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

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

Relevant Disclosure

- Co-author of
  - Comprehensive Executive Functioning Inventory-Child and Adult
  - Cognitive Assessment System –Second Edition
  - Co-Editor Handbook of Executive Functioning
  - Co-Editor Handbook of Intelligence and Achievement Testing
  - Compensated Speaker

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Goals for This Presentation

- Historical Perspective and Need
- Definitions of Executive Function
- Executive Function or Function**s**?
- Rating Scales for EF
- Comprehensive Executive Function Inventory (CEFI)
  - Structure – Normative Sample
  - Reliability
  - Interpretation
  - Validity
- EF and instruction

The Five Student Challenge

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

How do we help children be skillful?

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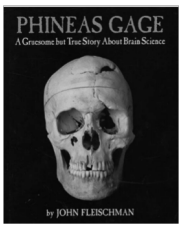
The Curious Story of Phineas Gage

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.



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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.

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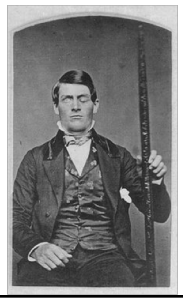
The Curious Story of Phineas Gage

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



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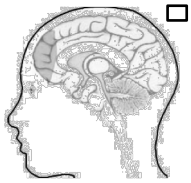
The case of Phineas Gage and others spurred scientists in the mid 1800s to seek to develop an understanding of the frontal lobes in particular the pre-frontal cortex.



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A Bit of EF Neuroanatomy

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

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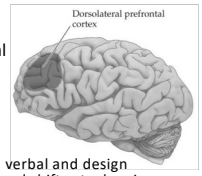
More Specifically



- 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.
- Chronic pain patients show declines in DLPFC functioning.

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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.
- Chronic pain patients also show declines in ACC function.

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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.

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Another View: *Hot* and *Cool* EF

- Cool (metacognitive) – functions associated with cognition such as planning and problem solving (deficits leading to a Dorsolateral Syndrome).
- Hot (emotional/motivational) – functions associated with coordinating and controlling emotions (deficits leading to an Orbitofrontal/Medial Syndrome).

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

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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

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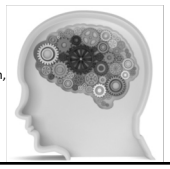
What is/are Executive Function(s)

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



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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.

Family Life PROJECT

PENNSTATE

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DOI: 10.1080/09084282.2011.595460

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Long-Term Cognitive Sequelae: Abused Children Without PTSD

Robert B. Perna
Behavioral Medicine Department, Walton Rehabilitation Hospital, Augusta, Georgia

Mark Kiefner
Bayside NeuroRehabilitation Services, Lewiston, Maine

Many lines of research suggest that childhood abuse and neglect are associated with later developing psychiatric diagnoses, academic problems, cognitive difficulty, and possible brain changes as measured through brain imaging. Data were collected on children (*N* = 41) who completed a neuropsychological evaluation. Of those evaluated, 18 had a documented history of physical and/or emotional abuse or significant neglect and 23 had no history of abuse/neglect. When controlling for Full-Scale IQ (FSIQ), the abused children had significantly lower scores on measures of executive functioning (Wisconsin

subsequently be diagnosed with a behavioral or emotional disorder. Consistent with psychobiological theories and imaging studies, our data are suggestive that childhood abuse and neglect are associated with later development of behavioral and emotional disorders and areas of cognitive weakness and possible impairment. Future research may be conducted to clarify these effects, the possibility of a dose–effect relationship, and

Key words: abuse/neglect, executive dysfunction, neuropsychological assessment

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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.

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Goldstein, Naglieri, Princiotta, & Otero (2013)

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

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What is Executive Function(s)

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

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What is Executive Function(s)

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

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What is Executive Function(s)

6. 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 contro**l" (p. 105).

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What is Executive Function(s)

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

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What is Executive Function(s)

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

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

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What is Executive Function(s)

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

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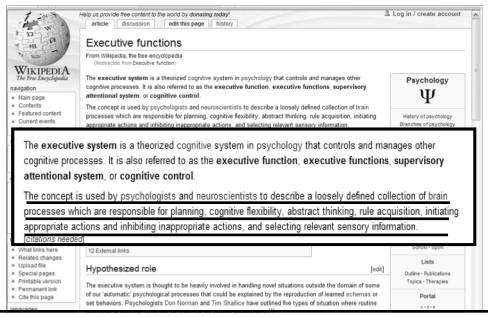
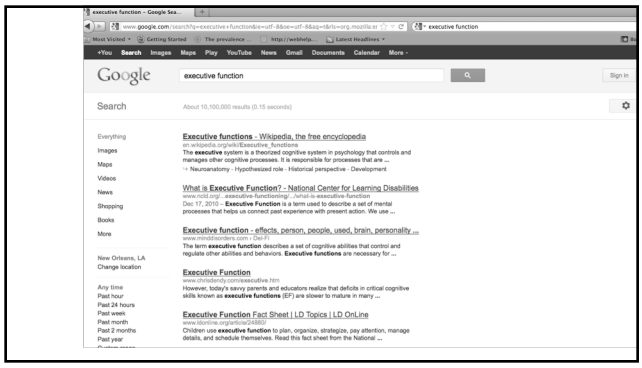
Executive Functions

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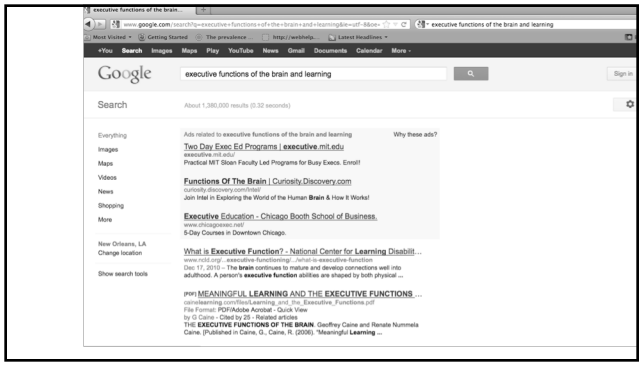
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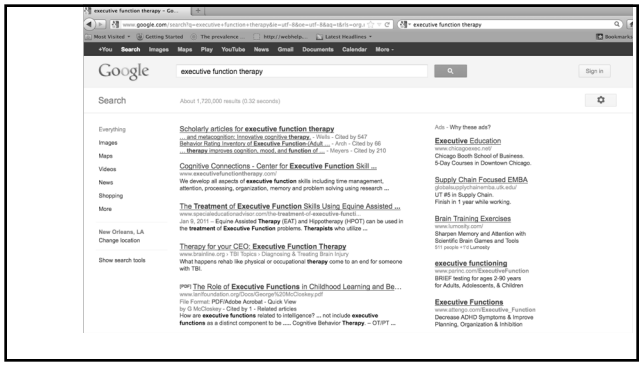
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Executive Functions

And Finally. . . .

A NICHD panel in 1994
identified 33 EFs by consensus!

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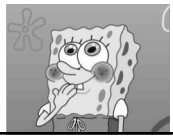
The Top Six Were:

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



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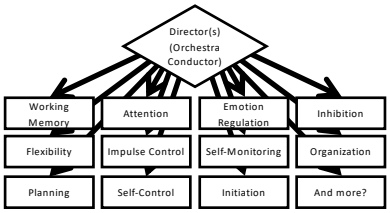
Three Categories of Theories

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



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A similarly named ability and behavior (e.g. planning) may only overlap to a small extent in explaining outcome.

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In fact EF ability likely forms the foundation reflected in behavior, achievement, emotional regulation and socialization. The contributed variance likely is impacted by a host of other variables. Ability and knowledge interact with these variables to shape skillful behavior.

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Are EF challenges associated with other psychiatric and developmental conditions?

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

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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 Tourette's

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

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.

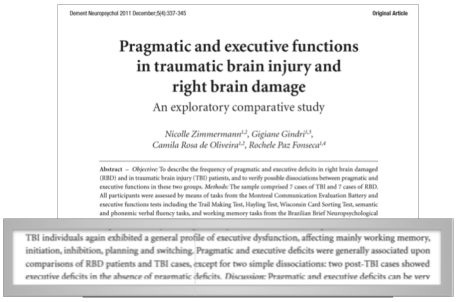
EF and Depression

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 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[2,3], Camila Rosa de Oliveira[2,3], Rochele Paz Fonseca[2,4]

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

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

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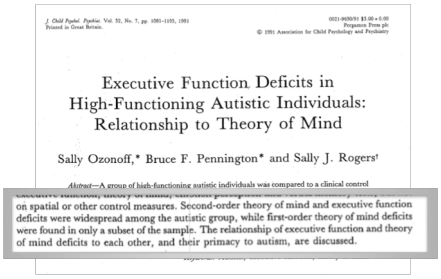
EF Deficits and ASD



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
© 1991 Association for Child Psychology and Psychiatry

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

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.

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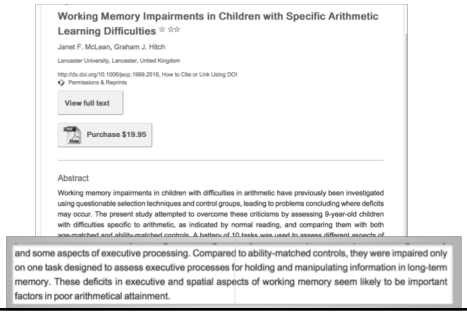
EF and Learning Disabilities



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
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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

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.

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

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Impaired Behavior Associated With Poor EF Can Result From:

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

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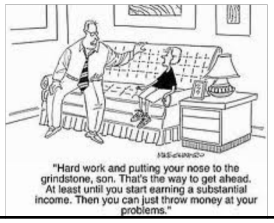
Starting with an assessment of EF behaviors defines the real life landscape and can be used as a foundation to than explore etiologies.



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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).

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Executive Function(s)

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

  Executive Function***s …*** or
  Executive Function?

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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?

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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 …

CEFI Scales
Attention
Emotion Regulation
Flexibility
Inhibitory Control
Initiation
Organization
Planning
Self-Monitoring
Working Memory

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CEFI Standardization Samples

- 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
  - Parent (N=1,400), Teacher (N=1,400) and Self (N=700) ratings were obtained

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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.**

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Item Factor Analyses – Part 1

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

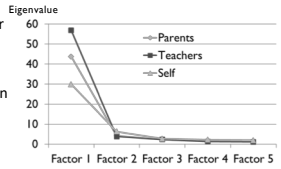

Table 8.2. Eigenvalues from the Inter-Item Correlations

	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 =pal Axis Factoring. Only the first 10 eigenvalues are presented.

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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**.

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Item Factor Analyses – Part 1

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

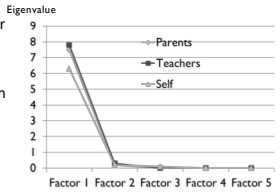

Table 8.4. Eigenvalues of the CEFI Scales Correlations

	Factor						
Form	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: Prg.

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Exploratory Factor Analyses

- Coefficients of Congruence – all very high

Table 8.6. Consistency of Factor Loadings Across Groups

Grouping Factor	CEFI Form	Coefficient of Congruence	Group 1				Group 2			
			Level	*N*	*M*	*SD*	Level	*N*	*M*	*SD*
Gender	Parent	.999	Male	700	98.1	14.9	Female	699	101.8	15.0
	Teacher	.999	Male	700	96.7	14.4	Female	700	103.2	15.0
	Self-Report	.992	Male	350	98.9	15.4	Female	350	101.0	14.6
Race/ Ethnic Group	Parent	.996	Non-White	615	99.8	15.6	White	784	100.0	14.6
	Teacher	.999	Non-White	609	97.8	15.3	White	791	101.6	14.6
	Self-Report	.995	Non-White	308	100.3	15.0	White	392	99.7	15.1
Age	Parent	.999	5 to 11	699	99.9	15.1	12 to 18	700	100.0	15.1
	Teacher	.999	5 to 11	700	100.0	15.1	12 to 18	700	100.0	15.0
	Self-Report	.995	12 to 15	400	98.7	15.0	16 to 18	300	101.6	15.0
Clinical/ Educational	Parent	.993	Non-Clinical	1,298	101.0	14.7	Clinical/Educational	277	84.6	12.4
	Teacher	.994	Non-Clinical	1,338	100.7	14.9	Clinical/Educational	280	87.1	12.2
	Self-Report	.976	Non-Clinical	632	100.8	14.8	Clinical/Educational	121	91.7	14.3

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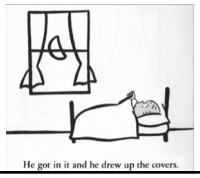
Exploratory Factor Analyses

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

60

Our Conclusion. . .

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



61

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

62

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

63

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

Anderson, 2002
Clin. Neuropsych.

64

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

Wasserman and Wasserman, 2013
Applied Neuropsych. Child

65

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

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

66

Naglieri & Goldstein, 2012

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

67

EF as a Mediator of Ability and Knowledge

- Ability: The skills we use to acquire and manipulate knowledge to solve problems. Also referred to as intelligence.
- Knowledge: Everything we learn in life. Also referred to as achievement.
  - Executive Function: How efficiently or skillfully you do what you decide to do.

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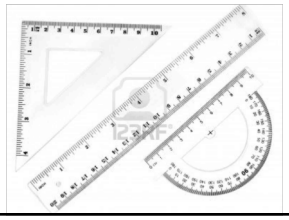
What comprises the best means of assessment of EF?

How to Measure Executive Function(s)

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



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From Weyandt et al, 2012

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-Osterrith Complex Figure Test (ROCF) or Rey Complex Figure Test (RCFT)	12	31/93 = 33%	24/56 = 43%	7/37 = 19%

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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.

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.

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Importance of a National Norm

- What is one 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 from our CEFI data 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).

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Importance of a National Norm

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

	Standard Scores				
Raw Score	<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

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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).

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Importance of a National Norm

- A normative sample that is representative of the US population is absolutely required.
- The sample should be stratified carefully and that sample should be thoroughly described in the test Manual.
- Remember the key question is not how similar someone is to an impaired group but how dissimilar they are to the norm.

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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.

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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 evaluating behaviors associated with 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.

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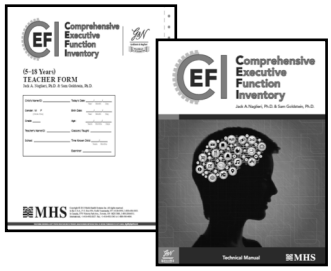
CEFI (Naglieri & Goldstein, 2012)



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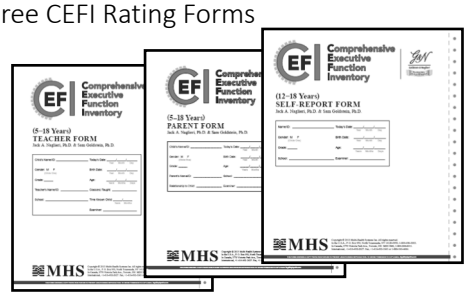
Three CEFI Rating Forms



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CEFI Forms

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

English Parent Form (5-18 years)	**English Teacher Form (5-18 years)**	**English Self-Report Form (12-18 years)**
Spanish Parent Form (5-18 years)	**Spanish Teacher Form (5-18 years)**	**Spanish Self-Report Form (12-18 years)**

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CEFI Scales

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

Consistency Index
Negative Impression Scale
Positive Impression Scale

Full Scale

CEFI Scales
Attention
Emotion Regulation
Flexibility
Inhibitory Control
Initiation
Organization
Planning
Self-Monitoring
Working Memory

86

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?

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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)

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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?

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?

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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?

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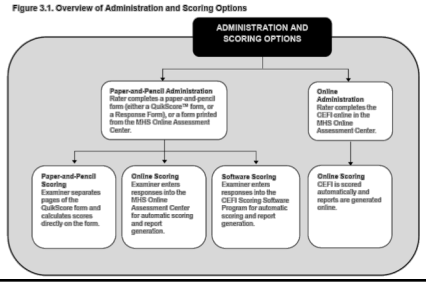
CEFI Administration & Scoring

Figure 3.1. Overview of Administration and Scoring Options



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CEFI Rating Form

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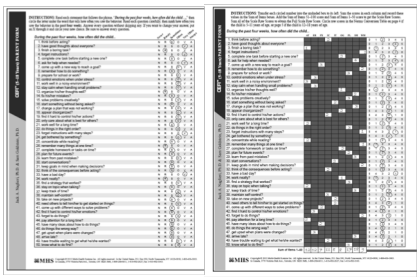
CEFI Rating Form



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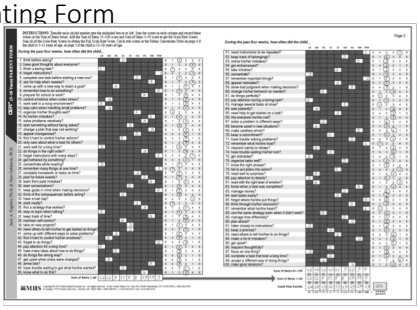
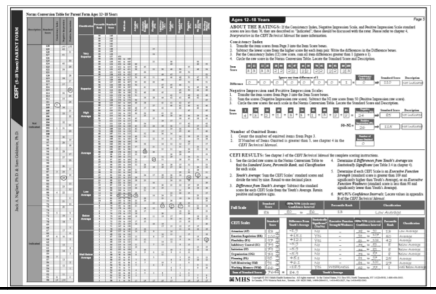
CEFI Rating Form



95

CEFI Rating Form



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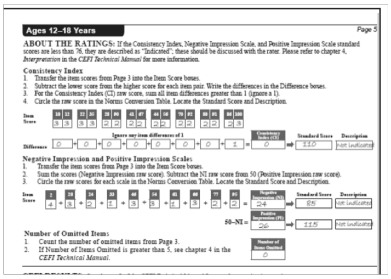
CEFI Rating Form



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.

Item Score	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	3	3	3	3	2	2	2	2	2	2	2	2	2	2	3

Ignore any item differences of 1

Difference: 0 + 0 + 0 + 0 + 0 + 0 + 0 + 1 = Consistency Index (CI): 0 → Standard Score: 110 → Description: 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	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	4	3	2	1	3	3	1	3	2	2	2	2	2	2	2

Positive Impression (PI): 24 → Standard Score: 85 → Description: Not Indicated

50–NI = Negative Impression (NI): 26 → Standard Score: 115 → Description: 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 Omitted Items: 0

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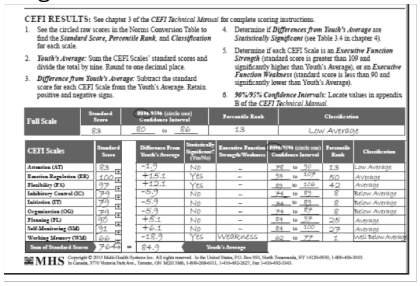
CEFI Rating Form



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	–	83 to 109	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)	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	62 to 77	1	Well Below Average
Sum of Standard Scores	76	84.9	Youth's Average				

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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

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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.

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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

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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[a]	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

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Age x (Race/Ethnicity) x Gender

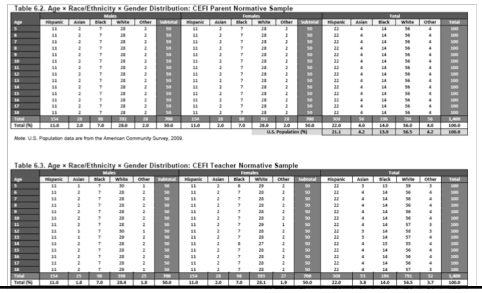

Table 6.2. Age × Race/Ethnicity × Gender Distribution: CEFI Parent Normative Sample

Age	Male						Female						Total					
	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 (%)		11.1	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

Age	Male						Female						Total					
	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	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	176	27	98	397	27	700	177	32	98	391	27	700	353	59	196	791	54	1,400
Total (%)	12.0	1.9	7.0	28.4	1.9	50.0	12.6	2.3	7.0	28.1	1.9	50.0	25.2	4.2	14.0	56.5	3.9	100.0

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Other Tables of Demographics (N=12)

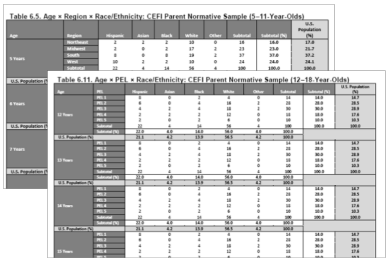

Table 6.5. Age × Region × Race/Ethnicity: CEFI Parent Normative Sample (5–11-Year Olds)

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	3	0	0	19	0	22	22.0	37.2
	West	10	3	11	10	0	34	34.0	24.1
	Subtotal	22	5	15	56	2	100	100.0	100.0
U.S. Population (%)		22.0	5.0	15.0	56.0	2.0	100.0		
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	6	0	2	6	0	14	14.0	14.7
	PEL 2	6	0	4	14	2	26	26.0	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	8	0	12	12.0	10.3
	Subtotal	22	4	14	58	4	102	100.0	100.0
U.S. Population (%)		22.0	4.0	14.0	58.0	4.0	102.0		
13 Years	PEL 1	6	0	2	6	0	14	14.0	14.7
	PEL 2	6	0	4	14	2	26	26.0	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	8	0	12	12.0	10.3
	Subtotal	22	4	14	58	4	102	100.0	100.0
U.S. Population (%)		22.0	4.0	14.0	58.0	4.0	102.0		
14 Years	PEL 1	6	0	2	6	0	14	14.0	14.7
	PEL 2	6	0	4	14	2	26	26.0	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	8	0	12	12.0	10.3
	Subtotal	22	4	14	58	4	102	100.0	100.0
U.S. Population (%)		22.0	4.0	14.0	58.0	4.0	102.0		
15 Years	PEL 1	6	0	2	6	0	14	14.0	14.7
	PEL 2	6	0	4	14	2	26	26.0	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	8	0	12	12.0	10.3
	Subtotal	22	4	14	58	4	102	100.0	100.0
U.S. Population (%)		22.0	4.0	14.0	58.0	4.0	102.0		
16 Years	PEL 1	6	0	2	6	0	14	14.0	14.7
	PEL 2	6	0	4	14	2	26	26.0	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	8	0	12	12.0	10.3
	Subtotal	22	4	14	58	4	102	100.0	100.0
U.S. Population (%)		22.0	4.0	14.0	58.0	4.0	102.0		
17 Years	PEL 1	6	0	2	6	0	14	14.0	14.7
	PEL 2	6	0	4	14	2	26	26.0	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	8	0	12	12.0	10.3
	Subtotal	22	4	14	58	4	102	100.0	100.0
U.S. Population (%)		22.0	4.0	14.0	58.0	4.0	102.0		
18 Years	PEL 1	6	0	2	6	0	14	14.0	14.7
	PEL 2	6	0	4	14	2	26	26.0	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	8	0	12	12.0	10.3
	Subtotal	22	4	14	58	4	102	100.0	100.0
U.S. Population (%)		22.0	4.0	14.0	58.0	4.0	102.0		

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CEFI Scale Reliabilities

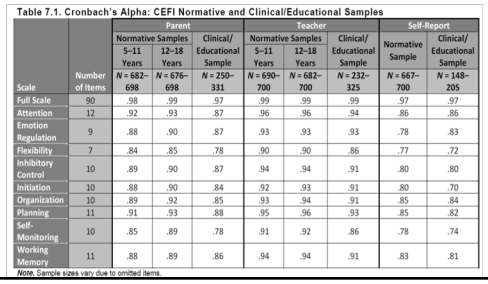

Table 7.1. Cronbach's Alpha: CEFI Normative and Clinical/Educational Samples

		Parent			Teacher			Self-Report	
		Normative Samples		Clinical/ Educational Sample	Normative Samples		Clinical/ Educational Sample	Normative Sample	Clinical/ Educational Sample
Scale	Number of Items	5–11 Years *N* = 682–698	12–18 Years *N* = 676–698	*N* = 250–331	5–11 Years *N* = 690–700	12–18 Years *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.

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Inter-Rater Reliability

- Parent Form (5-18 yrs) 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

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Inter-Rater Consistency

- Teacher Form (5-18 yrs) 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 rs significantPair-wise deletion of missing cases was used.

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Intra-Rater Consistency

Self-Rating Form (12-18 yrs) 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

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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

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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

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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.

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

Note. (R) = Reverse scored item.

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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.	n 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.	n 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

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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

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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.

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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.

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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

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Step 2: Interpret Estimated True Score Based Confidence Intervals

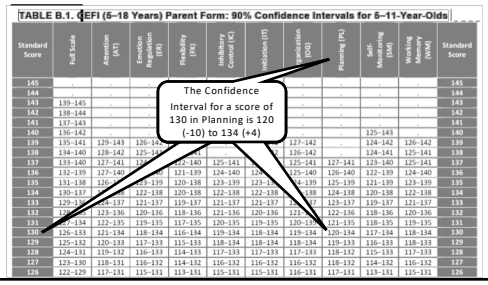

TABLE B.1. CEFI (5–18 Years) Parent Form: 90% Confidence Intervals for 5–11-Year-Olds

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	125–142	.	.	.	126–142	.	124–141	125–141	138
137	133–140	127–141	124–140	125–140	125–141	.	125–141	127–141	123–140	125–141	137
136	132–139	127–140	123–140	121–139	124–140	124–140	125–140	126–140	122–139	124–140	136
135	131–138	126–139	123–139	120–138	123–139	123–139	124–139	125–139	121–139	123–139	135
134	130–137	125–138	122–138	120–138	122–138	122–138	123–138	124–138	120–138	122–138	134
133	129–136	124–137	121–137	119–137	121–137	121–137	122–137	123–137	119–137	121–137	133
132	128–135	123–136	120–136	118–136	121–136	120–136	121–136	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)

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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

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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

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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

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Step 3: Compare CEFI Scale Scores

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

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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

	Parent Form				Teacher Form				Self-Report Form	
	5–11 Years		12–18 Years		5–11 Years		12–18 Years		12–18 Years	
Scale	$p < .05$	$p < .10$	$p < .05$	$p < .10$	$p < .05$	$p < .10$	$p < .05$	$p < .10$	$p < .05$	$p < .10$
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

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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	101.7		Youth's Average			

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

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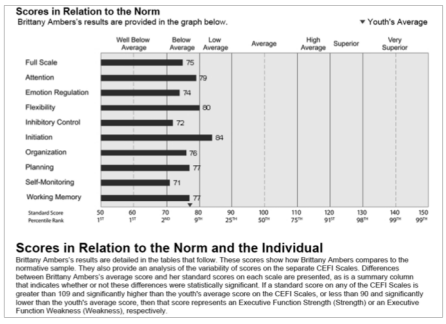

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Full Scale

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	-

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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

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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

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CEFI Interpretation

Step 1: Examine Quality of the ratings: Consistency, Positive and Negative Impression
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Step 6: Compare Results Over Time

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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

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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

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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

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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.

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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?

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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?

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US vs 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			

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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 rs significant, $p < .001$.

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CEFI Scores by Diagnosis

- We expected that individuals with ADHD, mood disorders, and Autism Spectrum Disorders might earn a low CEFI Full Scale score.
- 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).

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Group Differences: ADHD

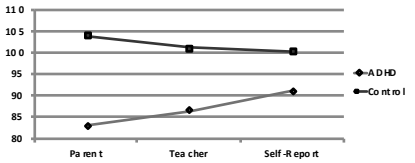

Table 8.19 Differences Between ADHD and Matched General Population Samples: CEFI Full Scale

Form		ADHD	Matched Gen. Pop.	*d*-ratio	*F* (*df*)	*P*
Parent	*M*	89.1	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, 276)	< .001
	SD	13.5	13.5			
	N	138	142			
Self-Report	*M*	91.3	100.3	-0.62	22.21 (1, 232)	< .001
	SD	14.7	14.7			
	N	117	117			

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Group Differences: ASD

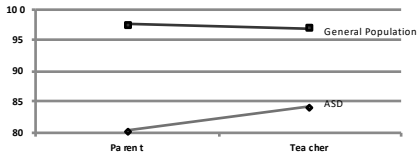

Table 8.20 Differences Between ASD and Matched General Population Samples: CEFI Full Scale

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			

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Group Differences: Learning Disabilities

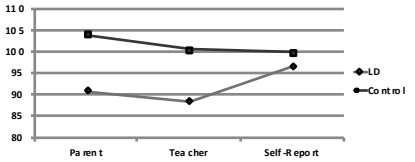

Table 8.22 Differences Between LD and Matched General Population Samples: CEFI Full Scale

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			

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Group Differences: Mood Disorders

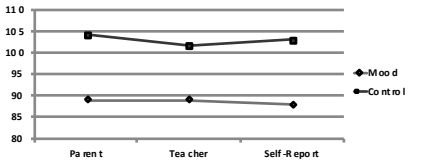

Table 8.21 Differences Between Mood Disorder and Matched General Population Samples: CEFI Full Scale

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			

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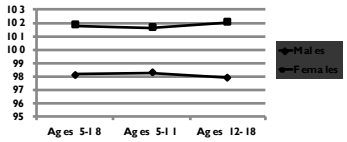
CEFI Gender Differences: Parent Raters

Girls are Smarter than Boys!

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



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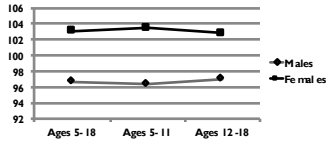
CEFI Gender Differences: Teacher Raters

- Girls are Smarter than Boys

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



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Gender Differences: Abilities Associated With EF

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

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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

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.

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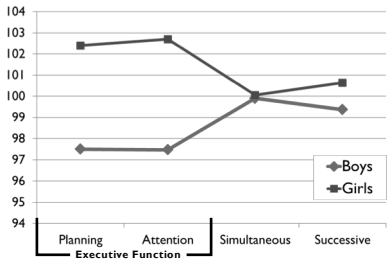
Gender Differences: Abilities Associated With EF



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Computer Scored Printout

Classification: Well Below Average ≤ 69; Below Average = 70–79; Low Average = 80–89; Average = 90–109; High Average = 110–119; Superior = 120–129; Very Superior ≥ 130.

Full Scale					
Score		**P** (10/15/2012)	**T** (10/15/2012)	**SR** (10/15/2012)	**Significant Differences Between Raters**
Standard Score		**106**	**97**	**103**	P > T, SR > T
90% CI		103-109	95-99	99-107	
Percentile Rank		66	42	58	

CEFI Scales					
Score		**P** (10/15/2012)	**T** (10/15/2012)	**SR** (10/15/2012)	**Significant Differences Between Raters**
Attention	**Standard Score**	**115**	**108**	**114**	No significant differences
	90% CI	108-120	103-112	104-121	
	Percentile Rank	84	70	82	
	EFS/EFW	Strength		Strength	
Emotion Regulation	**Standard Score**	**98**	**93**	**99**	No significant differences
	90% CI	91-106	87-100	89-109	
	Percentile Rank	45	32	47	
	EFS/EFW	-	-	-	
Flexibility	**Standard Score**	**97**	**99**	**97**	No significant differences
	90% CI	89-106	92-106	87-108	
	Percentile Rank	42	47	42	
	EFS/EFW	-	-	-	
Inhibitory Control	**Standard Score**	**101**	**76**	**89**	P > T
	90% CI	93-108	72-83	81-101	
	Percentile Rank	53	5	23	
	EFS/EFW	-	Weakness	-	

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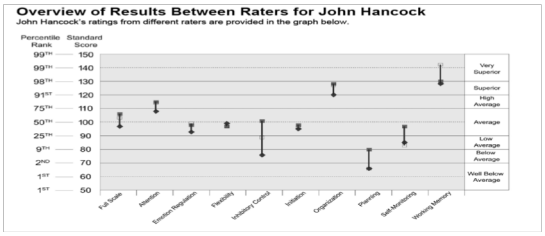

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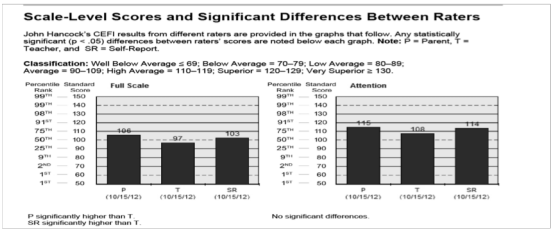

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CEFI: WISC-IV, CAS, and WJ III

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

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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.

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CEFI, WISC-IV, CAS, Achievement

Table 8.27 CEFI Manual Other Measure		Corrected *r*	*N*	CEFI Full Scale		CAS, WISC-IV, or WJ III ACH	
				M	*SD*	*M*	*SD*
WISC-IV	Full Scale	.39*	41	93.1	12.0	95.5	18.1
	Working Memory	.30	42	93.0	11.9	92.6	17.5
	Verbal Comprehension	.44**	42	93.0	11.9	96.8	14.7
	Perceptual Reasoning	.27	42	93.0	11.9	101.5	17.5
	Processing Speed	.34*	42	93.0	11.9	90.7	19.4
CAS	Full Scale	.45**	60	91.4	13.2	95.8	17.1
	Attention	.37**	60	91.4	13.2	96.5	15.1
	Planning	.49**	60	91.4	13.2	92.4	14.5
	Simultaneous	.43**	60	91.4	13.2	101.6	17.0
	Successive	.32*	60	91.4	13.2	98.0	14.6
WJ III ACH	Total Achievement	.51**	40	93.4	12.1	96.6	16.8
	Broad Reading	.48**	54	91.9	12.4	98.1	14.2
	Broad Math	.49**	53	92.0	11.9	97.7	16.9
	Broad Written Language	.47**	41	93.5	12.3	94.9	16.8

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CEFI & WISC-IV

Table H.25. Correlations Between the CEFI (5–18 Years) Teacher Form and the WISC-IV

	WISC-IV										CEFI	
	Full Scale		Working Memory		Verbal Comprehension		Perceptual Reasoning		Processing Speed			
CEFI	Obt. *r*	Cor. *r*	Obt. *r*	Cor. *r*	Obt. *r*	Cor. *r*	Obt. *r*	Cor. *r*	Obt. *r*	Cor. *r*	*M*	*SD*
Full Scale	.37*	.39*	.28	.30	.35*	.44**	.25	.27	.35*	.34*	93.0	11.9
Attention	.36*	.39*	.36*	.40**	.25	.33*	.28	.32*	.34*	.35*	91.8	11.2
Emotion Regulation	.17	.14	-.07	-.06	.24	.25	.09	.08	.14	.11	97.2	14.7
Flexibility	.52**	.57**	.40**	.46**	.55**	.68**	.40**	.45**	.35*	.37*	93.8	11.0
Inhibitory Control	.22	.21	.09	.08	.18	.20	.13	.13	.32*	.27	97.7	13.5
Initiation	.30	.25	.24	.21	.31*	.31*	.17	.14	.32*	.25	91.2	15.1
Organization	.16	.15	.15	.14	.15	.17	.07	.06	.20	.17	92.2	13.6
Planning	.42**	.40**	.34*	.38*	.42**	.54**	.27	.31*	.37*	.39*	93.6	11.1
Self-Monitoring	.36*	.39*	.29	.33*	.35*	.45**	.28	.31*	.26	.27	92.0	11.3
Working Memory	.41**	.38*	.38*	.36*	.39*	.43**	.33*	.31*	.26	.23	92.5	13.6
WISC-IV *M*	95.5		92.6		96.8		101.5		90.7			
WISC-IV *SD*	18.1		17.5		14.7		17.5		19.4			

Note. Pair-wise deletion of missing cases was used (*N* = 41–43); Obt. *r* = Obtained *r*; Cor. *r* = Corrected *r*.

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CEFI & CAS

Table H.18. Correlations Between the CEFI (5–18 Years) Teacher Form and the CAS

	CAS										CEFI	
	Full Scale		Attention		Planning		Simultaneous		Successive			
CEFI	Obt. *r*	Cor. *r*	Obt. *r*	Cor. *r*	Obt. *r*	Cor. *r*	Obt. *r*	Cor. *r*	Obt. *r*	Cor. *r*	*M*	*SD*
Full Scale	.45**	.45**	.33*	.37**	.43**	.49**	.42**	.43**	.28*	.32*	91.4	13.2
Attention	.40**	.41**	.26*	.30*	.36**	.42**	.38**	.39**	.30*	.35**	90.3	12.8
Emotion Regulation	.26*	.24	.24	.24	.21	.22	.26*	.23	.12	.13	96.9	14.7
Flexibility	.52**	.53**	.35**	.40**	.47**	.54**	.50**	.51**	.37**	.42**	92.2	13.0
Inhibitory Control	.27*	.25*	.17	.18	.26*	.29*	.24	.22	.19	.21	96.0	13.9
Initiation	.40**	.33**	.33**	.30*	.38**	.37**	.38**	.31*	.21	.20	89.0	16.3
Organization	.29*	.27*	.19	.20	.33**	.36**	.23	.21	.21	.23	90.5	14.3
Planning	.47**	.49**	.31*	.37**	.46**	.54**	.44**	.46**	.31*	.38**	92.5	12.4
Self-Monitoring	.48**	.50**	.37**	.43**	.42**	.50**	.46**	.48**	.29*	.35**	91.2	12.4
Working Memory	.48**	.45**	.36**	.38**	.42**	.46**	.47**	.45**	.27*	.30*	91.0	14.0
CAS *M*	95.8		96.5		92.4		101.6		98.0			
CAS *SD*	17.1		15.1		14.5		17.0		14.6			

Note. Pair-wise deletion of missing cases was used (*N* = 60–62); Obt. *r* = Obtained *r*; Cor. *r* = Corrected *r*. *$p < .05$; **$p < .01$.

154

CEFI & WJ-III *Total* Achievement

Table H.26. Correlations Between the CEFI (5–18 Years) III ACH Total Achievement Cluster

	WJ III ACH Total Achievement		CEFI	
	Obt. *r*	Cor. *r*	*M*	*SD*
Full Scale	.47**	.51**	93.4	12.1
Attention	.51**	.59**	92.5	10.9
Emotion Regulation	.22	.18	96.5	16.1
Flexibility	.56**	.61**	94.0	11.9
Inhibitory Control	.24	.23	97.8	14.0
Initiation	.37*	.32*	91.5	15.6
Organization	.32*	.32*	92.5	13.5
Planning	.51**	.58**	94.1	11.3
Self-Monitoring	.46**	.53**	92.7	11.1
Working Memory	.57**	.57**	93.2	13.1
WJ III ACH *M*	96.6			
WJ III ACH *SD*	16.8			

Note. Pair-wise deletion of missing cases was used (*N* = 40–41); Obt. *r* =

155

CEFI & WJ-III *Reading*

Table H.27. Correlations Between the CEFI (5–18 Years) WJ ACH Broad Reading Cluster

	WJ III ACH Broad Reading		CEFI	
	Obt. *r*	Cor. *r*	*M*	*SD*
Full Scale	.39**	.48**	91.9	12.4
Attention	.41**	.52**	90.9	11.7
Emotion Regulation	.25	.27*	96.9	14.6
Flexibility	.43**	.56**	92.5	12.8
Inhibitory Control	.26	.32*	96.6	13.0
Initiation	.26	.26	89.1	16.1
Organization	.27*	.31*	91.0	13.9
Planning	.43**	.54**	92.8	11.5
Self-Monitoring	.40**	.51**	91.4	11.7
Working Memory	.43**	.48**	91.5	13.7
WJ III ACH *M*	98.1			
WJ III ACH *SD*	14.2			

Note. Pair-wise deletion of missing cases was used (*N* = 54–55); Obt. *r* =

156

CEFI & WJ-III Broad *Math*

Table H.28. Correlations Between the CEFI (5–18 Years) III ACH Broad Math Cluster

	WJ III ACH Broad Math		CEFI	
	Obt. *r*	Cor. *r*	*M*	*SD*
Full Scale	.44**	.49**	92.0	11.9
Attention	.40**	.46**	90.7	11.4
Emotion Regulation	.16	.15	96.7	14.8
Flexibility	.52**	.55**	93.0	12.1
Inhibitory Control	.15	.15	96.6	13.0
Initiation	.43**	.38**	89.9	15.1
Organization	.33*	.33*	90.8	13.4
Planning	.49**	.57**	93.1	10.8
Self-Monitoring	.46**	.51**	91.6	11.4
Working Memory	.59**	.60**	91.6	13.1
WJ III ACH *M*	97.7			
WJ III ACH *SD*	16.9			

Note. Pair-wise deletion of missing cases was used (N = 53–54); Obt. r =

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CEFI & WJ-III Written Language

Table H.29. Correlations Between the CEFI (5–18 Years) III ACH Broad Written Language Cluster

	WJ III ACH Broad Written Language		CEFI	
	Obt. *r*	Cor. *r*	*M*	*SD*
Full Scale	.44**	.47**	93.5	12.3
Attention	.47**	.55**	92.5	10.9
Emotion Regulation	.20	.17	97.4	15.9
Flexibility	.50**	.54**	94.2	12.2
Inhibitory Control	.27	.26	98.1	13.8
Initiation	.33*	.28	91.6	15.6
Organization	.34*	.33*	92.0	13.8
Planning	.44**	.50**	94.4	11.5
Self-Monitoring	.44**	.49**	92.5	11.5
Working Memory	.47**	.47**	93.4	13.5
WJ III ACH *M*	94.9			
WJ III ACH *SD*	16.8			

Note. Pair-wise deletion of missing cases was used (N = 41–42); Obt. r =

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CEFI Has an Extensive Section on Strategies

CEFI (5–18 Years) Teacher Interpretive Report for John Hancock — Admin Date: 10/15/2012

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.)

Executive Function

Executive function is a dynamic system; its successful operation involves the inhibition and activation of various processes in an integrated effort to direct goal-oriented behavior. Additionally, executive function has a developmental trajectory. As the brain develops, executive function behaviors are acquired and progressively refined. Since executive function involves the integrated effort of multiple processes, a wide range of abilities or behaviors are implicated in its operation. Any single behavior or domain of behaviors can present as a symptom of a problem if the executive function system is impaired. As such, specific behaviors can be targeted through intervention strategies that will have a broad impact on executive function behaviors in general.

General Intervention Strategies

- Take a child's natural development into account when planning intervention strategies. Executive function behaviors require greater effort and are less accurate in early stages of development.
- Develop intervention strategies that initially incorporate external controls, prompts and cues to help the child learn and develop new abilities.
- Have strategies in place that gradually remove external controls to promote internalization of new behaviors. Encourage a child to self-prompt so that newly acquired skills become habit.
- State behavioral challenges in a positive manner that indicates change is possible with intervention.

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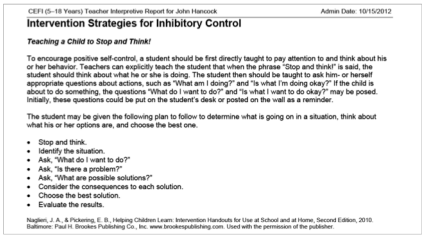

CEFI (5–18 Years) Teacher Interpretive Report for John Hancock Admin Date: 10/15/2012

Intervention Strategies for Inhibitory Control

Teaching a Child to Stop and Think!

To encourage positive self-control, a student should be first directly taught to pay attention to and think about his or her behavior. Teachers can explicitly teach the student that when the phrase "Stop and think!" is said, the student should think about what he or she is doing. The student then should be taught to ask him- or herself appropriate questions about actions, such as "What am I doing?" and "Is what I'm doing okay?" If the child is about to do something, the questions "What do I want to do?" and "Is what I want to do okay?" may be posed. Initially, these questions could be put on the student's desk or posted on the wall as a reminder.

The student may be given the following plan to follow to determine what is going on in a situation, think about what his or her options are, and choose the best one.

- Stop and think.
- Identify the situation.
- Ask, "What do I want to do?"
- Ask, "Is there a problem?"
- Ask, "What are possible solutions?"
- Consider the consequences to each solution.
- Choose the best solution.
- Evaluate the results.

Naglieri, J. A., & Pickering, E. B., Helping Children Learn: Intervention Handouts for Use at School and at Home, Second Edition, 2010. Baltimore: Paul H. Brookes Publishing Co., Inc. www.brookespublishing.com. Used with the permission of the publisher.

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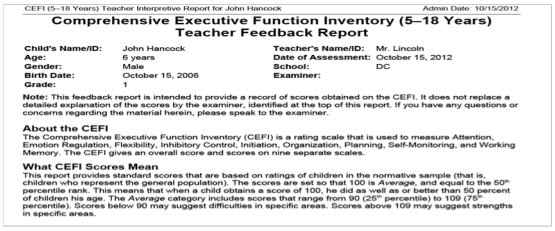

CEFI (5–18 Years) Teacher Interpretive Report for John Hancock Admin Date: 10/15/2012

Comprehensive Executive Function Inventory (5–18 Years)
Teacher Feedback Report

Child's Name/ID:	John Hancock	**Teacher's Name/ID:**	Mr. Lincoln
Age:	6 years	**Date of Assessment:**	October 15, 2012
Gender:	Male	**School:**	DC
Birth Date:	October 15, 2006	**Examiner:**	
Grade:	1		

Note: This feedback report is intended to provide a record of scores obtained on the CEFI. It does not replace a detailed explanation of the scores by the examiner, identified at the top of this report. If you have any questions or concerns regarding the material herein, please speak to the examiner.

About the CEFI
The Comprehensive Executive Function Inventory (CEFI) is a rating scale that is used to measure Attention, Emotion Regulation, Flexibility, Inhibitory Control, Initiation, Organization, Planning, Self-Monitoring, and Working Memory. The CEFI gives an overall score and scores on nine separate scales.

What CEFI Scores Mean
This report provides standard scores that are based on ratings of children in the normative sample (that is, children who represent the general population). The scores are set so that 100 is *Average*, and equal to the 50th percentile rank. This means that when a child obtains a score of 100, he did as well as or better than 50 percent of children his age. The *Average* category includes scores that range from 90 (25th percentile) to 109 (75th percentile). Scores below 90 may suggest difficulties in specific areas. Scores above 109 may suggest strengths in specific areas.

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A Case Study: 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. School 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.

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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.

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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	-

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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.

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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
5. 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

166

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
5. 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

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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

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EF Interventions

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

169

Cognitive Strategy = EF Instruction

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

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My Granddaughter Hones Her EF Skills

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Practice Pays Off!

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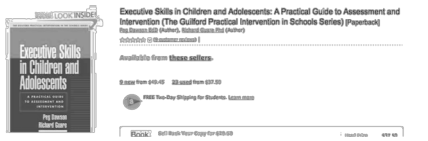
EF Instruction



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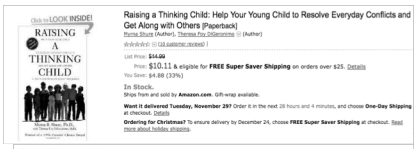
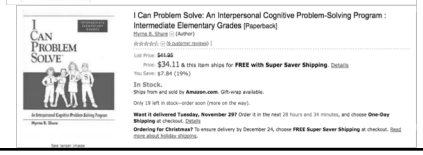
EF Instruction





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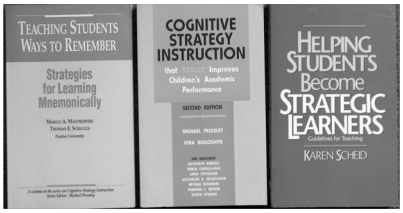
Cognitive Instructional Methods



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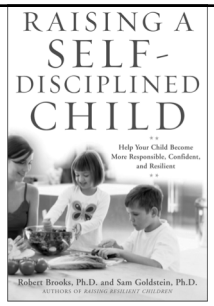
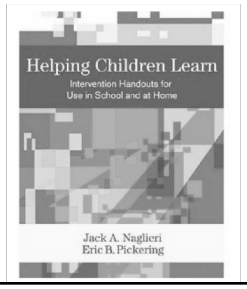
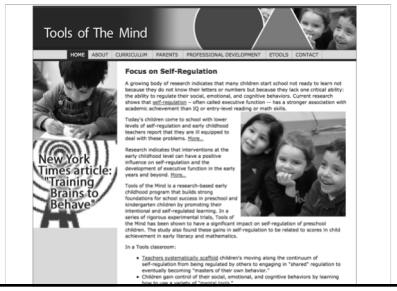




Tools of the Mind



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

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

179

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

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National Center for Learning Disabilities
Search
Email Signup
TYPES OF LD
FOR PARENTS
AT SCHOOL
ADULTS WITH LD
GET INVOLVED
RESOURCES
DONATE
Browse by Stage
Browse by Age
My child is struggling in school with learning. What should I do?
Now that my child has been identified with LD, what's next?
How do I ensure my child's success and plan for the future?
Types of LD
General LD Info
Dyslexia
Executive Functioning
Many people with LD struggle with executive function, which can make activities like planning, organizing, strategizing, remembering details and managing time and space difficult. Problems with executive function—a set of mental processes that helps connect past experience with present action—can be seen at any age and often contribute to the challenges individuals with LD face in academic learning.
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Tweet 23
Download: Free Executive Function E-Book and Infographic
Does your child have trouble with motivation, flexible thinking or working memory? Register now for our free infographic and e-book, which offer an in-depth look into executive function issues. More >
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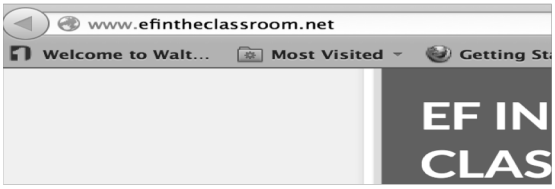
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Welcome to Walt...
Most Visited
Getting St
EF IN
CLAS

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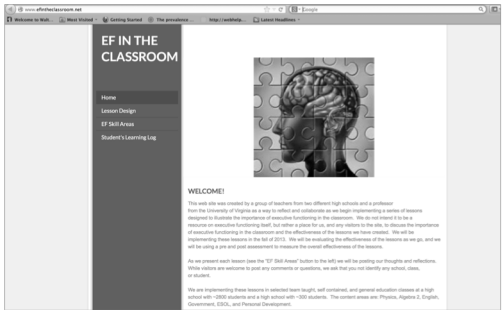
EF IN THE CLASSROOM
Home
Lesson Design
EF Skill Areas
Student's Learning Log
WELCOME!

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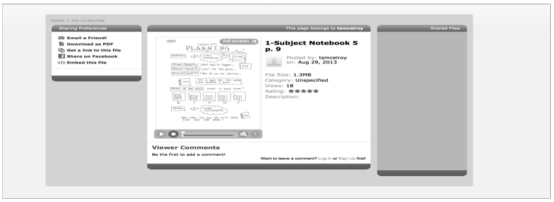

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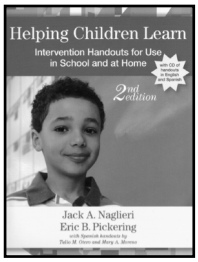
Teaching Children to use EF

- 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.



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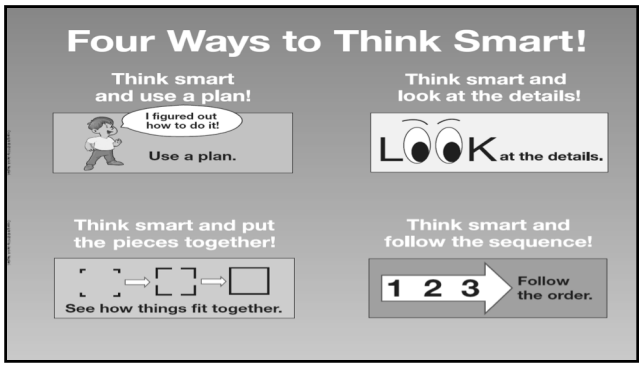

Steps to Strategic Instruction:

- **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.

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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"

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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.
- The 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 good EF behavior and outcome.

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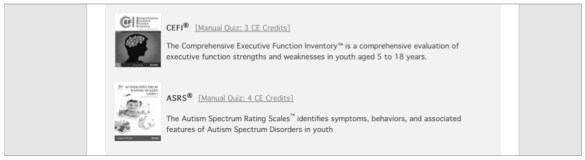
Continuing Education



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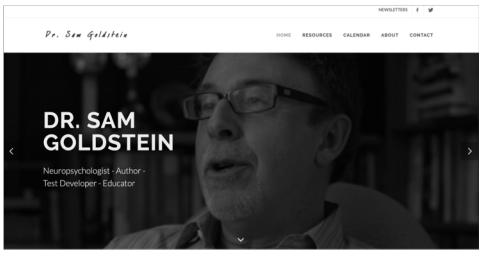

Questions?
www.samgoldstein.com
info@samgoldstein.com
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