Understanding Executive Functioning in Children:
New Ideas, New Data, and the Comprehensive Executive Functioning Inventory (CEFI)

Sam Goldstein, Ph.D.
Assistant Clinical Professor
University of Utah School of Medicine

www.samgoldstein.com
info@samgoldstein.com
@drsamgoldstein
@doctorsamgoldstein

Comprehensive Executive Function Inventory

ALABAMA CASE

Relevant Disclosure

- My expenses for this talk are in part supported by Multi- Health Systems.
- I have developed tests published by Multi- Health Systems, Pro-Ed and Western Psychological Services.
- I have authored books published by Springer, Wiley, Guilford, Double Day, McGraw Hill, Brookes, Kluwer and Specialty Press.
- I am Editor in Chief of the Journal of Attention Disorders (Sage) and Co-Editor of the Encyclopedia of Child Development (Springer)

Questions in Need of Answers

- Is there a need for a conceptual process like EF?
- Is EF an evidence based concept?
- Is there sufficient research to suggest EF is a powerful force in shaping children's lives?
- Is there sufficient research to suggest that EF theory guide the practices of education, mental health and parenting?
- Can EF be measured?
- Can EF be taught?

Truth is stranger than fiction, but it is because fiction is obliged to stick to possibilities. Truth isn't.

Mark Twain

A delusion is something people believe in despite a total lack of evidence.

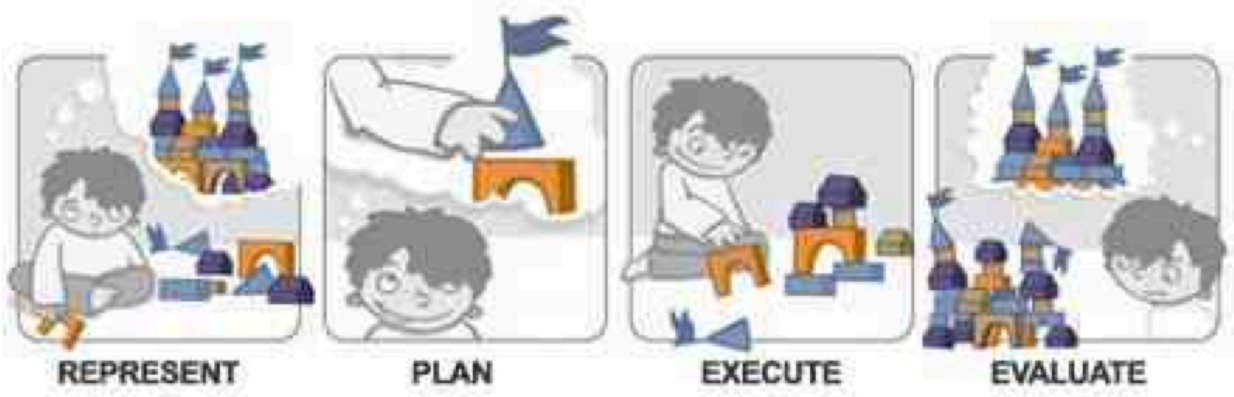
Richard Dawkins

When all else fails there is always delusion.

Conan O’Brien

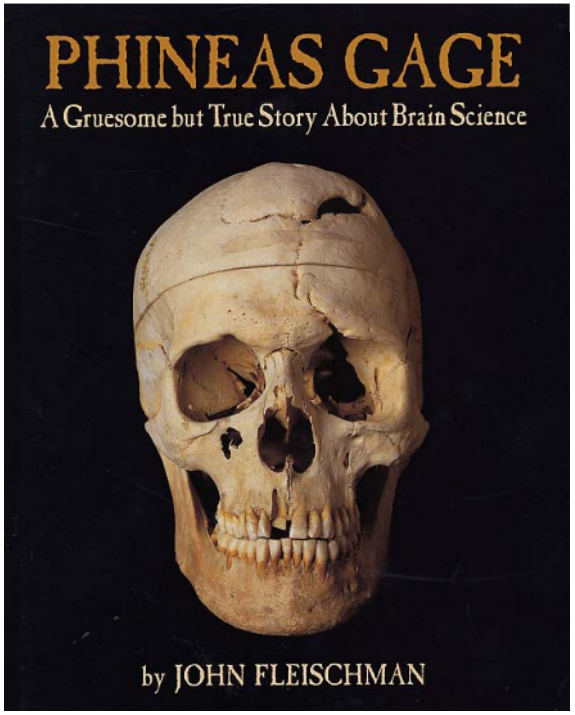
The Five Student Challenge

What variables predict the capacity to learn and the quality of performance?



The Curious Story of Phineas Gage

John Fleischman's book "Phineas Gage: A Gruesome but True Story About Brain Science" is an excellent source of information about this person, his life, and how this event impacted our understanding of how the brain works; and particularly the frontal lobes.



The Curious Story of Phineas Gage

- September 13, 1848 nearly 4:30 pm
- Phineas Gage (aged 26 years) was the foreman of a railroad track construction crew blasting granite bedrock near Cavendish, Vermont
- He is described as being good with his hands and good with his men
- In a few minutes, the course of his life will be changed dramatically

The Curious Story of Phineas Gage

- The job Phineas has is to use a “tamping iron” which is designed to set explosives
- A tamping iron is a rod about 3 ½ feet long weighing 13 ½ lbs pointed at one end flat on the other
- The flat end is for tamping – packing down- black blasting powder, in holes in the granite
- the pointed end for poking a hole in the gunpowder to carefully press the ropelike fuse into the coarse-grained explosive material

The Curious Story of Phineas Gage

- Gunpowder is very tricky to work with so they follow a prescribed and practiced pattern
  - Pour the powder, set the fuse, pour the sand, tamp the sand plug, shout a warning, and run like mad!
- But something went wrong – no one knows what
- The flat end of his tamping iron slipped into the hole, a spark flies, and BAM!
- The tamping iron flies straight up, though his head and lands with a loud clang about thirty feet away

The Curious Story of Phineas Gage

- It is hard to believe but, Phineas is alive and speaks even as blood is pouring down his face
- He is brought to town on an ox cart ambulance
- Arriving in town he gets down from the cart without help, goes into the Cavendish hotel and talks calmly to those he meets
- He is treated by Dr. Harlow and recovers
- But there were signs that something was wrong

The Curious Story of Phineas Gage

- Dr Harlow found that his behavior was odd
  - One day the doctor found him roaming around town, his head still heavily bandaged, in the rain with no coat or shoes
  - He would not take direction from the doctor
  - Phineas stated that he wanted to go home and intended to walk…the 20 miles to get there
- Ten weeks later Dr. Harlow declares Phineas is ready to go home even though he still seems odd

The Curious Story of Phineas Gage

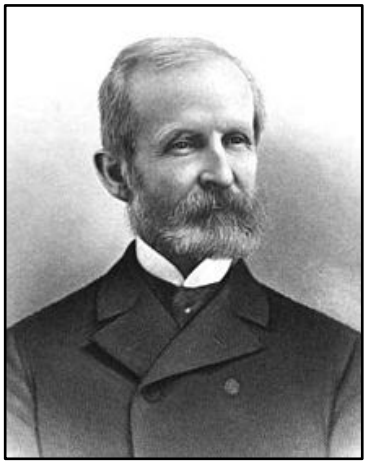
- About 10 months later Phineas is physically healed and returns to Cavendish, carrying his tamping iron, looking to get his old job back
- Phineas is unreliable, insulting, uses vulgar language, changes his mind frequently, and can no longer direct activity at the mine
- Dr. Harlow reports that Phineas “comes up with all sorts of new plans… but they are no sooner announced than he drops them.”
- He is like a small child who continually changes his mind

The Curious Story of Phineas Gage

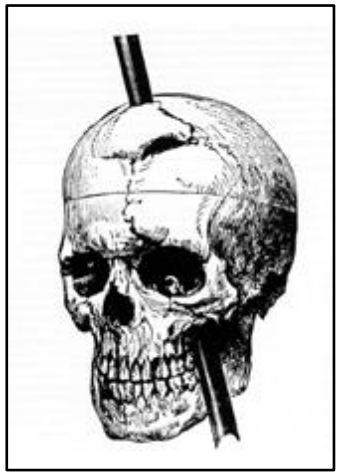
- **Before** the accident ‘he possessed a well-balanced mind, was seen as a shrewd, smart business man, very energetic and persistent in executing all his plans of operation’ (p 59)
- **After** the accident his mind was radically changed; so much so that his friends said he was no longer Phineas Gage
- Although most of his brain was not damaged, his frontal lobes were significantly injured.

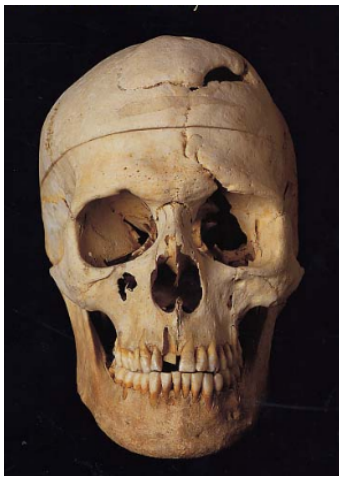
The Curious Story of Phineas Gage

One of three figures from Harlow's 1868 paper. The legend reads: Front and lateral view of the cranium, representing the direction in which the iron traversed its cavity



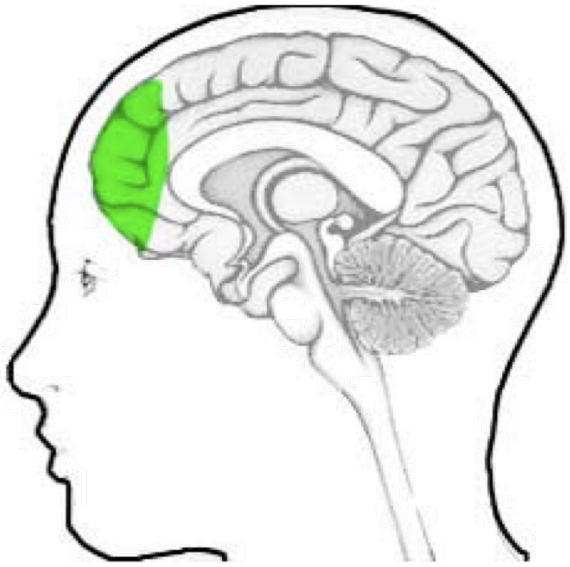
John Harlow 1819 - 1907





The Curious Story of Phineas Gage

The case of Phineas Gage and others spurred scientists in the mid 1800s to seek to develop an understanding of the frontal lobes in particular the pre-frontal cortex.

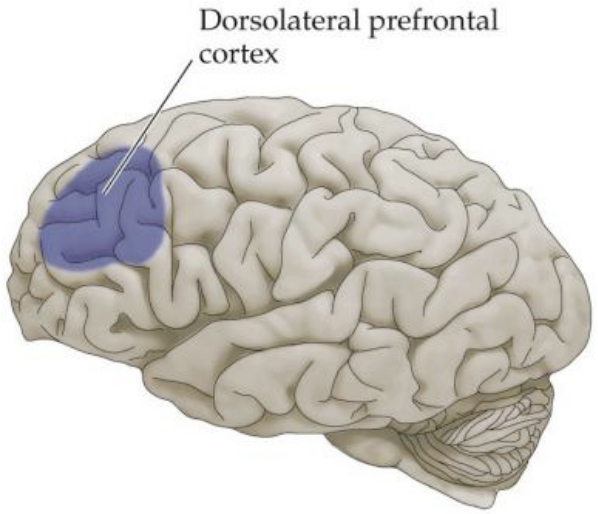


A Bit of EF Neuroanatomy

- Prefrontal
- Rich cortical, sub-cortical and brain stem connections.

More Specifically

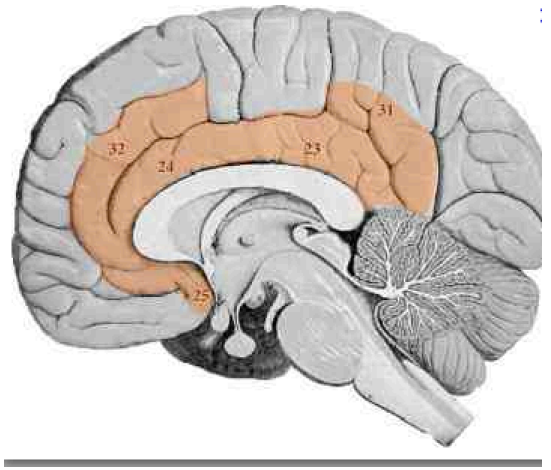
- The dorsolateral prefrontal cortex (DLPFC) is involved with integrating different dimensions of cognition and behavior.



- This area is associated with verbal and design fluency, ability to maintain and shift set, planning, response inhibition, working memory, organizational skills, reasoning, problem solving and abstract thinking.

More Specifically:

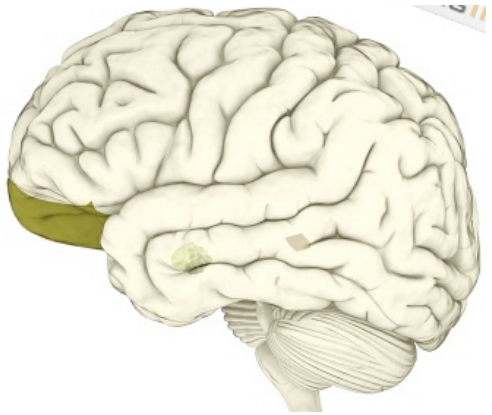
- The anterior cingulate cortex (ACC) is involved in emotional drives, experience and integration, inhibition of inappropriate responses, decision making and motivation



- Lesions in this area can lead to low drive states such as apathy and may also result in low drive states for such basic needs as food or drink and possibly decreased interest in social or vocational activities and sex.

And Finally:

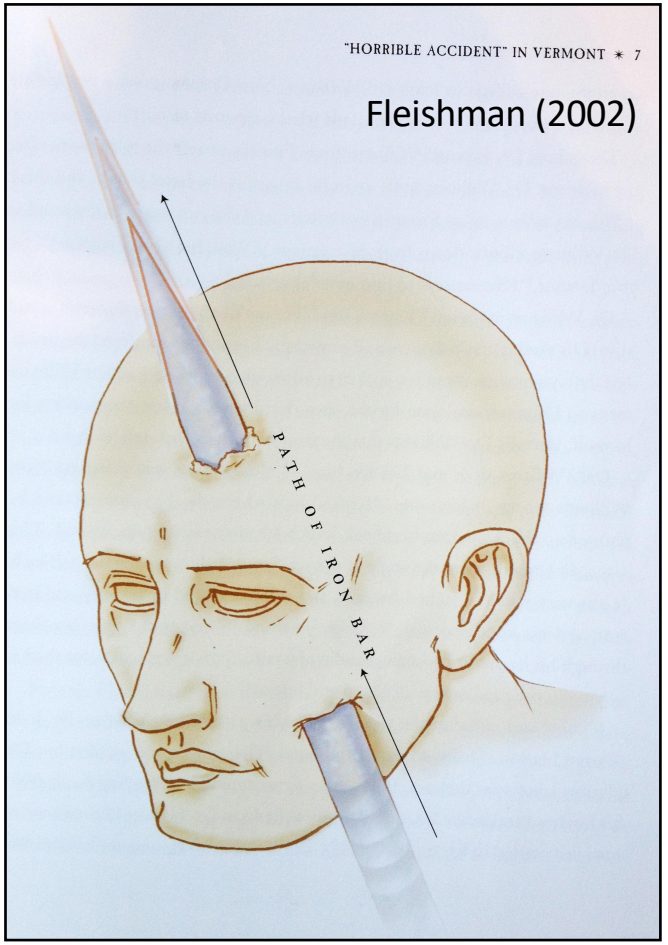
- The orbitofrontal cortex (OFC) plays a key role in impulse control, maintenance of set, monitoring ongoing behavior and socially appropriate behaviors.



- Lesions in this area can cause dis-inhibition, impulsivity, aggressive outbursts, sexual promiscuity and antisocial behavior.

Fleishman (2002, p 70)

- From Damaiso (1994) article in *Science*
- The rod passed through the left frontal lobe, between the two hemispheres, then to left hemisphere
- The damage was to the front of the frontal cortex more than the back, and the underside more than the top



The Curious Story of Phineas Gage

- Phineas and his tamping iron
- This presentation is about the important role the frontal lobes and the unique function this part of the brain provides we now call “Executive Function(s)”

The Curious Story of Phineas Gage

The Skull of Phineas is at Harvard's Warren Anatomical Museum

The skull of Phineas Gage

The skull of Phineas Gage, along with the tamping iron which did the damage. On display at Harvard's Warren Anatomical Museum.

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 do we mean by the term Executive Function(s)?

Executive Function(s)

- In 1966 Alexandr Luria first wrote and defined the concept of Executive Function (EF)
- He credited Bianchi (1895) and Bekhterev (1905) with the initial definition of the process

1902 - 1977

Luria's Research

- Luria studied Russian peasants in the 1930s.
- He found that they were "addicted" to the concrete world not the world of hypotheticals and possibilities.
- Their appreciation of the world was tied to practical function.

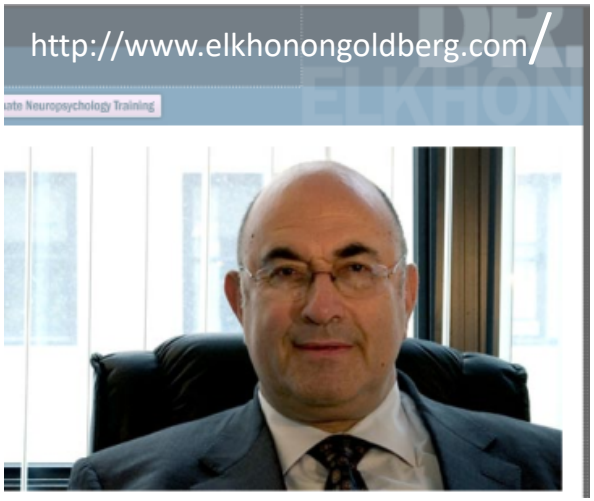
What is/are Executive Function(s)

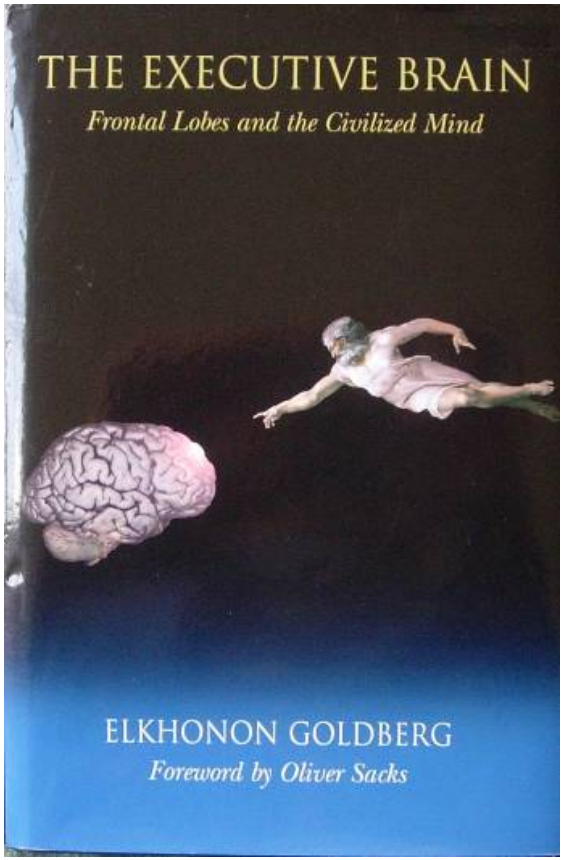
There is no formal excepted definition of EF

- 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

Executive Functions

Elkhonon Goldberg provides a valuable overview of the functions of the human brain's frontal lobes as the brain's executive





Does Experience Shape EF?

- The Family Life Project has demonstrated that poverty is associated with elevated cortisol in infancy and early childhood.
- This association is mediated through characteristics of the household.
- Parenting sensitivity mediates the relationship between poverty and stress physiology.
- In combination parenting sensitivity and elevated cortisol mediate the association between poverty and poor EF in children.

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.

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).

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).

What is Executive Function(s)

6. Pribram (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).

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).

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).

What is Executive Function(s)

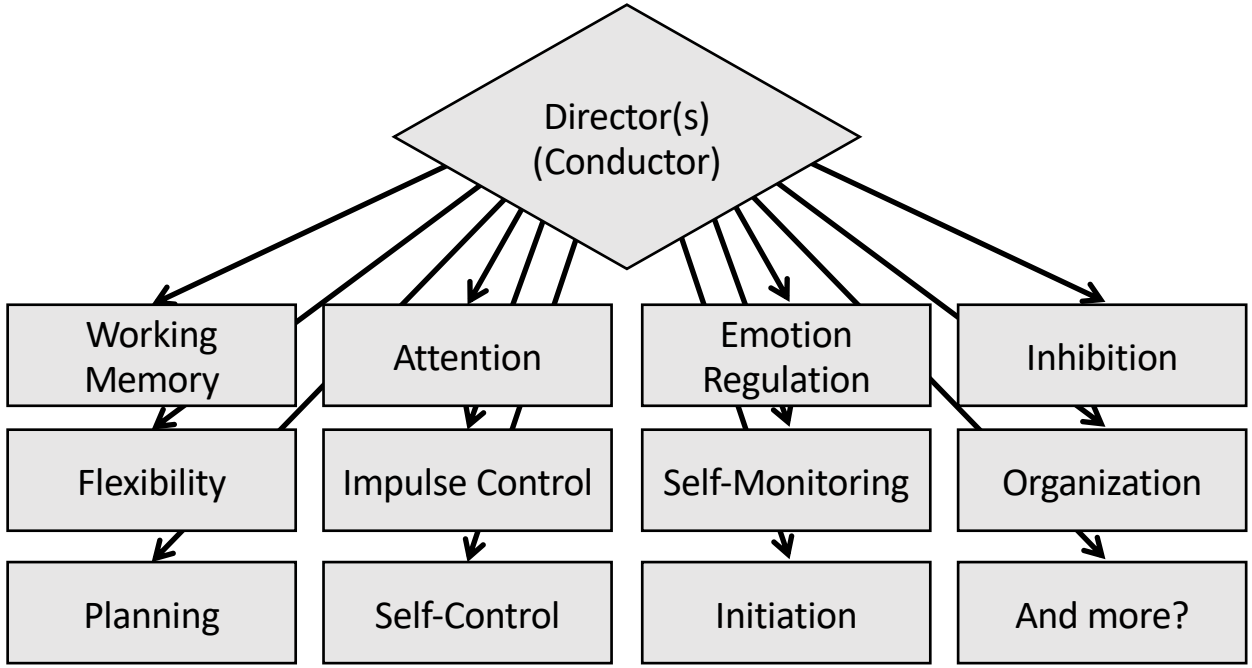
10. Lezak (1995): "**a collection of interrelated cognitive and behavioral skills that are responsible for purposeful, goal-directed activity**," …
11. Lezak (1995): "**how and whether a person goes about doing something**" (p. 42).
12. Luria (1966): "… **ability to correctly evaluate their own behavior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

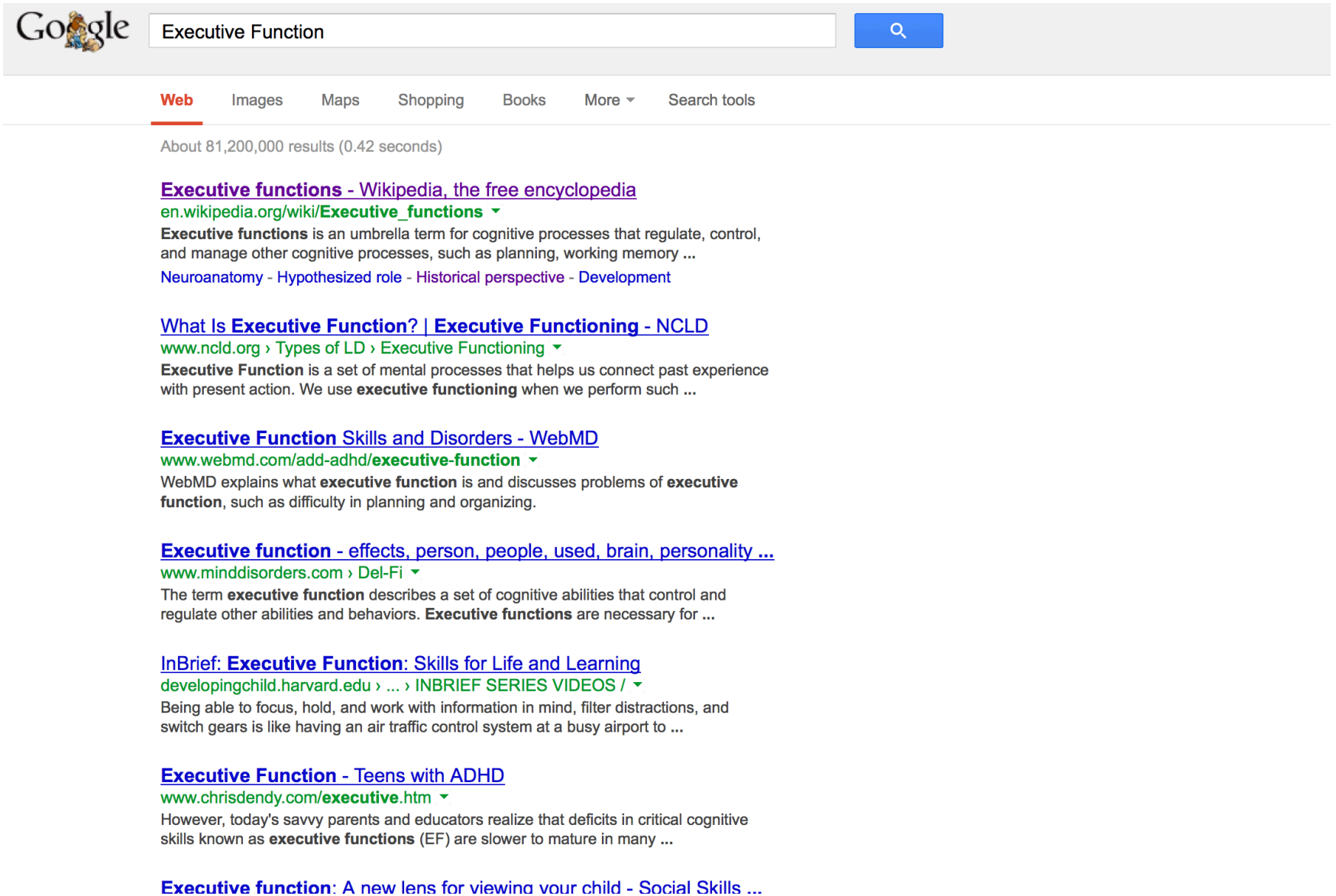
These theories fall in two broad categories:

- Those that describe EF as a set of abilities, cognitive processes and behaviors.
- Those that view EF as one or more controllers of abilities and behaviors.

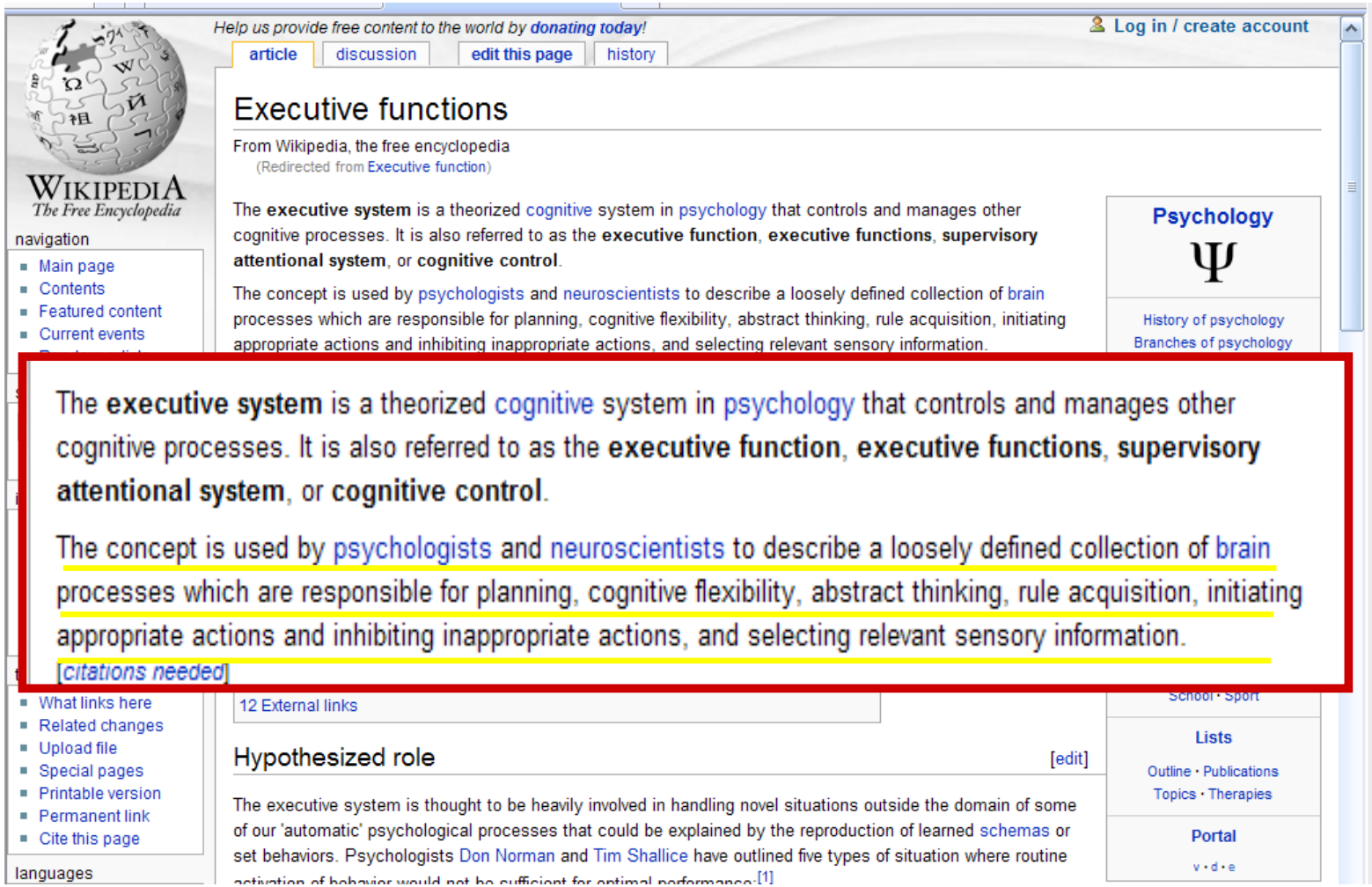
Two Categories of Theeories

- Regulators that control …
- Abilities, cognitive processes, or behaviors.

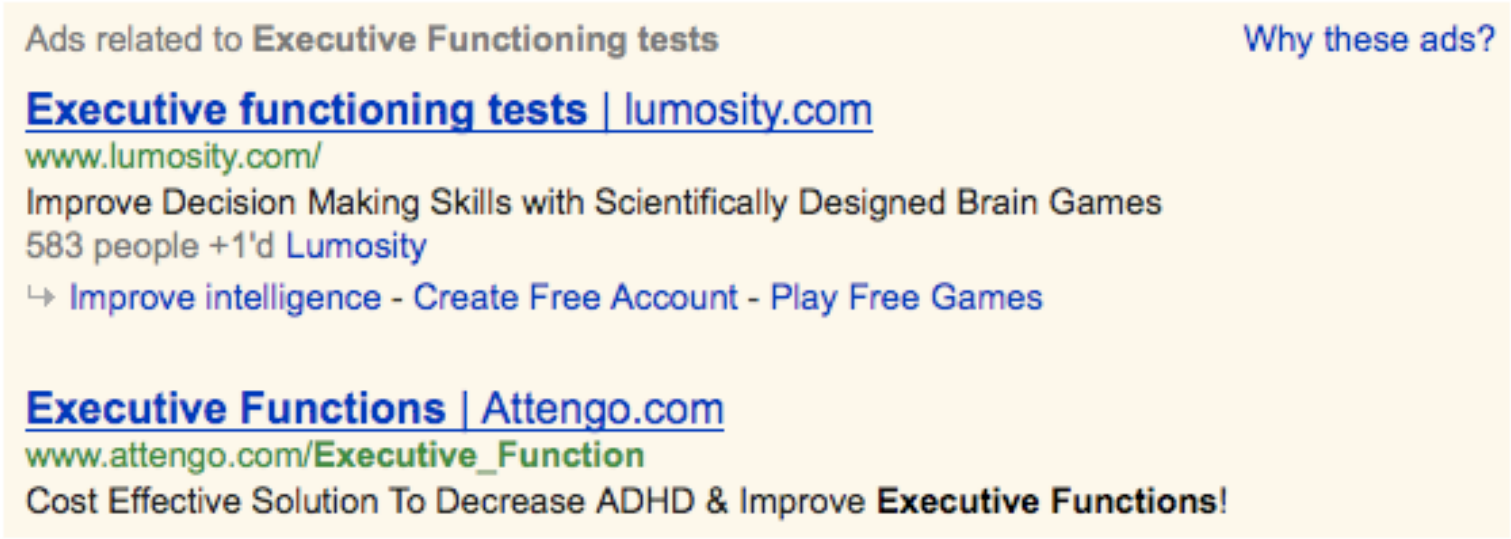



Google
Executive Function
Web
Images
Maps
Shopping
Books
More
Search tools
About 81,200,000 results (0.42 seconds)
Executive functions - Wikipedia, the free encyclopedia
en.wikipedia.org/wiki/Executive_functions
Executive functions is an umbrella term for cognitive processes that regulate, control, and manage other cognitive processes, such as planning, working memory ...
Neuroanatomy - Hypothesized role - Historical perspective - Development
What Is Executive Function? | Executive Functioning - NCLD
www.ncld.org › Types of LD › Executive Functioning
Executive Function is a set of mental processes that helps us connect past experience with present action. We use executive functioning when we perform such ...
Executive Function Skills and Disorders - WebMD
www.webmd.com/add-adhd/executive-function
WebMD explains what executive function is and discusses problems of executive function, such as difficulty in planning and organizing.
Executive function - effects, person, people, used, brain, personality ...
www.minddisorders.com › Del-Fi
The term executive function describes a set of cognitive abilities that control and regulate other abilities and behaviors. Executive functions are necessary for ...
InBrief: Executive Function: Skills for Life and Learning
developingchild.harvard.edu › ... › INBRIEF SERIES VIDEOS /
Being able to focus, hold, and work with information in mind, filter distractions, and switch gears is like having an air traffic control system at a busy airport to ...
Executive Function - Teens with ADHD
www.chrisdendy.com/executive.htm
However, today's savvy parents and educators realize that deficits in critical cognitive skills known as executive functions (EF) are slower to mature in many ...
Executive function: A new lens for viewing your child - Social Skills ...

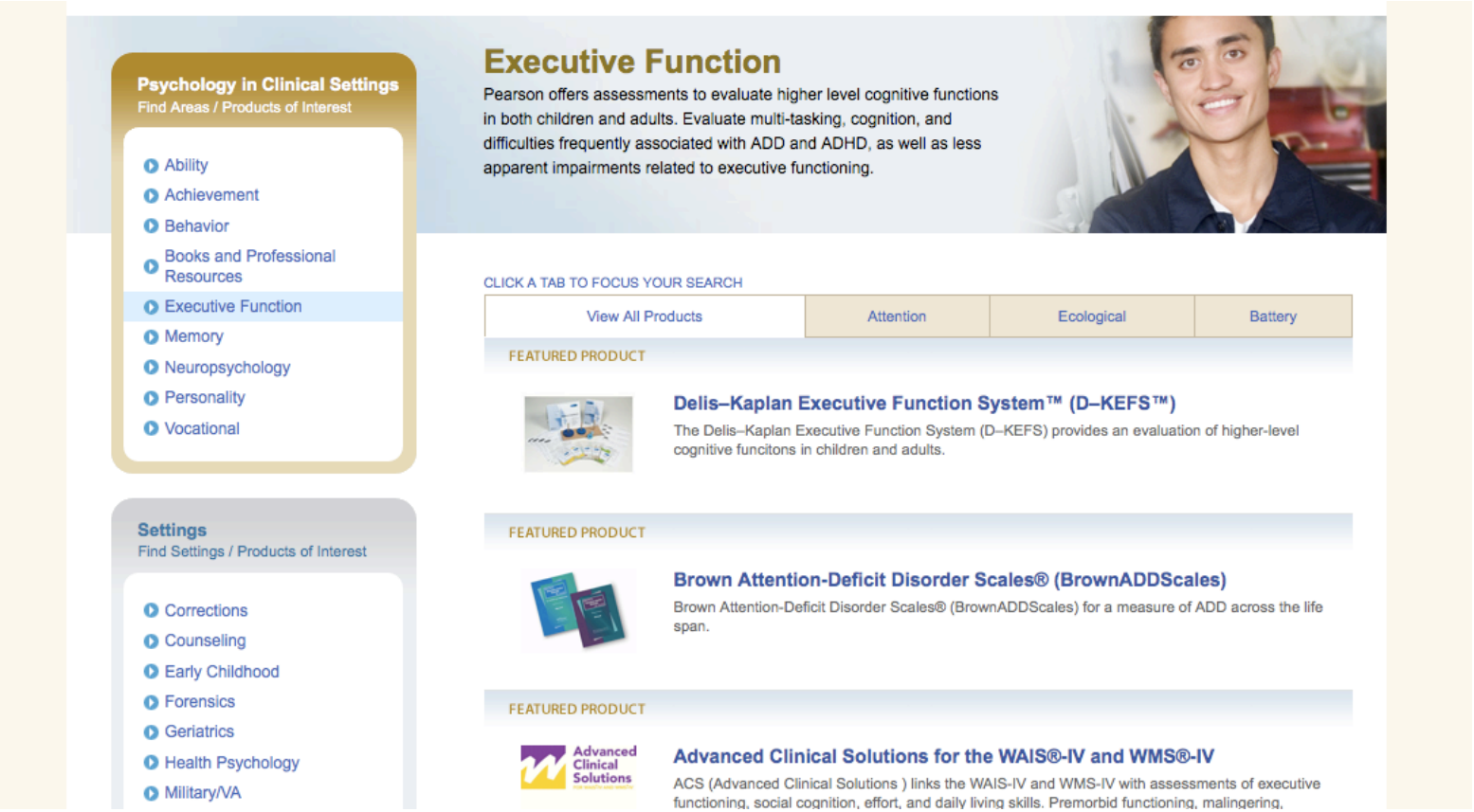
Executive Functions



EF is Becoming a Marketing Buzzword



EF is Becoming a Marketing Buzzword



And Finally. . . .

An NICHD panel in 1994
identified 33 EFs by consensus!

Eunice Kennedy Shriver
NICHD
National Institute of Child Health
& Human Development

The Top Six Were:

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

Are EF challenges associated with other psychiatric and developmental conditions?

"Oh yes. We single out someone every week and highlight their performance."

EF and ADHD

EF deficits are not necessarily unique to ADHD. They are neither necessary nor sufficient to make a diagnosis of ADHD. When EF impairments are measured in children with ADHD they tend to reflect specific rather than global impairments.

EF and Other Disruptive Disorders (ODD & CD)

Early reviews reported that EF deficits were not characteristic of children and adolescents with ODD and CD after co-morbid ADHD was factored out. More recent studies, however, suggest that inhibition deficits may be characteristic of both ADHD and CD but whether children with CD display impairments on additional EF measures is equivocal.

EF and Anxiety Disorders

EF deficits in set-shifting, cognitive flexibility, concept formation, interference control, and verbal fluency have been documented among children with separation anxiety disorder, overanxious disorder, and PTSD. EF in OCD has not been well addressed.

EF and Depression

Scant research has been conducted on the EF abilities among youth with depression. Studies that have included older adolescents have suggested some degree of sensitivity of EF tasks in identifying unipolar depression, but less specificity.

EF and Bi-Polar Disorder

There is a growing consensus about the nature of BD among children. Several studies have targeted its EF concomitants. Although results often have been confounded with significant co-morbidity issues, children and adolescents with BD reliably have demonstrated impairments relative to those without any history of mood disorders on several EF measures (e.g. working memory, set shifting).

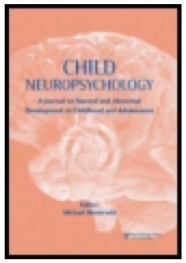
EF and Tourette's

Distinct and robust impairments in EF do not appear to be characteristic of children with TD.

EF and Traumatic Brain Injury

Child Neuropsychology: A Journal on Normal and Abnormal Development in Childhood and Adolescence

Volume 8, Issue 4, 2002



Long-Term Executive Function Deficits in Children With Traumatic Brain Injuries: Assessment Using the Behavior Rating Inventory of Executive Function (BRIEF)

DOI: 10.1076/chin.8.4.271.13503

Shanley Mangeot, Kira Armstrong, Andrew N. Colvin, Keith Owen Yeates & H. Gerry Taylor

pages 271-284

EF and Traumatic Brain Injury

Dement Neuropsychol 2011 December;5(4):337-345

Original Article

Pragmatic and executive functions in traumatic brain injury and right brain damage

An exploratory comparative study

Nicolle Zimmermann[1,2], *Gigiane Gindri*[1,3], *Camila Rosa de Oliveira*[1,2], *Rochele Paz Fonseca*[1,4]

Abstract – *Objective:* To describe the frequency of pragmatic and executive deficits in right brain damaged (RBD) and in traumatic brain injury (TBI) patients, and to verify possible dissociations between pragmatic and executive functions in these two groups. *Methods:* The sample comprised 7 cases of TBI and 7 cases of RBD. All participants were assessed by means of tasks from the Montreal Communication Evaluation Battery and executive functions tests including the Trail Making Test, Hayling Test, Wisconsin Card Sorting Test, semantic and phonemic verbal fluency tasks, and working memory tasks from the Brazilian Brief Neuropsychological Assessment Battery NEUPSILIN. Z-score was calculated and a descriptive analysis of frequency of deficits ($Z < -1.5$) was carried out. *Results:* RBD patients presented with deficits predominantly on conversational and narrative discursive tasks, while TBI patients showed a wider spread pattern of pragmatic deficits. Regarding EF, RBD deficits included predominantly working memory and verbal initiation impairment. On the other hand, TBI individuals again exhibited a general profile of executive dysfunction, affecting mainly working memory, initiation, inhibition, planning and switching. Pragmatic and executive deficits were generally associated upon comparisons of RBD patients and TBI cases, except for two simple dissociations: two post-TBI cases showed executive deficits in the absence of pragmatic deficits. *Discussion:* Pragmatic and executive deficits can be very

EF Deficits and ASD

J. Child Psychol. Psychiat. Vol. 32, No. 7, pp. 1081–1105, 1991
Printed in Great Britain.

0021-9630/91 $3.00 + 0.00
Pergamon Press plc

Executive Function Deficits in High-Functioning Autistic Individuals: Relationship to Theory of Mind

Sally Ozonoff,* Bruce F. Pennington* and Sally J. Rogers†

Abstract—A group of high-functioning autistic individuals was compared to a clinical control group matched on VIQ, age, sex and SES. Significant group differences were found on executive function, theory of mind, emotion perception and verbal memory tests, but not on spatial or other control measures. Second-order theory of mind and executive function deficits were widespread among the autistic group, while first-order theory of mind deficits were found in only a subset of the sample. The relationship of executive function and theory of mind deficits to each other, and their primacy to autism, are discussed.

Keywords: Autism, executive function, theory of mind

EF and Learning Disabilities

Working Memory Impairments in Children with Specific Arithmetic Learning Difficulties ☆ ☆☆

Janet F. McLean, Graham J. Hitch

Lancaster University, Lancaster, United Kingdom

http://dx.doi.org/10.1006/jecp.1999.2516, How to Cite or Link Using DOI

Abstract

Working memory impairments in children with difficulties in arithmetic have previously been investigated using questionable selection techniques and control groups, leading to problems concluding where deficits may occur. The present study attempted to overcome these criticisms by assessing 9-year-old children with difficulties specific to arithmetic, as indicated by normal reading, and comparing them with both age-matched and ability-matched controls. A battery of 10 tasks was used to assess different aspects of working memory, including subtypes of executive function. Relative to age-matched controls, children with poor arithmetic had normal phonological working memory but were impaired on spatial working memory and some aspects of executive processing. Compared to ability-matched controls, they were impaired only on one task designed to assess executive processes for holding and manipulating information in long-term memory. These deficits in executive and spatial aspects of working memory seem likely to be important factors in poor arithmetical attainment.

If all of these conditions are statistically related to behaviors and abilities reflecting EF than a common denominator must exist.

Executive Function

- EF is a **unitary** construct (e.g., Duncan & Miller, 2002; Duncan & Owen, 2000).
- EF is **unidimensional** in early childhood not adulthood.

- Both views are supported by some research (Miyake et al. , 2000), -- EF is a **unitary construct …but with partially different components**.

Executive Functions

- EF has **three components**: *inhibitory control, set shifting (flexibility), and working memory* (e.g., Davidson, et al., 2006; Miyake et al., 2000).
- EF has independent **abilities** (Wiebe, Espy, & Charak, 2008).
- Executive Function**s** is a **multidimensional** model (Friedman et al., 2006; Miyake et al., 2000).

Executive Function(s)

- Given all these definitions of EF(s) we wanted to address the question…

  Executive Function***s …*** or

  Executive Function?

Executive Function(s)

- One way to examine this issue is to research the factor structure of behaviors related to EF(s)
- To do so, we examined the factor structure of the Comprehensive Executive Function Inventory (CEFI)
- We conducted a series of research studies to answer the following question:
  - What is the underlying structure of the behaviors assessed on the CEFI?
  - Is there is just one underlying factor called Executive Function), or do the behaviors group together into different constructs suggesting a multidimensional structure?

CEFI Standardization

- 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 CEFI via the paper-and-pencil or online methods.

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.**

EXPLORATORY FACTOR ANALYSES

- 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

- The sample …

ITEM FACTOR ANALYSES – PART 1

- For the *first half* of the normative sample for Parent, Teacher and Self ratings' **item scores** (90 items) was analyzed using exploratory factor analysis
- The *scree plots* and the *very simple solution* criterion both indicated that only **one factor**.
- The *ratio of the first and second eigenvalues* was greater than four for all three forms, which indicated a **one factor solution.**

Item Factor Analyses – Part 1

- Item level factor analysis clearly indicted that one factor was the best solution

Table 8.2. Eigenvalues from the Inter-Item Correlations

Form	Factor						
	1	2	3	4	5	6	7
Parent	43.7	4.1	2.3	1.5	1.3	1.3	1.0
Teacher	56.8	3.8	2.3	1.3	1.1	1.1	0.8
Self-Report	29.9	6.3	2.7	2.1	1.9	1.8	1.5

Item Factor Analyses – Part 1

- Item level factor analysis clearly indicted that one factor was the best solution

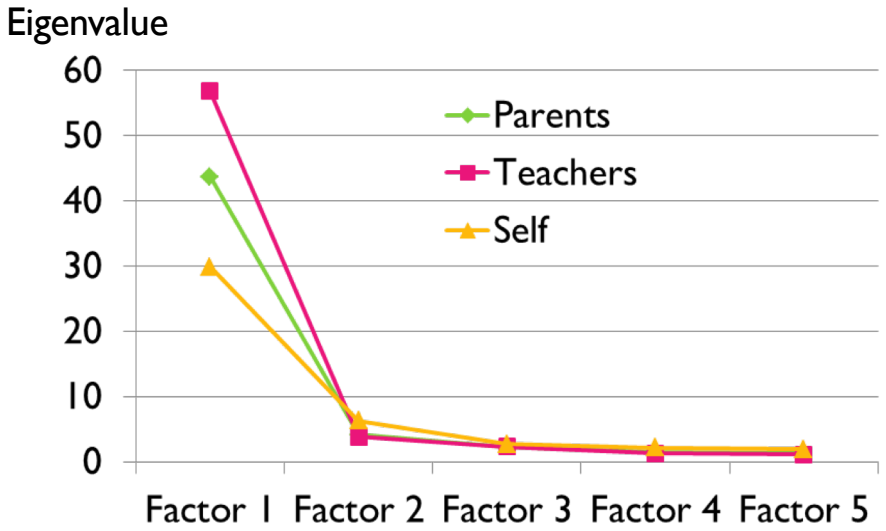


Table 8.2. Eigenvalues from the Inter-Item Correlations

	Factor						
Form	1	2	3	4	5	6	7
Parent	43.7	4.1	2.3	1.5	1.3	1.3	1.0
Teacher	56.8	3.8	2.3	1.3	1.1	1.1	0.8
Self-Report	29.9	6.3	2.7	2.1	1.9	1.8	1.5

Note. Extraction m:ipal Axis Factoring. Only the first 10 eigenvalues are presented.

SCALE FACTOR ANALYSES – PART 2

- 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**.

EXPLORATORY FACTOR ANALYSES – PART 2

- 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	6	7	
Parent	7.5	0.2	0.0	0.0	0.0	0.0	0.0	.0	0.0	-(
Teacher	7.8	0.3	0.0	0.0	0.0	0.0	0.0	.0	0.0	(
Self-Report	6.3	0.2	0.1	0.0	0.0	0.0	-0.1	.0	-0.1	-(

Note. Extraction method: Pag.

Item Factor Analyses – Part 2

- Scale level factor analysis clearly indicted that one factor was the best solution

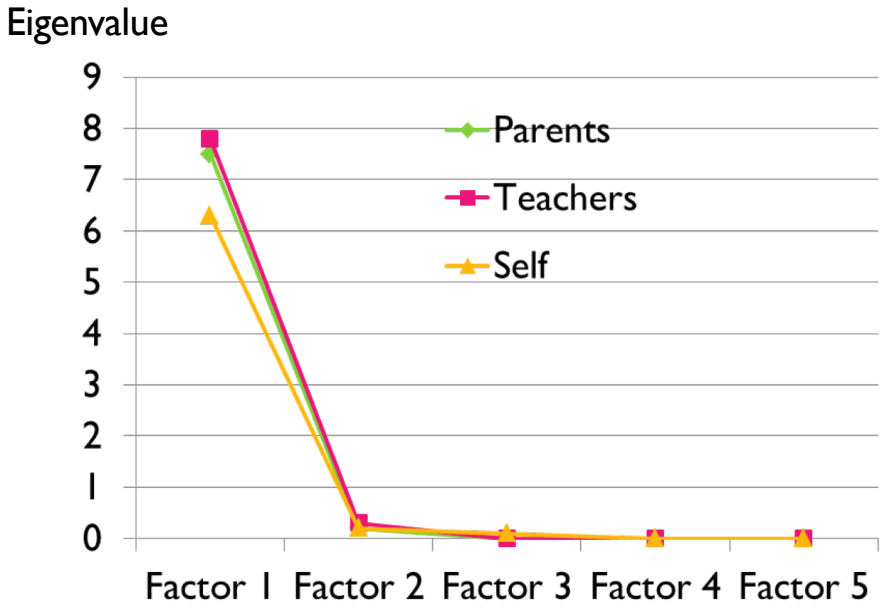


Table 8.4. Eigenvalues of the CEFI Scales Correlations

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

Note. Extraction method: Png.

EXPLORATORY FACTOR ANALYSES

Table 8.6. Consistency of Factor Loadings Across Groups

Grouping Factor	CEFI Form	Coefficient of Congruence	Group 1		
			Level	*N*	*M*
Gender	Parent	.999	Male	700	98.1
	Teacher	.999	Male	700	96.7
	Self-Report	.992	Male	350	98.9
Race/ Ethnic Group	Parent	.996	Non-White	615	99.8
	Teacher	.999	Non-White	609	97.8
	Self-Report	.995	Non-White	308	100.3
Age	Parent	.999	5 to 11	699	99.9
	Teacher	.999	5 to 11	700	100.0
	Self-Report	.995	12 to 15	400	98.7
Clinical/ Educational	Parent	.993	Non-Clinical	1,298	101.0
	Teacher	.994	Non-Clinical	1,338	100.7
	Self-Report	.976	Non-Clinical	632	100.8

Coefficients of Congruence* – are all very high indicating that the 12 comparisons of factor solutions yielded very similar findings

* In multivariate statistics, the **coefficient of congruence** is an index of the similarity between factors that have been derived in a factor analysis.

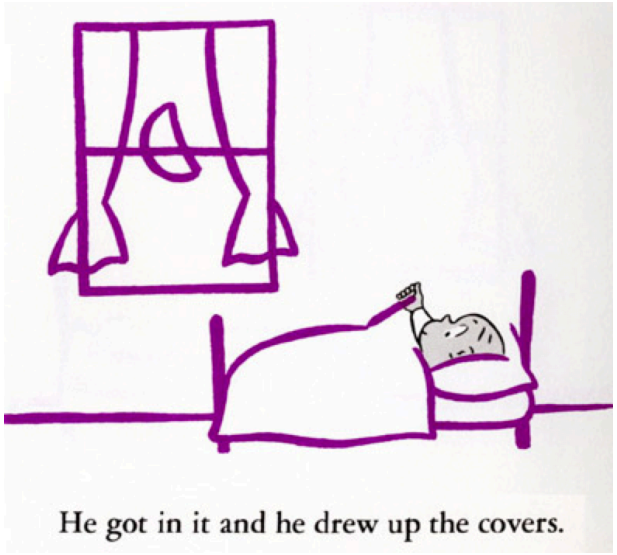
EXPLORATORY FACTOR ANALYSES

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* function**s** is the best term to use

Our Conclusion. . .

The concept of Executive Function is best defined as a unitary construct….how you do what you do.

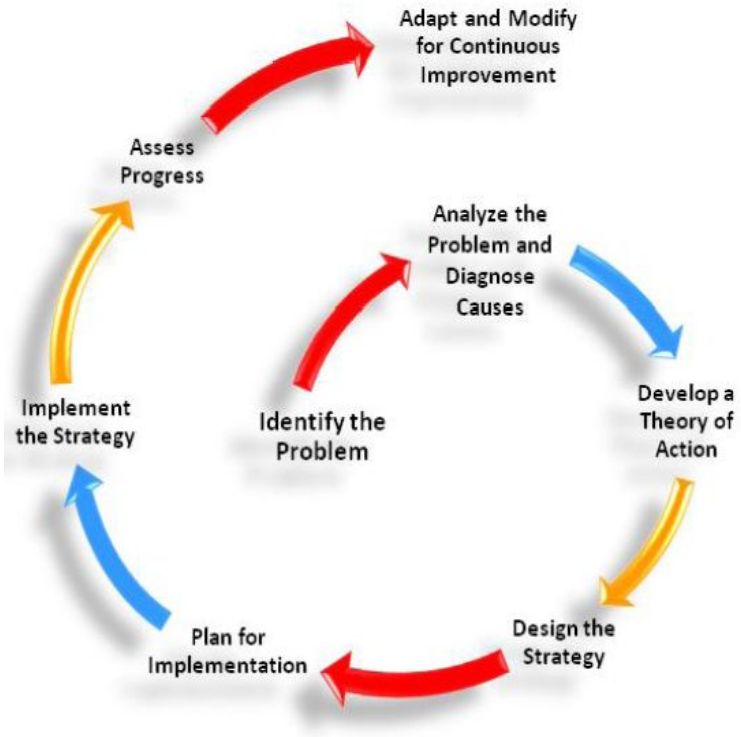


This includes:

- Initiation to achieve a goal.
- Planning and organizing tasks.
- Attending to details to notice success of the solution.
- Keeping information in memory.
- Possessing the mental flexibility to evaluate and modify the solution as information from self-monitoring is received.
- Demonstrating regulation and inhibitory control so that the task is completed successfully.

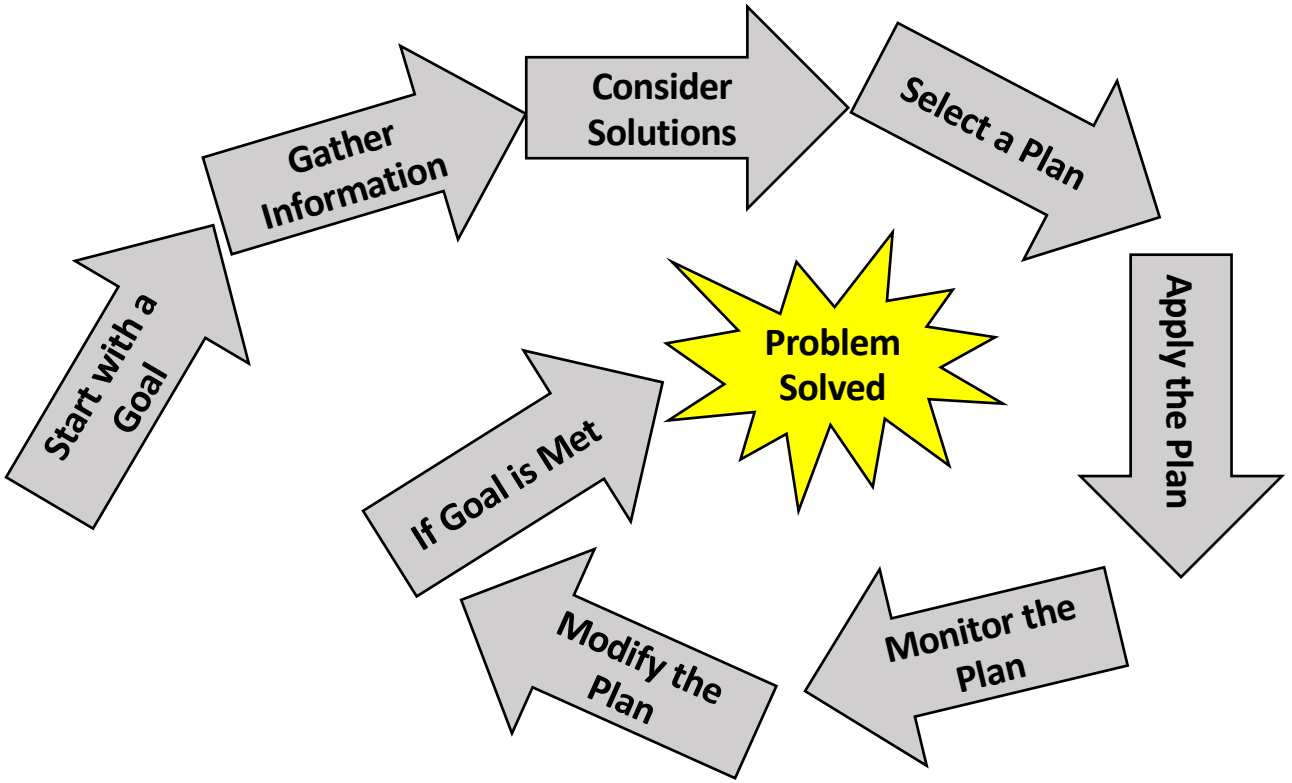
Naglieri & Goldstein, 2012

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



Naglieri & Goldstein, 2012

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



Latent class analysis of frontal lobe tasks strongly suggests a general EF that reflects the efficiency and perhaps automaticity of the executive management system.

Miyake, Friedman, et al
Cognitive Psychology

Conclusive evidence concerning the developmental trajectories of the different EF components on neuropsychological tests has yet to be established.

Huizinga, Dolan et al, 2006
Neuropsyhologica

An examination of factor analytic studies examining EF in children finds only a single factor- planning – common to all studies.

Anderson, 2002
Clin. Neuropsych.

EF abilities may develop in different tracks but merge in function as children develop.

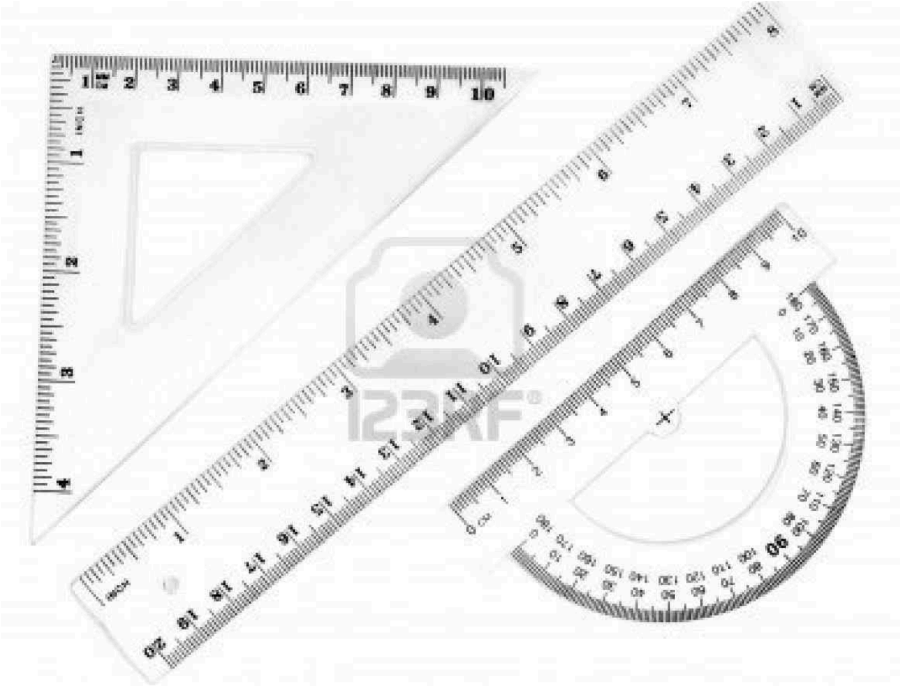
Wasserman and Wasserman, 2013
Applied Neuropsych. Child

EF appears to be a unitary, more domain specific process in children

Wiebe, Scheffield, et al, 2011
J. Of Exp. Child Psych.

How to Measure Executive Function(s)

A recent review by Weyandt et al (2012) found 168 measures used to evaluate EF.

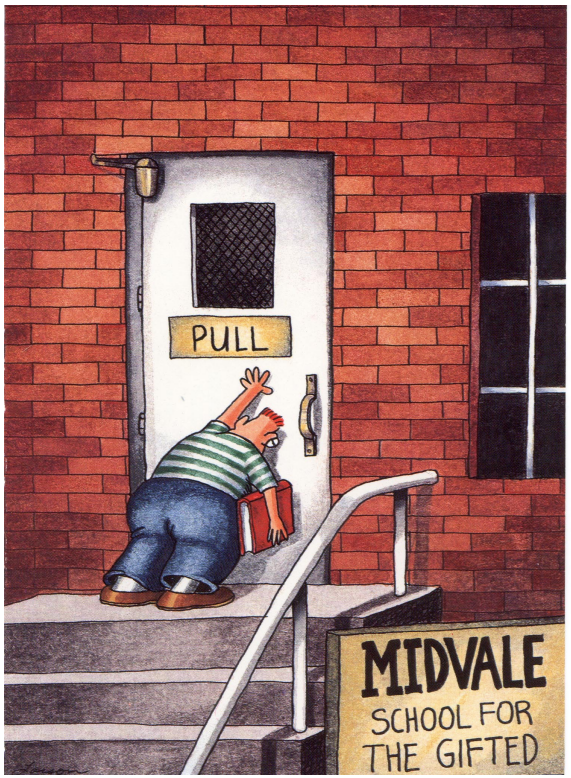


Executive Function Test	Number of Times Used	Sensitivity to Group Differences	Percentage of Significant Differences Between Clinical and Control Groups	Percentage of Significant Group Differences Between Two Clinical Groups
Stroop Color and Word Test and variants	41	28/73 = 38%	22/37 = 59%	6/36 = 17%
Wisconsin Card Sorting Test (including computerized and non-computerized versions)	34	75/226 = 33%	60/139 = 43%	14/88 = 16%
Trail Making Test and variants	26	43/121 = 36%	35/79 = 44%	8/42 = 19%
Continuous Performance Test and variants	19	31/72 = 43%	26/52 = 50%	5/15 = 33%
BRIEF	16	177/266 = 67%	88/104 = 85%	24/64 = 38%
Go/No-Go Test	14	37/81 = 46%	23/41 = 56%	7/17 = 41%
Tower of London test and Variants	13	3/75 = 4%	1/39 = 3%	2/39 = 5%
Rey-Osterith Complex Figure Test (ROCF) or Rey Complex Figure Test (RCFT)	12	31/93 = 33%	24/56 = 43%	7/37 = 19%

From Weyandt et al, 2012

What comprises the best means of assessment of EF?

How can we reliably and validly evaluate EF?



In general single EF tests share at most 10% of the variance with EF ratings and observations of everyday behavior.

Batteries of combined EF tests fare a bit better sharing up to 20% of the variance with observation and reported behavior.

The more tests in an EF battery the more factors identified in both exploratory and confirmatory studies.

The Delis-Kaplan Executive Functions System (D-KEFS) is an example of a battery approach to assessing EF.

Delis–Kaplan Executive Function System™ (D–KEFS™)

Author(s): Dean C. Delis, Edith Kaplan, Joel H. Kramer

Assess key components of executive functions within verbal and spatial modalities

At a Glance:

Administration: Flexibility in test selection; 90 minutes if all nine tests are administered; hand scorable; individual administration

Software Available: Yes

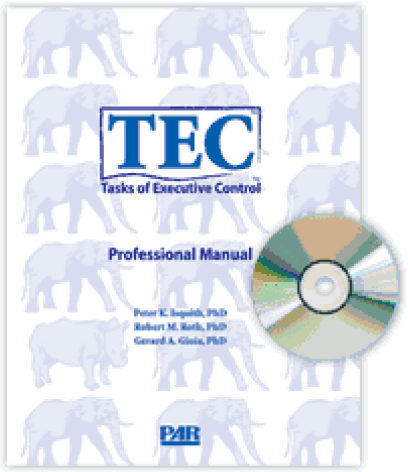
Qualification level: C-Level

Publication Date: 2001

Ages / Grades: Ages 8 through 89 years

Norms: Normed on over 1,500 individuals demographically and regionally matched with the U.S. population

Tasks of Executive Control is another example of a battery approach to assessing EF



Related Products

Tasks of Executive Control™ (TEC™)

Peter K. Isquith, PhD, Robert M. Roth, PhD, and Gerard A. Gioia, PhD

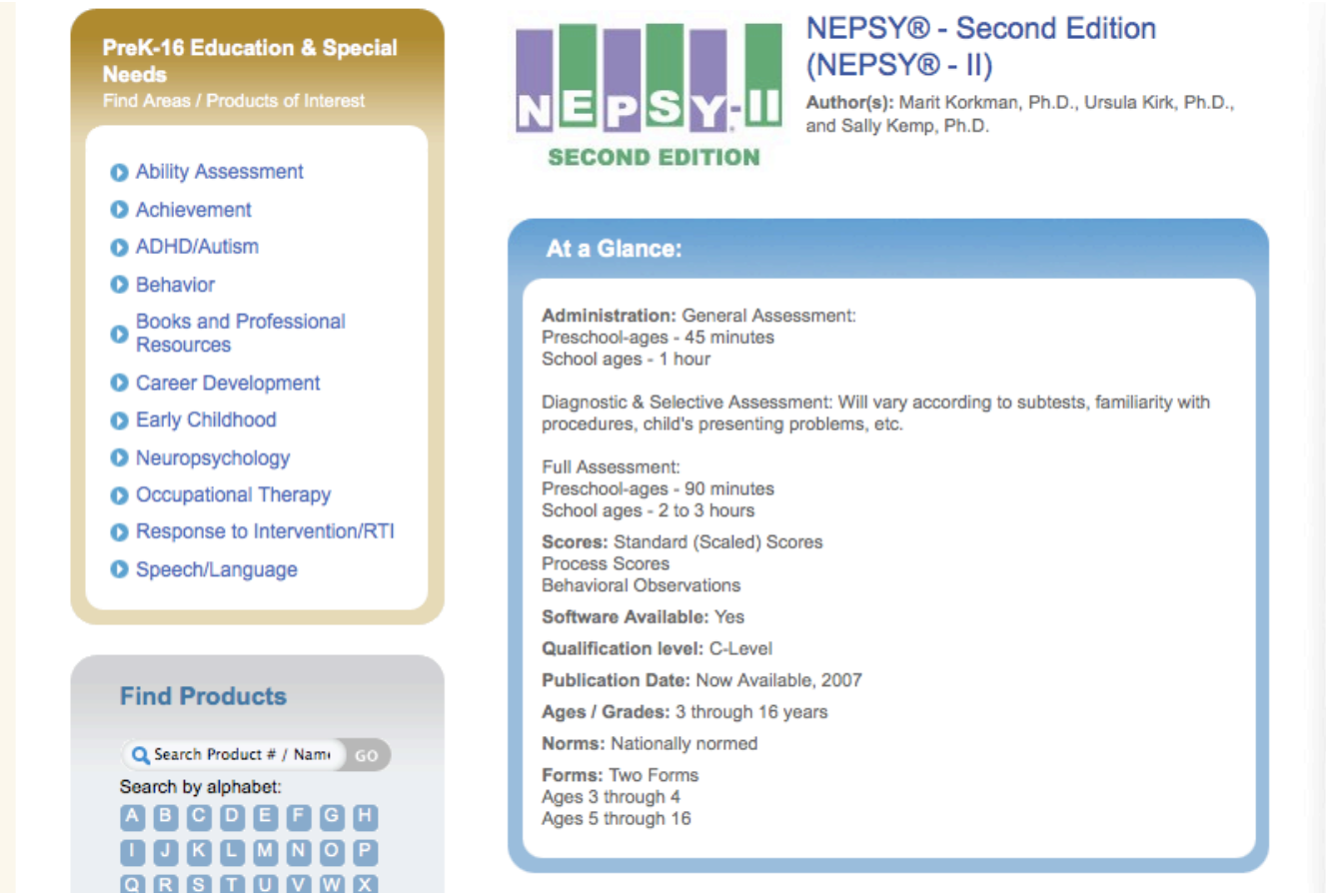
Purpose:	Assess attention, working memory, and inhibitory control
Age range:	5 to 18 years
Admin:	Individual
Admin time:	20-30 minutes
Qualification level:	B

Delis-Kaplan Executive Functions System (D-KEFS)

This collection of neuropsychological tests is used to measure a variety of verbal and nonverbal EFs for children and adults (ages 8 – 89 years). This tool was developed over the span of a decade by Dean Delis, Edith Kaplan, and Joel Kramer, and was published in 2001. The D-KEFS comprises nine tests that were designed to stand alone. Therefore, there are no aggregate measures or composite scores for an examinee's performance. A vast majority of these subtests are modified, pre-existing measures (e.g., the Trail Making Test), however, some of these measures reflect new indices of executive functions (e.g., Word Context Test).

The D-KEFS was normed with a representative sample. It has been reviewed to “hold much promise as a clinical and research tool (JCEN, 2005, 599-609). However the D-KEFS has been criticized because only 17% of the reliability values published in the D-KEFS manual are above a .80 value.

NEPSY II is another example of a battery approach to assessing EF



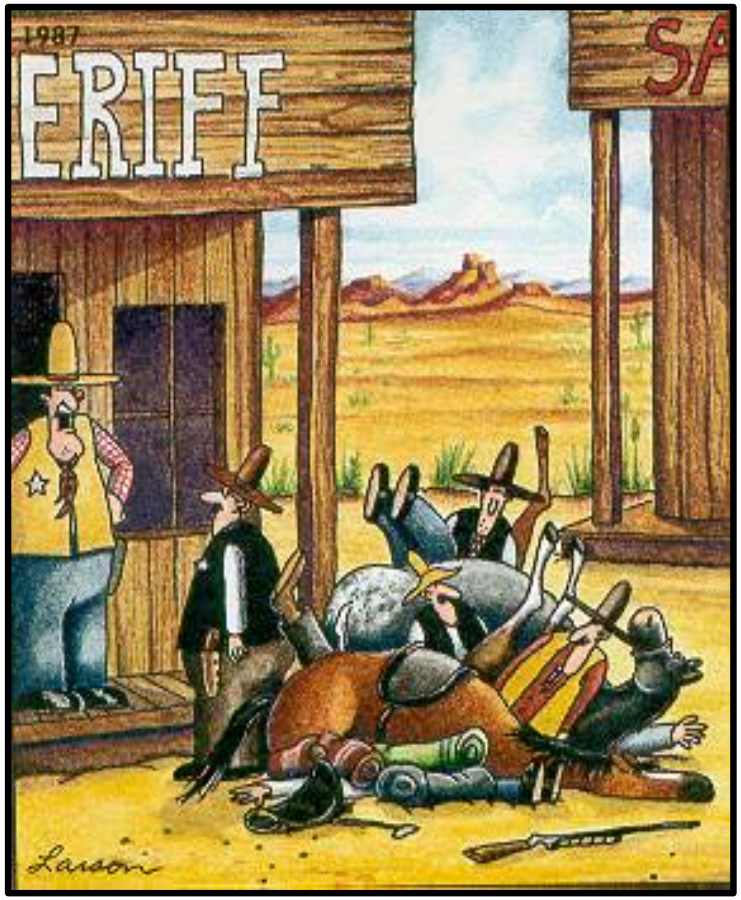
The NEPSY–II is the only single measure that allows the clinician to create a tailored assessment across six domains, specific to a child's (ages 3:0-16:11 years) situation in order to answer referral questions or diagnostic concerns. The results provide information relating to typical childhood disorders, which can lead to accurate diagnosis and intervention planning for success in school and at home.

Problems With EF Tests

- EF tests have limited information on test-retest reliability; what exists is often in the low-moderate range. Limited norms and ceiling effects plague some measures (i.e., WCST).
- Low ecological validity: EF tests have low correlations with ratings of EF in natural settings (0-20% shared variance).
- Most EF tests were not developed to actually assess EF but were borrowed from other areas of non-EF research (CPTs in schizophrenia, etc.). The problem is with how to conceptualize EF rather than with construct validity of current tests.
- Most EF tests may be more sensitive to frank brain damage than to a more subtle developmental delay in EF as in ADHD.
- EF factor scores (latent constructs) may be better than individual test scores as indices of EF.

Good Executive Function?

"And so you just threw everything together? Mathews, a posse is something you have to *organize.*"



EF Rating Scales

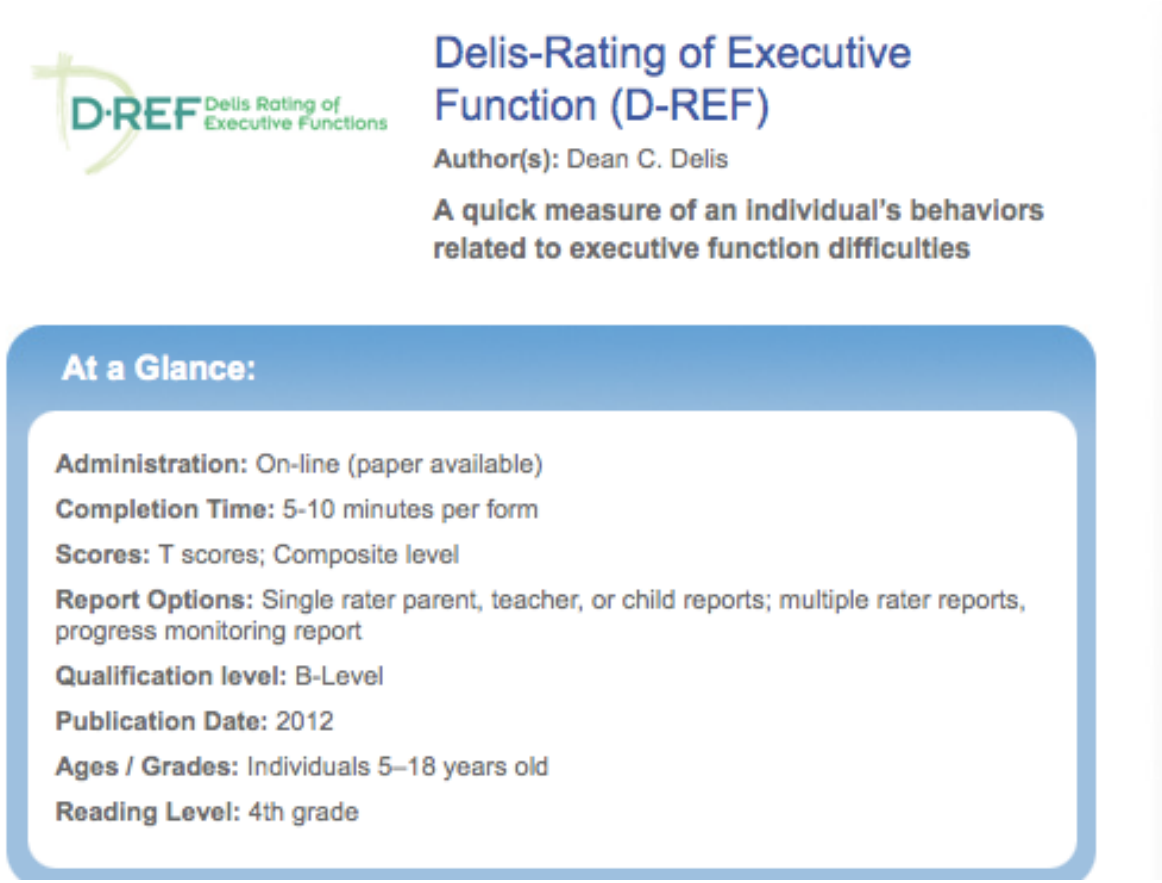
- Measures real world behavior
- Able to sample multiple sources (self, parents, teachers)
- Efficient ways to evaluate EF
- However
  - Self-ratings may be limited by impaired self-awareness
  - Observers may not be good at observing !

Behavior Rating Inventory of Executive Functioning (BRIEF) is an example of an EF Rating Scale

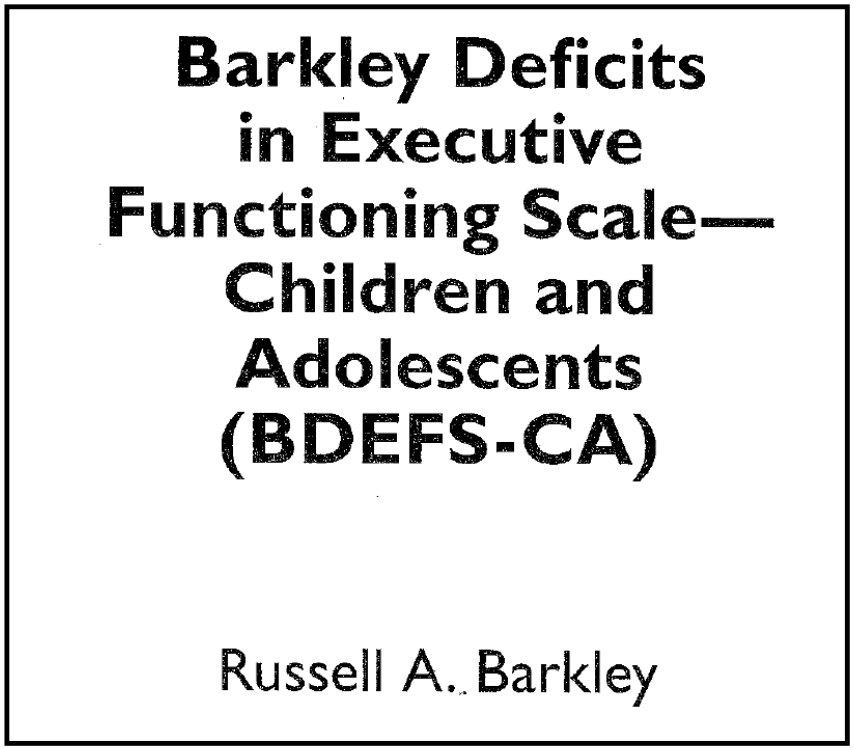
Overview & What's New

- Assesses impairment of executive function in children and adolescents ages 5-18 years.
- Shorter: Administration time is just 10 minutes for the core form and 5 minutes for the screening form.
- Information and research about new 12-item Parent, Teacher, and Self-Report screening forms **and** the core forms are included in one manual.
- Increased sensitivity to executive function: Items that distracted from sensitivity in key clinical groups (such as ADHD and autism spectrum disorder) have been eliminated.
- Updated with new normative data from all 50 states.
- Contains more concise scales, which reduce the burden on the parent, teacher, or adolescent respondent.
- Parent, Teacher and Self-Report forms have increased parallel structure
- Three indexes (Behavioral, Emotional, and Cognitive).
- A new infrequency scale helps identify unusual responding.

Delis-Rating of Executive Function is another example of an EF Rating Scale



Barkley's EF Scale is another example of an EF Rating Scale



Importance of a National Norm

- The diagnostic conclusions we reach are greatly influenced by the tools we use.
- The composition of the reference group can make a substantial difference in the conclusions reached.
- Norms that represent a typical population are needed for all assessment tools.
- We have an obligation to use the highest quality tests.

Importance of a National Norm

- Only tests that yield standard scores based on a ***representative*** normal sample should be used in clinical practice.
- A comparison of EF symptoms to a normative group is essential.
- Comparisons to children who do not represent the US population can be misleading.
- The use of raw scores should be avoided in all tests (especially achievement tests).

Importance of a National Norm

- What is the problem with scores based on a sample that is not representative of the U.S. populations?
  - You don't know how much the score you get is influenced by demographic variables
  - Let's look at some data …
- We created norms for groups of children based on PEL levels to see just how much influence this variable could have on a standard score (Mean = 100, SD = 15)

Importance of a National Norm

Calibration of Standard Scores (Mn = 100; SD = 15) Across Parental Educational Levels for CEFI Parent Ratings.

Raw Score	Standard Scores				
	<HS	HS Grad	Some Coll	Coll Grad	National
230	96	91	88	85	90
235	97	92	89	87	91
240	98	93	90	88	92
245	99	95	92	89	93
250	100	96	93	90	94
255	101	97	94	92	95
260	102	98	95	93	97
265	103	99	96	94	98
270	104	100	98	95	99
275	105	101	99	96	100
280	106	102	100	98	101
285	107	103	101	99	102
290	108	105	102	100	103
295	109	106	103	101	105
300	110	107	105	103	106
305	111	108	106	104	107
310	112	109	107	105	108
315	113	110	108	106	109

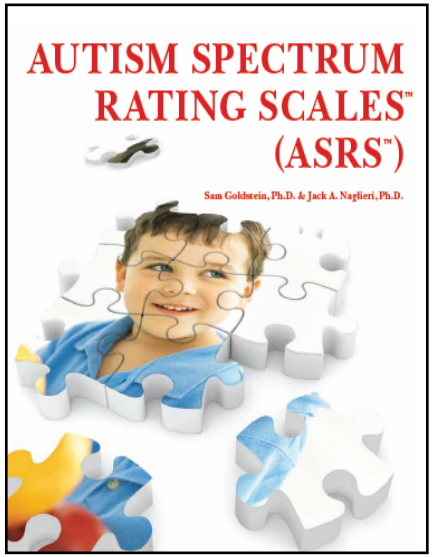
Importance of a National Norm

- The way we calibrate a psychological test or rating scale score has a direct impact on the reliability and validity of the instrument.
- The composition of the comparison and characteristics of the group is especially important whenever diagnostic decisions are being made.

Importance of a National Norm

We studied the differences between results when using a nationally representative sample versus a sample of children identified as having Autism as a reference group

- Raw score to standard score (T-scores) conversion table was constructed based on two different reference groups
  - Children with ASD
  - Nationally representative sample



Importance of a National Norm

- The sample of children with ASD (N = 243) were diagnosed with

  Autism (*n* = 137), Asperger Syndrome (*n* = 80), or Pervasive Developmental Disorder-Not Otherwise Specified (*n* = 26).

- Comprised of individuals with a single primary diagnosis made by a qualified professional (e.g., psychiatrist, psychologist) according to the DSM-IV-TR (APA, 2000) or ICD-10 (WHO, 2007)) using appropriate methods (e.g., record review, rating scales, observation, and interview).

Importance of a National Norm

Total Raw Scores on the ASRS for 6-18 Year olds rated by Teachers.

	Mean	SD	N
Total ASD Sample	129.1	46.9	243
Normative Sample	53.1	36.1	1,828

Importance of a National Norm

- The sample, representative of the US population, included males and females from each of the four geographic regions of the US and four racial-ethnic groups (Asian, Black, White-Not Hispanic and Hispanic Origin aged 6 – 18 years.
- The N = 1,828 (See Goldstein & Naglieri (2009) for more details about the normative sample of the ASRS and those identified with ASD.)

Score Calibrations

A Raw Score of 130 is a T of 50 based on ASD sample

A Raw Score of 80 is a T of 40 based on the ASD sample

Raw Score	ASD Comparison	National Comparison
170	59	82
165	58	81
160	57	80
155	56	78
150	54	77
145	53	75
140	52	74
135	51	73
130	50	71
125	49	70
120	48	69
115	47	67
110	46	66
105	45	64
100	44	63
95	43	62
90	42	60
85	41	59
80	40	57
75	38	56
70	37	55
65	36	53

Score Calibrations

Raw Score	ASD Comparison	National Comparison
170	59	82
165	58	81
160	57	80
155	56	78
150	54	77
145	53	75
140	52	74
135	51	73
130	50	71
125	49	70
120	48	69
115	47	67
110	46	66
105	45	64
100	44	63
95	43	62
90	42	60
85	41	59
80	40	57
75	38	56
70	37	55
65	36	53

A Raw Score of 130 is a T of 50 based on ASD sample

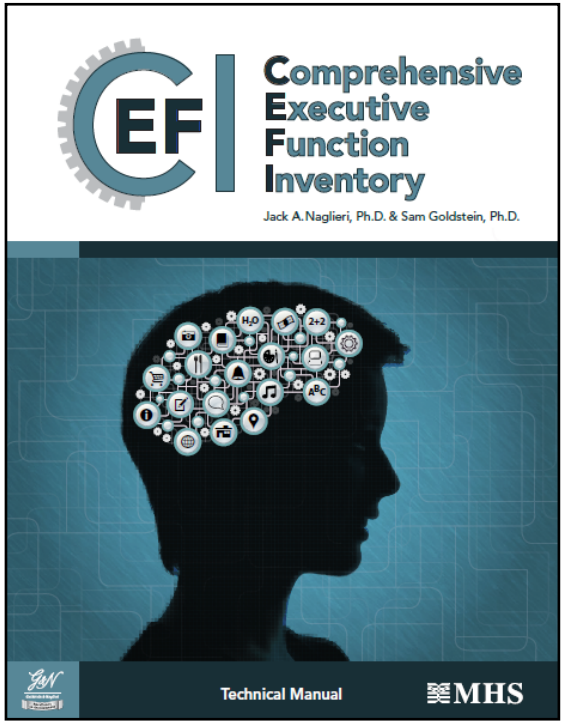
A Raw Score of 80 is a T of 40 based on the ASD sample

A Raw Score of 90 is a T of 42 based on ASD sample; but a T score of 60 (1 SD above the national reference group

Comprehensive Executive Function Inventory (CEFI)

Jack A. Naglieri
Sam Goldstein

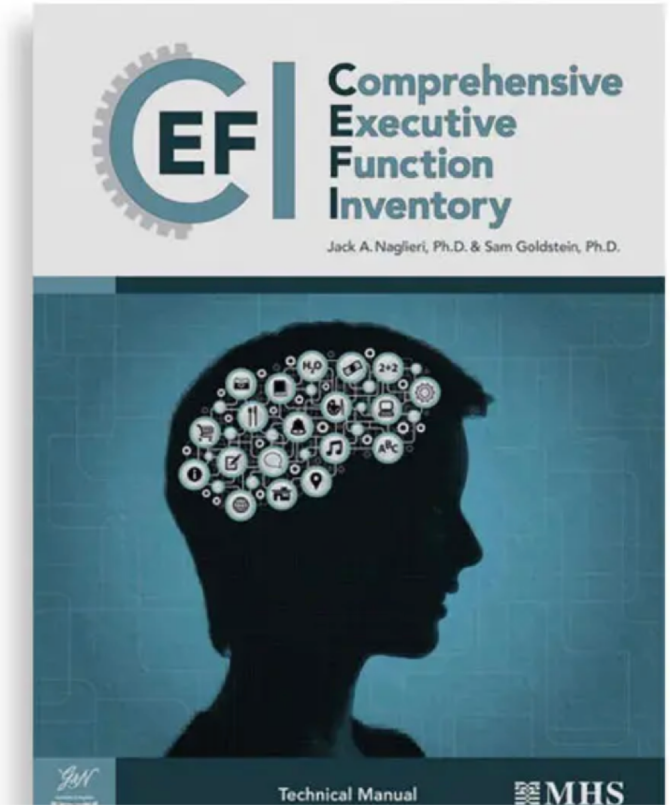
A rating scale designed to measure behaviors association with Executive Function for ages 5-18 years rated by a parent, teacher, or the child/youth.

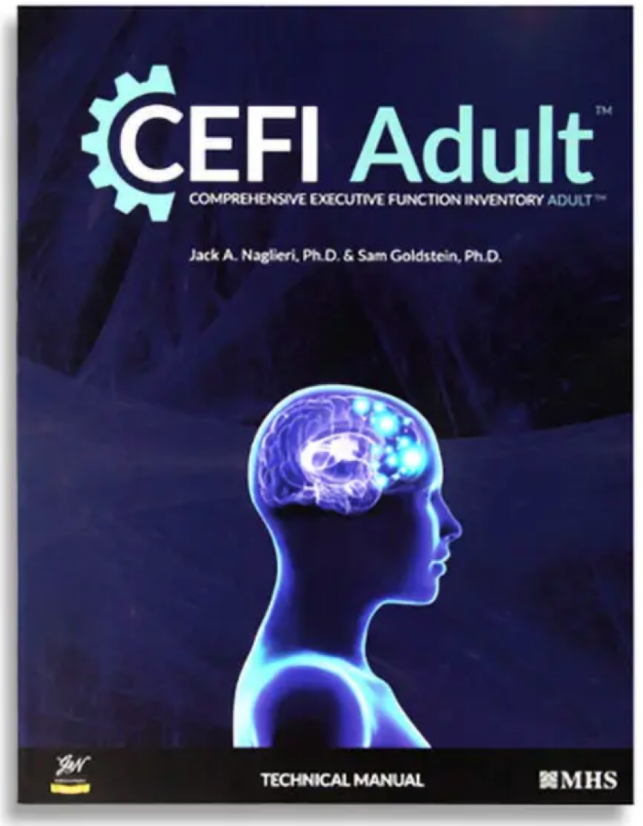


CEFI

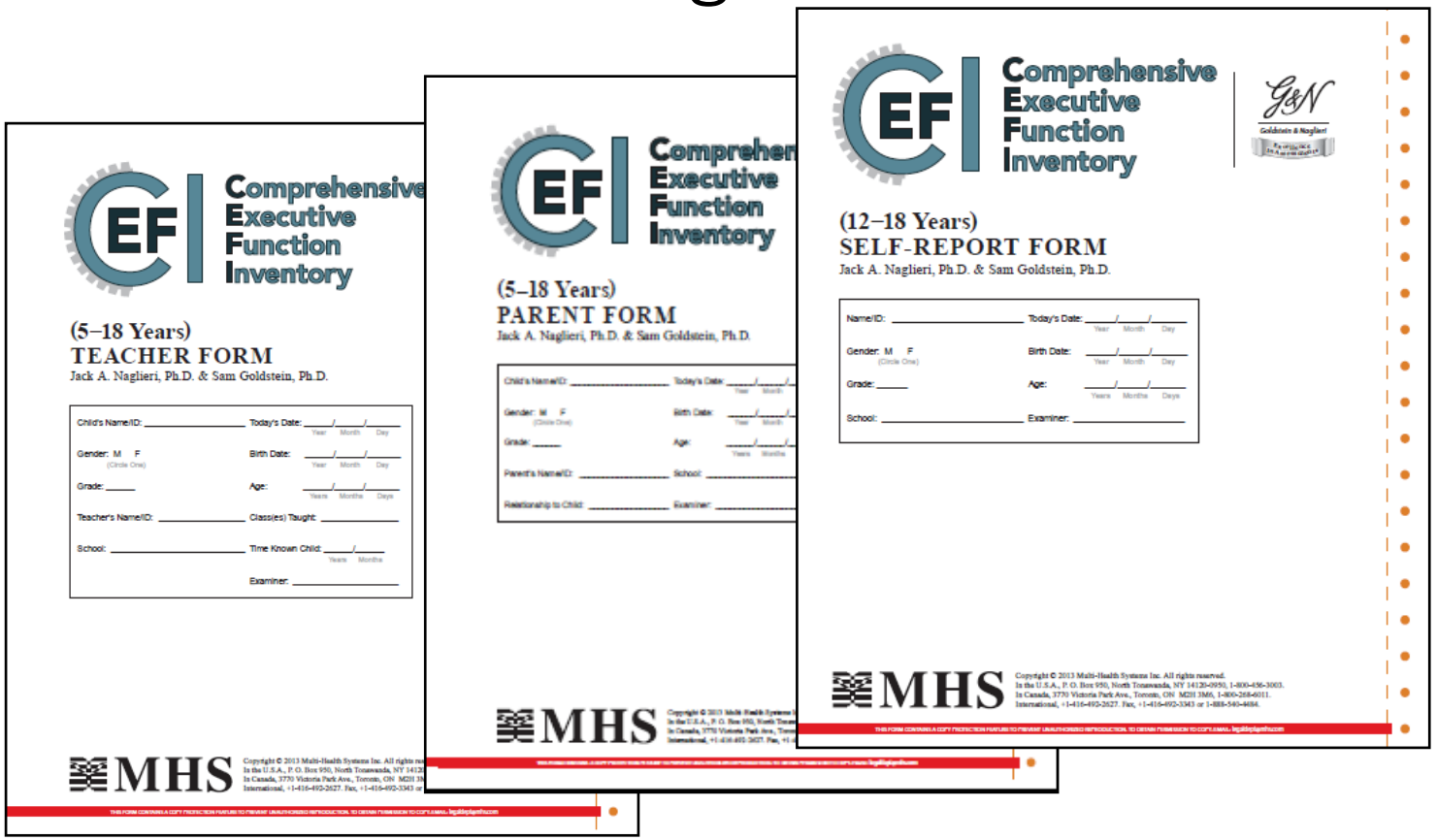
- The Comprehensive Executive Function Inventory (CEFI) is a rating scale designed to measure behaviors that are associated with Executive Function (EF) for children and youth aged 5 through 18 years.
- The rating scale can be completed by a parent, teacher, or the child/youth.
- The CEFI is composed of items related to attention, emotion regulation, flexibility, inhibitory control, initiation, organization, planning, self-monitoring, and working memory.
- The rating scale has been developed to demonstrate the highest psychometric qualities.

CEFI (Naglieri & Goldstein, 2012, 2018)



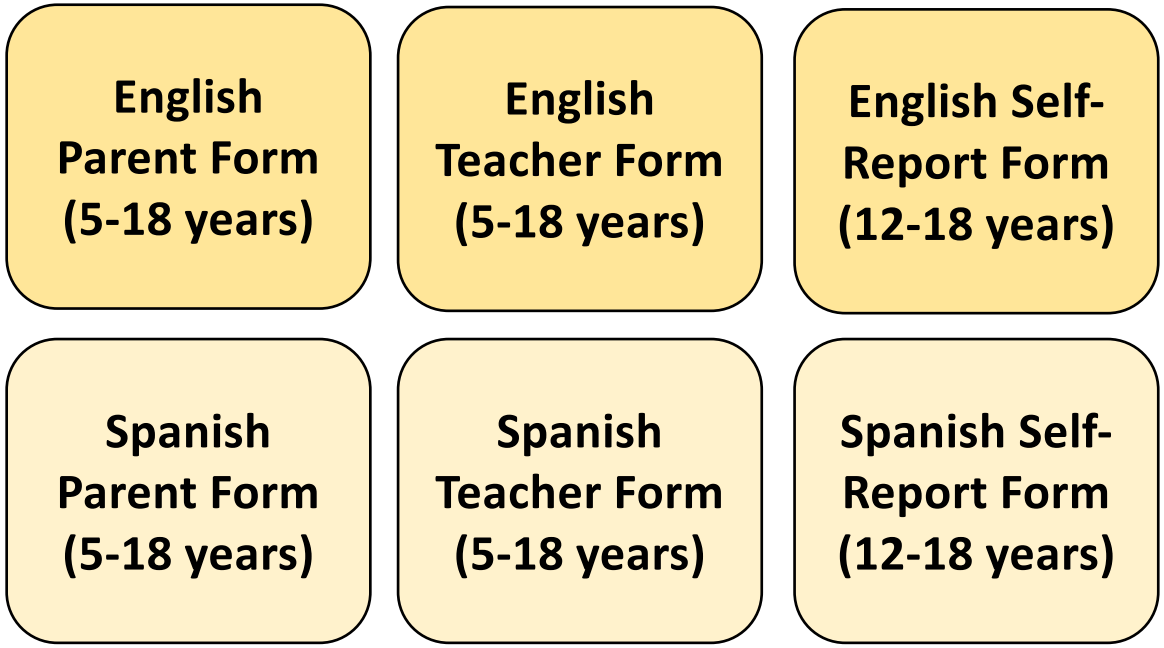


Three Child CEFI Rating Forms



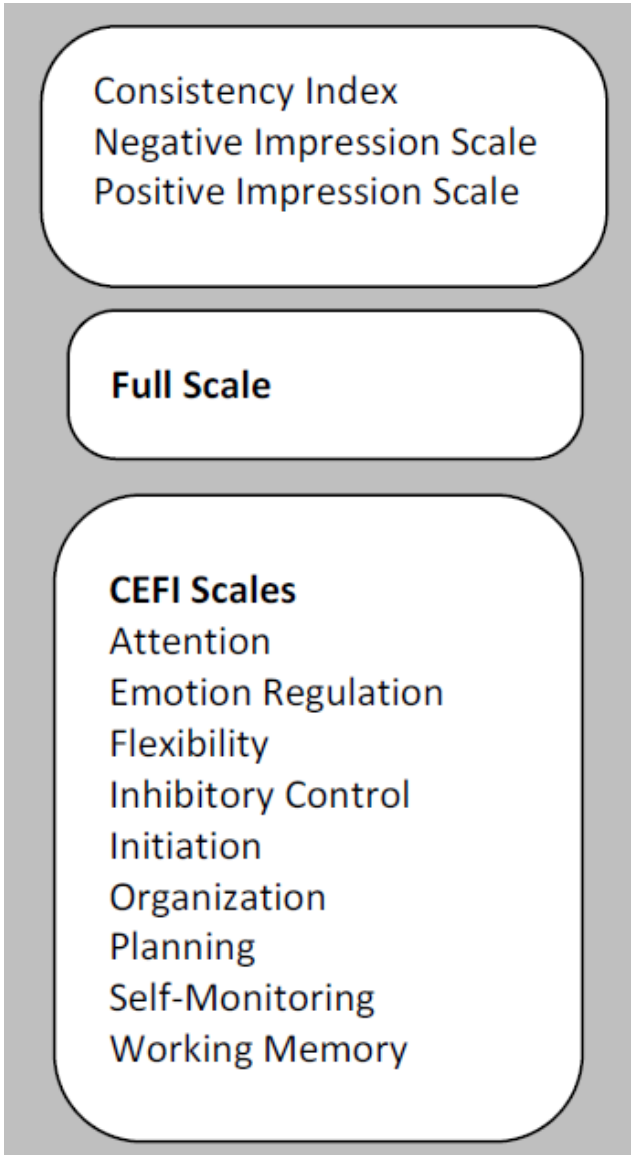
CEFI Forms

- Each 100-item form yields scales set at a mean of 100 and SD of 15



CEFI Scales

Each form yields a **Full Scale** score and 9 separate content scales which contain items as follows…



CEFI Items by Scale

Table C.4. Attention (12 items)

Item #	Parent/Teacher Item *During the past 4 weeks, how often did the child...*	Self-Report Item *During the past 4 weeks, how often did you...*
3.	finish a boring task?	finish a boring task?
11.	work well in a noisy environment?	work well in a noisy environment?
21.	work well for a long time?	work well for a long time?
25.	concentrate while reading?	concentrate while reading?
36.	stay on topic when talking?	stay on topic when talking?

Table C.5. Emotion Regulation (9 items)

Item #	Parent/Teacher Item *During the past 4 weeks, how often did the child...*	Self-Report Item *During the past 4 weeks, how often did you...*
10.	control emotions when under stress?	control emotions when under stress?
12.	stay calm when handling small problems?	stay calm when handling small problems?
42.	find it hard to control his/her emotions? (R)	find it hard to control your emotions? (R)
47.	get upset when plans were changed? (R)	get upset when plans were changed? (R)
64.	wait patiently?	wait patiently?

CEFI Items by Scale

Table C.6. Flexibility (7 items)

Item #	Parent/Teacher Item *During the past 4 weeks, how often did the child...*	Self-Report Item *During the past 4 weeks, how often did you...*
7.	come up with a new way to reach a goal?	come up with a new way to reach a goal?
41.	come up with different ways to solve problems?	come up with different ways to solve problems?
45.	have many ideas about how to do things?	have many ideas about how to do things?

Table C.7. Inhibitory Control (10 items)

Item #	Parent/Teacher Item *During the past 4 weeks, how often did the child...*	Self-Report Item *During the past 4 weeks, how often did you...*
1.	think before acting?	think before acting?
19.	find it hard to control his/her actions? (R)	find it hard to control your actions? (R)
32.	think of the consequences before acting?	think of the consequences before acting?
38.	maintain self-control?	maintain self-control?
49.	have trouble waiting to get what he/she wanted? (R)	have trouble waiting to get what you wanted? (R)

CEFI Items by Scale

Table C.8. Initiation (10 items)

Item #	Parent/Teacher Item *During the past 4 weeks, how often did the child...*	Self-Report Item *During the past 4 weeks, how often did you...*
16.	start something without being asked?	start something without being asked?
30.	start conversations?	start conversations?
39.	take on new projects?	take on new projects?
40.	need others to tell him/her to get started on things? (R)	need others to tell you to get started on things? (R)
55.	take initiative?	take initiative?
58.	appear motivated?	appear motivated?

Table C.9. Organization (10 items)

Item #	Parent/Teacher Item *During the past 4 weeks, how often did the child...*	Self-Report Item *During the past 4 weeks, how often did you...*
5.	complete one task before starting a new one?	complete one task before starting a new one?
13.	organize his/her thoughts well?	organize your thoughts well?
18.	appear disorganized? (R)	appear disorganized? (R)
27.	complete homework or tasks on time?	complete homework or tasks on time?
34.	work neatly?	work neatly?
52.	keep track of belongings?	keep track of belongings?

CEFI Items by Scale

Table C.10. Planning (11 items)

Item #	Parent/Teacher Item *During the past 4 weeks, how often did the child...*	Self-Report Item *During the past 4 weeks, how often did you...*
9.	prepare for school or work?	prepare for school or work?
15.	solve problems creatively?	solve problems creatively?
22.	do things in the right order?	do things in the right order?
28.	plan for future events?	plan for future events?

Table C.11. Self-Monitoring (10 items)

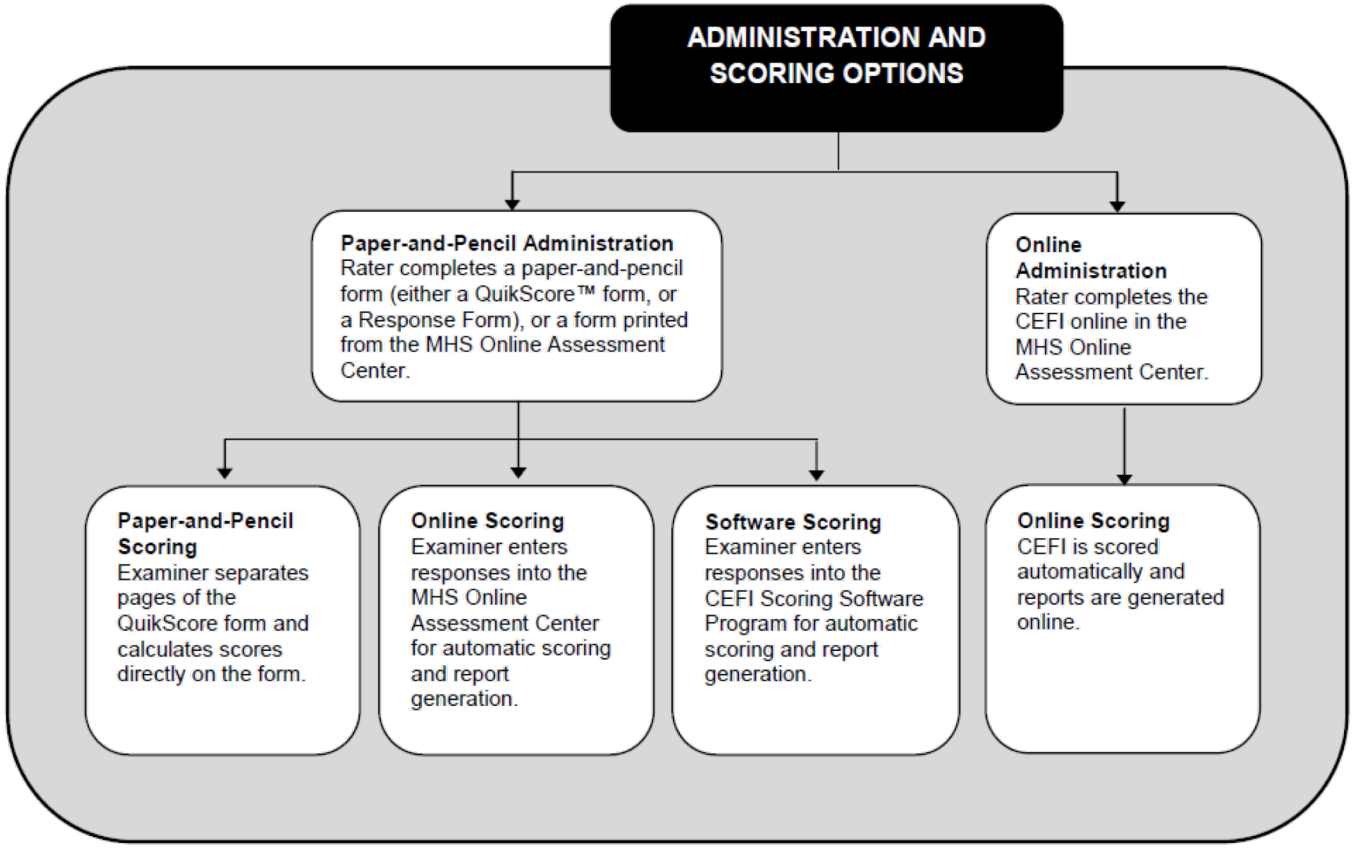
Item #	Parent/Teacher Item *During the past 4 weeks, how often did the child...*	Self-Report Item *During the past 4 weeks, how often did you...*
6.	ask for help when needed?	ask for help when needed?
14.	fix his/her mistakes?	fix your mistakes?
17.	change a plan that was not working?	change a plan that was not working?
29.	learn from past mistakes?	learn from past mistakes?

Table C.12. Working Memory (11 items)

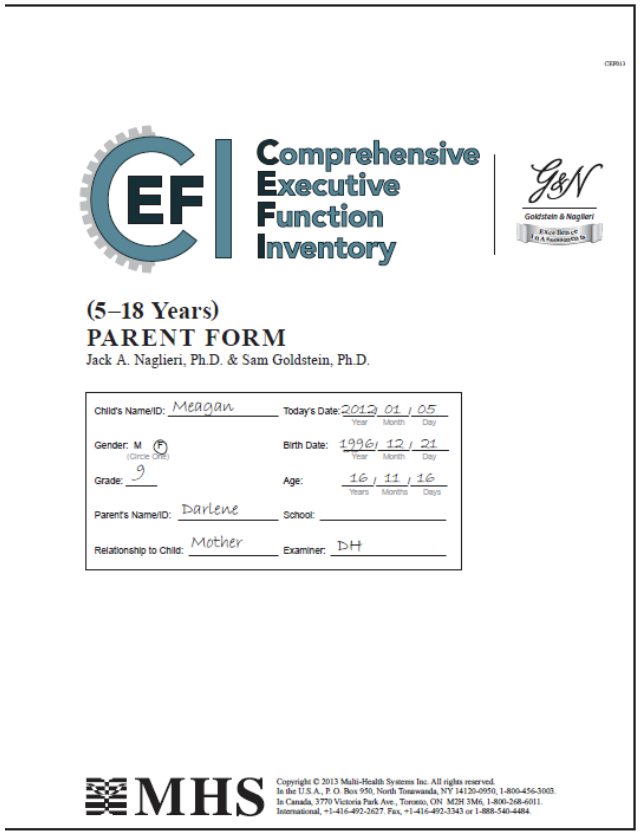
Item #	Parent/Teacher Item *During the past 4 weeks, how often did the child...*	Self-Report Item *During the past 4 weeks, how often did you...*
4.	forget instructions? (R)	forget instructions? (R)
8.	remember how to do something?	remember how to do something?
23.	forget instructions with many steps? (R)	forget instructions with many steps? (R)
26.	remember many things at one time?	remember many things at one time?

CEFI Administration & Scoring

Figure 3.1. Overview of Administration and Scoring Options



CEFI Rating Form



Comprehensive Executive Function Inventory

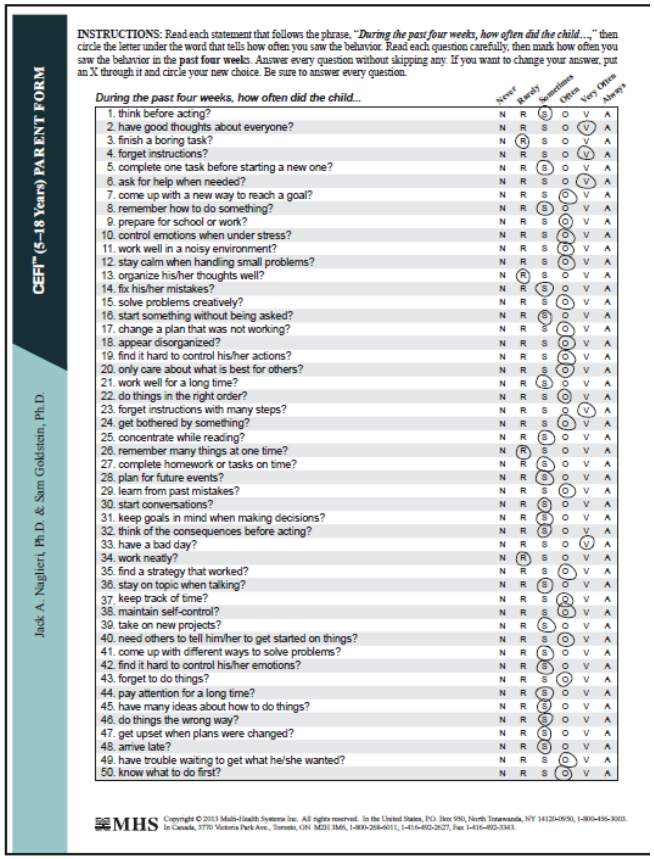
Goldstein & Naglieri

(5–18 Years)
PARENT FORM
Jack A. Naglieri, Ph.D. & Sam Goldstein, Ph.D.

Child's Name/ID: Meagan	Today's Date: 2012 / 01 / 05 (Year / Month / Day)
Gender: M (F) (Circle One)	Birth Date: 1996 / 12 / 21 (Year / Month / Day)
Grade: 9	Age: 16 / 11 / 16 (Years / Months / Days)
Parent's Name/ID: Darlene	School:
Relationship to Child: Mother	Examiner: DH

MHS

CEFI Rating Form



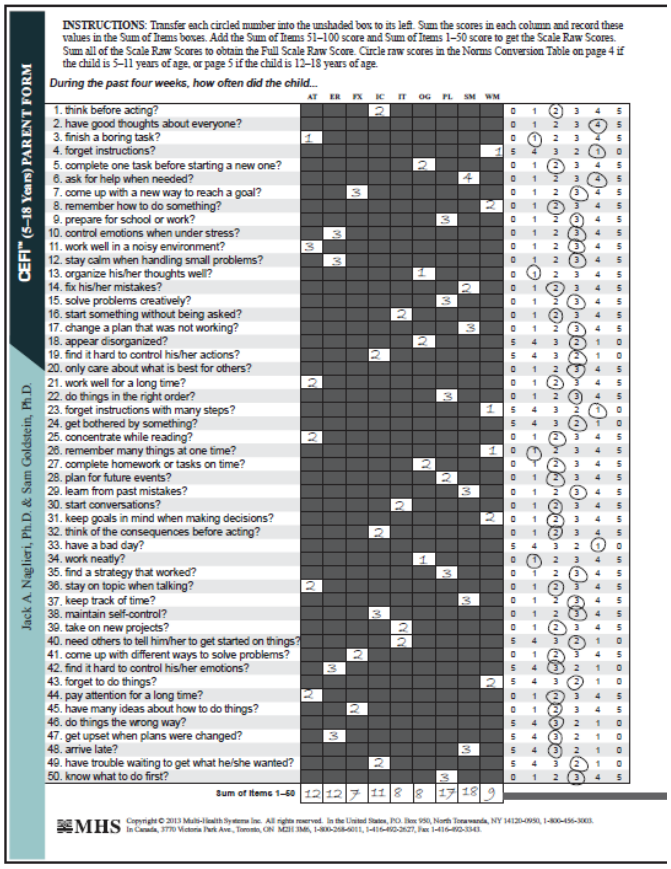
CEFI™ (5–18 Years) PARENT FORM

Jack A. Naglieri, Ph.D. & Sam Goldstein, Ph.D

INSTRUCTIONS: Read each statement that follows the phrase, "***During the past four weeks, how often did the child…,***" then circle the letter under the word that tells how often you saw the behavior. Read each question carefully, then mark how often you saw the behavior in the **past four weeks**. Answer every question without skipping any. If you want to change your answer, put an X through it and circle your new choice. Be sure to answer every question.

During the past four weeks, how often did the child...	Never	Rarely	Sometimes	Often	Very Often	Always
1. think before acting?	N	R	(S)	O	V	A
2. have good thoughts about everyone?	N	R	S	O	(V)	A
3. finish a boring task?	N	(R)	S	O	V	A
4. forget instructions?	N	R	S	O	(V)	A
5. complete one task before starting a new one?	N	R	(S)	O	V	A
6. ask for help when needed?	N	R	S	O	(V)	A
7. come up with a new way to reach a goal?	N	R	S	(O)	V	A
8. remember how to do something?	N	R	(S)	O	V	A
9. prepare for school or work?	N	R	S	(O)	V	A
10. control emotions when under stress?	N	R	S	(O)	V	A
11. work well in a noisy environment?	N	R	S	(O)	V	A
12. stay calm when handling small problems?	N	R	S	(O)	V	A
13. organize his/her thoughts well?	N	(R)	S	O	V	A
14. fix his/her mistakes?	N	R	(S)	O	V	A
15. solve problems creatively?	N	R	S	(O)	V	A
16. start something without being asked?	N	R	(S)	O	V	A
17. change a plan that was not working?	N	R	S	(O)	V	A
18. appear disorganized?	N	R	S	(O)	V	A
19. find it hard to control his/her actions?	N	R	S	(O)	V	A
20. only care about what is best for others?	N	R	S	(O)	V	A
21. work well for a long time?	N	R	(S)	O	V	A
22. do things in the right order?	N	R	S	(O)	V	A
23. forget instructions with many steps?	N	R	S	O	(V)	A
24. get bothered by something?	N	R	S	(O)	V	A
25. concentrate while reading?	N	R	(S)	O	V	A
26. remember many things at one time?	N	(R)	S	O	V	A
27. complete homework or tasks on time?	N	R	(S)	O	V	A
28. plan for future events?	N	R	(S)	O	V	A
29. learn from past mistakes?	N	R	S	(O)	V	A
30. start conversations?	N	R	(S)	O	V	A
31. keep goals in mind when making decisions?	N	R	(S)	O	V	A
32. think of the consequences before acting?	N	R	(S)	O	V	A
33. have a bad day?	N	R	S	O	(V)	A
34. work neatly?	N	(R)	S	O	V	A
35. find a strategy that worked?	N	R	S	(O)	V	A
36. stay on topic when talking?	N	R	(S)	O	V	A
37. keep track of time?	N	R	S	(O)	V	A
38. maintain self-control?	N	R	S	(O)	V	A
39. take on new projects?	N	R	(S)	O	V	A
40. need others to tell him/her to get started on things?	N	R	S	(O)	V	A
41. come up with different ways to solve problems?	N	R	(S)	O	V	A
42. find it hard to control his/her emotions?	N	R	(S)	O	V	A
43. forget to do things?	N	R	S	(O)	V	A
44. pay attention for a long time?	N	R	(S)	O	V	A
45. have many ideas about how to do things?	N	R	(S)	O	V	A
46. do things the wrong way?	N	R	(S)	O	V	A
47. get upset when plans were changed?	N	R	(S)	O	V	A
48. arrive late?	N	R	(S)	O	V	A
49. have trouble waiting to get what he/she wanted?	N	R	S	(O)	V	A
50. know what to do first?	N	R	S	(O)	V	A

MHS Copyright © 2013 Multi-Health Systems Inc. All rights reserved. In the United States, P.O. Box 950, North Tonawanda, NY 14120-0950, 1-800-456-3003. In Canada, 3770 Victoria Park Ave., Toronto, ON M2H 3M6, 1-800-268-6011, 1-416-492-2627, Fax 1-416-492-3343.



CEFI™ (5–18 Years) PARENT FORM

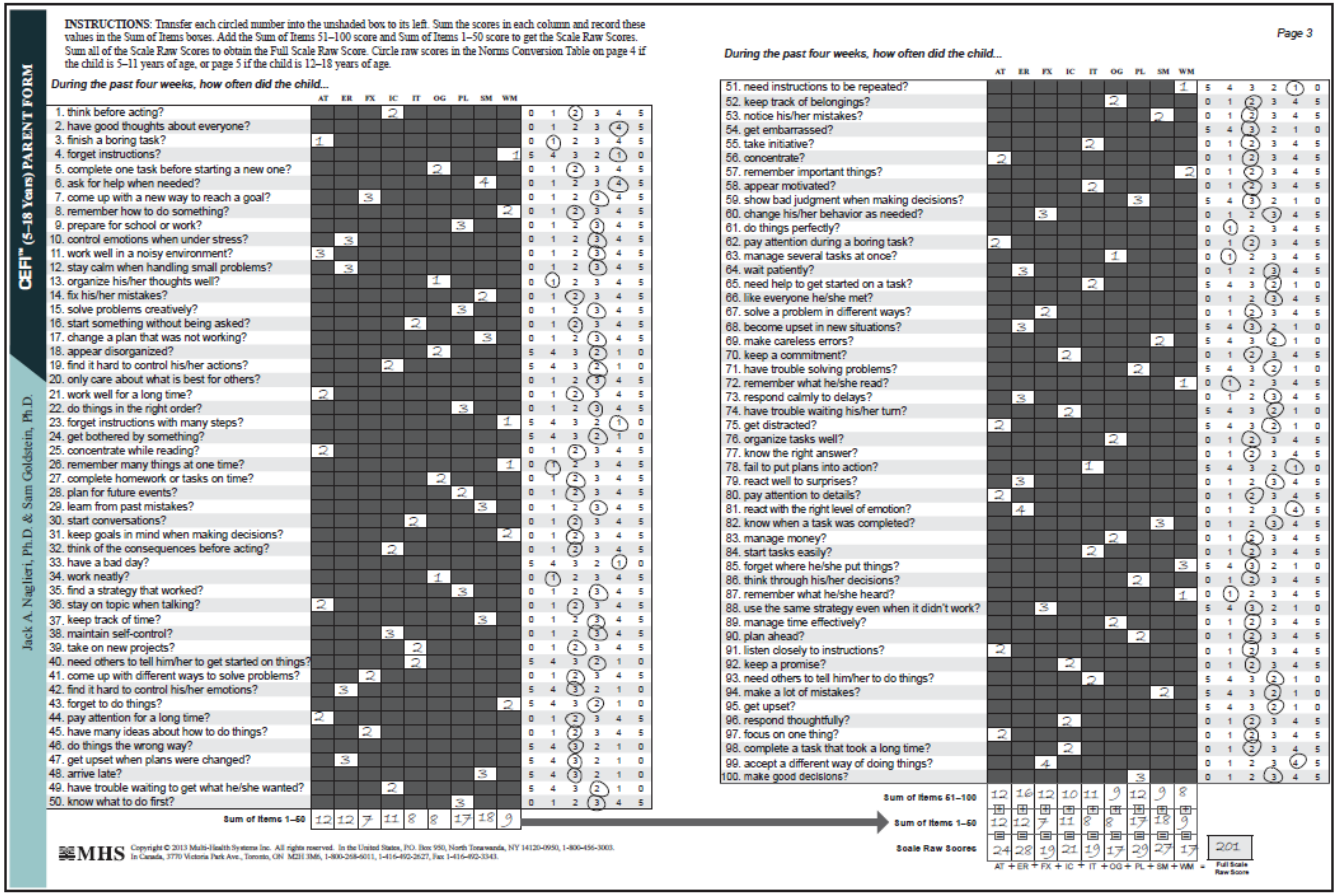
Jack A. Naglieri, Ph.D. & Sam Goldstein, Ph.D

INSTRUCTIONS: Transfer each circled number into the unshaded box to its left. Sum the scores in each column and record these values in the Sum of Items boxes. Add the Sum of Items 51–100 score and Sum of Items 1–50 score to get the Scale Raw Scores. Sum all of the Scale Raw Scores to obtain the Full Scale Raw Score. Circle raw scores in the Norms Conversion Table on page 4 if the child is 5–11 years of age, or page 5 if the child is 12–18 years of age.

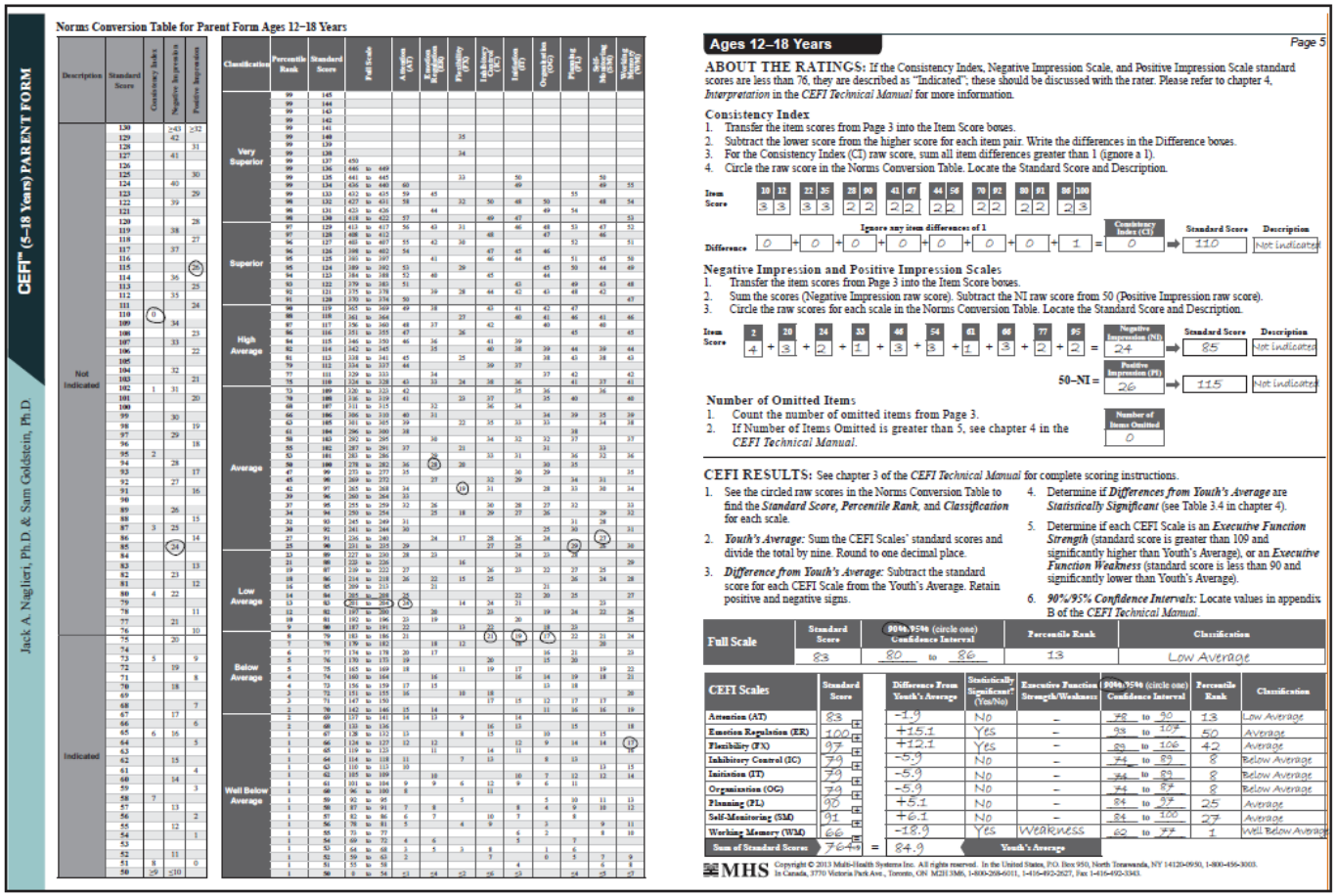
During the past four weeks, how often did the child...	AT	ER	FX	IC	IT	OG	PL	SM	WM	0	1	2	3	4	5
1. think before acting?				2						0	1	(2)	3	4	5
2. have good thoughts about everyone?										0	1	2	3	(4)	5
3. finish a boring task?	1									0	(1)	2	3	4	5
4. forget instructions?								1		5	4	3	2	(1)	0
5. complete one task before starting a new one?						2				0	1	(2)	3	4	5
6. ask for help when needed?							4			0	1	2	3	(4)	5
7. come up with a new way to reach a goal?			3							0	1	2	(3)	4	5
8. remember how to do something?								2		0	1	(2)	3	4	5
9. prepare for school or work?						3				0	1	2	(3)	4	5
10. control emotions when under stress?		3								0	1	2	(3)	4	5
11. work well in a noisy environment?	3									0	1	2	(3)	4	5
12. stay calm when handling small problems?		3								0	1	2	(3)	4	5
13. organize his/her thoughts well?						1				0	(1)	2	3	4	5
14. fix his/her mistakes?								2		0	1	(2)	3	4	5
15. solve problems creatively?						3				0	1	2	(3)	4	5
16. start something without being asked?					2					0	1	(2)	3	4	5
17. change a plan that was not working?							3			0	1	2	(3)	4	5
18. appear disorganized?						2				5	4	3	(2)	1	0
19. find it hard to control his/her actions?				2						5	4	3	(2)	1	0
20. only care about what is best for others?										0	1	2	(3)	4	5
21. work well for a long time?	2									0	1	(2)	3	4	5
22. do things in the right order?							3			0	1	2	(3)	4	5
23. forget instructions with many steps?								1		5	4	3	2	(1)	0
24. get bothered by something?										5	4	3	(2)	1	0
25. concentrate while reading?	2									0	1	(2)	3	4	5
26. remember many things at one time?								1		0	(1)	2	3	4	5
27. complete homework or tasks on time?						2				0	1	(2)	3	4	5
28. plan for future events?							2			0	1	(2)	3	4	5
29. learn from past mistakes?								3		0	1	2	(3)	4	5
30. start conversations?					2					0	1	(2)	3	4	5
31. keep goals in mind when making decisions?								2		0	1	(2)	3	4	5
32. think of the consequences before acting?				2						0	1	(2)	3	4	5
33. have a bad day?										5	4	3	2	(1)	0
34. work neatly?						1				0	(1)	2	3	4	5
35. find a strategy that worked?							3			0	1	2	(3)	4	5
36. stay on topic when talking?	2									0	1	(2)	3	4	5
37. keep track of time?								3		0	1	2	(3)	4	5
38. maintain self-control?				3						0	1	2	(3)	4	5
39. take on new projects?					2					0	1	(2)	3	4	5
40. need others to tell him/her to get started on things?					2					5	4	3	(2)	1	0
41. come up with different ways to solve problems?			2							0	1	(2)	3	4	5
42. find it hard to control his/her emotions?		3								5	4	(3)	2	1	0
43. forget to do things?								2		5	4	3	(2)	1	0
44. pay attention for a long time?	2									0	1	(2)	3	4	5
45. have many ideas about how to do things?			2							0	1	(2)	3	4	5
46. do things the wrong way?										5	4	(3)	2	1	0
47. get upset when plans were changed?		3								5	4	(3)	2	1	0
48. arrive late?								3		5	4	(3)	2	1	0
49. have trouble waiting to get what he/she wanted?				2						5	4	3	(2)	1	0
50. know what to do first?							3			0	1	2	(3)	4	5
Sum of Items 1–50	12	12	7	11	8	8	17	18	9						

MHS Copyright © 2013 Multi-Health Systems Inc. All rights reserved. In the United States, P.O. Box 950, North Tonawanda, NY 14120-0950, 1-800-456-3003. In Canada, 3770 Victoria Park Ave., Toronto, ON M2H 3M6, 1-800-268-6011, 1-416-492-2627, Fax 1-416-492-3343.

CEFI Rating Form



CEFI Rating Form



CEFI™ (5–18 Years) PARENT FORM

Jack A. Naglieri, Ph.D. & Sam Goldstein, Ph.D.

Norms Conversion Table for Parent Form Ages 12–18 Years

Description	Standard Score	Consistency Index	Negative Impression	Positive Impression
Not Indicated	130		≥43	≤32
	129		42	
	128			31
	127		41	
	126			
	125			30
	124		40	
	123			29
	122		39	
	121			
	120			28
	119		38	
	118			27
	117		37	
	116			
	115			26
	114		36	
	113			25
	112		35	
	111			24
	110	9		
	109		34	
	108			23
	107		33	
	106			22
	105			
	104		32	
	103			21
	102	1	31	
	101			20
	100			
	99		30	
	98			19
	97		29	
	96			18
	95	2		
	94		28	
	93			17
	92		27	
	91			16
	90			
	89		26	
	88			15
	87	3	25	
	86			14
	85		24	
	84			
	83			13
	82		23	
	81			12
	80	4	22	
	79			
	78			11
	77		21	
	76			10
Indicated	75		20	
	74			
	73	5		9
	72		19	
	71			8
	70		18	
	69			
	68			7
	67		17	
	66			6
	65	6	16	
	64			5
	63			
	62		15	
	61			4
	60		14	
	59			3
	58	7		
	57		13	
	56			2
	55		12	
	54			1
	53			
	52		11	
	51	8		0
	50	≥9	≤10	

Classification	Percentile Rank	Standard Score	Full Scale	Attention (AT)	Emotion Regulation (ER)	Flexibility (FX)	Inhibitory Control (IC)	Initiation (IT)	Organization (OG)	Planning (PL)	Self-Monitoring (SM)	Working Memory (WM)
Very Superior	99	145										
	99	144										
	99	143										
	99	142										
	99	141										
	99	140				35						
	99	139										
	99	138				34						
	99	137	450									
	99	136	446 to 449									
	99	135	441 to 445			33			50			50
	99	134	436 to 440	60					49			49
	99	133	432 to 435	59	45						55	
	98	132	427 to 431	58		32	50	48	50			48
	98	131	423 to 426		44				49		54	
	98	130	418 to 422	57			49	47				
Superior	97	129	413 to 417	56	43	31		46	48	53	47	52
	97	128	408 to 412				48		47		46	
	96	127	403 to 407	55	42	30				52		51
	96	126	398 to 402	54			47	45	46			
	95	125	393 to 397		41		46	44		51	45	50
	95	124	389 to 392	53		29			45	50	44	49
	94	123	384 to 388	52	40		45		44			
	93	122	379 to 383	51				43		49	43	48
	92	121	375 to 378		39	28	44	42	43	48	42	
	91	120	370 to 374	50								47
High Average	90	119	365 to 369	49	38		43	41	42	47		
	88	118	361 to 364			27		40	41	46	41	46
	87	117	356 to 360	48	37		42		40		40	
	86	116	351 to 355	47		26				45		45
	84	115	346 to 350	46	36		41	39				
	82	114	342 to 345		35		40	38	39	44	39	44
	81	113	338 to 341	45		25			38	43	38	43
	79	112	334 to 337	44			39	37				
	77	111	329 to 333		34				37	42		42
	75	110	324 to 328	43	33	24	38	36		41	37	41
Average	73	109	320 to 323	42				35	36		36	
	70	108	316 to 319	41		23	37		35	40		40
	68	107	311 to 315		32		36	34				
	66	106	306 to 310	40	31				34	39	35	39
	63	105	301 to 305	39		22	35	33	33		34	38
	61	104	296 to 300	38			34	32	32	38		
	58	103	292 to 295		30					37	33	37
	55	102	287 to 291	37		21		31				
	53	101	283 to 286		29		33	31		36	32	36
	50	100	278 to 282	36	28	20			30	35		
	47	99	273 to 277	35				30	29			35
	45	98	269 to 272		27		32	29		34	31	
	42	97	265 to 268	34		19	31		28	33	30	34
	39	96	260 to 264	33								
	37	95	255 to 259	32	26		30	28	27	32		33
	34	94	250 to 254		25	18	29	27	26		29	32
	32	93	245 to 249	31						31	28	
	30	92	241 to 244	30					25	30		31
	27	91	236 to 240		24	17	28	26	24		27	
	25	90	231 to 235	29			27	25		29	26	30
Low Average	23	89	227 to 230	28	23			24	23	28		
	21	88	220 to 226			16						29
	19	87	219 to 222	27			26	23	22	27	25	
	18	86	214 to 218	26	22	15	25			26	24	28
	16	85	209 to 213		21				21			
	14	84	205 to 208	25				22	20	25		27
	13	83	201 to 204	24	20	14	24	21			23	
	12	82	197 to 200				23		19	24	22	26
	10	81	192 to 196	23	19			20				25
	9	80	187 to 191	22		13	22		18	23		
Below Average	9	79	183 to 186	21			21	19	17	22	21	24
	7	78	179 to 182		18	12		18			20	
	6	77	174 to 178	20	17				16	21		23
	5	76	170 to 173	19			20		15	20		
	5	75	165 to 169	18		11	19	17			19	22
	4	74	160 to 164		16			16	14	19	18	21
	4	73	156 to 159	17	15				13	18		
	3	72	151 to 155	16		10	18					20
	3	71	147 to 150				17	15	12	17	17	
	2	70	142 to 146	15	14				11	16	16	19
Well Below Average	2	69	137 to 141	14	13	9		14				
	2	68	133 to 136				16	13		15		18
	1	67	128 to 132	13		8	15		10		15	
	1	66	124 to 127	12	12			12	9	14	14	17
	1	65	119 to 123		11		14	11				
	1	64	114 to 118	11		7	13		8	13		
	1	63	110 to 113	10							13	15
	1	62	105 to 109		10			10	7	12	12	14
	1	61	101 to 104	9	9	6	12	9	6	11		
	1	60	96 to 100	8			11					
	1	59	92 to 95			5			5	10	11	13
	1	58	87 to 91	7	8		10	8	4	9	10	12
	1	57	82 to 86	6	7		9	7		8		
	1	56	78 to 81	5		4	8		3		9	11
	1	55	73 to 77					6	2		8	10
	1	54	69 to 72	4	6			5		7		
	1	53	64 to 68	3	5	3	8		1	6		
	1	52	59 to 63	2			7		0	5	7	9
	1	51	55 to 58					4			6	8
	1	50	0 to 54	≤1	≤4	≤2	≤6	≤3		4	≤5	≤7

Ages 12–18 Years

Page 5

ABOUT THE RATINGS: If the Consistency Index, Negative Impression Scale, and Positive Impression Scale standard scores are less than 76, they are described as "Indicated"; these should be discussed with the rater. Please refer to chapter 4, *Interpretation* in the *CEFI Technical Manual* for more information.

Consistency Index

1. Transfer the item scores from Page 3 into the Item Score boxes.
2. Subtract the lower score from the higher score for each item pair. Write the differences in the Difference boxes.
3. For the Consistency Index (CI) raw score, sum all item differences greater than 1 (ignore a 1).
4. Circle the raw score in the Norms Conversion Table. Locate the Standard Score and Description.

Item Score	10 | 12	22 | 35	28 | 90	41 | 47	44 | 56	70 | 92	88 | 91	86 | 100
	3 | 3	3 | 3	2 | 2	2 | 2	2 | 2	2 | 2	2 | 2	2 | 3

Ignore any item differences of 1

Difference									=	Consistency Index (CI)	Standard Score	Description
	0	+ 0	+ 0	+ 0	+ 0	+ 0	+ 0	+ 1	=	0	110	Not Indicated

Negative Impression and Positive Impression Scales

1. Transfer the item scores from Page 3 into the Item Score boxes.
2. Sum the scores (Negative Impression raw score). Subtract the NI raw score from 50 (Positive Impression raw score).
3. Circle the raw scores for each scale in the Norms Conversion Table. Locate the Standard Score and Description.

Item Score	2	20	24	33	46	54	61	66	77	95		Negative Impression (NI)	Standard Score	Description
	4	+ 3	+ 2	+ 1	+ 3	+ 3	+ 1	+ 3	+ 2	+ 2	=	24	85	Not Indicated
50 – NI =												Positive Impression (PI) 26	115	Not Indicated

Number of Omitted Items

1. Count the number of omitted items from Page 3.
2. If Number of Items Omitted is greater than 5, see chapter 4 in the *CEFI Technical Manual*.

Number of Items Omitted: 0

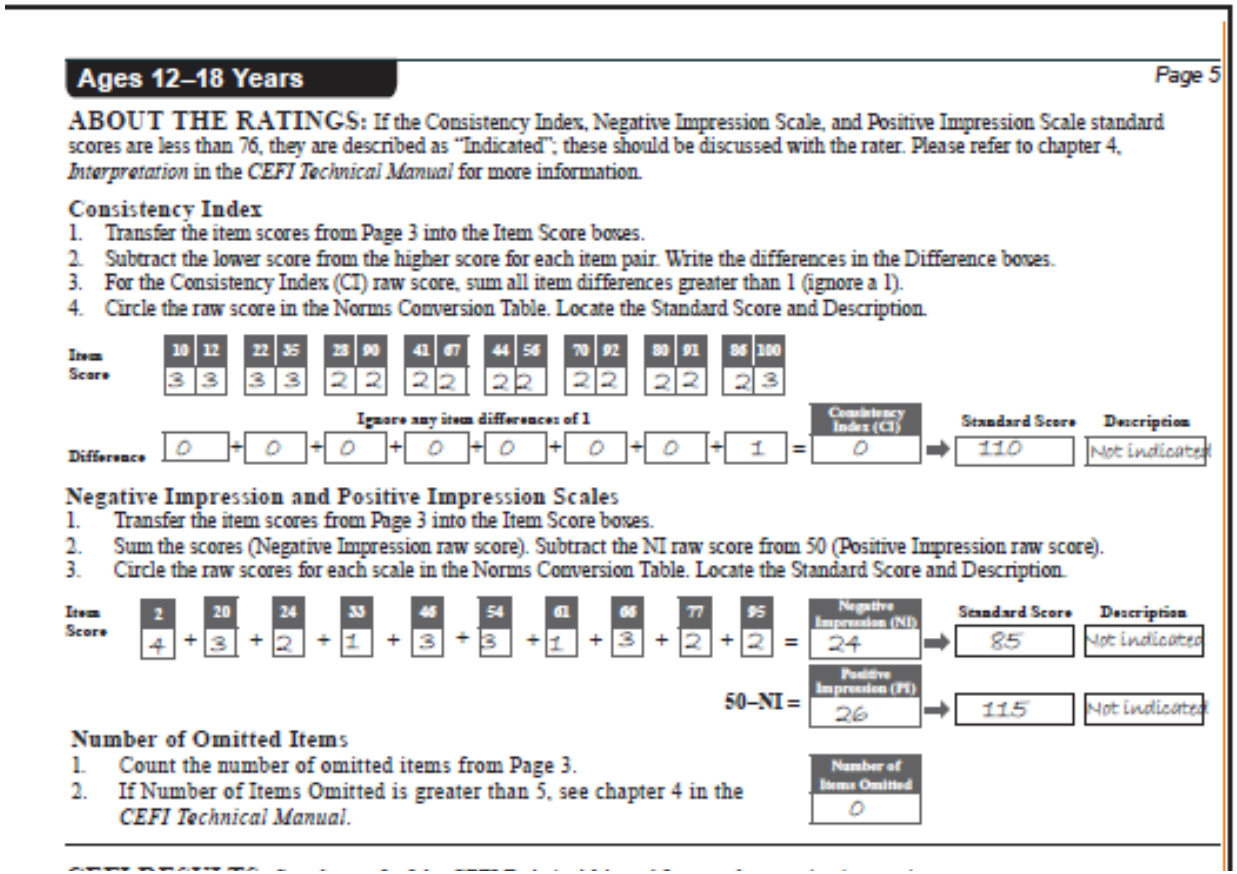
CEFI RESULTS: See chapter 3 of the *CEFI Technical Manual* for complete scoring instructions.

1. See the circled raw scores in the Norms Conversion Table to find the ***Standard Score***, ***Percentile Rank***, and ***Classification*** for each scale.
2. ***Youth's Average:*** Sum the CEFI Scales' standard scores and divide the total by nine. Round to one decimal place.
3. ***Difference from Youth's Average:*** Subtract the standard score for each CEFI Scale from the Youth's Average. Retain positive and negative signs.
4. Determine if ***Differences from Youth's Average*** are ***Statistically Significant*** (see Table 3.4 in chapter 4).
5. Determine if each CEFI Scale is an ***Executive Function Strength*** (standard score is greater than 109 and significantly higher than Youth's Average), or an ***Executive Function Weakness*** (standard score is less than 90 and significantly lower than Youth's Average).
6. ***90%/95% Confidence Intervals:*** Locate values in appendix B of the *CEFI Technical Manual*.

Full Scale	Standard Score	90%/95% (circle one) Confidence Interval	Percentile Rank	Classification
	83	80 to 86	13	Low Average

CEFI Scales	Standard Score		Difference From Youth's Average	Statistically Significant* (Yes/No)	Executive Function Strength/Weakness	90%/95% (circle one) Confidence Interval	Percentile Rank	Classification
Attention (AT)	83	+	-1.9	No	–	78 to 90	13	Low Average
Emotion Regulation (ER)	100	+	+15.1	Yes	–	93 to 107	50	Average
Flexibility (FX)	97	+	+12.1	Yes	–	89 to 106	42	Average
Inhibitory Control (IC)	79	+	-5.9	No	–	74 to 89	8	Below Average
Initiation (IT)	79	+	-5.9	No	–	74 to 89	8	Below Average
Organization (OG)	79	+	-5.9	No	–	74 to 87	8	Below Average
Planning (PL)	95	+	+5.1	No	–	84 to 97	25	Average
Self-Monitoring (SM)	91	+	+6.1	No	–	84 to 100	27	Average
Working Memory (WM)	66	+	-18.9	Yes	Weakness	60 to 77	1	Well Below Average
Sum of Standard Scores	764	=	84.9	Youth's Average				

CEFI Rating Form



Ages 12–18 Years Page 5

ABOUT THE RATINGS: If the Consistency Index, Negative Impression Scale, and Positive Impression Scale standard scores are less than 76, they are described as "Indicated"; these should be discussed with the rater. Please refer to chapter 4, *Interpretation* in the *CEFI Technical Manual* for more information.

Consistency Index

1. Transfer the item scores from Page 3 into the Item Score boxes.
2. Subtract the lower score from the higher score for each item pair. Write the differences in the Difference boxes.
3. For the Consistency Index (CI) raw score, sum all item differences greater than 1 (ignore a 1).
4. Circle the raw score in the Norms Conversion Table. Locate the Standard Score and Description.

	10 12	22 35	28 90	41 67	44 56	70 92	80 91	86 100
Item Score	3 3	3 3	2 2	2 2	2 2	2 2	2 2	2 3

Ignore any item differences of 1

										Consistency Index (CI)	Standard Score	Description
Difference	0	+ 0	+ 0	+ 0	+ 0	+ 0	+ 0	+ 1	=	0	110	Not Indicated

Negative Impression and Positive Impression Scales

1. Transfer the item scores from Page 3 into the Item Score boxes.
2. Sum the scores (Negative Impression raw score). Subtract the NI raw score from 50 (Positive Impression raw score).
3. Circle the raw scores for each scale in the Norms Conversion Table. Locate the Standard Score and Description.

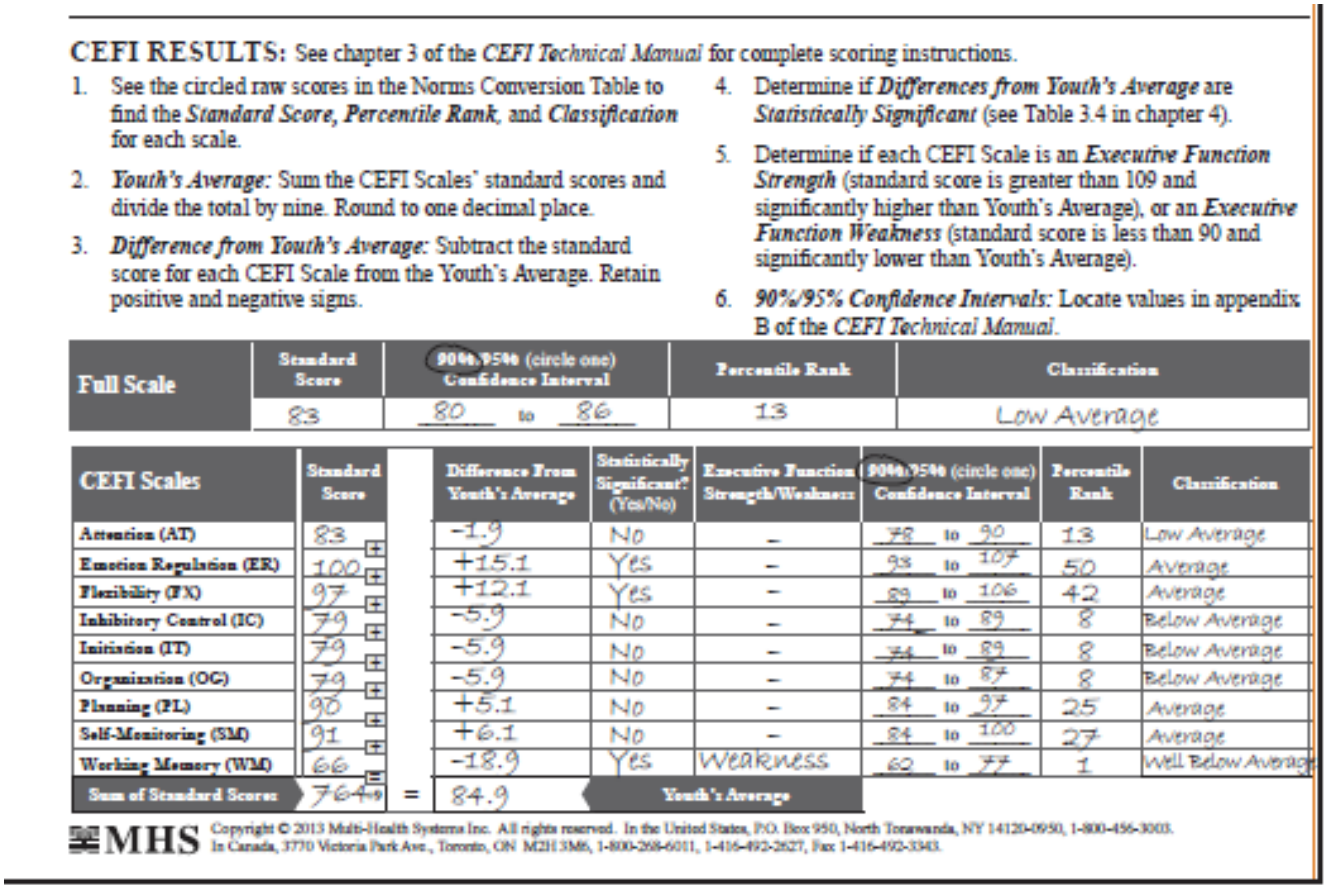
	2	20	24	33	46	54	61	66	77	95		Negative Impression (NI)	Standard Score	Description
Item Score	4	+ 3	+ 2	+ 1	+ 3	+ 3	+ 1	+ 3	+ 2	+ 2	=	24	85	Not Indicated
50–NI =												Positive Impression (PI) 26	115	Not Indicated

Number of Omitted Items

1. Count the number of omitted items from Page 3.
2. If Number of Items Omitted is greater than 5, see chapter 4 in the *CEFI Technical Manual*.

Number of Items Omitted: 0

CEFI Rating Form



CEFI RESULTS: See chapter 3 of the *CEFI Technical Manual* for complete scoring instructions.

1. See the circled raw scores in the Norms Conversion Table to find the ***Standard Score, Percentile Rank,*** and ***Classification*** for each scale.
2. ***Youth's Average:*** Sum the CEFI Scales' standard scores and divide the total by nine. Round to one decimal place.
3. ***Difference from Youth's Average:*** Subtract the standard score for each CEFI Scale from the Youth's Average. Retain positive and negative signs.
4. Determine if ***Differences from Youth's Average*** are ***Statistically Significant*** (see Table 3.4 in chapter 4).
5. Determine if each CEFI Scale is an ***Executive Function Strength*** (standard score is greater than 109 and significantly higher than Youth's Average), or an ***Executive Function Weakness*** (standard score is less than 90 and significantly lower than Youth's Average).
6. ***90%/95% Confidence Intervals:*** Locate values in appendix B of the *CEFI Technical Manual*.

Full Scale	Standard Score	90%/95% (circle one) Confidence Interval	Percentile Rank	Classification
	83	80 to 86	13	Low Average

CEFI Scales	Standard Score		Difference From Youth's Average	Statistically Significant? (Yes/No)	Executive Function Strength/Weakness	90%/95% (circle one) Confidence Interval	Percentile Rank	Classification
Attention (AT)	83	+	-1.9	No	–	78 to 90	13	Low Average
Emotion Regulation (ER)	100	+	+15.1	Yes	–	93 to 107	50	Average
Flexibility (FX)	97	+	+12.1	Yes	–	89 to 106	42	Average
Inhibitory Control (IC)	79	+	-5.9	No	–	74 to 89	8	Below Average
Initiation (IT)	79	+	-5.9	No	–	74 to 89	8	Below Average
Organization (OC)	79	+	-5.9	No	–	74 to 87	8	Below Average
Planning (PL)	90	+	+5.1	No	–	84 to 97	25	Average
Self-Monitoring (SM)	91	+	+6.1	No	–	84 to 100	27	Average
Working Memory (WM)	66	+	-18.9	Yes	Weakness	60 to 77	1	Well Below Average
Sum of Standard Scores	764	=	84.9	Youth's Average				

CEFI Readability

Reading levels were determined using the Flesch-Kincaid Grade Level Formula which is based on the total number of words, syllables, and sentences

Table 3.1. CEFI Readability Levels

Form	Readability Score		
	Overall	Instructions	Items
CEFI (5–18 Years) Parent Form	5.4	7.4	5.3
CEFI (5–18 Years) Teacher Form	5.4	7.4	5.3
CEFI (12–18 Years) Self-Report Form	5.2	6.7	5.2

CEFI Standardization

- Data collection: January – December, 2011
- Standardization and related research data (N = over 5,000 forms) were collected from 50 US states
- Data were collected using paper and pencil and online administration formats

Table 6.1. Differences Between Online and Paper Administrations: Cohen's *d* Effect Size Ratios

Rater	Full Scale	CEFI Scales	
		Median	Range
Parent	0.03	0.02	0.00–0.09
Teacher	0.01	0.04	0.01–0.06
Self	0.02	0.03	0.00–0.10

Note. Guidelines for interpreting $|d|$ = small effect size = 0.2; medium effect size = 0.5; large effect size = 0.8. N = 60, 59, and 52 for the parent, teacher, and self-report studies, respectively.

CEFI Normative Samples

- 1,400 ratings by Parents for children aged 5-18 years
- 1,400 ratings by Teachers for children aged 5-18 years
- 700 ratings from the self-report form for those aged 12-18 years
- There were equal numbers of ratings of or by males and females

CEFI Normative Samples

- Stratified according to the 2009 US Census by race/ethnicity, parental education, region, age, and sex
- The samples included students in special education

Table 6.15. Categories of Eligibility to Receive Educational Services across Normative Samples

Eligibility/Diagnostic Category	Parent		Teacher		Self-Report		% Dept. Education[a]
	N	%	*N*	%	*N*	%	
ADHD	62	4.4	55	3.9	43	6.1	4.7
Autism Spectrum Disorder	9	0.6	6	0.4	0	–	0.7
Communication[b]	13	0.9	20	1.4	0	–	2.9
Emotional	8	0.6	16	1.1	7	1.0	0.9
Hearing	0	–	5	0.4	0	–	0.2
Intellectual	2	0.1	6	0.4	0	–	1.0
Specific Learning	56	4.0	67	4.8	18	2.6	5.0
Traumatic Brain Injury	2	0.1	2	0.1	0	–	0.1
Visual	1	0.1	1	0.1	0	0.0	0.1
Other	9	0.6	15	1.1	0	0.0	-
TOTAL	162	10.9	193	12.7	68	9.7	-

[a] SOURCE for all disorders except ADHD: Digest of Education Statistics, National Center for Education Statistics. SOURCE for ADHD: National Center for Health Statistics (Pastor & Reuben, 2008).
[b] Communication includes speech and language impairments.

Age x (Race/Ethnicity) x Gender

Table 6.2. Age × Race/Ethnicity × Gender Distribution: CEFI Parent Normative Sample

	Males						Females						Total					
Age	Hispanic	Asian	Black	White	Other	Subtotal	Hispanic	Asian	Black	White	Other	Subtotal	Hispanic	Asian	Black	White	Other	Total
5	11	2	7	28	2	50	11	2	7	28	2	50	22	4	14	56	4	100
6	11	2	7	28	2	50	11	2	7	28	2	50	22	4	14	56	4	100
7	11	2	7	28	2	50	11	2	7	28	2	50	22	4	14	56	4	100
8	11	2	7	28	2	50	11	2	7	28	2	50	22	4	14	56	4	100
9	11	2	7	28	2	50	11	2	7	28	2	50	22	4	14	56	4	100
10	11	2	7	28	2	50	11	2	7	28	2	50	22	4	14	56	4	100
11	11	2	7	28	2	50	11	2	7	28	2	50	22	4	14	56	4	100
12	11	2	7	28	2	50	11	2	7	28	2	50	22	4	14	56	4	100
13	11	2	7	28	2	50	11	2	7	28	2	50	22	4	14	56	4	100
14	11	2	7	28	2	50	11	2	7	28	2	50	22	4	14	56	4	100
15	11	2	7	28	2	50	11	2	7	28	2	50	22	4	14	56	4	100
16	11	2	7	28	2	50	11	2	7	28	2	50	22	4	14	56	4	100
17	11	2	7	28	2	50	11	2	7	28	2	50	22	4	14	56	4	100
18	11	2	7	28	2	50	11	2	7	28	2	50	22	4	14	56	4	100
Total	154	28	98	392	28	700	154	28	98	392	28	700	308	56	196	784	56	1,400
Total (%)	11.0	2.0	7.0	28.0	2.0	50.0	11.0	2.0	7.0	28.0	2.0	50.0	22.0	4.0	14.0	56.0	4.0	100.0
											U.S. Population (%)		21.1	4.2	13.9	56.5	4.2	100.0

Note. U.S. Population data are from the American Community Survey, 2009.

Table 6.3. Age × Race/Ethnicity × Gender Distribution: CEFI Teacher Normative Sample

	Males						Females						Total					
Age	Hispanic	Asian	Black	White	Other	Subtotal	Hispanic	Asian	Black	White	Other	Subtotal	Hispanic	Asian	Black	White	Other	Total
5	11	1	7	30	1	50	11	2	6	29	2	50	22	3	13	59	3	100
6	11	2	7	28	2	50	11	2	7	28	2	50	22	4	14	56	4	100
7	11	2	7	28	2	50	11	2	7	28	2	50	22	4	14	56	4	100
8	11	2	7	28	2	50	11	2	7	28	2	50	22	4	14	56	4	100
9	11	2	7	28	2	50	11	2	7	28	2	50	22	4	14	56	4	100
10	11	2	7	28	2	50	11	2	7	28	2	50	22	4	14	56	4	100
11	11	2	7	28	2	50	11	2	7	29	1	50	22	4	14	57	3	100
12	11	1	7	30	1	50	11	2	7	28	2	50	22	3	14	58	3	100
13	11	1	7	29	2	50	11	2	7	28	2	50	22	3	14	57	4	100
14	11	2	7	28	2	50	11	2	8	27	2	50	22	4	15	55	4	100
15	11	2	7	28	2	50	11	2	7	28	2	50	22	4	14	56	4	100
16	11	2	7	28	2	50	11	2	7	28	2	50	22	4	14	56	4	100
17	11	2	7	28	2	50	11	2	7	28	2	50	22	4	14	56	4	100
18	11	2	7	29	1	50	11	2	7	28	2	50	22	4	14	57	3	100
Total	154	25	98	398	25	700	154	28	98	393	27	700	308	53	196	791	52	1,400
Total (%)	11.0	1.8	7.0	28.4	1.8	50.0	11.0	2.0	7.0	28.1	1.9	50.0	22.0	3.8	14.0	56.5	3.7	100.0
											U.S. Population (%)		21.1	4.2	13.9	56.5	4.2	100.0

Note. U.S. Population data are from the American Community Survey, 2009.

Other Tables of Demographics (N=12)

Table 6.5. Age × Region × Race/Ethnicity: CEFI Parent Normative Sample (5–11-Year-Olds)

Age	Region	Hispanic	Asian	Black	White	Other	Subtotal	Subtotal (%)	U.S. Population (%)
5 Years	Northeast	2	2	2	10	0	16	16.0	17.0
	Midwest	2	0	2	17	2	23	23.0	21.7
	South	8	0	8	19	2	37	37.0	37.2
	West	10	2	2	10	0	24	24.0	24.1
	Subtotal	22	4	14	56	4	100	100.0	100.0
U.S. Population (%									
6 Years									
U.S. Population (%									
7 Years									
U.S. Population (%									

Table 6.11. Age × PEL × Race/Ethnicity: CEFI Parent Normative Sample (12–18-Year-Olds)

Age	PEL	Hispanic	Asian	Black	White	Other	Subtotal	Subtotal (%)	U.S. Population (%)
12 Years	PEL 1	8	0	2	4	0	14	14.0	14.7
	PEL 2	6	0	4	16	2	28	28.0	28.5
	PEL 3	4	2	4	18	2	30	30.0	28.9
	PEL 4	2	2	2	12	0	18	18.0	17.6
	PEL 5	2	0	2	6	0	10	10.0	10.3
	Subtotal	22	4	14	56	4	100	100.0	100.0
	Subtotal (%)	22.0	4.0	14.0	56.0	4.0	100.0		
U.S. Population (%)		21.1	4.2	13.9	56.5	4.2	100.0		
13 Years	PEL 1	8	0	2	4	0	14	14.0	14.7
	PEL 2	6	0	4	16	2	28	28.0	28.5
	PEL 3	4	2	4	18	2	30	30.0	28.9
	PEL 4	2	2	2	12	0	18	18.0	17.6
	PEL 5	2	0	2	6	0	10	10.0	10.3
	Subtotal	22	4	14	56	4	100	100.0	100.0
	Subtotal (%)	22.0	4.0	14.0	56.0	4.0	100.0		
U.S. Population (%)		21.1	4.2	13.9	56.5	4.2	100.0		
14 Years	PEL 1	8	0	2	4	0	14	14.0	14.7
	PEL 2	6	0	4	16	2	28	28.0	28.5
	PEL 3	4	2	4	18	2	30	30.0	28.9
	PEL 4	2	2	2	12	0	18	18.0	17.6
	PEL 5	2	0	2	6	0	10	10.0	10.3
	Subtotal	22	4	14	56	4	100	100.0	100.0
	Subtotal (%)	22.0	4.0	14.0	56.0	4.0	100.0		
U.S. Population (%)		21.1	4.2	13.9	56.5	4.2	100.0		
15 Years	PEL 1	8	0	2	4	0	14	14.0	14.7
	PEL 2	6	0	4	16	2	28	28.0	28.5
	PEL 3	4	2	4	18	2	30	30.0	28.9
	PEL 4	2	2	2	12	0	18	18.0	17.6
	PEL 5	2	0	2	6	0	10	10.0	10.3

CEFI Scale Reliabilities

Table 7.1. Cronbach's Alpha: CEFI Normative and Clinical/Educational Samples

Scale	Number of Items	Parent			Teacher			Self-Report	
		Normative Samples		Clinical/ Educational Sample	Normative Samples		Clinical/ Educational Sample	Normative Sample	Clinical/ Educational Sample
		5–11 Years	12–18 Years		5–11 Years	12–18 Years			
		N = 682–698	*N* = 676–698	*N* = 250–331	*N* = 690–700	*N* = 682–700	*N* = 232–325	*N* = 667–700	*N* = 148–205
Full Scale	90	.98	.99	.97	.99	.99	.99	.97	.97
Attention	12	.92	.93	.87	.96	.96	.94	.86	.86
Emotion Regulation	9	.88	.90	.87	.93	.93	.93	.78	.83
Flexibility	7	.84	.85	.78	.90	.90	.86	.77	.72
Inhibitory Control	10	.89	.90	.87	.94	.94	.91	.80	.80
Initiation	10	.88	.90	.84	.92	.93	.91	.80	.70
Organization	10	.89	.92	.85	.93	.94	.91	.85	.84
Planning	11	.91	.93	.88	.95	.96	.93	.85	.82
Self-Monitoring	10	.85	.89	.78	.91	.92	.86	.78	.74
Working Memory	11	.88	.89	.86	.94	.94	.91	.83	.81

Note. Sample sizes vary due to omitted items.

Inter-Rater Reliability

Parent Form (5-18 years) shows very good consistency and similar mean scores

Scale	Obtained *r*	Corrected *r*	*N*	Parent 1		Parent 2		*d*-ratio
				M	*SD*	*M*	*SD*	
Full Scale	.83	.88	100	96.5	13.4	97.6	13.2	0.08
Attention	.79	.86	100	97.8	13.3	98.1	12.8	0.03
Emotion Regulation	.65	.73	98	94.7	13.5	95.6	13.4	0.07
Flexibility	.64	.76	99	97.8	13.0	97.9	12.3	0.01
Inhibitory Control	.80	.84	100	95.9	14.6	97.6	13.8	0.12
Initiation	.78	.84	100	96.8	13.7	98.8	13.3	0.15
Organization	.81	.86	99	96.5	13.2	97.9	13.9	0.10
Planning	.78	.85	100	98.0	13.6	98.4	13.0	0.03
Self-Monitoring	.70	.80	100	96.5	13.0	96.7	12.9	0.02
Working Memory	.81	.82	100	97.4	15.1	99.2	14.5	0.12

Inter-Rater Consistency

Teacher Form (5-18 years) shows good consistency and similar mean scores

Scale	Obtained *r*	Corrected *r*	*N*	Teacher 1		Teacher 2		*d*-ratio
				M	*SD*	*M*	*SD*	
Full Scale	.70	.68	98	94.4	17.0	96.8	13.8	0.16
Attention	.64	.63	98	93.5	16.8	96.4	13.9	0.19
Emotion Regulation	.56	.54	98	97.6	16.1	98.4	14.7	0.05
Flexibility	.66	.63	98	94.7	17.2	97.1	13.9	0.15
Inhibitory Control	.64	.64	98	96.5	16.0	98.2	14.2	0.11
Initiation	.64	.57	98	93.9	18.3	97.5	14.7	0.22
Organization	.67	.67	96	94.4	16.6	96.4	13.6	0.13
Planning	.70	.68	98	94.4	17.0	97.0	13.7	0.17
Self-Monitoring	.68	.68	98	94.4	16.4	96.1	13.7	0.11
Working Memory	.65	.61	98	94.3	18.0	97.2	13.9	0.18

Note. All *r*s significan Pair-wise deletion of missing cases was used.

Intra-Rater Consistency

Self-Rating Form (12-18 years) two ratings over time shows very good consistency and similar means

Scale	Obtained *r*	Corrected *r*	*N*	Time 1		Time 2		*d*-ratio
				M	*SD*	*M*	*SD*	
Full Scale	.78	.77	200	101.9	15.1	101.8	15.6	0.01
Attention	.74	.74	200	100.7	14.8	100.7	15.0	0.00
Emotion Regulation	.71	.74	200	100.7	14.2	102.6	14.6	0.13
Flexibility	.86	.86	200	101.9	14.4	101.3	15.1	0.04
Inhibitory Control	.77	.79	200	103.2	14.2	101.7	14.8	0.10
Initiation	.77	.79	200	101.7	14.8	100.7	14.2	0.07
Organization	.85	.86	200	101.7	14.0	101.1	14.9	0.04
Planning	.80	.82	200	101.7	14.1	101.2	14.4	0.03
Self-Monitoring	.74	.74	200	101.5	14.7	100.1	15.1	0.09
Working Memory	.75	.79	200	101.8	14.3	100.8	14.2	0.07

CEFI Interpretation

Step 1: Examine Quality of the Ratings: Consistency, Positive and Negative Impression

Step 2: Interpret Scale Scores

Step 3: Compare CEFI Scale Scores

Step 4: Examine Item-Level Responses

Step 5: Compare Results Across Raters

Step 6: Compare Results Over Time

Step 1: Consistency Index

- The Consistency Index provides information about whether the rater responded to similar items differently.
- Inconsistent responding can occur intentionally or unintentionally, and could be due to deliberate non-compliance, fatigue, a misunderstanding of the items or instructions, inattention, disinterest, or a lack of motivation

Step 1: Impression Scales

- The Negative Impression scale evaluates the likelihood that the rater underestimated the individual's functioning.
- The Positive Impression scale evaluates the likelihood that the rater overestimated the individual's functioning.

Step 1: Impression Scales

- Negative and Positive Impression Scale Items

Table 5.3. CEFI Negative Impression Scale and Positive Impression Scale Items

Negative Impression Scale
Item
2. have good thoughts about everyone? (R)
20. only care about what is best for others? (R)
24. get bothered by something?
33. have a bad day?
46. do things the wrong way?
54. get embarrassed?
61. do things perfectly? (R)
66. like everyone he/she met? (R)
77. know the right answer? (R)
95. get upset?

Positive Impression Scale
Item
2. have good thoughts about everyone?
20. only care about what is best for others?
24. get bothered by something? (R)
33. have a bad day? (R)
46. do things the wrong way? (R)
54. get embarrassed? (R)
61. do things perfectly?
66. like everyone he/she met?
77. know the right answer?
95. get upset? (R)

Note. (R) = Reverse scored item.

Step 1: Impression Scales

- A particular response style is indicated if the standard score is less than 76 (< 5% of the normative sample).

Scale	Interpretive Text	
	Standard Score ≤ 75	Standard Score > 75
Consistency Index	The rater responded in a different way to similar items. This rating pattern is not typical and should be further investigated.	The pattern of ratings is typical.
Negative Impression Scale	The pattern of ratings may under-estimate the child's behavior. This rating pattern is not typical and should be further investigated.	The pattern of ratings is typical.
Positive Impression Scale	The pattern of ratings may over-estimate the child's behavior. This rating pattern is not typical and should be further investigated.	The pattern of ratings is typical.
Time to Completion	The rater spent considerably less time than is usual completing the CEFI.	The time the rater took to complete the CEFI was typical.

Time to Completion is only for online administration

CEFI Interpretation

Step 1: Examine Quality of the ratings: Consistency, Positive and Negative Impression

Step 2: Interpret Scale Scores

Step 3: Compare CEFI Scale Scores

Step 4: Examine Item-Level Responses

Step 5: Compare Results Across Raters

Step 6: Compare Results Over Time

Step 2: Interpret Scale Scores

- All scales are set at mean of 100, SD of 15
- Low scores mean poor EF

Table 4.3. Interpretation Guidelines for Examining Scale Scores

Scale	Interpretation Guidelines
Full Scale	Reflects overall executive function. The Full Scale score is made up of 90 items from nine different areas that are conceptually related to executive function (i.e., Attention, Emotion Regulation, Flexibility, Inhibitory Control, Initiation, Organization, Planning, Self-Monitoring, and Working Memory). The CEFI Scales describe the content of the items for intervention purposes. If there is significant variation among the CEFI Scales, the Full Scale score will sometimes be higher and other times lower than scores on these scales. However, the Full Scale score is a good description of a child's/youth's executive function behaviors if there is no significant variation among the CEFI Scales.
Attention	Describes how well a child/youth can avoid distractions, concentrate on tasks, and sustain attention.
Emotion Regulation	Indicates the child's/youth's control and management of emotions, including staying calm when handling small problems and reacting with the right level of emotion.
Flexibility	Reflects a child's/youth's skill at adjusting behavior to meet circumstances, including coming up with different ways to solve problems, having many ideas about how to do things, and being able to solve problems using different approaches.
Inhibitory Control	Describes the child's/youth's ability to control behavior or impulses, including thinking about consequences before acting, maintaining self-control, and keeping commitments.

Step 2: Interpret Scale Scores

Table 4.3. Interpretation Guidelines for Examining Scale Scores

Scale	Interpretation Guidelines
Inhibitory Control	Describes the child's/youth's ability to control behavior or impulses, including thinking about consequences before acting, maintaining self-control, and keeping commitments.
Initiation	Indicates a child's/youth's skill at beginning tasks or projects on his/her own including starting tasks easily, being motivated, and taking the initiative when needed.
Organization	Reflects the child's/youth's ability to manage personal effects, work, or multiple tasks, including organizing tasks and thoughts well, managing time effectively, and working neatly.
Planning	Describes how well a child/youth can develop and implement strategies to accomplish tasks, including planning ahead and making good decisions.
Self-Monitoring	Indicates the child's/youth's ability to evaluate his/her own behavior in order to determine when a different approach is necessary, including noticing and fixing mistakes, knowing when help is required, and understanding when a task is completed.
Working Memory	Reflects how well a child/youth can keep information in mind that is important for knowing what to do and how to do it, including remembering important things, instructions, and steps.

Classification of Standard Scores

Standard Score	Percentile Rank	Classification
≥ 130	≥ 98	Very Superior
120–129	91–97	Superior
110–119	75–90	High Average
90–109	25–73	Average
80–89	9–23	Low Average
70–79	2–8	Below Average
≤ 69	≤ 2	Well Below Average

CEFI Scales

Scale	Interpretive Text
Full Scale	Reflects overall executive function. The Full Scale score is made up ninety executive function behaviors that are rationally assigned to nine CEFI Scales (i.e., Attention, Emotion Regulation, Flexibility, Inhibitory Control, Initiation, Organization, Planning, Self-Monitoring, and Working Memory) The CEFI Scales describe the content of the items for intervention purposes. If there is significant variation among the CEFI Scales, the Full Scale score will sometimes be higher and other times lower than scores on these scales. However, the Full Scale score is a good description of a child's executive function behaviors if there is no significant variation among the CEFI Scales.
Attention	Describes how well a child can avoid distractions, concentrate on tasks, and sustain attention.
Emotion Regulation	Indicates control and management of emotions, including staying calm when handling small problems and reacting with the right level of emotion.
Flexibility	Reflects how well a child adjusts his/her behavior to meet circumstances, including coming up with different ways to solve problems, having many ideas about how to do things, and being able to solve problems using different approaches.
Inhibitory Control	Describes the ability to control behavior or impulses, including thinking about consequences before acting, maintaining self-control, and keeping commitments.
Initiation	Indicates how a child begins tasks or projects on his/her own, including starting tasks easily, being motivated, and taking the initiative when needed.
Organization	Reflects the ability to manage personal effects, work, or multiple tasks, including organizing tasks and thoughts well, managing time effectively, and working neatly.
Planning	Describes how well a child can develop and implement strategies to accomplish tasks, including planning ahead and making good decisions.
Self-Monitoring	Indicates the ability a child has to evaluate his/her own behavior in order to determine when a different approach is necessary, including noticing and fixing mistakes, knowing when help is required, and understanding when a task is completed.
Working Memory	Reflects how well a child can keep information in mind that is important for knowing what to do and how to do it, including remembering important things, instructions, and steps.

Step 2: Interpret Estimated True Score Based Confidence Intervals

TABLE B.1. CEFI (5–18 Years) Parent Form: 90% Confidence Intervals for 5–11-Year-Olds

Standard Score	Full Scale	Attention (AT)	Emotion Regulation (ER)	Flexibility (FX)	Inhibitory Control (IC)	Initiation (IT)	Organization (OG)	Planning (PL)	Self-Monitoring (SM)	Working Memory (WM)	Standard Score
145	.	.	.	.	.	.	.	.	.	.	145
144	.	.	.	.	.	.	.	.	.	.	144
143	139–145	.	.	.	.	.	.	.	.	.	143
142	138–144	.	.	.	.	.	.	.	.	.	142
141	137–143	.	.	.	.	.	.	.	.	.	141
140	136–142	.	.	.	.	.	.	.	125–143	.	140
139	135–141	129–143	126–142	.	.	.	127–142	.	124–142	126–142	139
138	134–140	128–142	125–141	.	.	.	126–142	.	124–141	125–141	138
137	133–140	127–141	124–	122–140	125–141	1–	125–141	127–141	123–140	125–141	137
136	132–139	127–140	–140	121–139	124–140	124–	125–140	126–140	122–139	124–140	136
135	131–138	126–1–	123–139	120–138	123–139	123–13–	24–139	125–139	121–139	123–139	135
134	130–137	1–38	122–138	120–138	122–138	122–138	–138	124–138	120–138	122–138	134
133	129–136	124–137	121–137	119–137	121–137	121–137	12–37	123–137	119–137	121–137	133
132	128–35	123–136	120–136	118–136	121–136	120–136	121–1–	122–136	118–136	120–136	132
131	127–134	122–135	119–135	117–135	120–135	119–135	120–135	121–135	118–135	119–135	131
130	126–133	121–134	118–134	116–134	119–134	118–134	119–134	120–134	117–134	118–134	130
129	125–132	120–133	117–133	115–133	118–134	118–134	118–134	119–133	116–133	118–133	129
128	124–131	119–132	116–133	114–133	117–133	117–133	117–133	118–132	115–133	117–133	128
127	123–130	118–131	116–132	114–132	116–132	116–132	116–132	118–132	114–132	116–132	127
126	122–129	117–131	115–131	113–131	115–131	115–131	116–131	117–131	113–131	115–131	126

The Confidence Interval for a score of 130 in Planning is 120 (-10) to 134 (+4)

Step 2: Interpret Scale Scores Using the Prorating Tables

If items are not completed by the rater, you can prorate the scores

TABLE A.1. CEFI Full Scale Prorated Values: 1 to 5 Omitted Items

Raw Score	Prorated Value					Raw Score
	1 Omitted Item	2 Omitted Items	3 Omitted Items	4 Omitted Items	5 Omitted Items	
445	450					445
444	449					444
443	448					443
442	447					442
441	446					441
440	445	450				440
439	444	449				439
438	443	448				438
437	442	447				437
436	441	446				436
435	440	445	450			435

Step 2: Interpret Scale Scores Using the Prorating Tables

If 1 item on each scale is not completed by the rater, you can prorate that scale's score

TABLE A.2. CEFI Scales Prorated Values: 1 Omitted Item

Raw Score	Prorated Values									Raw Score
	Attention (AT)	Emotion Regulation (ER)	Flexibility (FX)	Inhibitory Control (IC)	Initiation (IT)	Organization (OG)	Planning (PL)	Self-Monitoring (SM)	Working Memory (WM)	
27	29	30	32	30	30	30	30	30	30	27
26	28	29	30	29	29	29	29	29	29	26
25	27	28	29	28	28	28	28	28	28	25
24	26	27	28	27	27	27	26	27	26	24
23	25	26	27	26	26	26	25	26	25	23
22	24	25	26	24	24	24	24	24	24	22
21	23	24	25	23	23	23	23	23	23	21
20	22	23	23	22	22	22	22	22	22	20
19	21	21	22	21	21	21	21	21	21	19
18	20	20	21	20	20	20	20	20	20	18
17	19	19	20	19	19	19	19	19	19	17
16	17	18	19	18	18	18	18	18	18	16
15	16	17	18	17	17	17	17	17	17	15
14	15	16	16	16	16	16	15	16	15	14

CEFI Interpretation

Step 1: Examine Quality of the ratings: Consistency, Positive and Negative Impression

Step 2: Interpret Scale Scores

Step 3: Compare CEFI Scale Scores

Step 4: Examine Item-Level Responses

Step 5: Compare Results Across Raters

Step 6: Compare Results Over Time

Step 3: Compare CEFI Scale Scores

- Compare CEFI Scales to the child's mean ***and*** the normative mean

Step 3: Compare CEFI Scale Scores

Table 3.4. Critical Values for Significance Testing (at $p \leq .05$ and $p \leq .10$) when Comparing CEFI Scale Standard Scores with Individual's Average CEFI Scale Standard Score

Scale	Parent Form				Teacher Form				Self-Report Form	
	5–11 Years		12–18 Years		5–11 Years		12–18 Years		12–18 Years	
	$p < .05$	$p < .10$	$p < .05$	$p < .10$	$p < .05$	$p < .10$	$p < .05$	$p < .10$	$p < .05$	$p < .10$
Attention	9.1	7.6	8.5	7.1	6.6	5.5	6.6	5.5	11.8	9.9
Emotional Regulation	11.0	9.3	10.0	8.4	8.4	7.0	8.3	7.0	14.4	12.1
Flexibility	12.3	10.3	11.8	9.9	9.9	8.3	9.8	8.2	14.8	12.5
Inhibitory Control	10.6	8.9	10.0	8.4	8.0	6.7	7.9	6.6	13.9	11.7
Initiation	10.9	9.1	10.0	8.4	8.8	7.4	8.6	7.2	14.1	11.8
Organization	10.3	8.7	9.0	7.5	8.3	7.0	8.1	6.8	12.3	10.3
Planning	9.6	8.0	8.7	7.3	7.2	6.1	6.9	5.8	12.3	10.3
Self-Monitoring	11.9	10.0	10.5	8.8	9.4	7.9	9.0	7.6	14.6	12.2
Working Memory	10.8	9.1	10.2	8.5	7.8	6.6	8.0	6.7	13.1	11.0

Step 3: Compare CEFI Scale Scores

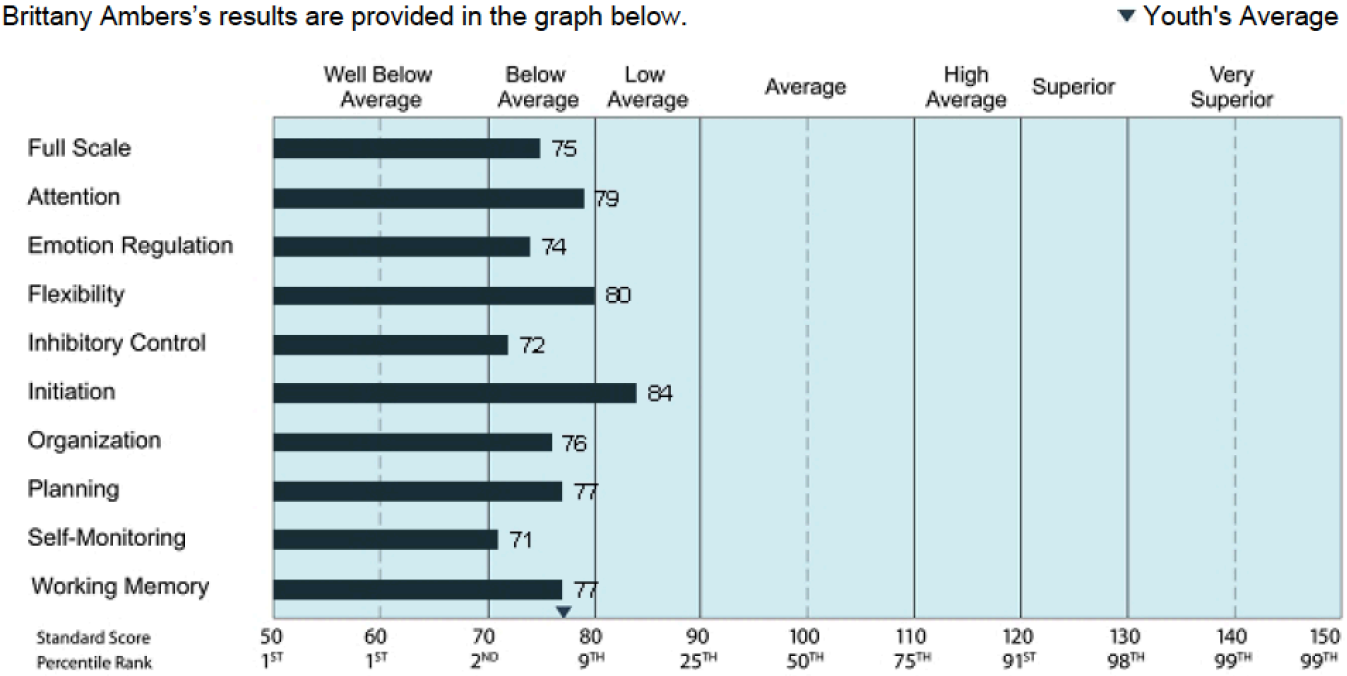
Figure 4.1. Illustration of Executive Function Weakness and Strengths on the CEFI (5–18 Years) Teacher Form

CEFI Scales	Standard Score		Difference From Youth's Average	Statistically Significant? (Yes/No)	Executive Function Strength/Weakness	90%/95% (circle one) Confidence Interval	Percentile Rank	Classification
Attention (AT)	95	+	-6.7	Yes	—	90 to 100	37	Average
Emotion Regulation (ER)	82	+	-19.7	Yes	Weakness	77 to 90	12	Low Average
Flexibility (FX)	112	+	10.3	Yes	Strength	103 to 118	79	High Average
Inhibitory Control (IC)	99	+	-2.7	No		93 to 105	47	Average
Initiation (IT)	120	+	18.3	Yes	Strength	112 to 125	91	Superior
Organization (OG)	99	+	-2.7	No		93 to 105	47	Average
Planning (PL)	101	+	-0.7	No		96 to 106	53	Average
Self-Monitoring (SM)	102	+	0.3	No		95 to 109	55	Average
Working Memory (WM)	105	=	3.3	No		99 to 111	63	Average
Sum of Standard Scores	915	÷9	101.7	Youth's Average				

Note. Differences from the Child's/Youth's Average are significant at $p < .10$.

Scores in Relation to the Norm

Brittany Ambers's results are provided in the graph below.



Scores in Relation to the Norm and the Individual

Brittany Ambers's results are detailed in the tables that follow. These scores show how Brittany Ambers compares to the normative sample. They also provide an analysis of the variability of scores on the separate CEFI Scales. Differences between Brittany Ambers's average score and her standard scores on each scale are presented, as is a summary column that indicates whether or not these differences were statistically significant. If a standard score on any of the CEFI Scales is greater than 109 and significantly higher than the youth's average score on the CEFI Scales, or less than 90 and significantly lower than the youth's average score, then that score represents an Executive Function Strength (Strength) or an Executive Function Weakness (Weakness), respectively.

Attention Weakness

Overview of Results		Diff from Mean	Diff Needed	Sig?	Str / Wk?
Full Scale	81				
Attention	73	-10.0	6.6	Sig	YES
Emotional Regulation	89	6.0	8.3		
Flexibility	87	4.0	9.8		
Inhibitory Control	84	1.0	7.9		
Initiation	82	-1.0	8.6		
Organization	80	-3.0	8.1		
Planning	81	-2.0	6.9		
Self-Monitoring	79	-4.0	9.0		
Working Memory	92	9.0	8.0	Sig	No
Average of 9 Scales	83				

Sig & Below Average = Weakness

Sig but Not Above Average = NO Strength

CEFI Summary

Full Scale			
Standard Score	**90% Confidence Interval**	**Percentile Rank**	**Classification**
75	73-78	5	Below Average

CEFI Scales							
Scale	**Standard Score**	**90% Confidence Interval**	**Percentile Rank**	**Classification**	**Difference from Youth's Average (76.7)**	**Statistically Significant? (p < .05)**	**Executive Function Strength/ Weakness**
Attention	79	74-87	8	Below Average	2.3	No	-
Emotion Regulation	74	69-84	4	Below Average	-2.7	No	-
Flexibility	80	74-92	9	Low Average	3.3	No	-
Inhibitory Control	72	67-82	3	Below Average	-4.7	No	-
Initiation	84	78-93	14	Low Average	7.3	No	-
Organization	76	71-85	5	Below Average	-0.7	No	-
Planning	77	72-85	6	Below Average	0.3	No	-
Self-Monitoring	71	67-82	3	Below Average	-5.7	No	-
Working Memory	77	72-87	6	Below Average	0.3	No	-

CEFI Interpretation

Step 1: Examine Quality of the ratings: Consistency, Positive and Negative Impression

Step 2: Interpret Scale Scores

Step 3: Compare CEFI Scale Scores

Step 4: Examine Item-Level Responses

Step 5: Compare Results Across Raters

Step 6: Compare Results Over Time

Step 4: Examine Item-Level Scores

Table C.1. CEFI (5–18 Years) Parent Form: Item-Level Classifications for 5–11-Year-Olds

Item		Item Score						Scale
		0	1	2	3	4	5	
1	think before acting?	Below Average	Below Average	Average	Average	Above Average	Above Average	IC
3	finish a boring task?	Below Average	Below Average	Average	Average	Above Average	Above Average	AT
4	forget instructions?	Below Average	Below Average	Below Average	Average	Average	Above Average	WM
5	complete one task before starting a new one?	Below Average	Below Average	Average	Average	Above Average	Above Average	OG
6	ask for help when needed?	Below Average	Below Average	Below Average	Average	Average	Above Average	SM
7	come up with a new way to reach a goal?	Below Average	Below Average	Average	Average	Above Average	Above Average	FX
8	remember how to do something?	Below Average	Below Average	Below Average	Average	Average	Above Average	WM
9	prepare for school or work?	Below Average	Below Average	Below Average	Average	Average	Above Average	PL
10	control emotions when under stress?	Below Average	Below Average	Average	Average	Above Average	Above Average	ER
11	work well in a noisy environment?	Below Average	Below Average	Average	Average	Above Average	Above Average	AT
12	stay calm when handling small problems?	Below Average	Below Average	Average	Average	Average	Above Average	ER
13	organize his/her thoughts well?	Below Average	Below Average	Below Average	Average	Average	Above Average	OG
14	fix his/her mistakes?	Below Average	Below Average	Average	Average	Average	Above Average	SM
15	solve problems creatively?	Below Average	Below Average	Average	Average	Average	Above Average	PL
		Below	Below			Above	Above	

CEFI Interpretation

Step 1: Examine Quality of the ratings: Consistency, Positive and Negative Impression

Step 2: Interpret Scale Scores

Step 3: Compare CEFI Scale Scores

Step 4: Examine Item-Level Responses

Step 5: Compare Results Across Raters

Step 6: Compare Results Over Time

Step 5: Compare Results Across Raters

Table 4.5. Critical Values ($p < .10$) Denoting Statistically Significant Differences Between Raters

Scale	Parent to Parent		Teacher to Teacher		Parent to Teacher		Parent to Self-Report	Teacher to Self-Report
	5–11 Years	12–18 Years	5–11 Years	12–18 Years	5–11 Years	12–18 Years	12–18 Years	12–18 Years
Full Scale	5	5	4	4	4	4	8	5
Attention	10	10	7	7	9	9	13	11
Emotion Regulation	13	12	10	10	11	11	15	14
Flexibility	14	14	12	12	13	13	15	15
Inhibitory Control	12	12	9	9	11	10	14	13
Initiation	13	12	10	10	12	11	14	14
Organization	12	10	10	9	11	10	12	12
Planning	11	10	8	8	10	9	13	11
Self-Monitoring	14	12	11	11	13	11	15	14
Working Memory	13	12	9	9	11	11	11	13

CEFI Interpretation

Step 1: Examine Quality of the ratings: Consistency, Positive and Negative Impression

Step 2: Interpret Scale Scores

Step 3: Compare CEFI Scale Scores

Step 4: Examine Item-Level Responses

Step 5: Compare Results Across Raters

Step 6: Compare Results Over Time

Step 6: Compare Results Over Time

Determine if CEFI pre post scores differ significantly – but also if the post-test standard score is in the Average range or higher

Table 4.6. Critical Values Denoting Statistically Significant Change Over Time

Scale	Parent Form				Teacher Form				Self-Report Form	
	5–11 Years		12–18 Years		5–11 Years		12–18 Years		12–18 Years	
	$p < .05$	$p < .10$	$p < .05$	$p < .10$	$p < .05$	$p < .10$	$p < .05$	$p < .10$	$p < .05$	$p < .10$
Full Scale	6	5	5	5	4	4	4	4	8	6
Attention	12	10	11	10	9	7	9	7	16	13
Emotion Regulation	15	13	14	12	11	10	11	10	20	17
Flexibility	17	14	16	14	14	12	14	12	20	17
Inhibitory Control	15	12	14	12	11	9	11	9	19	16
Initiation	15	13	14	12	12	10	12	10	19	16
Organization	14	12	12	10	11	10	11	9	17	14
Planning	13	11	12	10	10	8	9	8	17	14
Self-Monitoring	17	14	14	12	13	11	12	11	20	17
Working Memory	15	13	14	12	11	9	11	9	18	15

Validity of the CEFI Scales

- Factor analysis is a valuable tool to understand how items group.
- But we also need to know if the items have validity.
- Discriminating children with EF deficits from the regular population is important.
- Discriminating children with EF deficits from those who are not in the regular population and have other problems is very important.

Content Validity

Table 8.1 Sample Items for Each CEFI Component

Component	CEFI Definition	Example Item Content
Attention	Describes how well a child/youth can avoid distractions, concentrate on tasks, and sustain attention.	focus on one thing?
		pay attention for a long time?
Emotion Regulation	Indicates control and management of emotions, including staying calm when handling small problems and reacting with the right level of emotion.	stay calm when handling small problems?
		respond calmly to delays?
Flexibility	Reflects how well a child/youth adjusts his/her behavior to meet circumstances, including coming up with different ways to solve problems, having many ideas about how to do things, and being able to solve problems using different approaches.	come up with different ways to solve problems?
		have many ideas about how to do things?
Inhibitory Control	Describes the ability to control behavior or impulses, including thinking about consequences before acting, maintaining self-control, and keeping commitments.	think of the consequences before acting?
		maintain self-control?
Initiation	Indicates how a child/youth begins tasks or projects on his/her own, including starting tasks easily, being motivated, and taking the initiative when needed.	appear motivated?
		start tasks easily?

Content Validity

Table 8.1 Sample Items for Each CEFI Component

Component	CEFI Definition	Example Item Content
Organization	Reflects the ability to manage personal effects, work, or multiple tasks, including organizing tasks and thoughts well, managing time effectively, and working neatly.	organize tasks well?
		manage time effectively?
Planning	Describes how well a child/youth can develop and implement strategies to accomplish tasks, including planning ahead and making good decisions.	find a strategy that worked?
		plan ahead?
Self-Monitoring	Indicates the child's/youth's ability to evaluate his/her own behavior in order to determine when a different approach is necessary, including noticing and fixing mistakes, knowing when help is required, and understanding when a task is completed.	fix his/her/your mistakes?
		notice his/her/your mistakes?
Working Memory	Reflects how well a child/youth can keep information in mind that is important for knowing what to do and how to do it, including remembering important things, instructions, and steps.	remember many things at one time?
		remember important things?

US versus Canada

- Samples were matched on age, gender, race/ethnicity, and parental education levels

Table 8.13. Differences Between Canadian and U.S. Matched Samples: CEFI Full Scale

Form		Canadian	U.S.	*d-ratio*	*F (df)*	*p*
Parent	*M*	101.5	102.7	0.08	0.87 (1, 521)	0.351
	SD	15.5	15.6			
	N	263	263			
Teacher	*M*	98.3	100.5	0.16	1.75 (1, 272)	0.187
	SD	14.0	14.0			
	N	137	137			
Self-Report	*M*	102.0	101.4	-0.04	0.10 (1, 196)	0.750
	SD	15.4	14.9			
	N	101	101			

CEFI Consistency Between Raters

Comparisons across parent, teacher, and self-report ratings show good correlations and good mean score consistency

Table 8.15. Correlations Between CEFI Forms: CEFI Full Scale

Comparison	Obtained *r*	Corrected *r*	*N*	Rater Type	*M*	*SD*	Rater Type	*M*	*SD*	*d*-ratio
Parent to Teacher	.719	.791	126	Parent	96.2	14.3	Teacher	97.2	12.6	-0.08
Parent to Self-Report	.669	.705	126	Parent	96.2	14.3	Self-Report	94.4	14.3	0.12
Teacher to Self-Report	.594	.679	126	Teacher	97.2	12.6	Self-Report	94.4	14.3	-0.21

Note. All *r*s significant, $p < .001$.

CEFI Scores by Diagnosis

- We expected that those with ADHD, mood disorders, and Autism Spectrum Disorders might earn a low CEFI Full Scale score.
- LD students should not be as low
- We compared groups matched on gender, race/ethnicity, and parental education

Impairment in executive function is common in a number of internalizing and externalizing forms of psychopathology (Willcutt et al., 2005; see chapter 2, *Theory and Research*, for further discussion). For instance, research and theory has pointed to executive function deficits in Attention-Deficit/Hyperactivity Disorder (ADHD) and mood disorders (e.g., Weyandt et al., in press), as well as Autism Spectrum Disorders (ASD; e.g., Gilbert, Bird, Brindley, Frith, & Burgess, 2008; Gilotty, Kenworthy, Sirian, Black, & Wagner, 2002; Happé, Booth, Charlton, & Hughes, 2006; Ozonoff, Pennington, & Rogers, 1991; Solomon, Ozonoff, Ursu, Ravizza, Cummings, Ly, & Carter, 2009).

Group Differences: ADHD

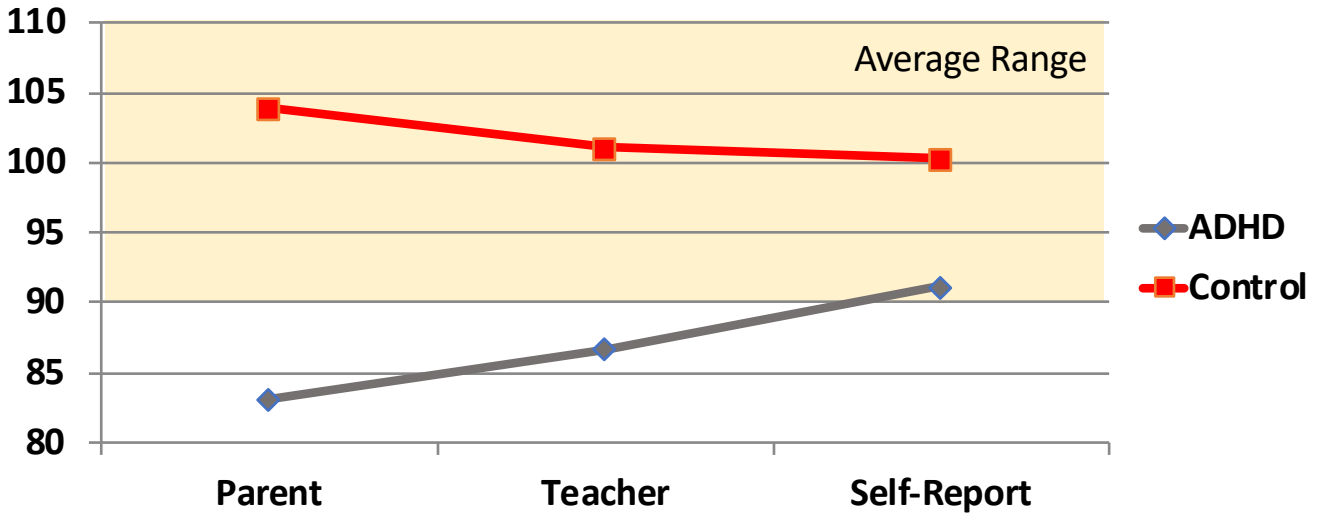


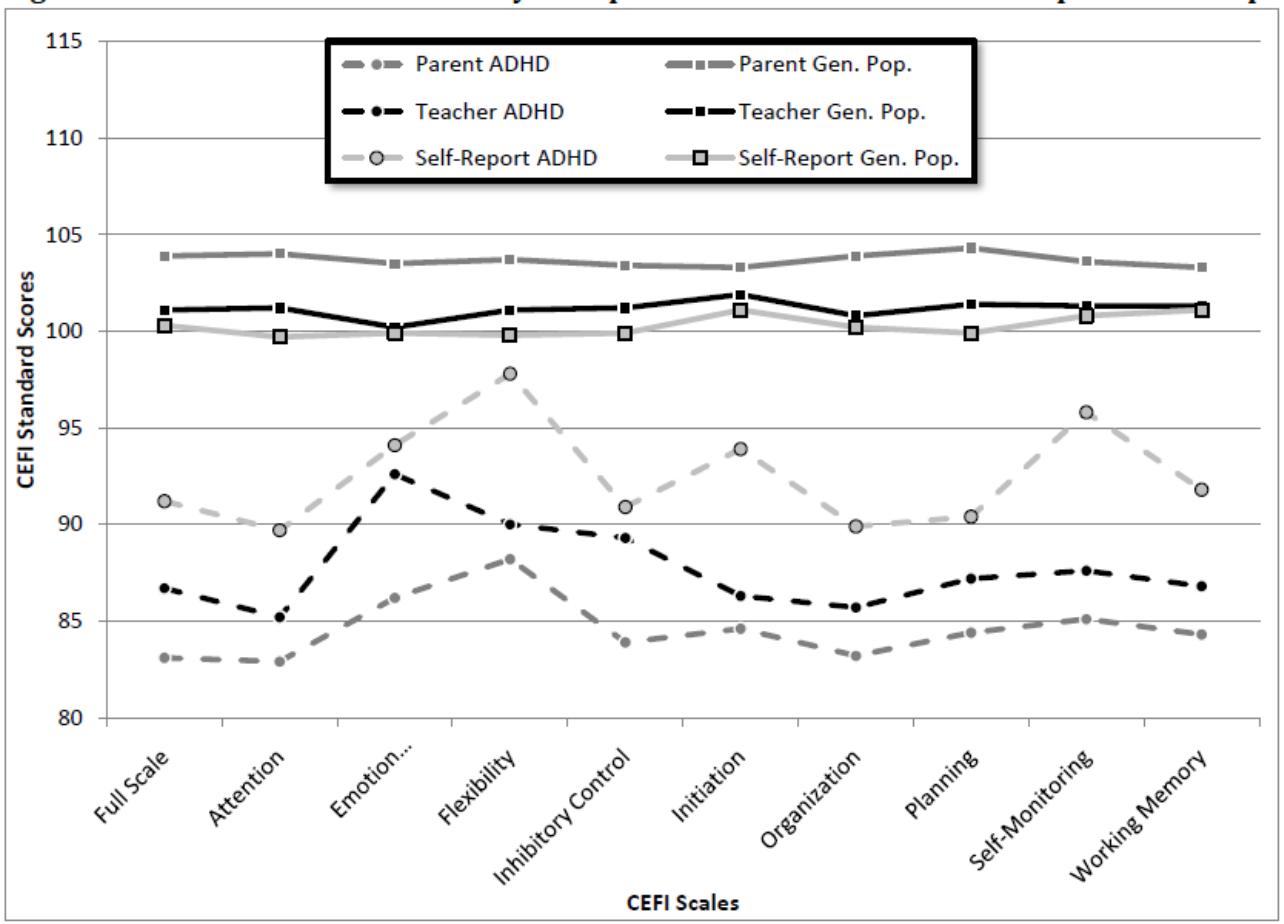
Table 8.19 Differences Between ADHD and Matched General Population Samples: CEFI Full Scale

Form		ADHD	Matched Gen. Pop.	*d*-ratio	*F* (*df*)	*P*
Parent	*M*	83.1	103.9	-1.59	216.56 (1, 340)	< .001
	SD	13.0	13.0			
	N	171	171			
Teacher	*M*	86.7	101.1	-1.07	79.93 (1, 278)	< .001
	SD	13.5	13.5			
	N	138	142			
Self-Report	*M*	91.2	100.3	-0.62	22.21 (1, 232)	< .001
	SD	14.7	14.7			
	N	117	117			

Note. ADHD = Attention Deficit/Hyperactivity Disorder; Gen. Pop. = General Population

CEFI Scales: ADHD

Figure H.1. Mean Standard Scores by Group: ADHD & Matched General Population Sample



Group Differences: ASD

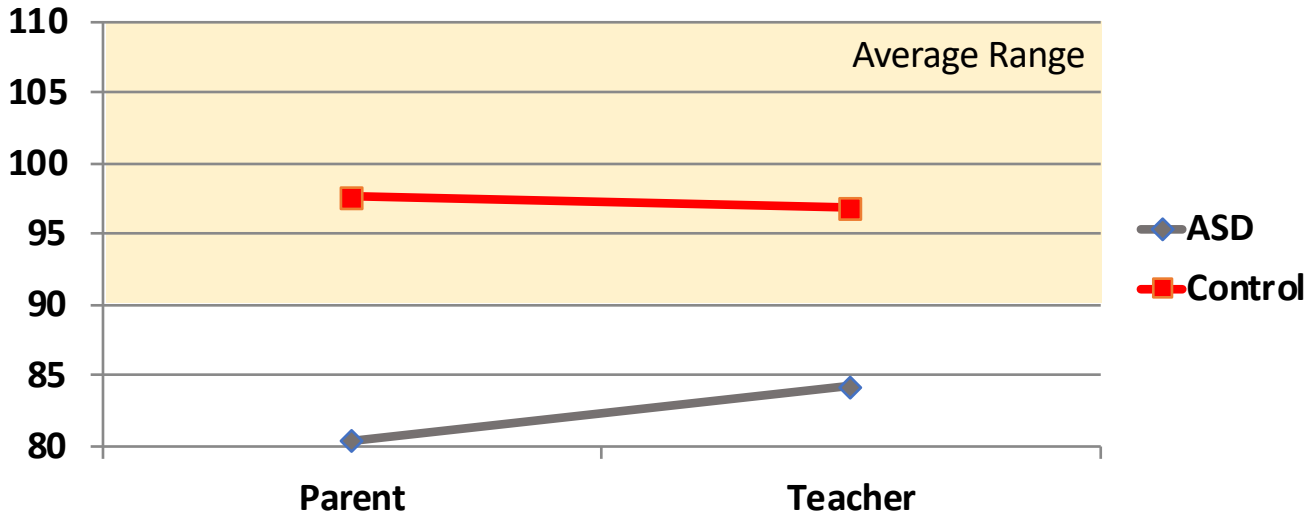
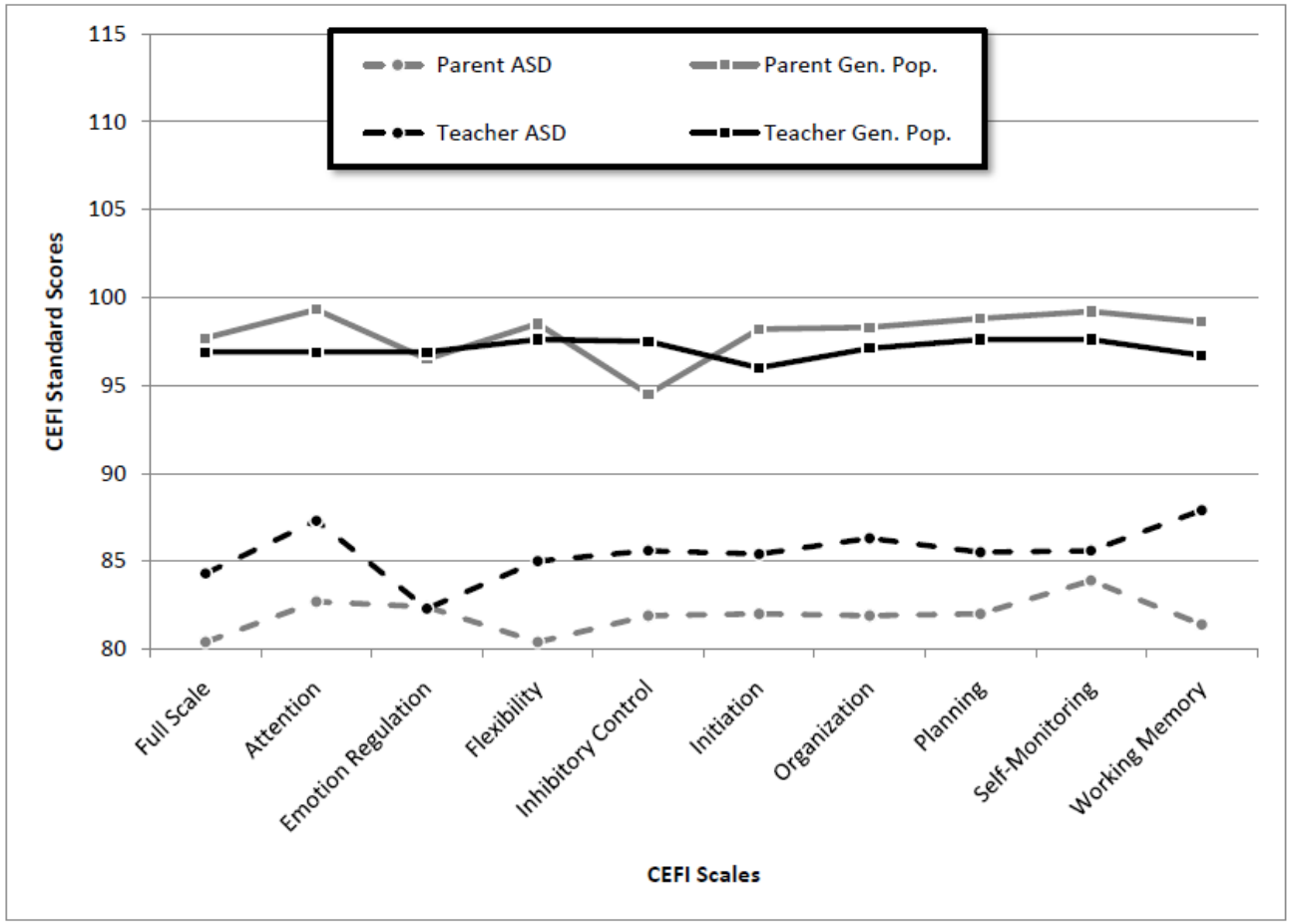


Table 8.20 Differences Between ASD and Matched General Population Samples: CEFI Full Scale

Form		ASD	Matched Gen. Pop.	*d*-ratio	*F* (*df*)	*P*
Parent	*M*	80.4	97.7	-1.41	48.96 (1, 96)	< .001
	SD	12.2	12.2			
	N	48	50			
Teacher	*M*	84.3	96.9	-0.99	23.11 (1, 92)	< .001
	SD	12.7	12.7			
	N	47	47			

CEFI Scales: ASD

Figure H.2. Mean Standard Scores by Group: ASD & Matched General Population Samples



Group Differences: Learning Disabilities

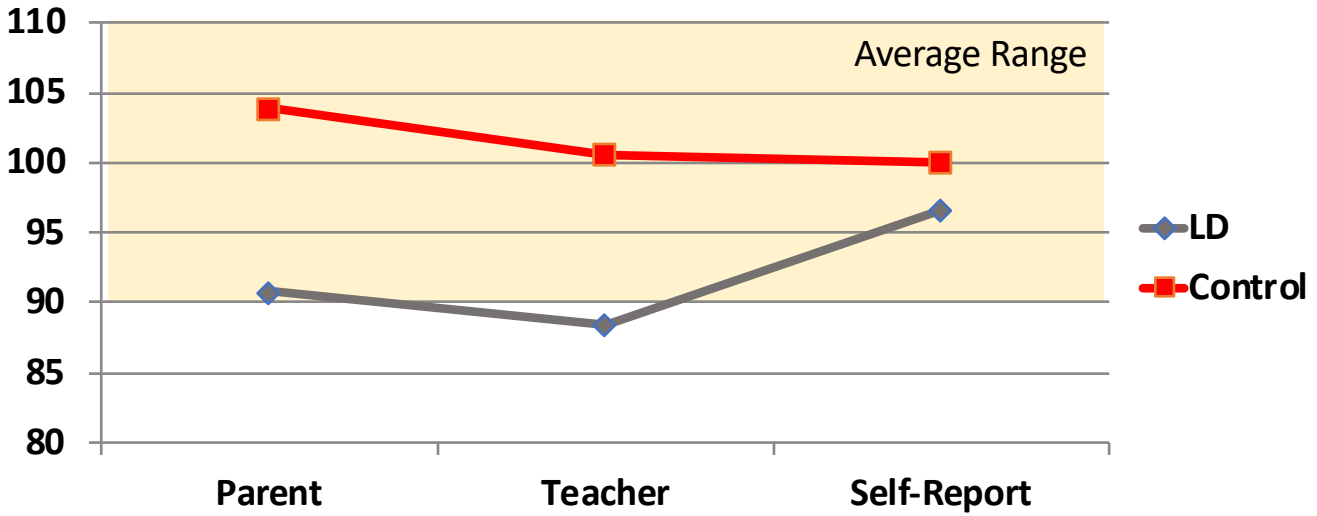
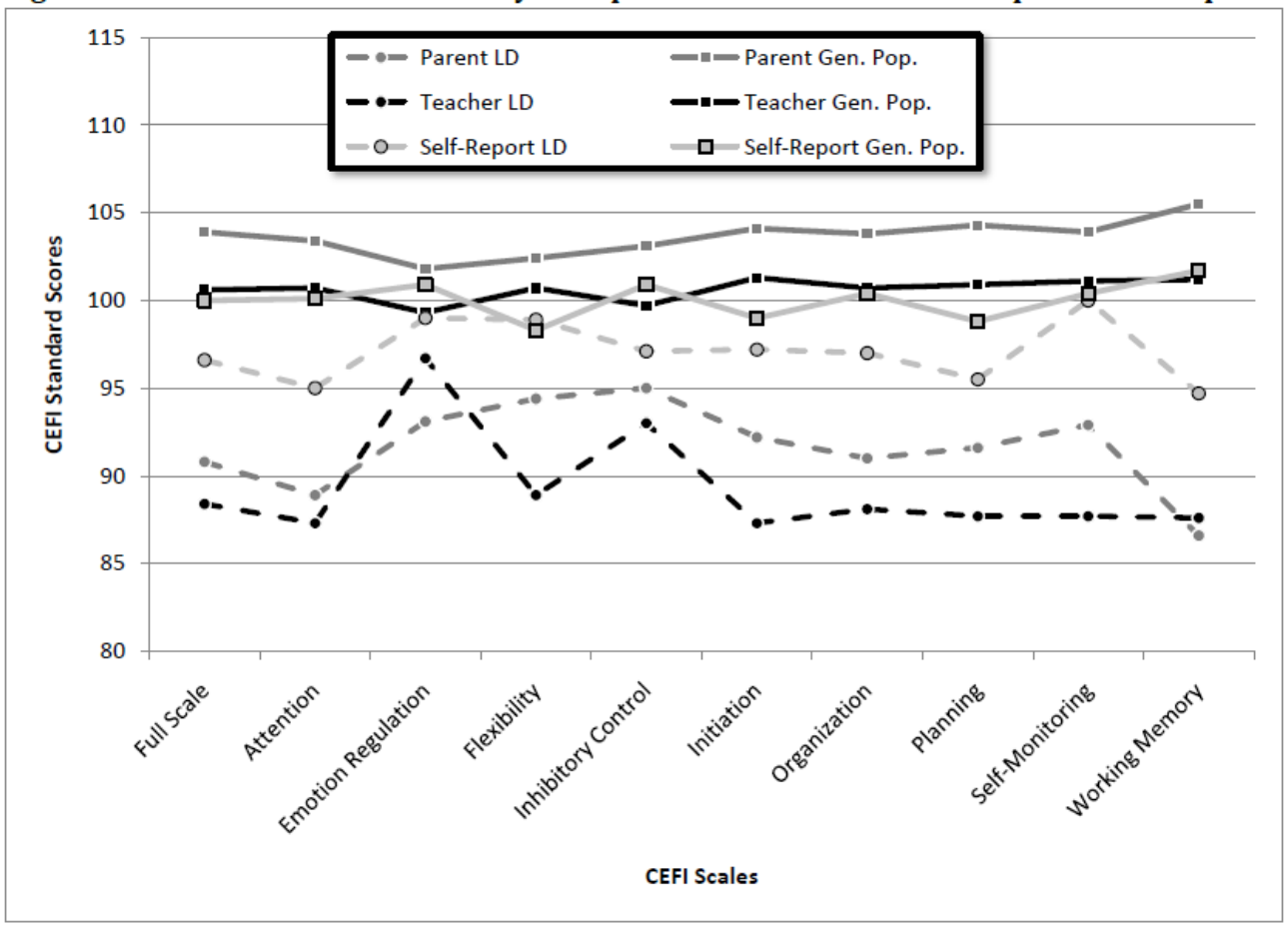


Table 8.22 Differences Between LD and Matched General Population Samples: CEFI Full Scale

Form		LD	Matched Gen. Pop.	*d*-ratio	*F* (*df*)	*p*
Parent	*M*	90.8	103.9	-0.92	19.89 (1, 93)	< .001
	SD	14.4	14.4			
	N	47	48			
Teacher	*M*	88.4	100.6	-0.91	37.29 (1, 178)	< .001
	SD	13.4	13.4			
	N	90	90			
Self-Report	*M*	96.6	100.0	-0.21	1.45 (1, 126)	0.231
	SD	15.9	15.9			
	N	64	64			

CEFI Scales: SLD

Figure H.3. Mean Standard Scores by Group: LD & Matched General Population Samples



Group Differences: Mood Disorders

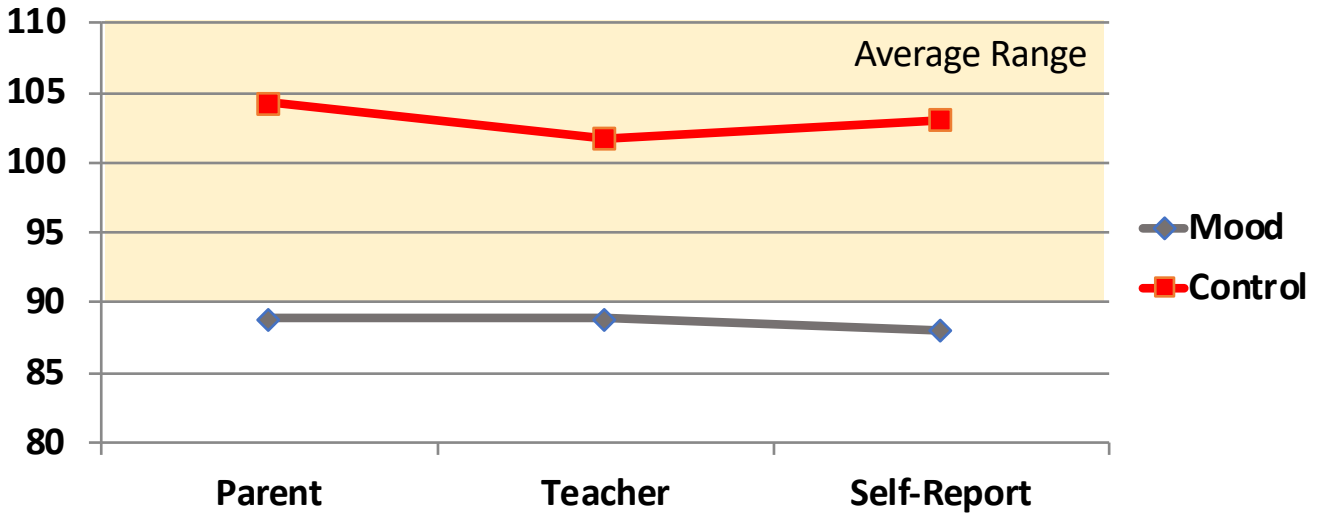
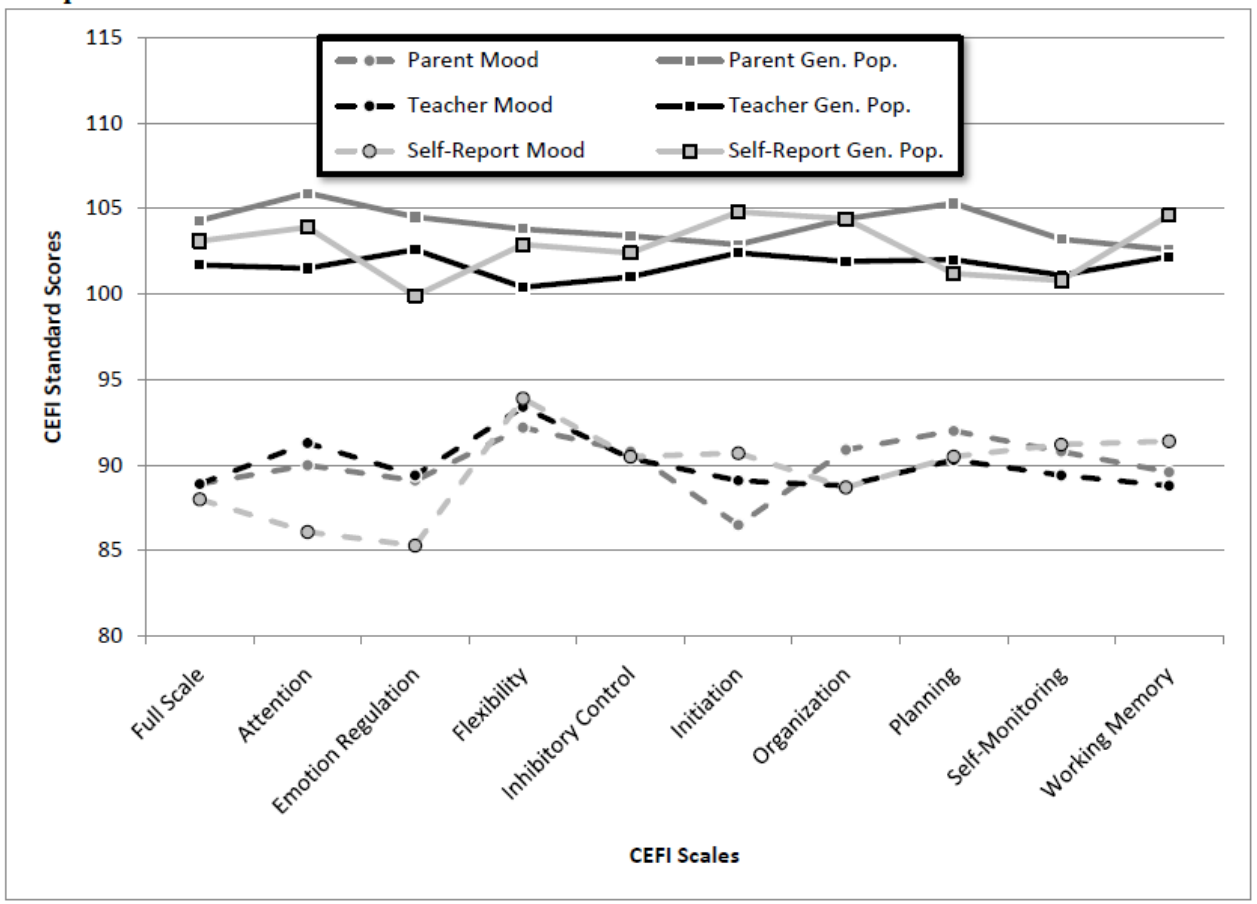


Table 8.21 Differences Between Mood Disorder and Matched General Population Samples: CEFI Full Scale

Form		Mood Disorder	Matched Gen. Pop.	*d*-ratio	*F* (*df*)	*p*
Parent	*M*	88.9	104.3	-1.11	22.66 (1, 71)	< .001
	SD	13.8	13.8			
	N	36	37			
Teacher	*M*	88.9	101.7	-1.01	14.9 (1, 57)	< .001
	SD	12.8	12.8			
	N	29	30			
Self-Report	*M*	88.0	103.1	-1.09	16.34 (1, 53)	< .001
	SD	13.9	13.9			
	N	27	28			

CEFI Scales: Mood Disorders

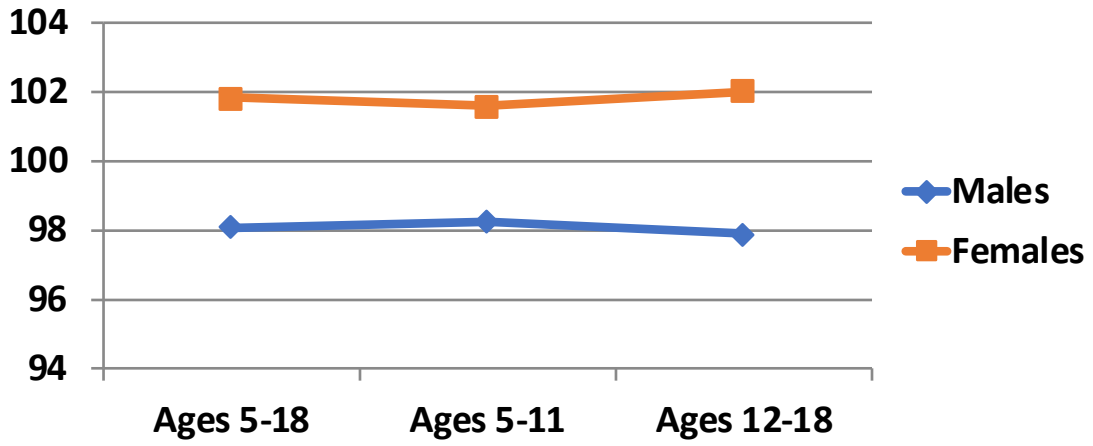
Figure H.4. Mean Standard Scores by Group: Mood Disorder & Matched General Population Samples



Gender Differences: Parent Raters

Girls have better EF than Boys

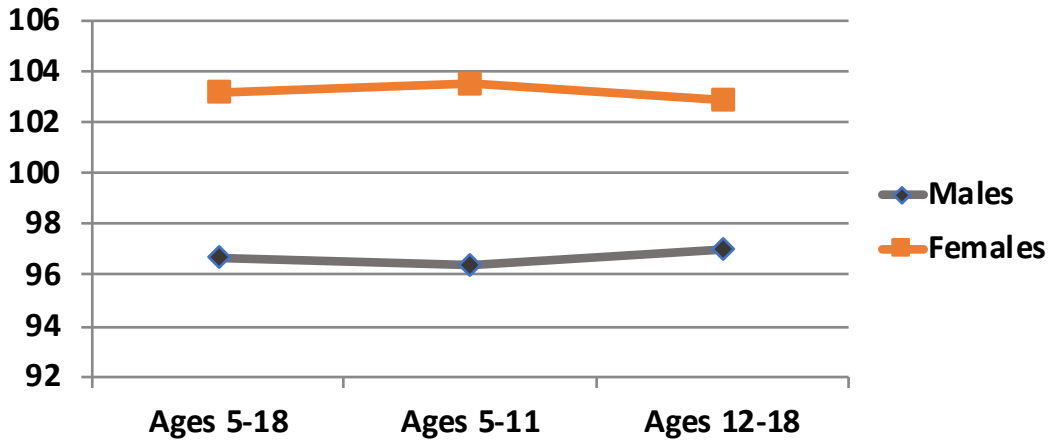
Parents	N	MMn	SD	N	FMn	SD	ES
Ages 5-18	700	**98.1**	14.9	699	**101.8**	15.0	**-0.25**
Ages 5-11	350	**98.2**	14.3	349	**101.6**	15.6	**-0.22**
Ages 12-18	350	**97.9**	15.4	350	**102.0**	14.4	**-0.28**



Gender Differences: Teacher Raters

- Girls have better EF than Boys

Teachers	N	MMn	SD	N	FMn	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**



Girls are Better EF Than Boys

- Gi

Journal of Educational Psychology
2001, Vol. 93, No. 2, 430–437

0022-0663/01/$5.00 DOI: 10.1037//0022-0663.93.2.430

Gender Differences in Planning, Attention, Simultaneous, and Successive (PASS) Cognitive Processes and Achievement

Jack A. Naglieri
George Mason University

Johannes Rojahn
Ohio State University

Planning = .3 and Attention = .35

Gender differences in ability and achievement have been studied for some time and have been conceptualized along verbal, quantitative, and visual–spatial dimensions. Researchers recently have called for a theory-based approach to studying these differences. This study examined 1,100 boys and 1,100 girls who matched the U.S. population using the Planning, Attention, Simultaneous, Successive (PASS) cognitive-processing theory, built on the neuropsychological work of A. R. Luria (1973). Girls outperformed boys on the Planning and Attention scales of the Cognitive Assessment System by about 5 points (d = .30 and .35, respectively). Gender differences were also found for a subsample of 1,266 children on the Woodcock–Johnson Revised Tests of Achievement Proofing (d = .33), Letter–Word Identification (d = .22), and Dictation (d = .22). The results illustrate that the PASS theory offers a useful way to examine gender differences in cognitive performance.

CEFI: WISC-IV, CAS, Achievement

- Data from the Neurology, Leasrning and Behavior Center in Salt Lake City, UT
- Children given the WISC-IV (N = 43), CAS (N = 62), and the WJIII achievement (N = 58) as part of a neuropsychological test battery

CEFI, WISC-IV, CAS, Achievement

Table 8.26. Demographic Characteristics of the CAS, WISC-IV, and WJ III ACH Validity Samples

Demographic		Sample					
		CAS		WISC-IV		WJ III ACH	
		N	%	*N*	%	*N*	%
Gender	Male	38	61.3	29	67.4	36	62.1
	Female	24	38.7	14	32.6	22	37.9
Race/Ethnic Group	Hispanic	1	1.6	1	2.3	1	1.7
	Asian	2	3.2	2	4.7	2	3.4
	White	55	88.7	38	88.4	52	89.7
	Other	4	6.5	2	4.7	3	5.2
Parental Education Level	High school diploma or less	1	1.6	0	0.0	1	1.7
	Some college or associate's degree	21	33.9	12	27.9	18	31.0
	Bachelor's degree or higher	36	58.1	26	60.5	34	58.7
	Missing information	4	6.5	5	11.6	5	8.6
Diagnostic or Educational Group	ADHD	24	38.7	15	34.9	20	34.5
	Anxiety	15	24.2	9	20.9	14	24.1
	ASD	7	11.3	5	11.6	7	12.1
	LD	3	4.8	3	7.0	3	5.2
	Mood	4	6.5	3	7.0	5	8.6
	Other	9	4.8	8	4.6	9	5.1
Total		62	100.0	43	100.0	58	100.0
Age *M (SD)*		10.4 (2.9)		10.2 (2.6)		10.5 (2.7)	

Note. ADHD = Attention-Deficit/Hyperactivity Disorder; Anxiety = Anxiety Disorder; ASD = Autism Spectrum Disorder; LD = Learning Disorder; Mood = Mood Disorder.

CEFI & WISC-IV

	WISC-IV						
	FS	VC	PR	WM	PS	CEFI	
						Mn	SD
CEFI							
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.							

CEFI & CAS

	CAS					CEFI	
	FS	Plan	Sim	Att	Suc		
CEFI						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.

CEFI & Achievement

	WJ-III Achievement Tests				
CEFI Scales	Total	Broad Reading	Broad Math	Broad Written Language	Median
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 &Achievement

School Psychology Quarterly
2012, Vol. 27, No. 4, 236–246

1045-3830/12/$12.00 DOI: 10.1037/spq0000012

Examining an Executive Function Rating Scale as a Predictor of Achievement in Children at Risk for Behavior Problems

Shanna S. Sadeh, Matthew K. Burns, and Amanda L. Sullivan
University of Minnesota

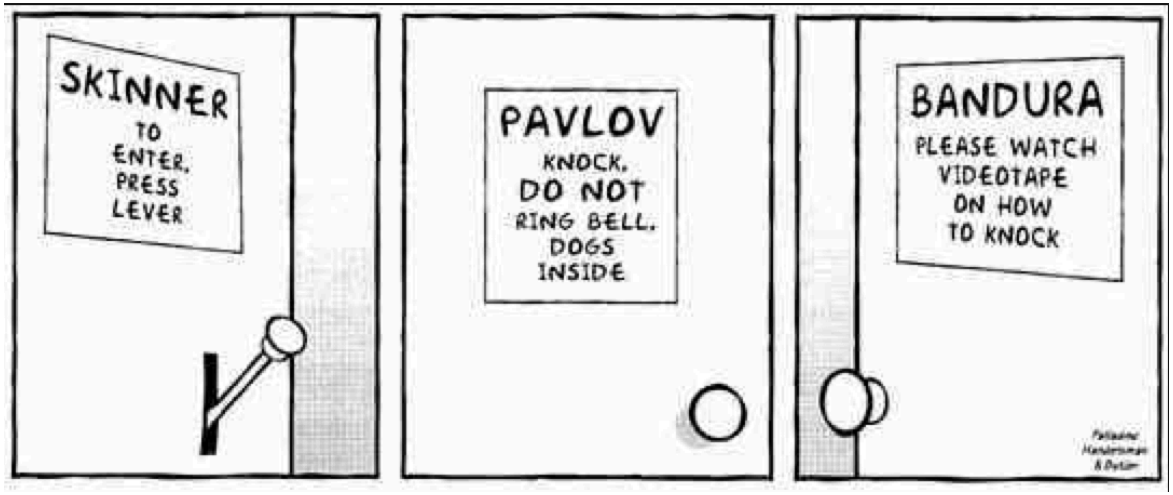
Executive Function items (from BASC) did not predict achievement

Evidence suggests that executive function (EF) may be a potent and malleable predictor of academic achievement in children. Schools may be able to use this predictive power if researchers develop EF measures that not only have ecological and construct validity, but also are also efficient and affordable. To this end, Garcia-Barrera and colleagues (2011) developed a behavior rating scale from items on Behavior Assessment System for Children-Teacher Report (Reynolds & Kamphaus, 1992) to screen children for deficits in EF. It is important to know how well this measure fits and predicts data from young children identified as at risk for behavior disorders because this population is often the focus of prevention and intervention efforts. The present study used confirmatory factor analysis to investigate how well the factor structure of the EF screener fit data from 220 kindergartners at risk for developing behavior disorders. The relationships between EF and academic achievement in math and reading were also examined. The confirmatory factor analysis results indicated adequate model-data fit, but the multiple regression models yielded trivial effect sizes, indicating EF scores did not predict well either kindergarten or first-grade achievement scores when controlling for gender and intelligence scores. The study's limitations and future research needed on the convergence of EF measurements were discussed.

CEFI, WISC-IV, & CAS Implications

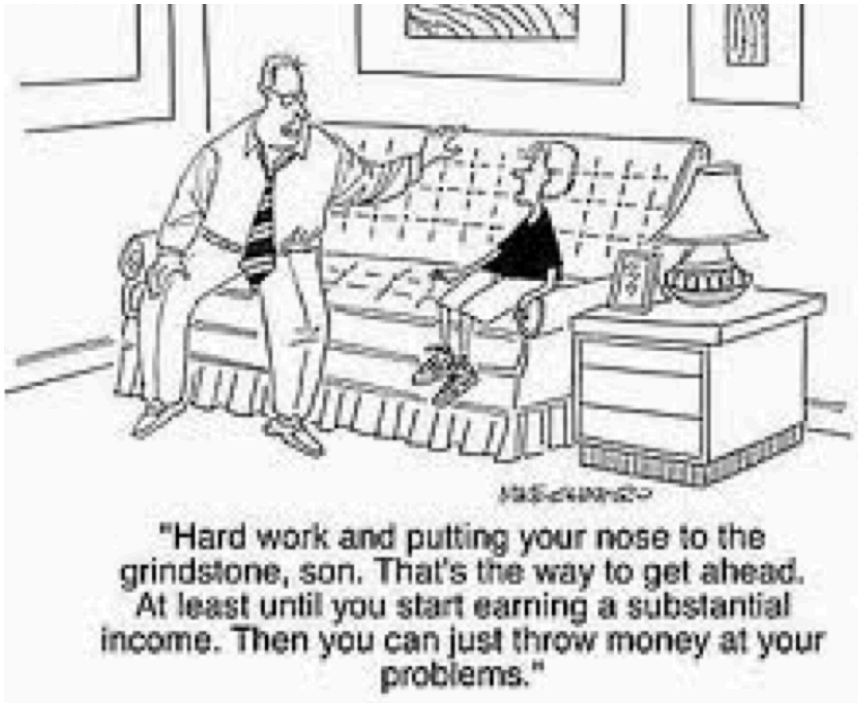
- The relationship between the CEFI and the WISC-IV, CAS, provide evidence of criterion-related validity for the CEFI.
- Only about half of the correlations with WISC-IV were significant.
- All of the four PASS scales from the CAS and the three sub-scales of the WJ III were significantly correlated with the CEFI

CEFI Interpretive Case



Impairment in behaviors associated with EF can have multiple etiologies often operating simultaneously.

Starting with an assessment of EF behaviors defines the real life landscape and can be used as a foundation to than explore etiologies.



Impaired EF Behavior Can Result From

- Lack of ability.
- Lack of knowledge.
- Lack of motivation.
- Internalizing symptoms.
- Externalizing symptoms.
- Poor impulse control.

Barry

- Barry is a 17-year-old, 11th grader with a long standing history of good academic, social and behavioral functioning.
- 5 years ago Barry's parents divorced; his mother remarried. His relationship with his mother is good but inconsistent with his father.
- Over the past year, he became increasingly depressed and socially isolated. The quality of his chool work has declined.
- This past fall he took a number of advanced placement classes, he was also a starter on his high school football team.
  - As the season ended his school work declined precipitously and a long standing relationship with a girlfriend ended.

Barry

- Barry's self-report: Revised Children's Manifest Anxiety Scale = 99th percentile.
- His self-report: Reynolds Adolescent Depression Scale = 96th percentile.
- His Millon profile was characteristic of a youth feeling vulnerable, anxious, misunderstood, unappreciated, angry, depressed and disconnected from others.

Barry

Full Scale			
Standard Score	**90% Confidence Interval**	**Percentile Rank**	**Classification**
70	68-73	2	Below Average

CEFI Scales							
Scale	**Standard Score**	**90% Confidence Interval**	**Percentile Rank**	**Classification**	**Difference from Youth's Average (72.4)**	**Statistically Significant? (p < .10)**	**Executive Function Strength/ Weakness**
Attention	72	68-80	3	Below Average	-0.4	No	-
Emotion Regulation	78	73-88	7	Below Average	5.6	No	-
Flexibility	75	70-87	5	Below Average	2.6	No	-
Inhibitory Control	82	76-91	12	Low Average	9.6	Yes	-
Initiation	68	64-79	2	Well Below Average	-4.4	No	-
Organization	76	71-85	5	Below Average	3.6	No	-
Planning	62	58-71	1	Well Below Average	-10.4	Yes	Weakness
Self-Monitoring	62	59-74	1	Well Below Average	-10.4	Yes	Weakness
Working Memory	77	72-87	6	Below Average	4.6	No	-

Barry

Scores	
Consistency Index	Standard Score = 110 Inconsistent response style is not indicated.
Negative Impression Scale	Standard Score = 72 Negative impression response style is indicated.
Positive Impression Scale	Standard Score = 128 Positive impression response style is not indicated.
Number of Omitted Items	Number of Items Omitted = 0 None of the items were omitted.

Barry

CEFI Scales

Note: For the CEFI Scales, item scores that are substantially above the average are indicated by a lightly shaded cell (i.e.,), and those substantially below the average rating are in a darker cell (i.e.,).

Attention	
Item	**Score**
3. finish a boring task?	1
11. work well in a noisy environment?	2
21. work well for a long time?	2
25. concentrate while reading?	1
36. stay on topic when talking?	2
44. pay attention for a long time?	2
56. concentrate?	1
62. pay attention during a boring task?	1
75. get distracted? (R)	1
80. pay attention to details?	1
91. listen closely to instructions?	2
97. focus on one thing?	0

Emotion Regulation	
Item	**Score**
10. control emotions when under stress?	1
12. stay calm when handling small problems?	2
42. find it hard to control his/her emotions? (R)	1
47. get upset when plans were changed? (R)	3
64. wait patiently?	3
68. become upset in new situations? (R)	3
73. respond calmly to delays?	2
79. react well to surprises?	2
81. react with the right level of emotion?	1

Barry

CEFI Scales

Note: For the CEFI Scales, item scores that are substantially above the average are indicated by a lightly shaded cell (i.e.,), and those substantially below the average rating are in a darker cell (i.e.,).

Attention	
Item	**Score**
3. finish a boring task?	1
11. work well in a noisy environment?	2
21. work well for a long time?	2
25. concentrate while reading?	1
36. stay on topic when talking?	2
44. pay attention for a long time?	2
56. concentrate?	1
62. pay attention during a boring task?	1
75. get distracted? (R)	1
80. pay attention to details?	1
91. listen closely to instructions?	2
97. focus on one thing?	0

Emotion Regulation	
Item	**Score**
10. control emotions when under stress?	1
12. stay calm when handling small problems?	2
42. find it hard to control his/her emotions? (R)	1
47. get upset when plans were changed? (R)	3
64. wait patiently?	3
68. become upset in new situations? (R)	3
73. respond calmly to delays?	2
79. react well to surprises?	2
81. react with the right level of emotion?	1

Barry

Flexibility	
Item	**Score**
7. come up with a new way to reach a goal?	0
41. come up with different ways to solve problems?	1
45. have many ideas about how to do things?	1
60. change his/her behavior as needed?	3
67. solve a problem in different ways?	1
88. use the same strategy even when it didn't work? (R)	4
99. accept a different way of doing things?	1

Inhibitory Control	
Item	**Score**
1. think before acting?	2
19. find it hard to control his/her actions? (R)	2
32. think of the consequences before acting?	1
38. maintain self-control?	1
49. have trouble waiting to get what he/she wanted? (R)	4
70. keep a commitment?	2
74. have trouble waiting his/her turn? (R)	4
92. keep a promise?	3
96. respond thoughtfully?	2
98. complete a task that took a long time?	2

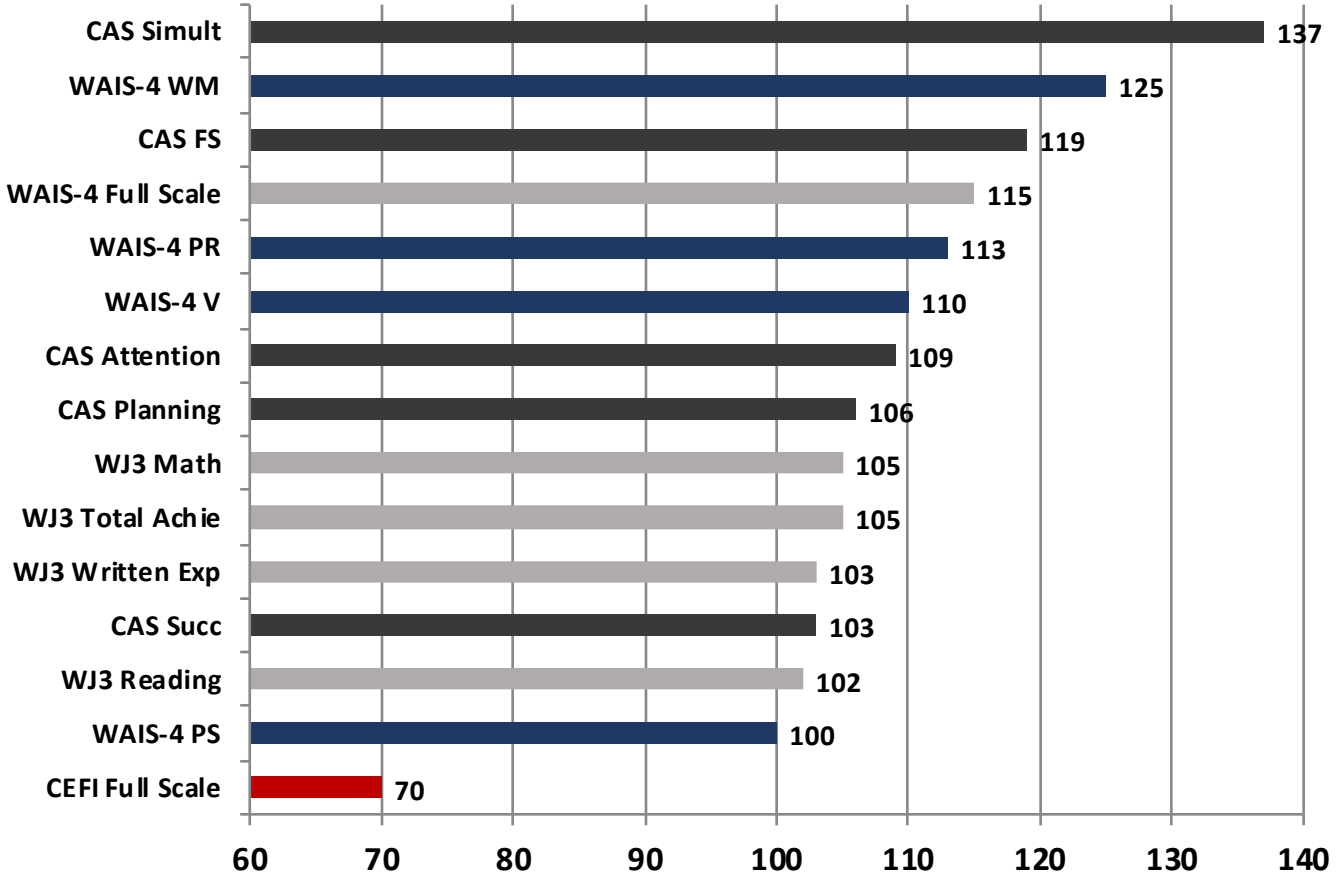
Initiation	
Item	**Score**
16. start something without being asked?	1
30. start conversations?	2
39. take on new projects?	0
40. need others to tell him/her to get started on things? (R)	2

Planning	
Item	**Score**
9. prepare for school or work?	1
15. solve problems creatively?	1
22. do things in the right order?	2
28. plan for future events?	0
35. find a strategy that worked?	1
50. know what to do first?	1
59. show bad judgment when making decisions? (R)	1
71. have trouble solving problems? (R)	2
86. think through his/her decisions?	1
90. plan ahead?	1
100. make good decisions?	1

Self-Monitoring	
Item	**Score**
6. ask for help when needed?	1
14. fix his/her mistakes?	1
17. change a plan that was not working?	1
29. learn from past mistakes?	1
37. keep track of time?	1
48. arrive late? (R)	1
53. notice his/her mistakes?	2
69. make careless errors? (R)	2
82. know when a task was completed?	1
94. make a lot of mistakes? (R)	1

Working Memory	
Item	**Score**

Barry's CEFI, Ability, Achievement



Barry

Making Instructions Easier to Process

- Make sure you have the child's attention.
- Provide both oral and written instructions.
- Give one instruction at a time and then repeat the instructions to the child, if necessary.
- Have the child repeat back the instructions to confirm that he/she understands what to do.

Structuring the Environment to Improve Attention

- Be clear and concise when discussing behavior changes with the child. Avoid lengthy discussions of problematic behaviors.
- Develop a strategy and an action plan for how the child can increase positive attention from others.
- Seat the child at the front of the class near the teacher.
- Avoid open concept classroom layouts. A more enclosed, traditional classroom environment reduces distractions.
- Modify a student's schedule so that more demanding classes are taught earlier in the day.
- Schedule activities and courses in a way that maximizes the attention of the child by alternating tasks that require a lot of attention (instruction classes) with other activities (physical activity) and breaks. It is best if the schedule is predictable so that the child has consistency.
- Suggest strategies for reducing distractions and sensory stimulation, such as using headphones or earplugs.
- Provide only those materials that are necessary for the task and model this practice so that the child will learn to focus and use only what is needed to complete his/her work.
- Assign a job or task during large group activities or when the child needs to be patient for his/her turn, to keep the child engaged throughout the activity.
- Provide the child with activities to do (e.g., organized sports, volunteering) during unstructured free time (recess, lunch, breaks).
- Decrease workload (e.g., break tasks up into smaller, more manageable tasks) so that it aligns with a child's attention level and abilities. Increase workload as the child gains a greater attention span.
- Reduce the length of assignments to emphasize quality over quantity of work.
- Accommodate regular breaks during tasks that allow the child to get out of his/her seat and move around.
- Allow extra time on assignments, quizzes and tests.

Barry

Intervention Strategies

This section provides intervention strategies for improving upon the weaknesses identified by *Low Average* to *Well Below Average* scores on the CEFI Scales. References for the sources of these strategies are provided at the end of the Intervention Strategies section. (See *CEFI Items by Scale* for a full list of items with below average scores for item-level indicators of specific weaknesses.)

Framework for Implementing Intervention Strategies

The material on this page provides a general framework to follow when implementing the various specific intervention strategies for the behaviors measured in the CEFI that may appear on subsequent pages of this report.

General Developmental Issues

- A child's developmental level should be taken into account when planning intervention strategies.
- Utilize intervention strategies that initially include external controls, prompts and cues to help the child learn and develop new skills.
- Gradually remove external controls to promote internalization of new behaviors and explicitly encourage children to develop and use their own strategies.
- Encourage the child by explicitly communicating that change is possible with effort and motivation to achieve.
- Carefully consider strategies to enhance generalization of new skills, across tasks, time, and settings.

External Support

- Structure the environment (e.g., cues, prompts), including the child's schedule (e.g., create a consistent routine with breaks and extra time for tasks) until internal control of behavior is mastered.
- Provide lists and charts that give specific suggestions for how to accomplish tasks and activities.
- Encourage children to develop their own solutions to getting things done.

Motivation

Barry

Intervention Strategies for Initiation

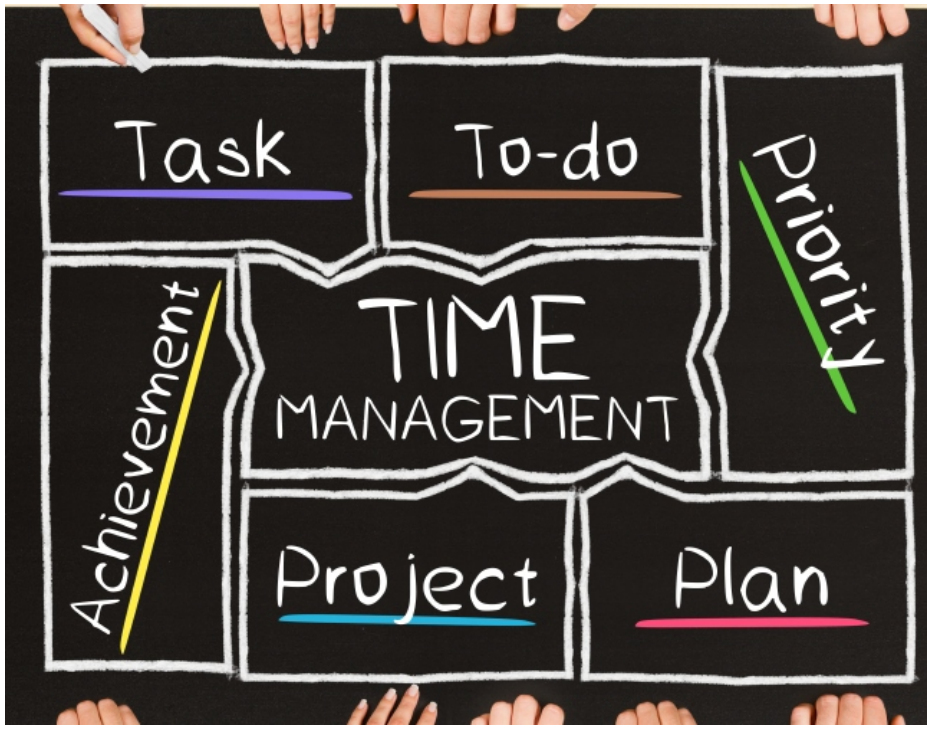
Helping Children Learn to Initiate Behaviors

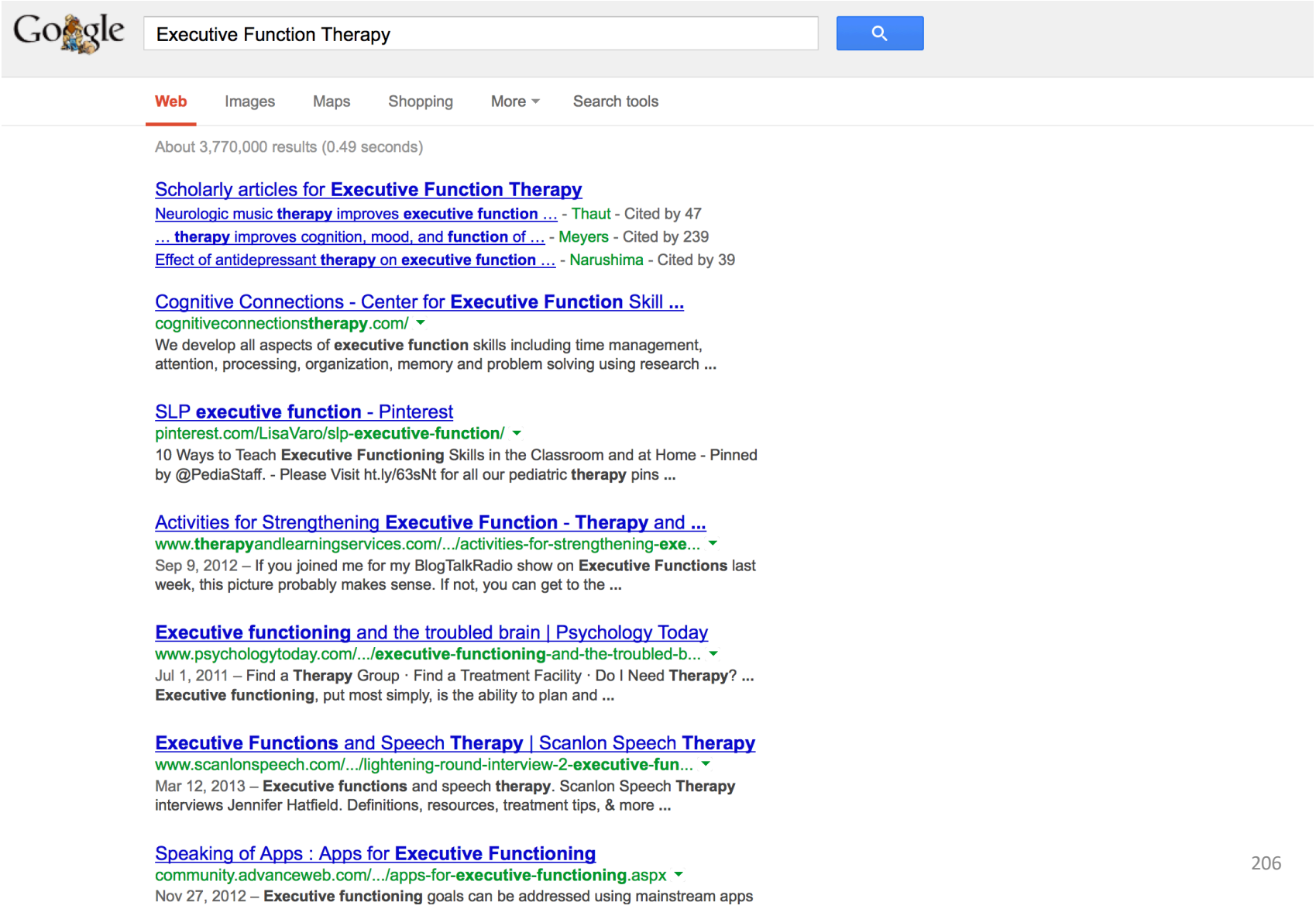
- Create routines for the child that address tasks or activities that he/she has difficulty initiating. For example, develop a bedtime routine that helps the child initiate activities associated with preparing to go to bed.
- Start tasks early to give the child enough time to overcome difficulties with initiation.
- Reduce time constraints that might discourage the child from starting an activity or task.
- Create cues that a child can use without the presence of others. For instance, record verbal cues, set an alarm, or use reminder setting on cell phones that prompt a child to begin a task (e.g., homework). Avoid excessive use of cues for improving a child's initiation behaviors; however, as this can be perceived as nagging and can cause the child to avoid initiating a given task.
- Use a series of cognitive exercises that move the child from thinking to planning to verbally talking through what they will do to start a task.
- Employ errorless learning techniques to teach the child how to initiate tasks and activities. Errorless learning involves immediately providing the correct answer. Future errors of the same kind are followed by nonjudgmental corrective feedback.
- Monitor a child's progress once a task is initiated to ensure that it gets completed.

Barry: Conclusions

- Barry's depression has a significant influence on what he does and how he performs on a daily basis
- Barry is intellectually capable (WAIS and CAS) and good in Planning and Attention on the CAS, but his behavior reflects poor application of those neurocognitive abilities

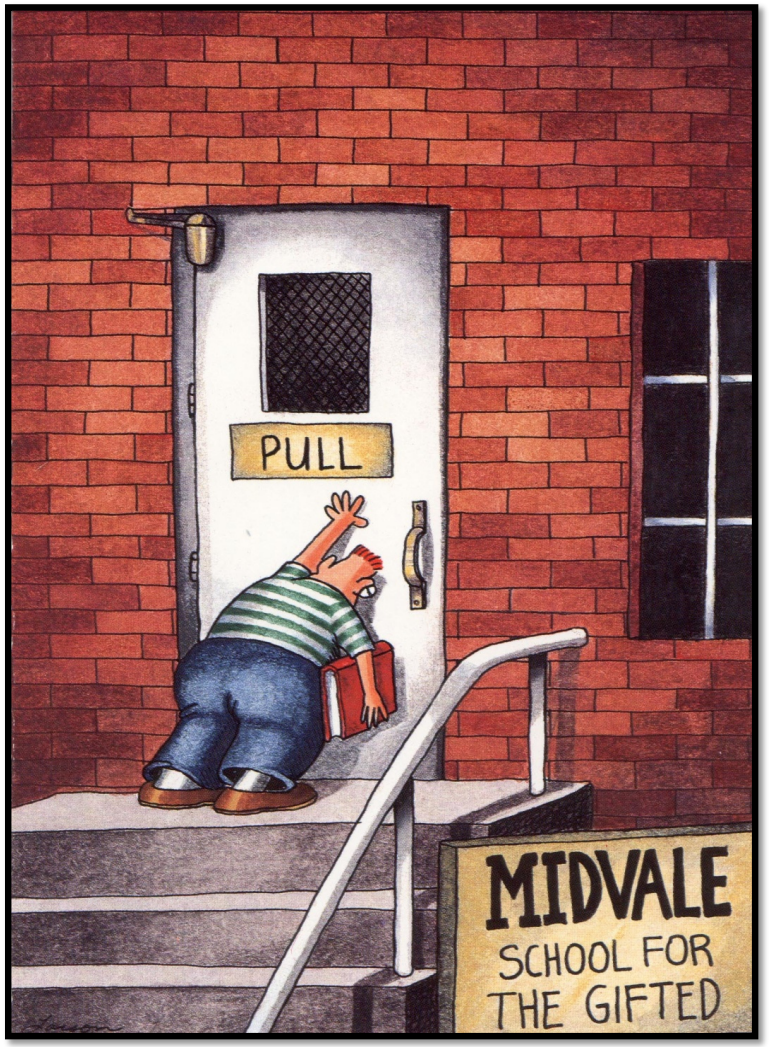
Can EF be taught, improved, developed or strengthened?




Google
Executive Function Therapy
Web
Images
Maps
Shopping
More
Search tools
About 3,770,000 results (0.49 seconds)
Scholarly articles for Executive Function Therapy
Neurologic music therapy improves executive function ... - Thaut - Cited by 47
... therapy improves cognition, mood, and function of ... - Meyers - Cited by 239
Effect of antidepressant therapy on executive function ... - Narushima - Cited by 39
Cognitive Connections - Center for Executive Function Skill ...
cognitiveconnectionstherapy.com/
We develop all aspects of executive function skills including time management, attention, processing, organization, memory and problem solving using research ...
SLP executive function - Pinterest
pinterest.com/LisaVaro/slp-executive-function/
10 Ways to Teach Executive Functioning Skills in the Classroom and at Home - Pinned by @PediaStaff. - Please Visit ht.ly/63sNt for all our pediatric therapy pins ...
Activities for Strengthening Executive Function - Therapy and ...
www.therapyandlearningservices.com/.../activities-for-strengthening-exe...
Sep 9, 2012 – If you joined me for my BlogTalkRadio show on Executive Functions last week, this picture probably makes sense. If not, you can get to the ...
Executive functioning and the troubled brain | Psychology Today
www.psychologytoday.com/.../executive-functioning-and-the-troubled-b...
Jul 1, 2011 – Find a Therapy Group · Find a Treatment Facility · Do I Need Therapy? ... Executive functioning, put most simply, is the ability to plan and ...
Executive Functions and Speech Therapy | Scanlon Speech Therapy
www.scanlonspeech.com/.../lightening-round-interview-2-executive-fun...
Mar 12, 2013 – Executive functions and speech therapy. Scanlon Speech Therapy interviews Jennifer Hatfield. Definitions, resources, treatment tips, & more ...
Speaking of Apps : Apps for Executive Functioning
community.advanceweb.com/.../apps-for-executive-functioning.aspx
Nov 27, 2012 – Executive functioning goals can be addressed using mainstream apps

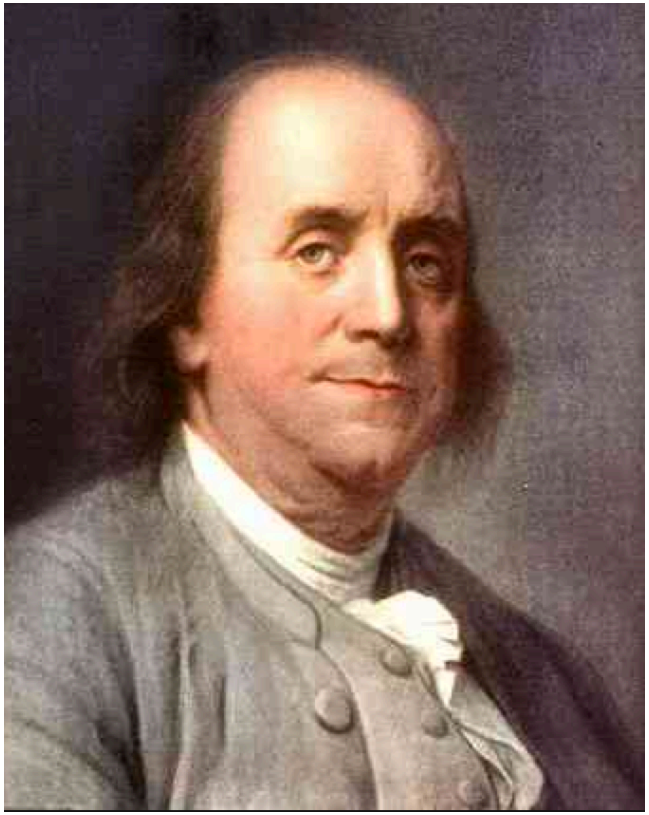
Poor EF

How do we help this student … at the school for the gifted?



Tell me and I forget. Teach me and I remember. Involve me and I learn.

Benjamin Franklin



Can strategic, instructional interventions provide remedial and compensatory support for children with EF deficits?

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.

JOURNAL OF LEARNING DISABILITIES
VOLUME 33, NUMBER 6, NOVEMBER/DECEMBER 2000, PAGES 591–597

Effectiveness of a Cognitive Strategy Intervention in Improving Arithmetic Computation Based on the PASS Theory

Jack A. Naglieri and Deanne Johnson

Abstract

The purpose of this study was to determine if an instruction designed to facilitate planning, given by teachers to their class as a group, would have differential effects depending on the specific Planning, Attention, Simultaneous, Successive (PASS) cognitive characteristics of each child. A cognitive strategy instruction that encouraged planning was provided to the group of 19 students with learning disabilities and mild mental impairments. All students completed math worksheets during 7 baseline and 14 intervention sessions. During the intervention phase, students engaged in self-reflection and verbalization of strategies about how the arithmetic computation worksheets should be completed. The sample was sorted into one experimental and four contrast groups after the experiment was completed. There were four groups with a cognitive weakness in each PASS scale from the Cognitive Assessment System and one group with no cognitive weakness. The results showed that children with a cognitive weakness in Planning improved considerably (large effect size of 1.4), in contrast to those with a cognitive weakness in Attention (small effect size of 0.3), Simultaneous weakness (a slight deterioration and effect size of -0.2), Successive weakness (medium effect size of 0.4), and no cognitive weakness (small effect size of .2). These data showed that children with a Planning weakness benefitted from the instruction designed to help them be more plaful. Those childrne who received the planning-based instruction who were not low inplanning did not show the same level of improvement.

Children with PASS Profiles

- 21 children with LD and mild mental impairments
- Teachers followed Planning Facilitation method described by Naglieri and Gottling (1997, 1997)
- Students were given instruction that facilitated the use of Planning

Planning Facilitation in Math -

Naglieri & Gottling (1997)

- Students were encouraged to
  - determine how they did the pages
  - verbalize and discuss their methods
  - be self-reflective
- Teachers asked questions to facilitate
  - How did you do the problems & why?
  - What will you do next time?
  - What did you notice on this page?

Planning Facilitation in Math -
Naglieri & Gottling (1997)

- Students said:
  - When I get distracted I move my seat
  - I have to remember to borrow
  - I'll do the easy ones first
  - I do them row by row
  - Keep the columns straight
  - Be sure to do them right not just get it done

Illustration of a Math Worksheet Used in this Study.

Name:			Page 1	2	12	5	1	2
Date:				2	12	14	10	3
				+	+	+	+	+
988	98,923		7,344	5	6	3	3	13
- 335	287	-	3,740	5	13	3	5	26
	-							
15	50		154					
X 1	X 2	X	68	5	18	24	25	13
				-	-	-	-	-
				11	1	3	3	5
864	99,979		9,424	11	5	6	3	9
+ 192	+ 241	+	6,430					
83,052	71,085		81,747	9	9	7	7	8
- 44,247	24,408	-	12,688	9	13	11	11	9
	-							
				-	-	-	-	-
				3	10	4	1	4
1304	934		1918	5	14	9	6	7
X 39	X 533	X	767					

Children with PASS Profiles

Naglieri & Johnson (1998)

- Seven 10-minute Baseline sessions
- Fourteen 10-minute Intervention sessions
- Children completed math computation worksheets that came from the curriculum
- Children with a cognitive weakness in each of the PASS areas were identified
- Cognitive Weakness = significant PASS ipsative score *and* the weakness must be a score < 90.

HAMMILL INSTITUTE ON DISABILITIES

Journal of Learning Disabilities
44(2) 184–195

DOI: 10.1177/0022219410391190
http://journaloflearningdisabilities
.sagepub.com
SAGE

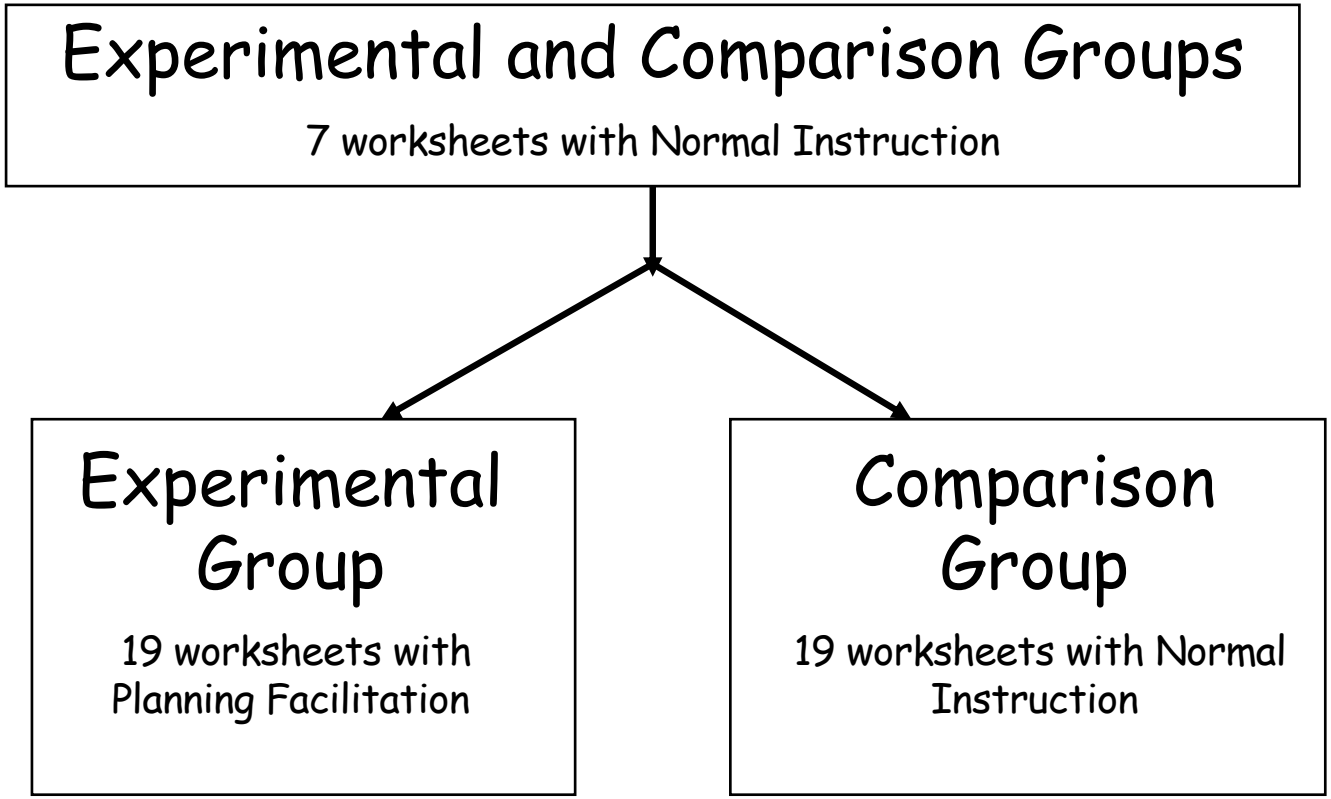
A Cognitive Strategy Instruction to Improve Math Calculation for Children With ADHD and LD: A Randomized Controlled Study

Jackie S. Iseman[1] and Jack A. Naglieri[1]

Abstract

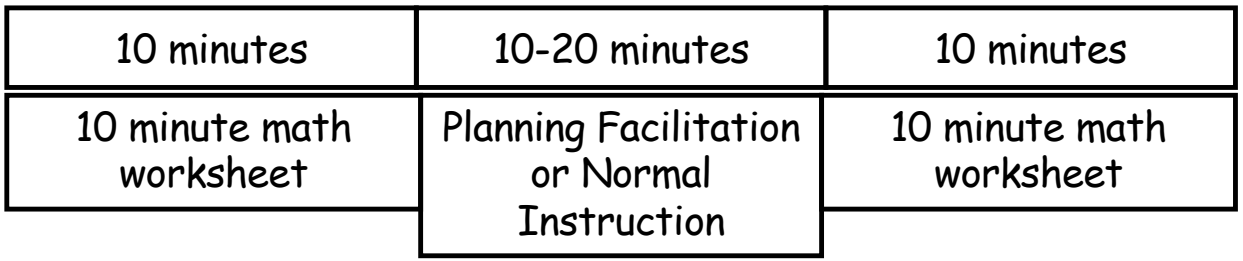
The authors examined the effectiveness of cognitive strategy instruction based on PASS (Planning, Attention, Simultaneous, Successive) given by special education teachers to students with ADHD randomly assigned by classroom. Students in the experimental group were exposed to a brief cognitive strategy instruction for 10 days, which was designed to encourage development and application of effective planning for mathematical computation, whereas the comparison group received-standard math instruction. Standardized tests of cognitive processes and math achievement were given at pretest. All students completed math worksheets throughout the experimental phase. Standardized achievement tests (*Woodcock-Johnson Tests of Achievement, Third Edition*, Math Fluency and *Wechsler Individualized Achievement Test, Second Edition*, Numerical Operations) were administered pre- and postintervention, and Math Fluency was also administered at 1 year follow-up. Large pre–post effect sizes were found for students in the experimental group but not the comparison group on math worksheets (0.85 and 0.26), Math Fluency (1.17 and 0.09), and Numerical Operations (0.40 and –0.14, respectively). At 1 year follow-up, the experimental group continued to outperform the comparison group. These findings suggest that students with ADHD evidenced greater improvement in math worksheets, far transfer to standardized tests of math (which measured the skill of generalizing learned strategies to other similar tasks), and continued advantage 1 year later when provided the PASS-based cognitive strategy instruction.

Design of the Study



Instructional Sessions

- Math lessons were organized into “instructional sessions” delivered over 13 consecutive days
- Each instructional session was 30-40 minutes
- Each instructional session was comprised of three segments as shown below



Normal Instruction and Planning Facilitation Sessions

- Normal Instruction
  - 10 minute math worksheet
  - 10 - 20 of math instruction
  - 10 minute math worksheet
- Planning Facilitation
  - 10 minute math worksheet
  - 10 minutes of planning facilitation
  - 10 minute math worksheet

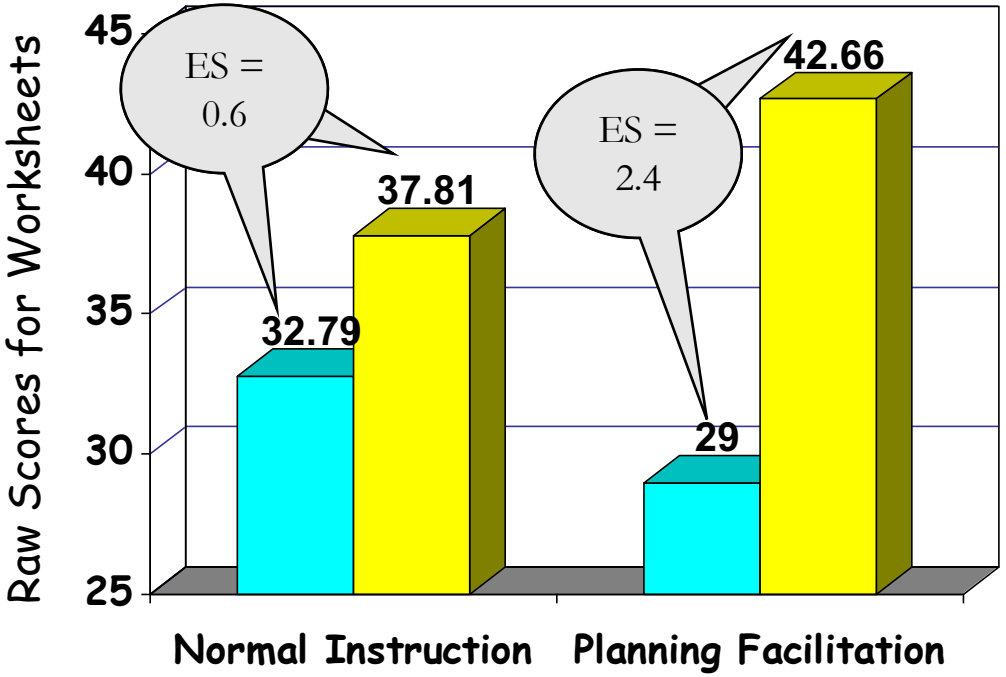
Planning Strategy Instruction

- Teachers facilitated discussions to help students become more self-reflective about use of strategies
- Teachers asked questions like:
  - What was your goal?
  - Where did you start the worksheet?
  - What strategies did you use?
  - How did the strategy help you reach your goal?
  - What will you do again next time?
  - What other strategies will you use next time?

Student Plans

- “My goal was to do all of the easy problems on every page first, then do the others.”
- “I do the problems I know, then I check my work.”
- “I do them (the algebra) by figuring out what I can put in for X to make the problem work.”
- “I did all the problems in the brain-dead zone first.”
- “I try not to fall asleep.”

Worksheet Means and Effect Sizes for the Students with ADHD



Baseline

Intervention

Reminder

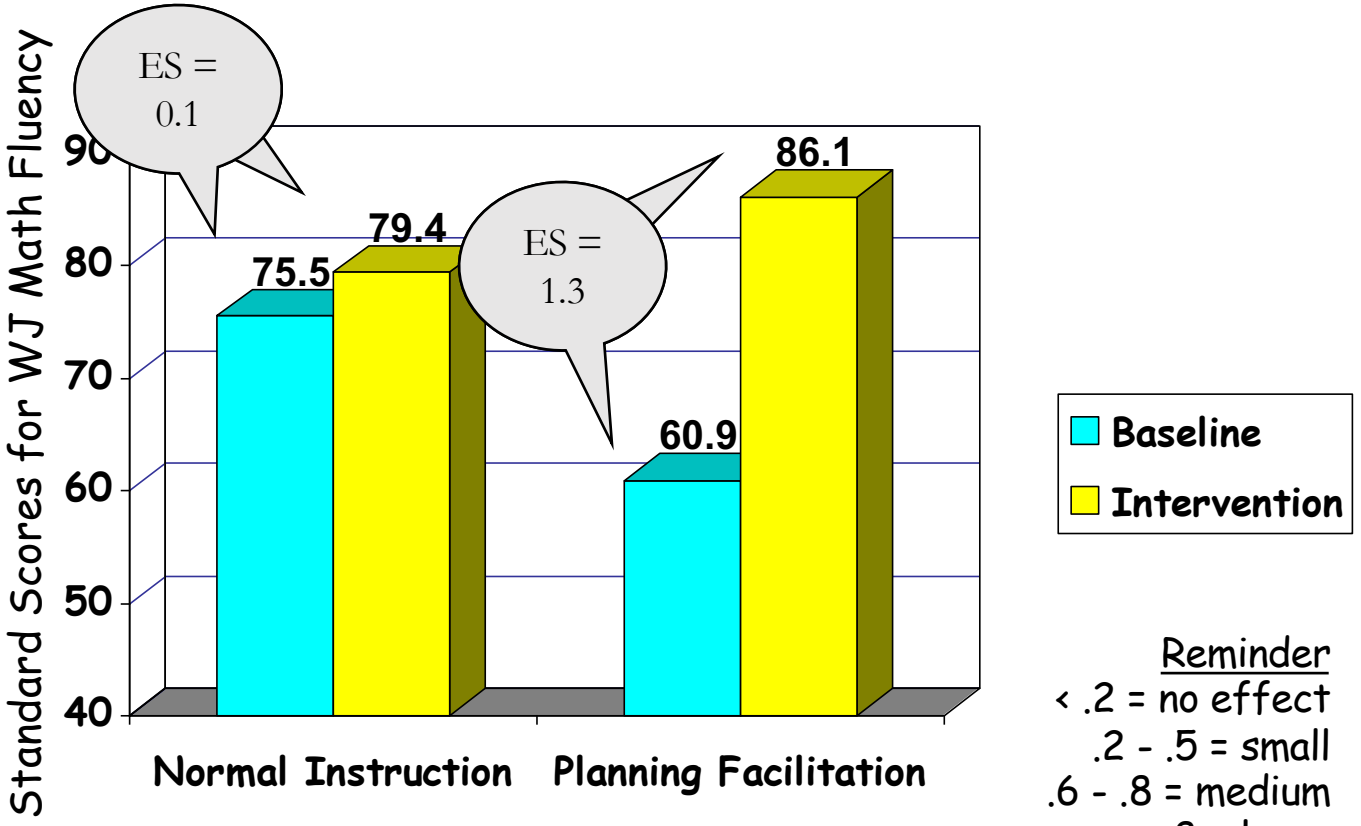
< .2 = no effect

.2 - .5 = small

.6 - .8 = medium

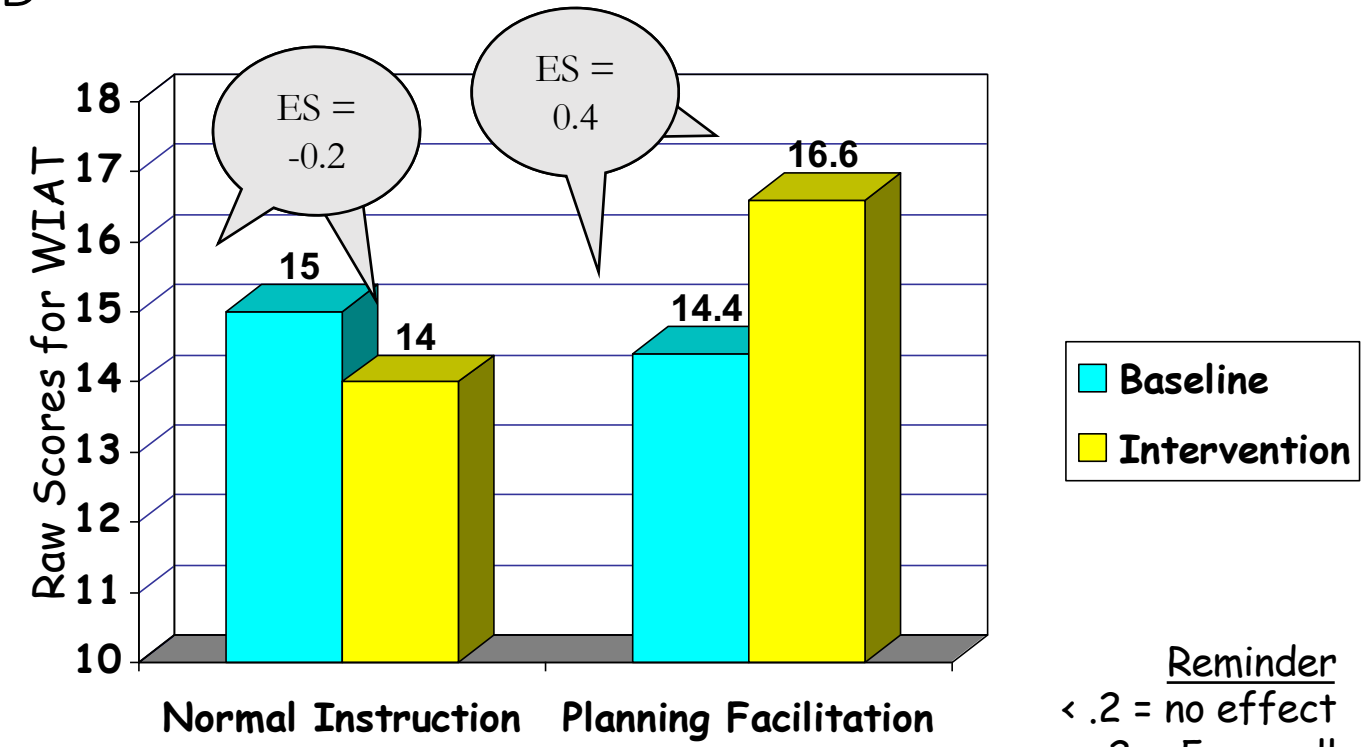
> .8 = large

WJ Math Fluency Means and Effect Sizes for the Students with ADHD



Reminder
< .2 = no effect
.2 - .5 = small
.6 - .8 = medium
> .8 = large

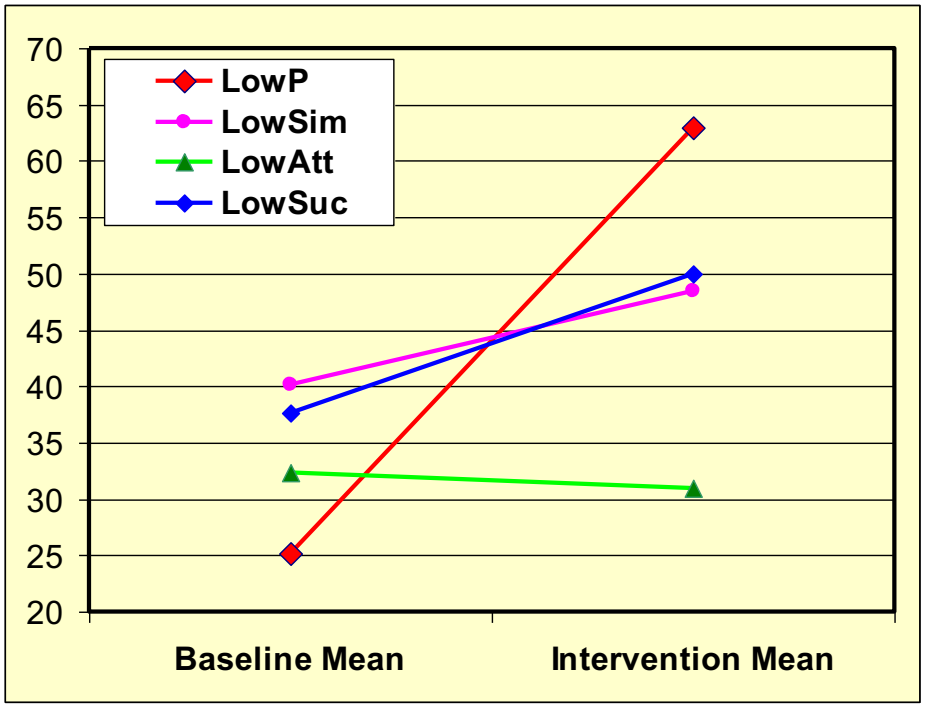
WIAT Numerical Operation Means and Effect Sizes for Students with ADHD



Reminder
< .2 = no effect
.2 - .5 = small
.6 - .8 = medium
> .8 = large

Iseman (2005)

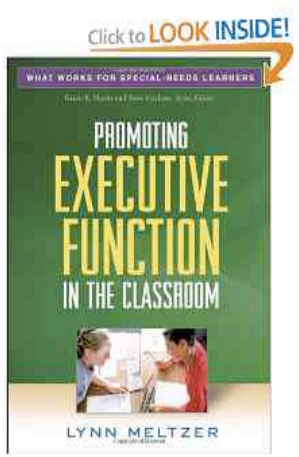
- Baseline Intervention means by PASS profile
- Different response to the same intervention



One Year Follow-up

At 1-year follow-up, 27 of the students were retested on the WJ-III ACH Math Fluency subtest as part of the school's typical yearly evaluation of students. This group included 14 students from the comparison group and 13 students from the experimental group. The results indicated that the improvement of students in the experimental group ($M = 16.08$, $SD = 19$, $d = 0.85$) was significantly greater than the improvement of students in the comparison group ($M = 3.21$, $SD = 18.21$, $d = 0.09$).

EF Instruction



Promoting Executive Function in the Classroom (What Works for Special-Needs Learners) [Paperback]

Lynn Meltzer PhD (Author)

(1 customer review)

List Price: $35.00

Price: $30.45 & this item ships for **FREE with Super Saver Shipping**. Details

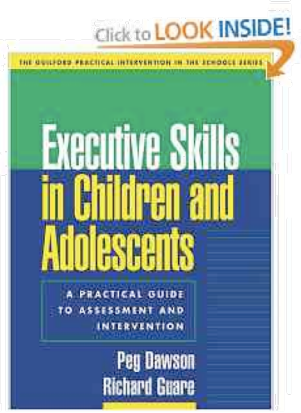
You Save: $4.55 (13%)

In Stock.

Ships from and sold by **Amazon.com**. Gift-wrap available.

Want it delivered Tuesday, November 29? Order it in the next 29 hours and 9 minutes, and choose **One-Day Shipping** at checkout. Details

Ordering for Christmas? To ensure delivery by December 24, choose **FREE Super Saver Shipping** at checkout. Read more about holiday shipping.



Executive Skills in Children and Adolescents: A Practical Guide to Assessment and Intervention (The Guilford Practical Intervention in Schools Series) [Paperback]

Peg Dawson EdD (Author), Richard Guare Phd (Author)

(9 customer reviews)

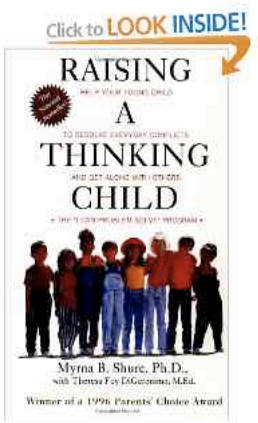
Available from these sellers.

9 new from $49.45 **23 used** from $37.50

FREE Two-Day Shipping for Students. Learn more

Book **Sell Back Your Copy for $20.50** Used Price $37.50

Cognitive Strategy = EF Instruction



Raising a Thinking Child: Help Your Young Child to Resolve Everyday Conflicts and Get Along with Others [Paperback]

Myrna Shure (Author), Theresa Foy DiGeronimo (Author)

(10 customer reviews) |

List Price: $14.99

Price: $10.11 & eligible for **FREE Super Saver Shipping** on orders over $25. Details

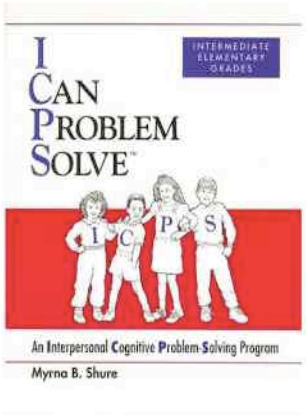
You Save: $4.88 (33%)

In Stock.

Ships from and sold by **Amazon.com**. Gift-wrap available.

Want it delivered Tuesday, November 29? Order it in the next 28 hours and 4 minutes, and choose **One-Day Shipping** at checkout. Details

Ordering for Christmas? To ensure delivery by December 24, choose **FREE Super Saver Shipping** at checkout. Read more about holiday shipping.



See larger image

I Can Problem Solve: An Interpersonal Cognitive Problem-Solving Program : Intermediate Elementary Grades [Paperback]

Myrna B. Shure (Author)

(6 customer reviews) |

List Price: $41.95

Price: $34.11 & this item ships for **FREE with Super Saver Shipping**. Details

You Save: $7.84 (19%)

In Stock.

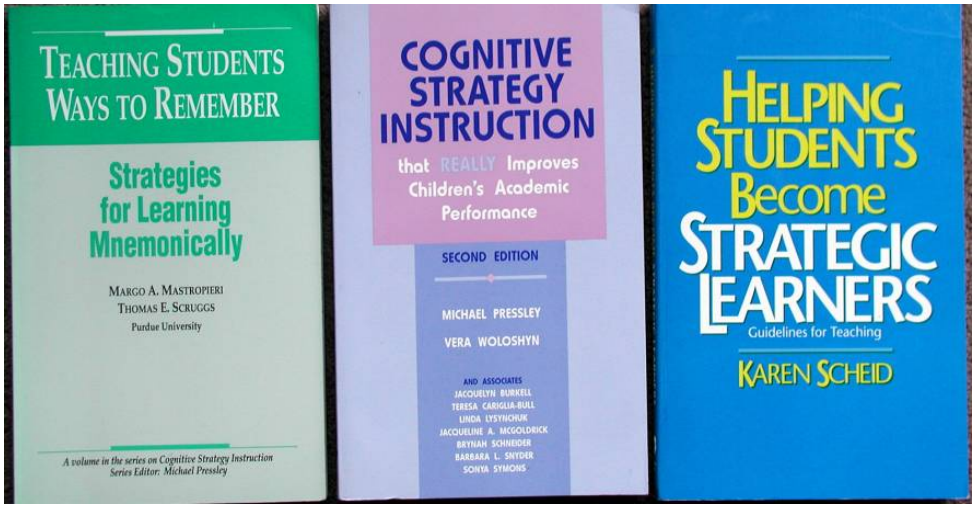
Ships from and sold by **Amazon.com**. Gift-wrap available.

Only 19 left in stock--order soon (more on the way).

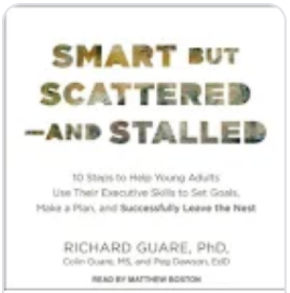
Want it delivered Tuesday, November 29? Order it in the next 28 hours and 34 minutes, and choose **One-Day Shipping** at checkout. Details

Ordering for Christmas? To ensure delivery by December 24, choose **FREE Super Saver Shipping** at checkout. Read more about holiday shipping.

Cognitive Instructional Methods

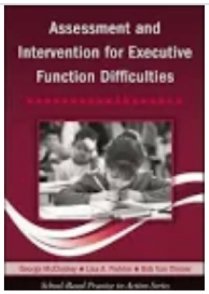


Executive Functioning Lessons and...



Smart but Scattered - and Stalled -...

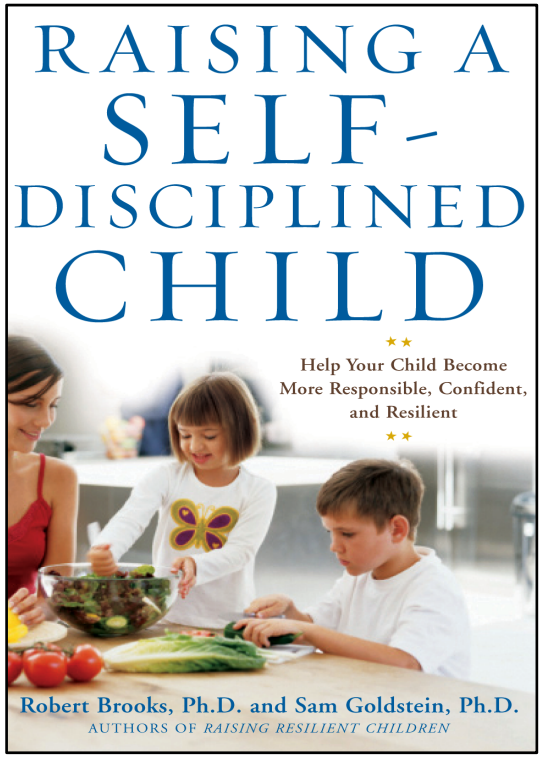
Executive Functioning Advanced...



Assessment And Intervention F...

15 Working Memory Brain Games: Impro...

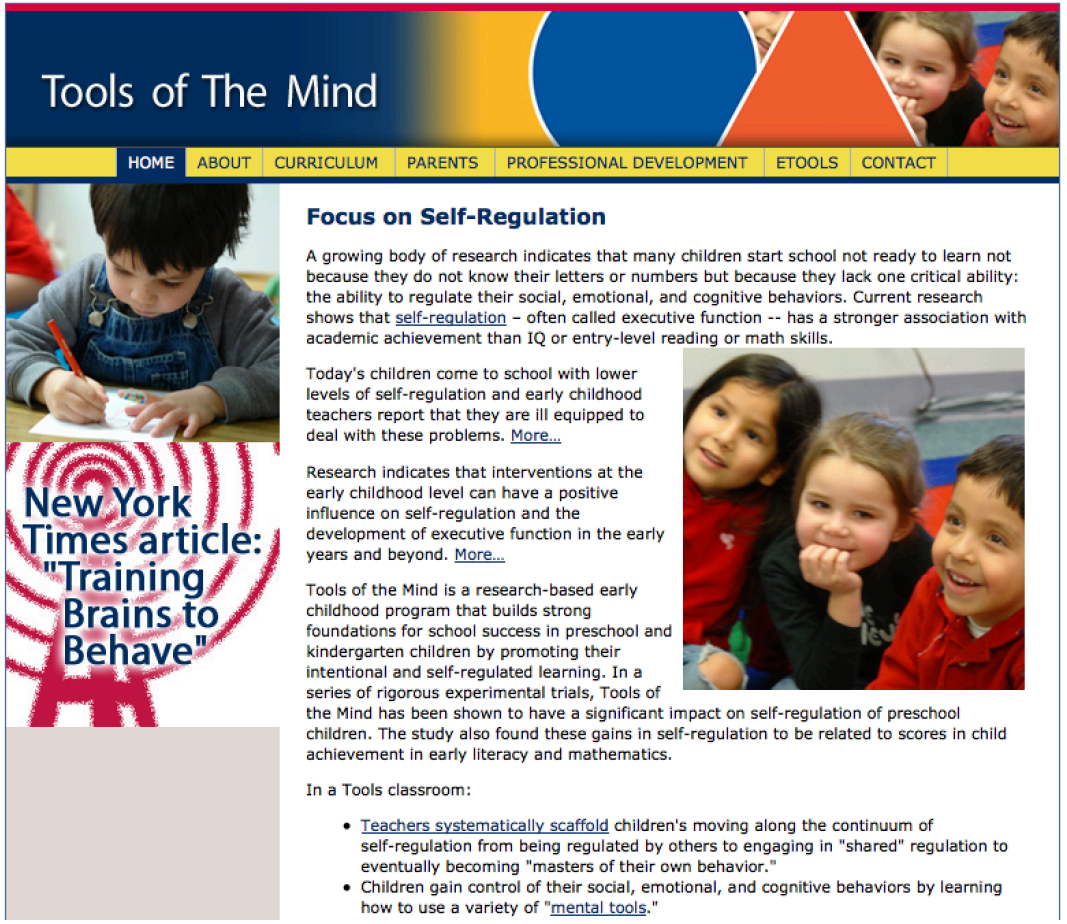
Self-Discipline = EF



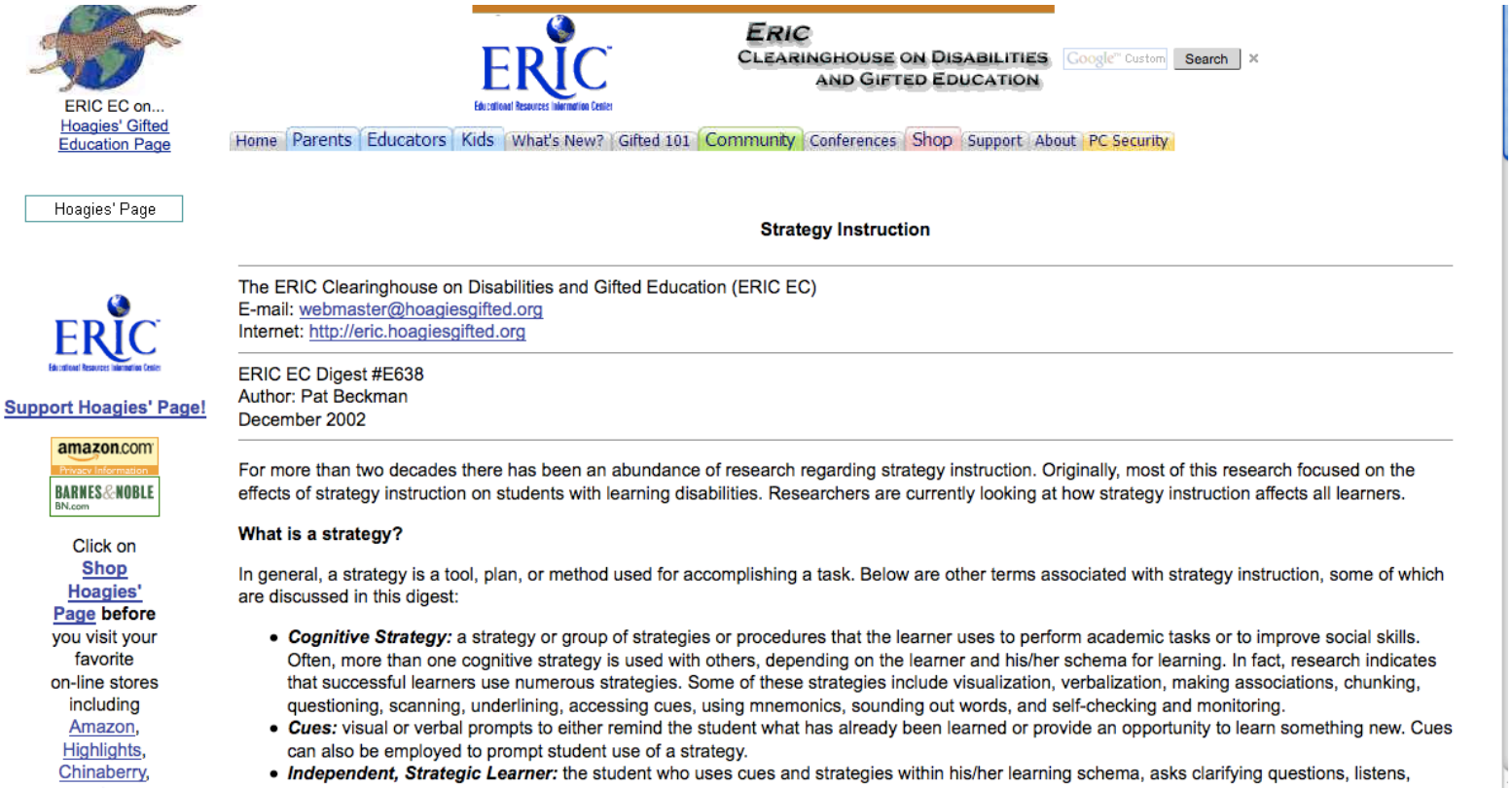
My Granddaughter Hones Her EF Skills

Practice Pays Off!

Tools of the Mind



http://www.hoagiesgifted.org/eric/e638.html



ERIC EC on...
Hoagies' Gifted Education Page

Hoagies' Page

Support Hoagies' Page!

Click on Shop Hoagies' Page before you visit your favorite on-line stores including Amazon, Highlights, Chinaberry,

ERIC Clearinghouse on Disabilities and Gifted Education

Search

Home | Parents | Educators | Kids | What's New? | Gifted 101 | Community | Conferences | Shop | Support | About | PC Security

Strategy Instruction

The ERIC Clearinghouse on Disabilities and Gifted Education (ERIC EC)
E-mail: webmaster@hoagiesgifted.org
Internet: http://eric.hoagiesgifted.org

ERIC EC Digest #E638
Author: Pat Beckman
December 2002

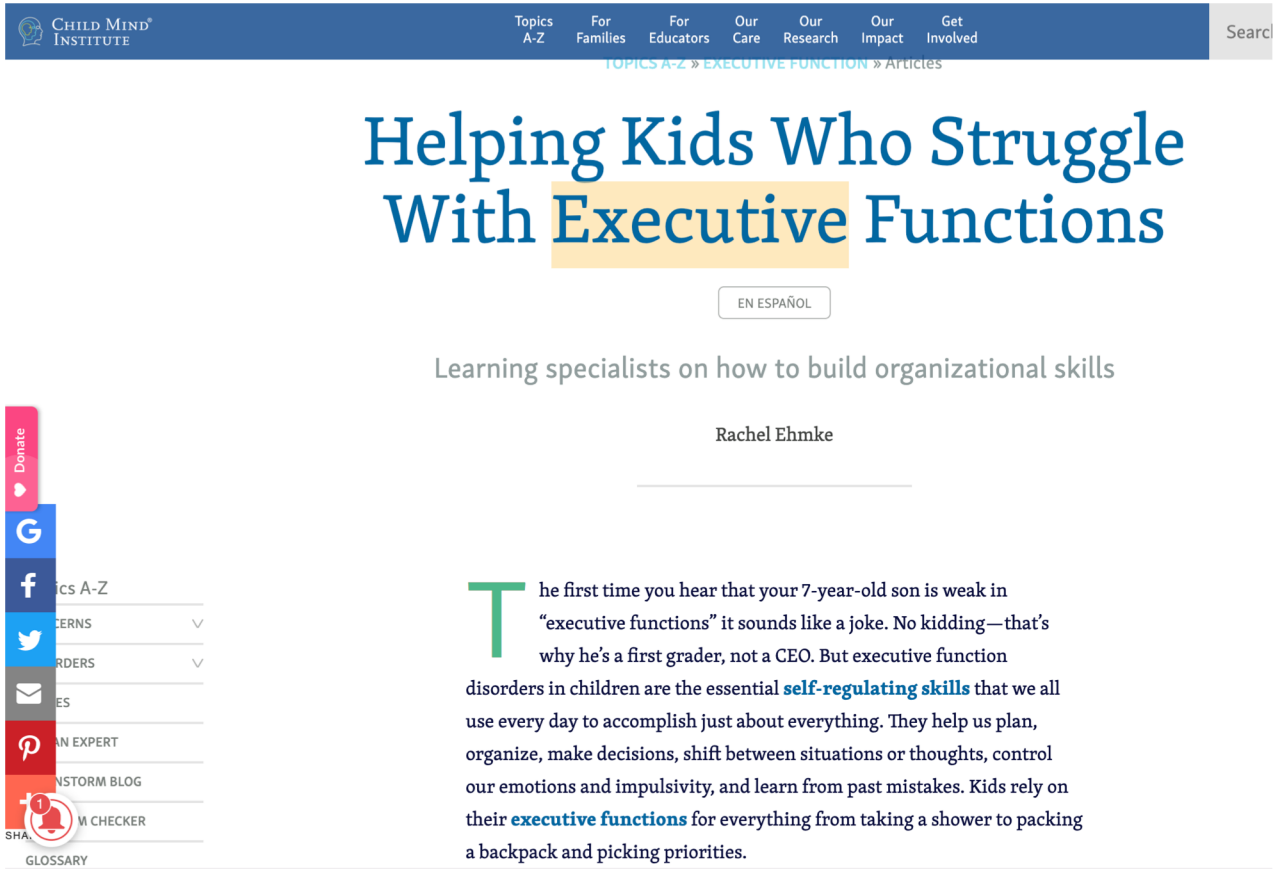
For more than two decades there has been an abundance of research regarding strategy instruction. Originally, most of this research focused on the effects of strategy instruction on students with learning disabilities. Researchers are currently looking at how strategy instruction affects all learners.

What is a strategy?

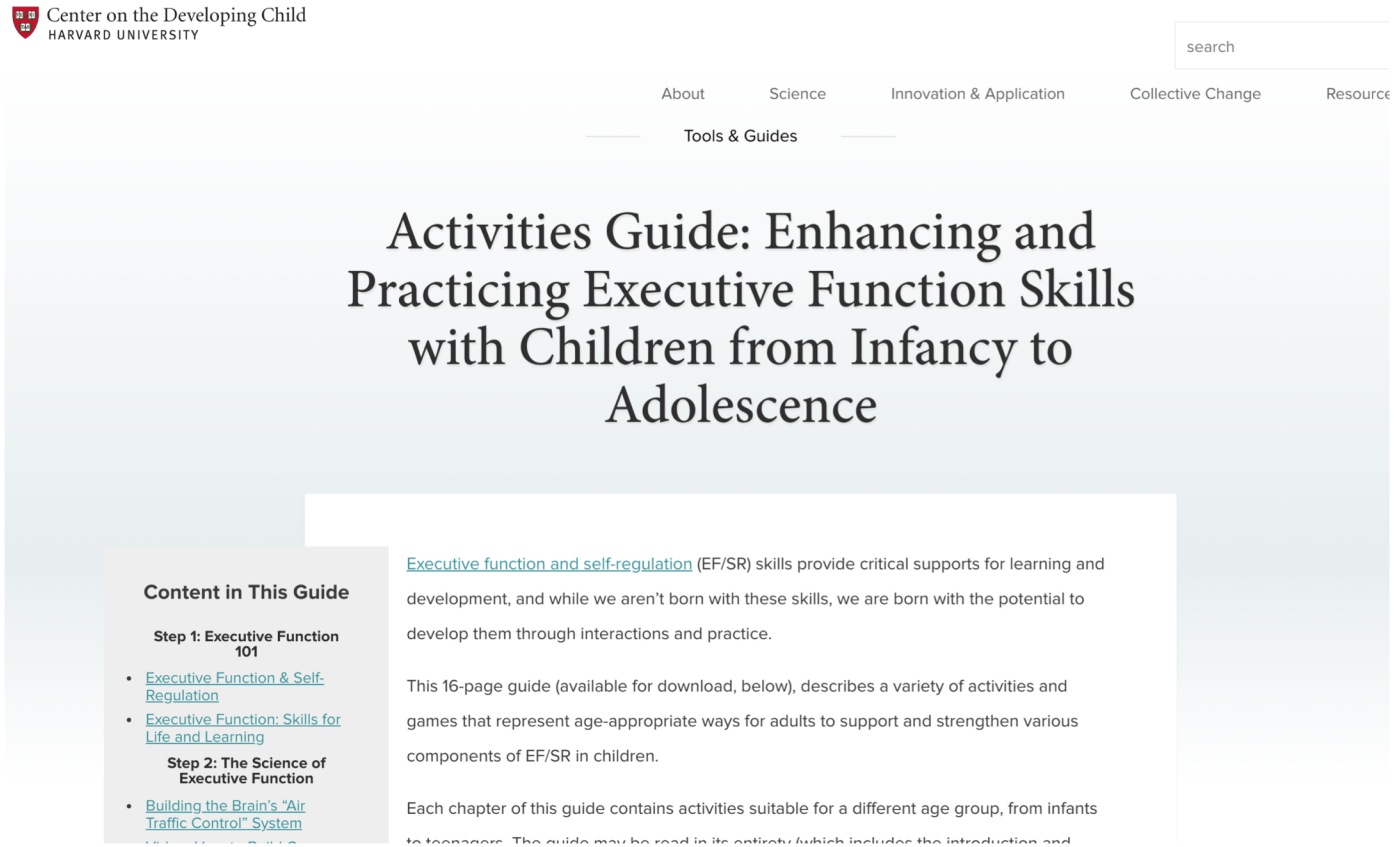
In general, a strategy is a tool, plan, or method used for accomplishing a task. Below are other terms associated with strategy instruction, some of which are discussed in this digest:

- ***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 his/her schema for learning. In fact, research indicates that successful learners use numerous strategies. Some of these strategies include visualization, verbalization, making associations, chunking, questioning, scanning, underlining, accessing cues, using mnemonics, sounding out words, and self-checking and monitoring.
- ***Cues:*** visual or verbal prompts to either remind the student what has already been learned or provide an opportunity to learn something new. Cues can also be employed to prompt student use of a strategy.
- ***Independent, Strategic Learner:*** the student who uses cues and strategies within his/her learning schema, asks clarifying questions, listens,

https://childmind.org/article/helping-kids-who-struggle-with-executive-functions/



https://developingchild.harvard.edu/resources/activities-guide-enhancing-and-practicing-executive-function-skills-with-children-from-infancy-to-adolescence/



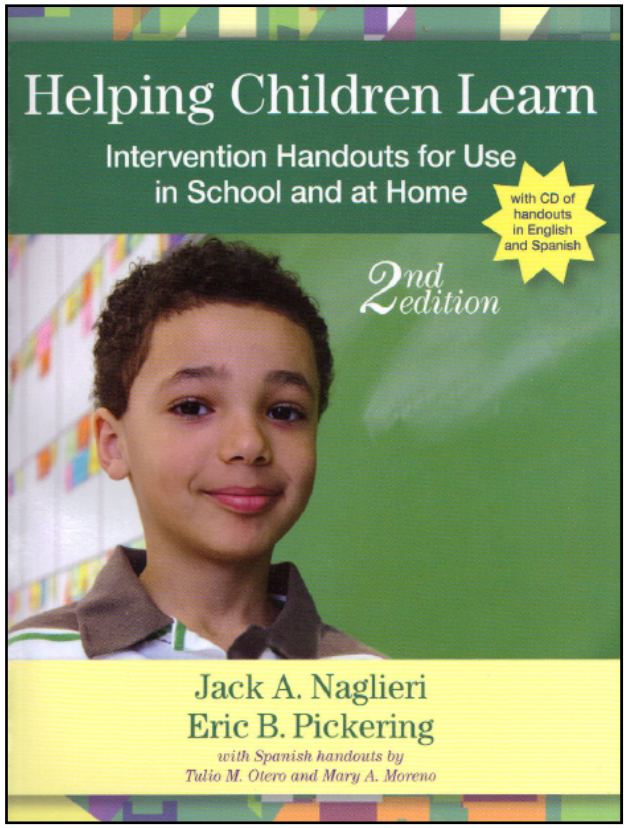
https://www.understood.org/en/school-learning/partnering-with-childs-school/instructional-strategies/at-a-glance-classroom-accommodations-for-executive-functioning-issues

http://nichcy.org/research/ee/learning-strategies

http://www.ncld.org/at-school/especially-for-teachers/effective-teaching-practices/strategic-instruction-model-sim-how-to-teach-how-to-learn

Teaching Children to use EF

- Helping Children Learn Intervention Handouts for Use in School and at Home, *Second Edition*
  By Jack A. Naglieri, Ph.D., & Eric B. Pickering, Ph.D.,
- Spanish handouts by Tulio Otero, Ph.D., & Mary Moreno, Ph.D.

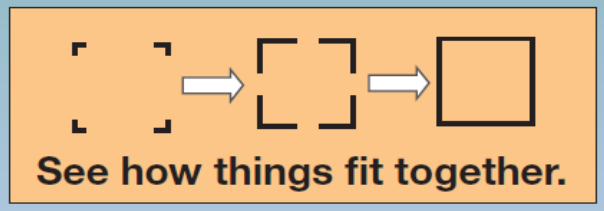


Four Ways to Think Smart!

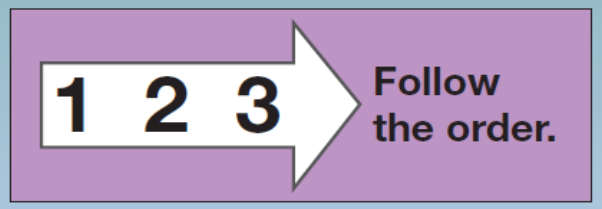
Think smart and use a plan!

Think smart and look at the details!

Think smart and put the pieces together!



Think smart and follow the sequence!



Copyright © 2010 by Jack A. Naglieri

Talk with Students

How to Be Smart: Planning

When we say people are smart, we usually mean that they know a lot of information. But being smart also means that someone has a lot of ability to learn new things. Being smart at learning new things includes knowing and using your *thinking abilities*. There are ways you can use your abilities *better* when you are learning.

What Does Being Smart Mean?

One ability that is very important is called *Planning*. The ability to *plan* helps you figure out *how to do things*. When you don't know how to solve a problem, using Planning ability will help you figure out how to do it. This ability also helps you control what you think and do. It helps you to stop before doing something you shouldn't do. Planning ability is what helps you wait until the time is right to act. It also helps you make good decisions about what to say and what to do.

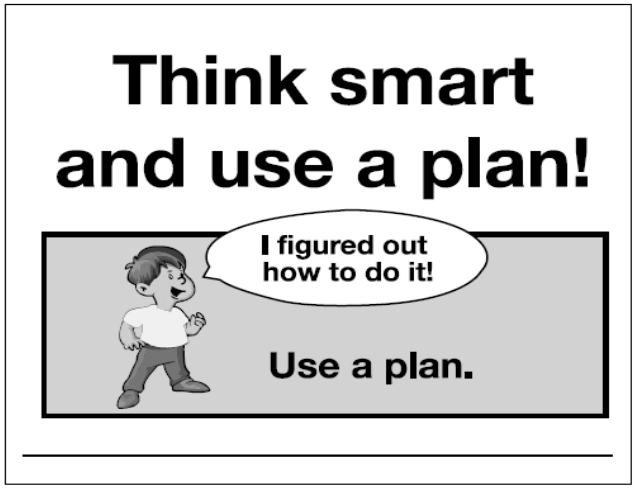
Talk with Students

How Can You Be Smarter?

You can be smarter if you PLAN before doing things. Sometimes people say, "Look before you leap," "Plan your work and work your plan," or "Stop and think." These sayings are about using the ability to plan. When you stop and think about *how* to study, you are using your ability to plan.

You will be able to do more if you remember to use a plan. An easy way to remember to use a plan is to look at the picture "Think smart and use a plan!" (Figure 1). You should always use a plan for reading, vocabulary, spelling, writing, math problem solving, and science.

Do you have a favorite plan for learning spelling words? Do you use flashcards or go on the Internet to learn? Do you ask the teacher or another student for help? You can learn more by using a plan for studying that works best for you.



It is smart to have a plan for doing all schoolwork. When you read, you should have a plan. One plan is to look at the questions you have to answer about the story first. Then read the story to find the answers. Another plan is to make a picture of what you read so that you can see all the parts of the story. When you write you should also have a plan. Students who are good at writing plan and organize their thoughts first. Then they think about what they are doing as they write. Using a plan is a good way to be smarter about your work!

Talk with Students

How to Be Smart: Attention

When we say people are smart, we usually mean that they know a lot of information. But being smart also means that someone has a lot of ability to learn new things. Being smart at learning new things includes knowing and using your *thinking abilities*. There are ways you can use your abilities *better* when you are learning.

What Does Being Smart Mean?

Attention is a very important ability that everyone has. Everything we do requires the ability to focus on some things and ignore others. The ability to pay attention is what makes us able to focus our thoughts on one thing and resist distractions. No one can learn without the ability to attend. We cannot attend to *all* the information our brain is receiving. In order to focus, we must resist attending to some things so we can focus on others. In school there is much to attend to and many things that are distracting. Students hear others talking, a noise in the hallway, or the beep of a computer; they see a flash of light from the window; and so forth. Schoolwork requires a lot of focus of attention.

jnaglieri@gmail.com

Talk with Students

How Can You Be Smarter?

You can be smarter if you carefully use your ability to attend. Remember to be aware of how well you are attending. Be sure to notice if you are being distracted. If you are having a problem, do something to help you pay attention. You will be able to do more if you remember to "Think smart and look at the details!" (see Figure 1). Remember to think about how well you are attending when you do your work.

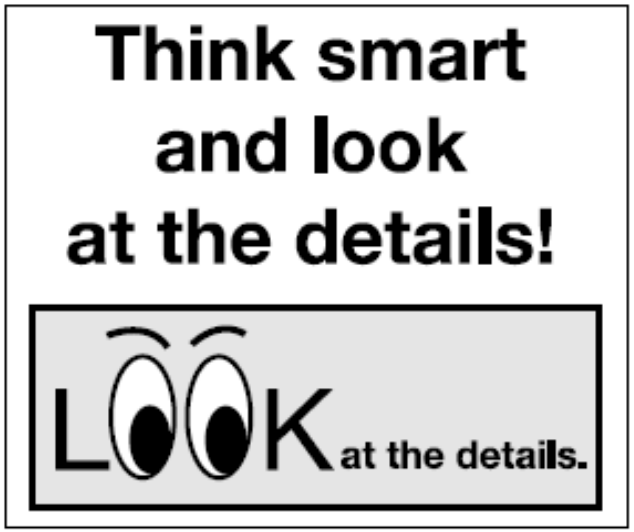


Figure 1. Picture reminder to attend to the details.

It is smart to be aware of your level of attention. Also remember to notice if you are being distracted. Ask yourself, "Am I losing my ability to focus?" or "Am I getting distracted?" If so, change your seat, take a short break, stand up and stretch, or do something to help you attend better. Remember that you can't learn if you can't pay attention.

You should remember that Attention can be disrupted by loud noises or seeing something distracting. It is important to notice when your ability to attend is good or bad. If you are having trouble attending, figure out what you need to do to attend better.

Talk with Students

How to Be Smart: Simultaneous

When we say someone is smart, we usually mean that they know a lot of information. Yet, being smart also means having a lot of ability to learn new things. Being smart at learning new things includes knowing and using *thinking abilities*. There are ways to use your abilities *better* when you are learning.

What Does Being Smart Mean?

Simultaneous ability is what you use to see how things fit together. This ability helps you see the *big* picture. This ability is what helps you understand the meaning of a sentence and a story. It is also very important for seeing patterns in numbers, word spellings, or themes in a story. It also lets you judge distances. For example, when you throw a ball you have to judge the distance to your target and how high you have to aim to get it there.

How Can You Be Smarter?

You can be smarter if you look to see how things are connected. Sometimes people say, "Get the big picture." This saying is about using your Simultaneous ability. When you stop and think about *how things fit together to make the "big picture,"* you are using your Simultaneous ability.

Talk with Students

You will be able to learn more if you remember to see patterns and themes in all you do. An easy way to remember to do this is to look at the picture "Think smart and put the pieces together!" (Figure 1). You should always use your ability to see how parts go together to make a whole when reading; studying vocabulary, spelling, or science; and solving math problems.

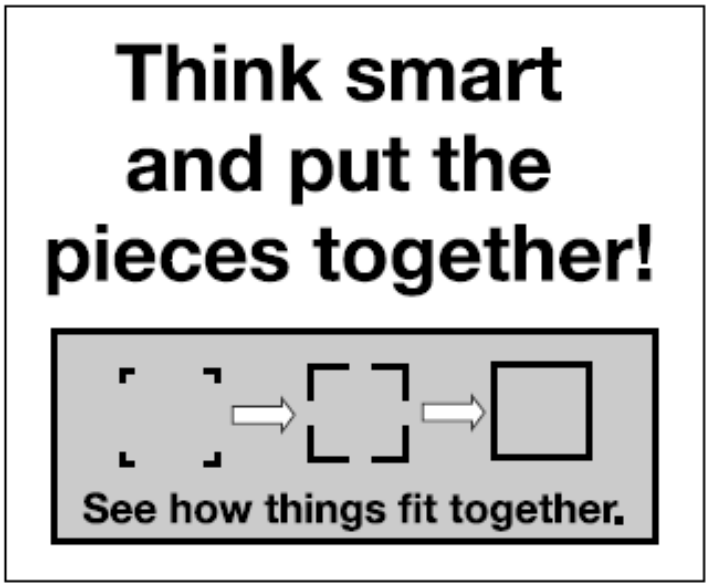


Figure 1. Picture for remembering to see the big picture.

It is smart to use your ability to see the big picture when doing all schoolwork. When you read, you should draw a picture of the characters and story line. Use a series of drawings that shows what happens in the story. Creating a story by using pictures is an excellent way to organize the information. Simultaneous ability is used when you do that, and it is a good way to be smarter about your work!

You can improve your math skills if you use Simultaneous ability. Think about the problem, see what information is needed and what is not, figure out what is related to what, and use esti-

Talk with Students

How to Be Smart: Successive

When we say people are smart, we usually mean they know a lot of information. But being smart also means that someone has a lot of ability to learn new things. Being smart at learning new things includes knowing and using your *thinking abilities*. There are ways you can use your abilities *better* when you are learning.

What Does Being Smart Mean?

Successive ability is what you use to put *information in order.* It is what you use when you have to remember the *sequence* of information, such as a telephone number. When you tie your shoe you have to do all the steps in the right *order*. When you are sounding out a word you haven't seen before, you are using your Successive ability to say the sounds in the correct *order*. When you repeat a word you have never heard before, especially if it is in a different language, you are using Successive ability. This ability also helps you put sounds together to say words, and words together to make sentences. Sequential ability is very important for reading, math, and all of your subjects.

Talk with Students

How Can You Be Smarter?

You can be smarter if you pay attention to the sequences in which things must be done. There are ways of making the sequence easier to remember. For example, group letters when spelling words. Find out if writing the words 10 times each helps you. Do flashcards work better for you? It is smart to find out how you learn sequences best and then to use what works best for you. Thinking about the sequences of things is a good way to be smarter about your work!

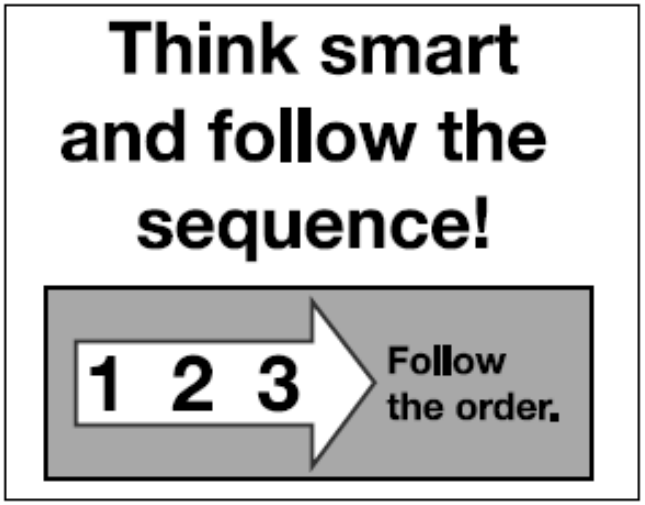


Figure 1. Picture for remembering to follow the sequence.

Remembering to Follow the Sequence

Remember that sometimes when you are anxious, tired, or just doing too many things at one time, you might forget to look at the order in which information is presented. When you see that you are not using your Successive ability, say to yourself, "Think smart and follow the sequence!" (see Figure 1). Looking closely at the sequences of things will make you smarter!

How to Teach about Planning

Teaching Students About Planning

How Learning Depends on Planning Ability

The purpose of education is certainly to provide students with knowledge and skills, but researchers have found that children also need to learn how to learn. To achieve that goal, we must teach students to evaluate, apply solutions, self-monitor, and self-correct—in short, to plan their work and use plans to solve all types of problems. When we teach our students to become strategic, self-reliant, reflective, and flexible learners, we are teaching use of a method called *Cognitive Strategy Instruction* (Scheid, 1993), and this is an effective method.

When reading, and especially when obtaining meaning from text, the student must plan an approach to examining the information that is provided. This involves applying strategies to separate the important from the less important part of the text, concentrate on the details, self-monitor, and self-correct as needed. Students who are good at writing organize their goals before beginning and reflect and revise during and following production of the text. When doing math, students who are successful evaluate the problem, choose which method to use to solve it, evaluate the success of that method, change methods if necessary, and check the final answer carefully. This is also sometimes referred to as metacognition, problem solving, strategic behavior, or a self-reliant learning style. When we use cognitive strategy instruction, we are teaching students to think about what they are doing so that they can be more successful.

Importantly, these descriptions of how to learn, and the cognitive strategy instruction approach in general, are descriptions of the behaviors associated with the cognitive processing ability called *Planning* in this book (see the Planning Explained handout, p. 55). In order to help students be more successful, we must teach them to be more planful.

How to Teach Planning

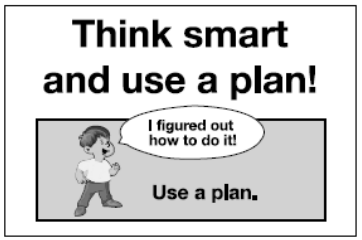


Figure 1. A drawing that helps students remember to use a plan.

The first step in teaching children to become strategic, self-reliant, reflective, and flexible learners is to tell them what a plan is and give them an easy way to remember to use a plan. In Figure 1 (which also appears in the PASS poster on the CD), we provide a fast and simple message: "Think smart and use a plan!" We should provide cognitive strategies in specific academic areas, such as decoding, reading comprehension, vocabulary, spelling, writing, math problem solving, science, and so forth, so that we

teach children to approach *all* of their work with a plan (Pressley & Woloshyn, 1995). The parent or teacher should facilitate the use of strategies so that the student learns self-regulated strategy development and use.

Parents and teachers should only provide as much help to the child as needed and avoid teaching the child to rely on the adult for the solution. Because our goal is self-reliance, we have to carefully guide and encourage the child so that he or she can figure out how to solve problems without always depending on the teacher for the answers. Throughout the day, the teacher should

1. Teach children that a plan is a way to do something.
2. Encourage children by asking, "What is your plan?" or "Did you use a plan?"
3. Remind students to think of a strategy. If needed, provide one and explain when and where to use it.
4. Teach a limited number of strategies and encourage students to develop their own.
5. Teach strategy use in all areas of the curriculum.
6. Teach children that using a plan is also important in social situations, especially in sports, on the playground, and when playing many kinds of games.
7. Remind students that using a plan requires thoughtful examination of the problem, not rapid task completion.
8. Teach students to examine each problem carefully and always use a plan.

Resources

Pressley, M.P., & Woloshyn, V. (1995). *Cognitive strategy instruction that really improves children's academic performance* (2nd ed.). Brookline, MA: Brookline Books.
Scheid, K. (1993). *Helping students become strategic learners*. Brookline, MA: Brookline Books.

Steps to Strategic Instruction:

- **Describe the strategy**. Students obtain an understanding of the strategy and its purpose-why it is important, when it can be used, and how to use it.
- **Model its use.** The teacher models the strategy, explaining to the students how to perform it.
- **Provide ample assisted practice time.** The teacher monitors, provides cues, and gives feedback. Practice results in automaticity so the student doesn't have to "think" about using the strategy.
- **Promote student self-monitoring and evaluation of personal strategy use.** Students will likely use the strategy if they see how it works for them; it will become part of their learning schema.
- **Encourage continued use and generalization of the strategy.** Students are encouraged to try the strategy in other learning situations.

Benefits of Strategy Instruction

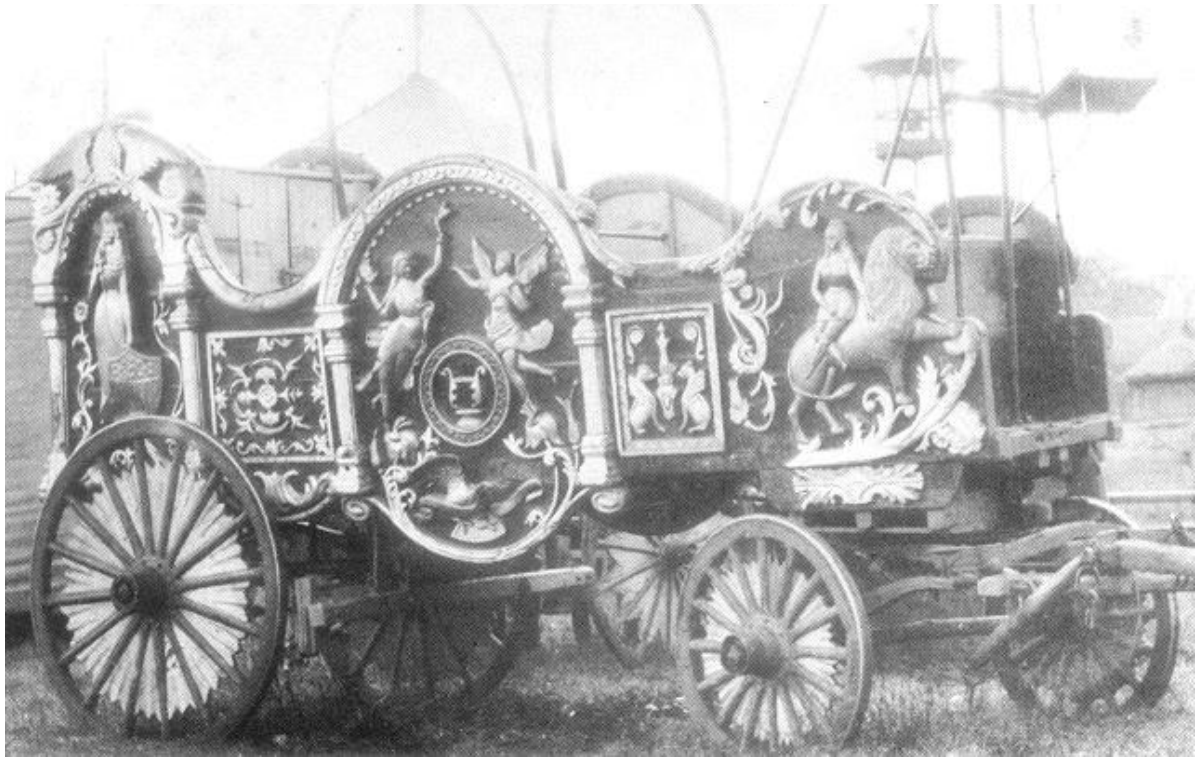
- Students trust their minds
- Students know there is more than one right way to do things
- They acknowledge their mistakes and try to rectify them
- They evaluate their products and behavior
- Memories are enhanced
- Learning increases
- Self-esteem increases
- Students feel a sense of power
- Students become more responsible
- Work completion and accuracy improve
- Students develop and use a personal study process
- They know how to "try"
- On-task time increases: students are more "engaged"

Conclusions

- The concept of EF is evolving.
- Data from the CEFI Standardization indicate that when measured using observable behaviors the term Executive Function is supported.
- CEFI provides a well normed measure of EF that has demonstrated reliability & validity.
- There is emerging evidence that children can be taught to be more strategic – an important indication of efficient EF.

Questions in Need of Answers

- Is there a need for a conceptual process like EF? YES
- Is EF an evidence based concept? YES
- Is there sufficient research to suggest EF is a powerful force in shaping children's lives? YES
- Is there sufficient research to suggest that EF theory guide the practices of education, mental health and parenting? YES
- Can EF be measured? YES
- Can EF be taught? YES



There is plenty of room on the Bandwagon for good science and committed professionals.

If we don’t get on the Bandwagon and start steering who knows where we will end up?

Questions?

www.samgoldstein.com

info@samgoldstein.com

@drsamgoldstein

@doctorsamgoldstein

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