods & UDL • Explicit Teaching and Practice

Cognitive Flexibility & <u>Behavioral</u> Strategies

EF Difficulty	Possible Impact (Difficulties with...)	Potential Strategy
COGNITIVE FLEXIBILITY	• Need for Predictable and Consistent Patterns of Behavior • Tolerating Frustration • Adapting to Changes (routines, events)	• First/Then Boards or concepts • Cognitive Behavioral Techniques • Behavioral Momentum (and gradual exposure to change)

Cognitive Flexibility & <u>Social</u> Strategies

EF Difficulty	Possible Impact (Difficulties with…)	Potential Strategy
COGNITIVE FLEXIBILITY	• Adapting to Social Changes (conversation, social plans, etc.) • Perspective-Taking • Flexibility with Social Expectations	• Social Stories and Scripts about Flexibility • Explicit Teaching and Practice • Role-Playing and Video Modeling Changes in Routine

Common Pitfalls to Avoid

Considerations for Implementation:

- Intervention Integrity (fidelity) ⬆
  - Intervention isolation ⬇
- Intervention Acceptability ⬆
- Intervention Feasibility ⬆

Image: https://en.wikipedia.org/wiki/Trapping_pit

Accessing and Implementing EF Strategies

- **Informal Plans** within School-wide MTSS

- **504 Plans**
  - Eligibility = (1) qualified individual with a disability, (2) limits 1 more life activities)
  - Allow for *reasonable accommodations*

- **Individualized Education Programs (IEPs)**
  - Eligibility = (1) qualified educational disability (2) *educational impact* in the school setting
  - Provide special education and related services

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Thank you!

www.kennedykrieger.org/cassi