

ADHD and Executive Functioning: Good Science and Good Practice for School Psychologists



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Relevant Disclosure

- Co-Author of *Managing Attention Disorders in Children* (1990, 1998) .
- Author of *Managing Attention and Learning Disorders in Late Adolescence and Adulthood* (1997).
- Co-author of *Clinician's Guide to Adult ADHD: Assessment and Intervention* (2002).
- Co-author of the *Autism Spectrum Rating Scales* (MHS, 2009).
- Author of *Understanding and Managing Children's Classroom Behavior* (1997,2007)
- Co-author of *Assessment of Autism Spectrum Disorders First and Second Editions* (Guilford, 2009, 2019).
- Co-author/presenter *Assessment of Autism Spectrum Disorders CEU* (APA, 2009).
- Co-author of *Raising a Resilient Child With Autism Spectrum Disorders* (2011, McGraw Hill).
- Co-author of *Treatment of Autism Spectrum Disorders* (2012, Springer).
- Co-author of the *Autism Spectrum Evaluation Scales* (in development, MHS).
- Compensated speaker financially supported by Multi-Health Systems.

My Unitary Goal for This Session

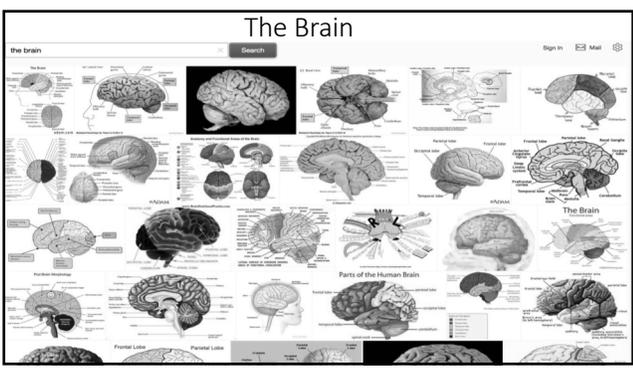
Understand and be able to apply the science, clinical practice and educational ramifications of EF and ADHD

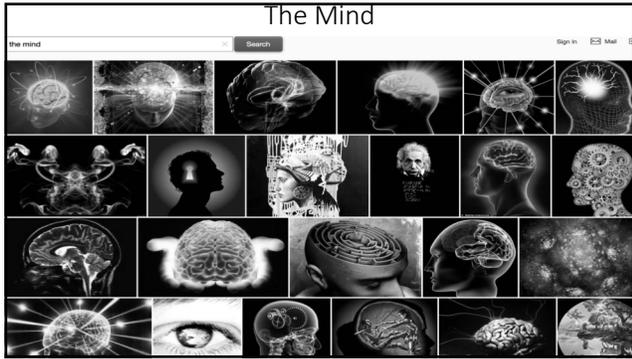
What is the Relationship?

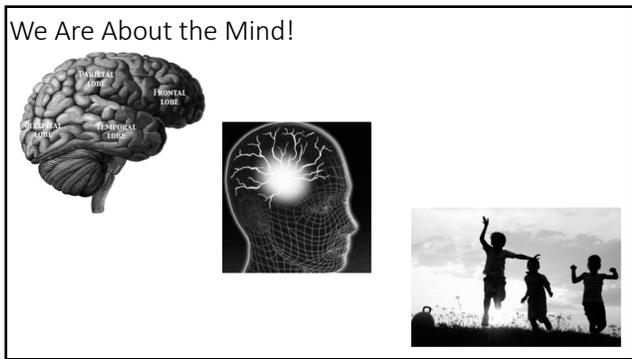
- ADHD is a Diagnosis/EF is a set of Processes.
- ADHD is defined by behavior/EF is defined by Process.
- ADHD is a summary term for a group of Symptoms/EF is a summary term for a group of Processes.
- ADHD may include some EF Processes/EF may include some ADHD Symptoms.
- Tests for ADHD and/or EF do not correlate very well with behavioral measures of ADHD and/or EF.
- ADHD is defined by consensus/EF has no such consensus thus far.
- ADHD is not EFDD.

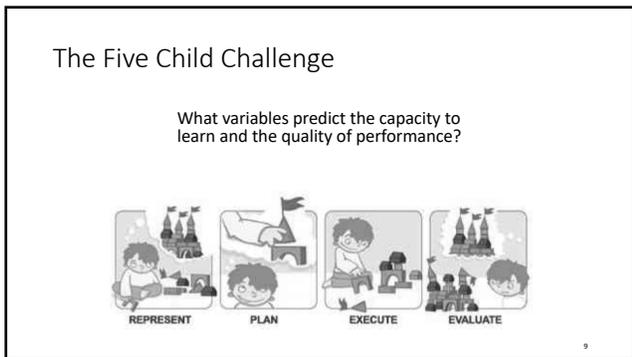
How Do We Enhance Compliance and Fidelity?











What is/are Executive Function(s)

There is no formal excepted definition of EF

- We typically find a vague general statement of EF (e.g., goal-directed action, cognitive control, top-down inhibition, effortful processing, etc.).
- Or a listing of the constructs such as
 - Inhibition,
 - Working Memory,
 - Planning,
 - Problem-Solving,
 - Goal-Directed Activity,
 - Strategy Development and Execution,
 - Emotional Self-Regulation,
 - Self-Motivation



What Neural Activities Require EF?

- Those that involve planning or decision making.
- Those that involve error correction or troubleshooting.
- Situations when responses are not well-rehearsed or contain novel sequences of actions.
- Dangerous or technically difficult situations.
- Situations that require the overcoming of a strong habitual response or resisting temptation.

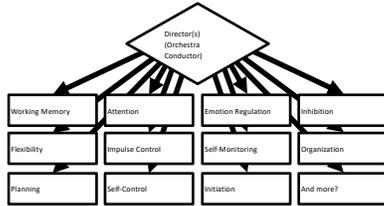
What Neuronal Structures are Implicated in EF?

- Prefrontal
- Rich cortical, sub-cortical and brain stem connections.
- The dorsolateral prefrontal cortex (DLPFC) is involved with integrating different dimensions of cognition and behavior.
- The anterior cingulate cortex (ACC) is involved in emotional drives, experience and integration, inhibition of inappropriate responses, decision making and motivation.
- The orbitofrontal cortex (OFC) plays a key role in impulse control, maintenance of set, monitoring ongoing behavior and socially appropriate behaviors.



Three Categories of EF Theories

- Regulators that control
- Abilities (cognitive processes)
- Behaviors



EF CEFI & Achievement

WJ-III Achievement Tests

CEFI Scales	Total	Broad			Median
		Reading	Math	Written Language	
Full Scale	.51	.48	.49	.47	.49
Attention	.59	.52	.46	.55	.54
Emotion Regulation	.18	.27	.15	.17	.18
Flexibility	.61	.50	.55	.54	.55
Inhibitory Control	.23	.32	.15	.26	.25
Initiation	.32	.26	.38	.28	.30
Organization	.32	.31	.33	.33	.33
Planning	.58	.54	.57	.50	.56
Self-Monitoring	.53	.51	.51	.49	.51
Working Memory	.57	.48	.60	.47	.53

p < .05 p < .01

EF CEFI & Intelligence

CEFI	WISC-IV					CEFI	
	FS	VC	PR	WM	PS	Mn	SD
Full Scale	.39	.44	.27	.30	.34	93.0	11.9
Attention	.39	.33	.32	.40	.35	91.8	11.2
Emotion Regulation	.14	.25	.08	-.06	.11	97.2	14.7
Flexibility	.57	.68	.45	.46	.37	93.8	11.0
Inhibitory Control	.21	.20	.13	.08	.27	97.7	13.5
Initiation	.25	.31	.14	.21	.25	91.2	15.1
Organization	.15	.17	.06	.14	.17	92.2	13.6
Planning	.46	.54	.31	.38	.39	93.6	11.1
Self-Monitoring	.39	.45	.31	.33	.27	92.0	11.3
Working Memory	.38	.43	.31	.36	.23	92.5	13.6
WISC-IV M	95.5	96.8	101.5	92.6	90.7	92.6	
WISC-IV SD	18.1	14.7	17.5	17.5	19.4	17.5	

Note: All correlations were corrected for range instability.

EF & Neuropsychological Abilities

	CAS					CEFI	
	FS	Plan	Sim	Att	Suc	Mn	SD
Full Scale	.45	.49	.43	.37	.32	91.4	13.2
Attention	.40	.42	.39	.30	.35	90.3	12.8
Emotion Regulation	.26	.22	.23	.24	.13	96.9	14.7
Flexibility	.52	.54	.51	.40	.42	92.2	13.0
Inhibitory Control	.27	.29	.22	.18	.21	96.0	13.9
Initiation	.40	.37	.31	.30	.20	89.0	16.3
Organization	.29	.36	.21	.20	.23	90.5	14.3
Planning	.47	.54	.46	.37	.38	92.5	12.4
Self-Monitoring	.48	.50	.49	.43	.35	91.2	12.4
Working Memory	.48	.46	.45	.38	.30	91.0	14.0
CAS Mn	95.8	92.4	101.6	96.5	98.0		
CAS SD	17.1	14.5	17.0	15.1	14.6		

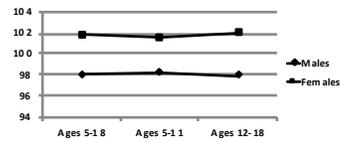
Note: All correlations were corrected for range instability.

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Gender Differences: Parent Raters

Girls have better EF than Boys

Parents	N	Mn	SD	N	Mn	SD	ES
Ages 5-18	700	98.1	14.9	699	101.8	15.0	-0.25
Ages 5-11	350	98.2	14.3	349	101.6	15.6	-0.22
Ages 12-18	350	97.9	15.4	350	102.0	14.4	-0.28

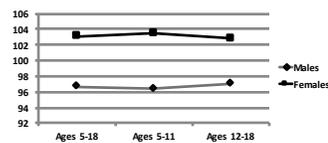


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Gender Differences: Teacher Raters

Girls have better EF than Boys

Teachers	N	Mn	SD	N	Mn	SD	ES
Ages 5-18	700	96.7	14.4	700	103.2	15.0	-0.44
Ages 5-11	350	96.4	14.5	350	103.5	14.9	-0.49
Ages 12-18	350	97.0	14.4	350	102.9	15.0	-0.40



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Goldstein, Naglieri, Princiotta, & Otero (2013)

- We found more than 30 definitions of EF(s).
- Executive function(s) has come to be an umbrella term used for many different abilities, including planning, working memory, attention, inhibition, self-monitoring, self-regulation and initiation carried out by pre-frontal areas of the frontal lobes.

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What is Executive Function(s)

1. Barkley (2011): "EF is thus a **self-directed set of actions**" (p. 11).
2. Dawson & Guare (2010): "Executive skills allow us **to organize our behavior over time**" (p. 1).
3. Delis (2012): "Executive functions reflect the **ability to manage and regulate one's behavior** (p. 14).

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What is Executive Function(s)

4. Denckla (1996): "EF (is) a set of **domain-general control processes...**" (p. 263).
5. Gioia, Isquith, Guy, & Kenworthy (2000): "a **collection of processes that are responsible for guiding, directing, and managing cognitive, emotional, and behavioral functions**" (p. 1).

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What is Executive Function(s)

- 6. Pribam (1973): "**executive programmes ...to maintain brain organization**" (p. 301).
- 7. Roberts & Pennington (1996): EF "**a collection of related but somewhat distinct abilities such as planning, set maintenance, impulse control, working memory, and attentional control**" (p. 105).

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What is Executive Function(s)

- 6. Stuss & Benson (1986): "**a variety of different capacities that enable purposeful, goal-directed behavior, including behavioral regulation, working memory, planning and organizational skills, and self-monitoring**" (p. 272).
- 7. Welsh and Pennington (1988): "**the ability to maintain an appropriate problem-solving set for attainment of a future goal**" (p. 201).

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What is Executive Function(s)

- 10. McCloskey (2006): "**a diverse group of highly specific cognitive processes collected together to direct cognition, emotion, and motor activity, including ...the ability to engage in purposeful, organized, strategic, self-regulated, goal directed behavior**" (p. 1)

"think of executive functions as a set of independent but coordinated processes rather than a single trait" (p. 2).

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What is Executive Function(s)

- 10. Lezak (1995): "a collection of interrelated cognitive and behavioral skills that are responsible for purposeful, goal-directed activity," ...
- 11. "how and whether a person goes about doing something" (p. 42).
- 12. Luria (1966): "... ability to correctly evaluate their own behavior and the adequacy of their actions" (p. 227).

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Executive Functions

The screenshot shows the Wikipedia article for 'Executive functions'. A red box highlights the following text:

The **executive system** is a theorized cognitive system in psychology that controls and manages other cognitive processes. It is also referred to as the **executive function**, **executive functions**, **supervisory attentional system**, or **cognitive control**.

The concept is used by psychologists and neuroscientists to describe a loosely defined collection of brain processes which are responsible for planning, cognitive flexibility, abstract thinking, rule acquisition, initiating appropriate actions and inhibiting inappropriate actions, and selecting relevant sensory information (category: research).

Hypothesized role
The executive system is thought to be heavily involved in handling novel situations outside the domain of some of our automatic psychological processes that could be explained by the reproduction of learned schemata or set behaviors. Psychologists Don Norman and Tim Shallice have outlined the types of situation where routine

And Finally. . . .

An NICHD panel in 1994 identified 33 EFs by consensus!

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The Top Six Were:

- Self-regulation
- Sequencing of behavior
- Flexibility
- Response inhibition
- Planning
- Organization of behavior

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What is the relationship of EF to attention?

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Conditions and Disorders That Have Demonstrated EF Impairments

- Depression – sense of helplessness and hopelessness.
- Anxiety – lack of confidence in predicting outcome.
- ADHD – Immaturity in developing effective self-discipline.
- Oppositional and Conduct Disorders – noncompliance and rule violation.
- Autism – social learning impairment.
- Learning Disability – delayed acquisition of academic knowledge despite good instruction.

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Executive Function(s)

- One way to examine the issue addressing the nature of EF is to research the factor structure of behaviors related to EF(s)
- To do so, we examined the factor structure of a nationally representative sample of children.
- We conducted a series of research studies to answer the following question:
 - What is the underlying structure of EF behaviors?
 - Is there is just one underlying factor called Executive Function), or do the behaviors group together into different constructs suggesting a multidimensional structure?

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EXPLORATORY FACTOR ANALYSES

- Both item-level and scale-level exploratory factor analyses (EFA) were conducted.
- The normative samples for parents, teacher, and self ratings were randomly split into two samples and EFA conducted using
 - the item raw scores
 - nine scales' raw scores
- We used a standardization sample from our instrument the Comprehensive Executive Functioning Inventory (CEFI).

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Sample Characteristics

- Sample was stratified by
 - Sex, age, race/ethnicity, parental education level (PEL; for cases rated by parents), geographic region
 - Race/ethnicity of the child (Asian/Pacific Islander, Black/African American/African Canadian, Hispanic, White/Caucasian, Multi-racial by the rater
 - Parents provided PEL of both parents
 - The higher of the two levels was used to classify the parental education level of the child.
 - All raters completed the questionnaire via paper-and-pencil or online methods.

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EXPLORATORY FACTOR ANALYSES

- For the *first half* of the normative sample using item scores: EFA of the 90 items was conducted
- The scree plot test and the very simple solution criterion both indicated that only **one factor** should be retained.
- The ratio of the first and second eigenvalues was greater than four for all three forms, which is a common rule to support a **one factor solution**.

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EXPLORATORY FACTOR ANALYSES

- Using the *second half* of the normative sample EFA was conducted using raw scores for the Attention, Emotion Regulation, Flexibility, Inhibitory Control, Initiation, Organization, Planning, Self-Monitoring, and Working Memory scales
- Both the Kaiser rule (eigenvalues > 1) *and* the Eigenvalue Ratio criterion (> 4) unequivocally indicated **one factor**.

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EXPLORATORY FACTOR ANALYSES

- Factor analysis of the CEFI Scales also clearly indicated a one factor solution

Table 8.4. Eigenvalues of the CEFI Scales Correlations

Form	Factor								
	1	2	3	4	5	6	7	8	9
Parent	7.5	0.2	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
Teacher	7.8	0.3	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
Self-Report	6.3	0.2	0.1	0.0	0.0	0.0	-0.1	-0.1	-0.1

NOTE. Extraction method: Png.

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EXPLORATORY FACTOR ANALYSES

- Conclusions
 - When using parent (N = 1,400), teacher (N = 1,400), or self-ratings (N = 700) based on behaviors observed and reported for a nationally representative sample (N = 3,500) aged 5 to 18 years Executive Function *not* functions is the best term to use.

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Naglieri & Goldstein, 2012

- Executive Function is: how efficiently you do what you decide to do.



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What is Attention?

- Attention appears to primarily involve the basal ganglia, cerebellum and the frontal lobes.
- Problems with attention are often a bio-psychosocial phenomena often leading to/interacting with cognitive deficits causing impairment in all walks of life.
- The symptoms of inattention as reflected in ADHD lead to a nearly infinite number of consequences (Barkley, 2015).

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Current diagnostic criteria specify that ADHD involves difficulties with inattention and/or hyperactivity/impulsivity. Researchers using factor analysis have consistently found support for an inattention factor in both children and adults. Findings have been mixed regarding whether hyperactivity and impulsivity reflect one or two dimensions.

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Inattention appears to be a condition stemming in part from inefficient operation of the physical brain moderated by the mind relative to task and environmental demands leading to poor execution of behavior.

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ADHD is not the equivalent of poor attention to detail

ADHD reflects exaggeration of normal behavior.

Poor regulation of attention leads to a nearly infinite number of consequences

Self-regulation

- The ability to inhibit
- The ability to delay
- The ability to separate thought from feeling
- The ability to separate experience from response
- The ability to consider an experience and change perspective
- The ability to consider alternative responses

Self-regulation

- The ability to choose a response and act successfully towards a goal
- The ability to change the response when confronted with new data
- The ability to negotiate life automatically
- The ability to track cues

Poor self-regulation is synonymous with. . .

Poor self-control

Poor self-regulation leads to . . .

Impulsive behavior

Poor self-regulation leads to:

- Knowing what to do is not the same as doing what you know
- Cue-less behavior
- Inconsistent behavior
- Unpredictable behavior
- The illusion of competence
- Riding an emotional roller coaster
- Problems with automatic behavior

In light of these data it is not surprising that inattention contributes to EF deficits and that both fuel poor emotional regulation.

Assessment

- ADHD and EF: Both by observation, testing and questionnaires.
- The end point for ADHD is a diagnosis. This only requires reported or observed behavior over time in multiple settings.
- The end point for EF is an overview of strengths and weaknesses. This requires observation and assessment.

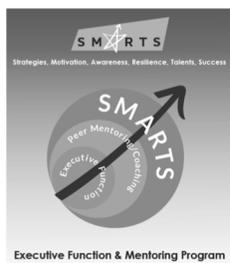
Symptom relief is not synonymous with changing long term outcome.

Cognitive Strategy = EF Instruction

- A strategy is a procedure that the learner uses to perform academic tasks
- Using a strategy means the child thinks about 'how you do what you do'
- Successful learners use many strategies.
- Some of these strategies include visualization, verbalization, making associations, chunking, questioning, scanning, using mnemonics, sounding out words, and self-checking and monitoring.

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A Promising Program



A Promising Program

Tools of the Mind

HOME ABOUT CURRICULAR PARENTS PROFESSIONAL DEVELOPMENT STUDIOS CONTACT

Focus on Self-Regulation

A growing body of research indicates that many children start school not ready to learn not because they do not know their letters or numbers but because they lack the social skills and ability to regulate their mood, attention, and cognitive resources. Current research shows that self-regulation (often called executive function) has a stronger association with academic achievement than IQ or early word reading in math tests.

Today's children come to school with lower levels of self-regulation and their classroom teachers report that they are "struggling" to deal with these problems. Still,...

Research indicates that interventions at the early childhood level can have a positive influence on self-regulation and the development of executive function in the early years and beyond. Still,...

Tools of the Mind is a research-based early childhood program that builds strong foundations for school success in preschool and kindergarten children by promoting their emotional and self-regulation learning. In a series of rigorous experimental trials, Tools of the Mind has been shown to have a significant impact on self-regulation of preschool children. The study also found that gains in self-regulation to be related to scores in oral achievement in early literacy and mathematics.

In a Tools classroom:

- Teachers intentionally scaffold children's moving along the continuum of self-regulation from being regulated by others to engaging in "silent" regulation to eventually becoming "masters of their own behavior."
- Children gain control of their social, emotional, and cognitive behavior by learning

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Promising Resources

ERIC CLEARINGHOUSE ON DISABILITIES AND GIFTED EDUCATION

Home | Parents | Educators | Kids | What's New | Gifted US | Community | Conferences | SHIP | Support | About | PC Security

Strategy Instruction

The ERIC Clearinghouse on Disabilities and Gifted Education (ERIC ED)
 Email: info@discoveryfulltext.org
 Internet: <http://eric.ed.gov>

ERIC Clearinghouse
 Public-Use Database
 Copyright 2012

For more than two decades there has been an abundance of research regarding strategy instruction. Originally, most of this research focused on the effects of strategy instruction on students with learning disabilities. Researchers are currently looking at how strategy instruction affects all learners.

What is a strategy?

In general, a strategy is a plan, plan, or method used for accomplishing a task. Below are other terms associated with strategy instruction, some of which are discussed in this report:

- **Cognitive Strategy:** a strategy or group of strategies or procedures that the learner uses to perform academic tasks or to improve social skills. Often, more than one cognitive strategy is used with others, depending on the learner and teacher's response to learning. In fact, research indicates that successful learners use numerous strategies. Some of these strategies include visualization, verbalization, making associations, chunking, questioning, learning, understanding, accessing tasks using mnemonics, activating prior knowledge, and self-checking and monitoring.
- **Case:** a real or virtual prompt to allow remind the student what has already been learned or provide an opportunity to learn something new. Cases can also be employed to prompt student use of a strategy.
- **Independent, Strategic Learner:** the student who uses cues and strategies within teacher learning systems, asks clarifying questions, listens,

Promising Resources

NICHD National Dissemination Center for Children with Disabilities

Home | Disabilities | Babies & Toddlers | Children (3 to 22) | Disability & Education Laws | Research | En Español

You are here: Home / Research Center / Evidence for Education / The Power of Strategy Instruction

The Power of Strategy Instruction

By Stephen D. Lee, Ed.D.
 Evidence for Education, Volume 1, Issue 1, 2006
 Links updated, October 2010

Table of Contents
 Introduction
 Early Stages of the Good Learner
 Spotlight on the SHIP Model
 SHIP Content Library Continuum: A Working Example
 Spotlight on SHIP for Reading
 Combining Strategy Instruction with Direct Instruction
 Promote Student ID
 Conclusion

If you've ever played the game of chess, chances are you used a fairly unsophisticated approach when first making your very moved the board. It's also likely that basic tactics quickly emerged after just a few moves—such as not going or not a castle and public domain such as knight and rook.

Tags

Direct Instruction, Evidence for Education, Learning Disabilities, Learning Strategy Instruction, Research, Self-Regulated Strategy Development (SRSD), SHIP Model

Quick Links

Topics, A-Z
 Publications
 State Organizations
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ESPECIALLY FOR...

Families and Communities
 Early Intervention Providers
 Schools and Administrators

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Promising Resources



Promising Resources



Conclusions

The concept of EF is evolving.
 Not unexpectedly there is a strong relationship between EF and attention. Thus EF and ADHD.
 Not unexpectedly both are bi-directional in their relationship to emotional regulation.
 There is emerging evidence that children can be taught to be more strategic – an important indication of good EF behavior and outcome.
 This process may or may not enhance the progress and outcome of children with ADHD



 **Questions?**

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TEDx: <https://www.youtube.com/watch?v=isfw8JJ-eWM>
