Executive Functioning: From Assessment to Intervention

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Executive Function & CEFI

conclusions

Meltzer (2010)

➤ 'Classroom instruction generally focuses on Content (or the *what to know)*, rather than on the *how to do or learn…*and does not address metacognitive strategies that teach students to think about *how* they think and learn'.
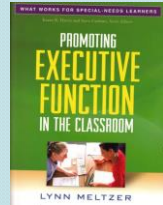
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How to Promote EF in the Classroom

➤ Teach students to be metacognitive learners who think about how they think and learn
➤ Encourage students to keep an EF diary
➤ Create daily 5-10 minute discussions so that the students can share strategies they used
➤ Have students team up in pairs or small groups and brainstorm new strategies
➤ Peer mentoring the best EF strategies

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Presentation Outline

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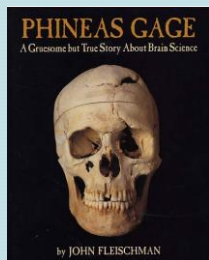 • Validity
➤ EF and instruction

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conclusions   4

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.
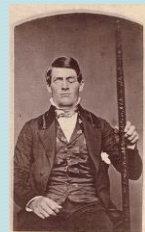
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The Curious Story of Phineas Gage

• September 13, 1848 26 year old Phineas Gag was in charge of a railroad track construction crew blasting granite bedrock near Cavendish, Vermont
• He is described as being good with his hands and good with his men
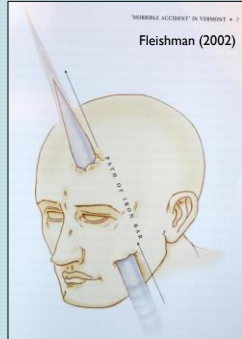• He has a particularly dangerous job

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Fleishman (2002, p 70)

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

Fleishman (2002)

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The Curious Story of Phineas Gage

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

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Before . . . & . . . After

- **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 ability to direct others was gone, he had considerable trouble with decision making, control of impulses and interpersonal relationships – management of intellect, behavior and emotion

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A Bit of EF Neuroanatomy

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

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More Specifically

Dorsolateral prefrontal cortex

- 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.
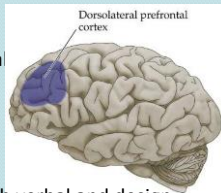
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What Neural Activities Require EF?

- 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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  • Interpretation
  • Validity
➤ EF and instruction

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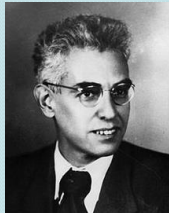---

Frontal Lobes and Executive Function(s)

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

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Executive Function (s)

➤ In 1966 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

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1902 - 1977   conclusions   15

Executive Functions

• Elkhonon Goldberg provides a valuable review of what the frontal lobes do
• Describes EF as the orchestra leader

http://www.elkhonongoldberg.com

THE NEW EXECUTIVE BRAIN
FRONTAL LOBES IN A COMPLEX WORLD
Elkhonon Goldberg, Ph.D.
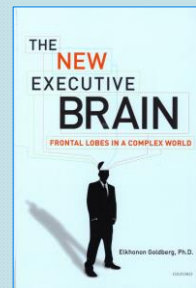
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Goldberg (2009, p. 4)

• "The frontal lobes … are liked to intentionality, purposefulness, and complex decision making."
• They make us human, and as Luria stated, are "the organ of civilization"
• Frontal lobes are about …"leadership, motivation, drive, vision, self-awareness, and awareness of others, success, creativity, sex differences, social maturity, cognitive development and learning…"

THE NEW EXECUTIVE BRAIN
FRONTAL LOBES IN A COMPLEX WORLD
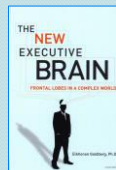
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What is Executive Function(s)

There is no formal accepted 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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Goldstein, Naglieri, Princiotta, & Otero (2013)

➢ Executive function(s) has come to be an umbrella term used for many different "abilities": planning, working memory, attention, inhibition, self-monitoring, self-regulation and initiation carried out by pre-frontal areas of the frontal lobes.

➢ We found more than 30 definitions of EF(s)

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Definitions of 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. Gioia, Isquith, Guy, & Kenworthy (2000): "a **collection of processes that are responsible for guiding, directing, and managing cognitive, emotional, and behavioral functions**" (p. 1).
5. Pribram (1973): "**executive programmes …to maintain brain organization** " (p. 301).

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What is Executive Function(s)

6. Roberts & Pennington (1996): EF "**a collection of related but somewhat distinct abilities such as planning, set maintenance, impulse control, working memory, and attentional control**" (p. 105).

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What is Executive Function(s)

6. Stuss & Benson (1986): "**a variety of different capacities that enable … behavioral regulation, working memory, planning and organizational skills, and self-monitoring**" (p. 272).
7. McCloskey (2006): **"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): "**how and whether a person goes about doing something**" (Lezak, p. 42).
11. Luria (1966): "… **ability to correctly evaluate their own behavior and the adequacy of their actions**" (p. 227).

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Executive Function	**Executive Functions**
• EF has 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**.	• 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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  • Interpretation
  • Validity
➤ EF and instruction

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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?

➤ Development of a behavior rating scale to measure Executive Function(s)

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CEFI Authors (New Orleans, 2008)

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Executive Function(s)

➤ We conducted a series of research studies to answer the following question:
  • What is the underlying structure of EF behaviors?
    ◦ Is there is just one underlying factor called executive function), or is Ef a multidimensional construct?
➤ We used the Comprehensive Executive Function Inventory (CEFI)
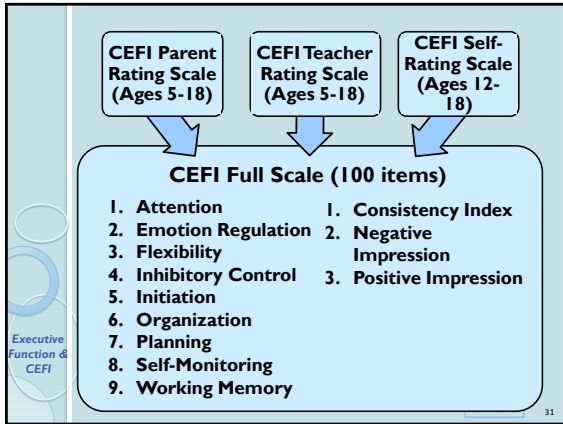
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CEFI (Naglieri & Goldstein, 2012)

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CEFI Parent Rating Scale (Ages 5-18) → **CEFI Teacher Rating Scale (Ages 5-18)** → **CEFI Self-Rating Scale (Ages 12-18)**

CEFI Full Scale (100 items)

1. Attention
2. Emotion Regulation
3. Flexibility
4. Inhibitory Control
5. Initiation
6. Organization
7. Planning
8. Self-Monitoring
9. Working Memory

1. Consistency Index
2. Negative Impression
3. Positive Impression

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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

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

➢ The sample …

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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

Eigenvalue chart (Parents, Teachers, Self) — Factor 1 through Factor 5

Table 8.2. Eigenvalues from the Inter-Item Correlations

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 = Principal 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 2

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

Eigenvalue

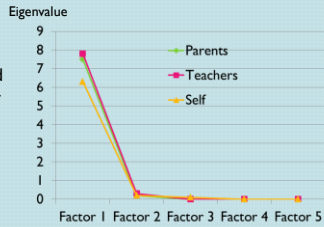Legend: Parents, Teachers, Self

Factor 1 Factor 2 Factor 3 Factor 4 Factor 5

Table 8.4. Eigenvalues of the CEFI Scales Correlations

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: Png.

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EXPLORATORY FACTOR ANALYSES

Table 8.6. Consistency of Factor Loadings Across Groups

Grouping Factor	CEFI Form	Coefficient of Congruence
Gender	Parent	.999
	Teacher	.999
	Self-Report	.992
Race/Ethnic Group	Parent	.996
	Teacher	.999
	Self-Report	.995
Age	Parent	.999
	Teacher	.999
	Self-Report	.995
Clinical/Educational	Parent	.993
	Teacher	.994
	Self-Report	.976

Nearly identical factor solutions (ALL ONE FACTOR) by Gender, Race/Ethnic, Age and Clinical/typical status

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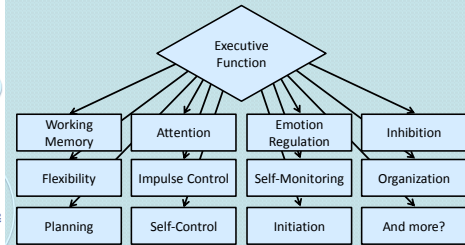

EXPLORATORY FACTOR ANALYSES

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

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EF and its components
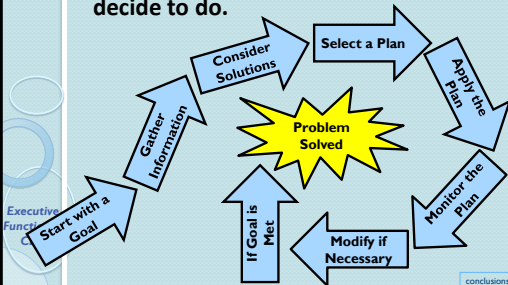
➢ Abilities, cognitive processes, and behaviors

Executive Function → Working Memory, Attention, Emotion Regulation, Inhibition, Flexibility, Impulse Control, Self-Monitoring, Organization, Planning, Self-Control, Initiation, And more?

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Naglieri & Goldstein, 2012

➢ Executive Function is: *how you do what you decide to do.*

Start with a Goal → Gather Information → Consider Solutions → Select a Plan → Apply the Plan → Monitor the Plan → Modify if Necessary → If Goal is Met → Problem Solved
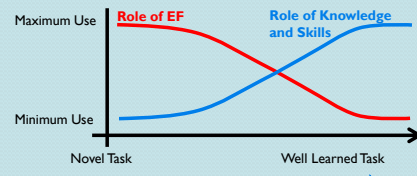
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EF's Learning Curves

➢ Learning depends upon instruction and intelligence (&EF)
➢ At first, intelligence plays a major role in learning
➢ When a new task is learned and practiced it becomes a skill and execution requires less intelligence

Maximum Use, Role of EF, Role of Knowledge and Skills, Minimum Use, Novel Task, Well Learned Task, Over time and with experience

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Executive Function Defined

➢ The concept of Executive Function is best defined as a unitary construct…

how you do *what* you do.

➢ This includes **initiation** to achieve a goal, **planning** and **organizing** the tasks, **attending** to details to notice success of the solution, keeping information in **memory** and having **flexibility** to modify the solution as information from **self-monitoring** is received and demonstrating **emotion regulation** and **inhibitory control** so that the task is completed successfully.

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A Comprehensive Evaluation of EF should include Behavior, Cognition and Social Emotional Skills

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conclusions

Executive Function - Measured

➢ The concept of EF defined as: "**how and whether a person goes about doing something**" (Lezak, 1995, p. 42) is should be assessed across three areas:

• EF Behaviors - *Comprehensive Executive Function Inventory* (CEFI, Naglieri & Godstein, 2014)

• EF Ability Cognitive Assessment System – Second Edition (CAS2, Naglieri, Das & Goldstein, 2014)

• EF Social Emotional Skills - Devereux Student Strength Assessment K-8th Grade (DESSA; LeBuffe, Sharipiro & Naglieri, 2012)
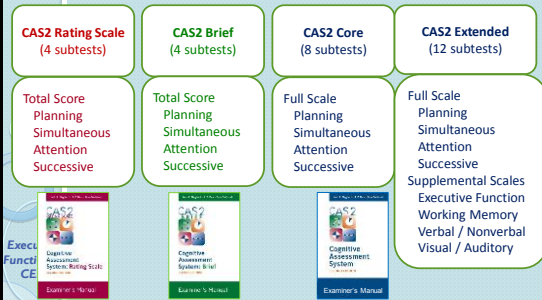
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PASS Comprehensive System

(Naglieri, Das, & Goldstein, 2014)

CAS2 Rating Scale (4 subtests)	**CAS2 Brief** (4 subtests)	**CAS2 Core** (8 subtests)	**CAS2 Extended** (12 subtests)
Total Score Planning Simultaneous Attention Successive	Total Score Planning Simultaneous Attention Successive	Full Scale Planning Simultaneous Attention Successive	Full Scale Planning Simultaneous Attention Successive Supplemental Scales Executive Function Working Memory Verbal / Nonverbal Visual / Auditory

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CAS2

➢ Supplementary Scales: Executive Function, Working Memory, Verbal, Nonverbal

➢ Added: A Visual and Auditory comparison

Supplemental Composite Scores

Subtest	Scaled Score				
	EF w/o WM	EF w/ WM	WM	VC	NvC
Planned Codes					7
Planned Connections	8	8			
Matrices					10
Verbal-Spatial Relations		11	11	11	
Figure Memory					10
Expressive Attention	9	9			
Receptive Attention				9	
Sentence-Repetition/Questions		7	7	7	
	EF w/o WM	EF w/ WM	WM	VC	NvC
Sum of Subtest Scaled Scores	17	35	18	27	27
Composite Index Scores	91	91	94	93	92
Percentile Rank	27	27	34	32	30
% Confidence Interval Upper	101	99	101	101	99
Lower	84	85	88	87	86

Note: EF w/o WM = Executive Function without Working Memory; EF w/WM = Executive Function with Working Memory; WM = Working Memory; VC = Verbal Content; NvC = Nonverbal Content.
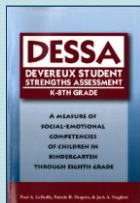
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The DESSA Comprehensive System

➢ Universal screening with an 8-item, strength-based behavior rating scale, the *DESSA-mini* for universal screening and ongoing progress monitoring

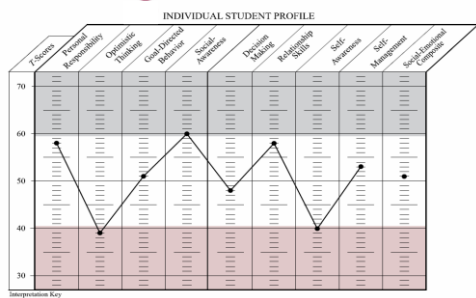➢ 72-item *DESSA* to find specific areas of need in Social-Emotional skills

Paul LeBuffe　&　Valerie Shapiro

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DESSA has 8 scales and a Total

Comprehensive Executive Function Inventory (CEFI)

> A rating scale designed to measure behaviors association with Executive Function for ages 5-18 years

> CEFI has three forms: parent, teacher, and self ratings.

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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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EF is a Brain-Based Ability

> EF is an ability by virtue of its relationship to the brain

> Because there is a relationship between BRAIN FUNCTION and BEHAVIOR, behaviors tell us about the ABILITY (sometimes…)

> EF SKILLS are the result of EF Ability *and* well practiced behaviors that reflect EF
  • Not all abilities and not all behaviors involve EF

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EF Rating Scales

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

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

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Review of Rating Scales

Sam Goldstein · Jack A. Naglieri Editors

Handbook of Executive Functioning

Assessment of Executive Function Using Rating Scales: Psychometric Considerations

Jack A. Naglieri and Sam Goldstein

Introduction

In any field of scientific study the information we obtain from research is directly related to the quality of the information we obtain from the tools we use. The better the tool, the more accurate and reliable the information that is obtained. Ultimately, the validity of the tools used in science will be proportionate to the quality of the concepts being

psychometric issues have for the assessment and the implications for interpretation of results will be emphasized. Special attention will be paid to scale development procedures, particularly methods used to develop derived scores. The second section of this chapter will focus on rating scales used to assess behaviors considered indicative of executive function. The overall aim is to provide an examination of the relevant psychometric issues and the extent to which researchers and

From Handbook of Executive Function (Goldstein & Naglieri, 2014)

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A look at some EF Rating Scales

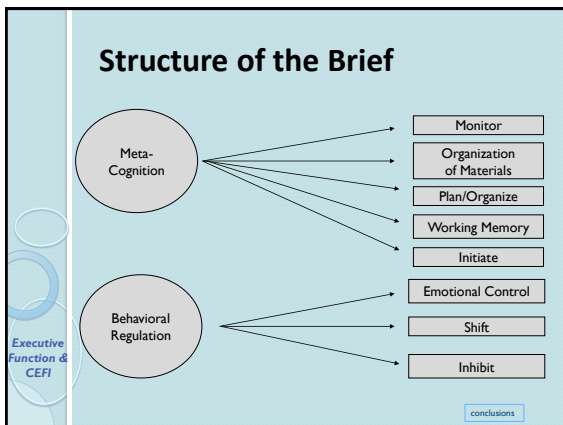Executive Function & CEFI

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Behavior Rating Inventory of Executive Functioning (BRIEF)

➢ High internal consistency (alphas = .80 -.98) and test-retest reliability (rs = .82 for parents, .88 for teachers) were found.

BRIEF
Behavior Rating Inventory of Executive Function
Professional Manual
PAR

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Structure of the Brief

Meta-Cognition → Monitor, Organization of Materials, Plan/Organize, Working Memory, Initiate

Behavioral Regulation → Emotional Control, Shift, Inhibit

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Factor analysis of BRIEF

Table 29 — Summary of Factor Loadings for Two-Factor Model for the BRIEF Parent Form

Scale	Normative sample Factor 1	2	Clinical sample Factor 1	2
Plan/Organize	.374		.969	
Working Memory	.879		.817	
Initiate	.812		.713	
Organization of Materials	.637		.683	
Monitor	.762		.582	
Emotional Control		.990		.902
Shift		.466		.774
Inhibit	.487			.686

Factor correlation (r): .87 / .71
Cumulative % variance: 74% / 76%

Table 30 — Summary of Factor Loadings for Two-Factor Model for the BRIEF Teacher Form

Scale	Normative sample Factor 1	2	Clinical sample Factor 1	2
Plan/Organize	.960		.899	
Working Memory	.928		.869	
Initiate	.910		.830	
Organization of Materials	.725		.881	
Monitor	.648		.598	
Emotional Control		1.024		1.013
Shift		.671		.865
Inhibit		.548		.762

Factor correlation (r): .62 / .56
Cumulative % variance: 83% / 79%

The Inhibit scale does not load on Behavioral Regulation

Emotional Control loadings are >1.0 on the Behavioral Regulation factor

Executive Function & CEFI

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Behavior Rating Inventory of Executive Functioning (BRIEF)

STANDARDIZATION

Demographic Characteristics

The goal of the sampling procedure for the normative group was to approximate the population of the United States according to key demographic variables: gender, socioeconomic status (SES), ethnicity, age, and geographical population density. The normative data samples were obtained through public and private school recruitment in urban, suburban, and rural settings in the State of Maryland, which has a full range of ethnicities, socioeconomic classes, and population densities. A total of 25 schools were sampled, including 12 elementary, 9 middle, and 4 high schools. A small subgroup of ratings of adolescents (n = 18) was obtained from the normal control group in a study of patients with traumatic brain injury at Case Western Reserve University in Cleveland, Ohio (Turkstra, 2000).

Executive Function & CEFI
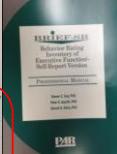
Educational Attainment

Annual averages of Educational Attainment by State for persons 25 years old and over based on 2000 Census (American National Standards Institute)

	State	2009		
		High school graduate or more	Bachelor's degree or more	Advanced degree or more
	United States	85.3	27.9	10.3
1	Massachusetts	89.0	38.2	16.4
2	Maryland	88.2	35.7	16.0
3	Connecticut	88.6	35.6	15.5
4	Virginia	86.6	34.0	14.1
5	New York	84.7	32.4	14.0
6	Vermont	91.0	33.1	13.3
7	New Jersey	87.4	34.5	12.9
8	Colorado	89.3	35.9	12.7
9	Illinois	86.4	30.6	11.7
10	Rhode Island	84.7	30.5	11.7

Median household income for the US is $50,022 and for Maryland is $64,596

Executive Function & CEFI

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BRIEF-Adolescent (N=1,118)

STANDARDIZATION

Demographic Characteristics of the Normative Sample

The goal of the sampling procedure for the normative group was to approximate the U.S. population according to key demographic variables: age, gender, race/ethnicity, parent education, and geographical population density. The normative data samples were obtained through public and private school recruitment in urban, suburban, and rural settings in Maryland, Ohio, Vermont, New Hampshire, Florida, and Washington state. Combined, these environments offer a full range of races/ethnicities, socioeconomic classes, and population densities.

Executive Function & CEFI

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Delis-Rating of Executive Function

D·REF Delis-Rating of Executive Functions

Delis-Rating of Executive Function (D-REF)

Author(s): Dean C. Delis

A quick measure of an individual's behaviors related to executive function difficulties

At a Glance:

Administration: On-line (paper available)
Completion Time: 5-10 minutes per form
Scores: T scores; Composite level
Report Options: Single rater parent, teacher, or child reports; multiple rater reports, progress monitoring report
Qualification level: B-Level
Publication Date: 2012
Ages / Grades: Individuals 5–18 years old
Reading Level: 4th grade

Executive Function & CEFI

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Standardization Sample

➢ Manual states that the samples are representative of the US population

Description and Representativeness of the Sample

The D-REF normative data are based on national samples representative of the U.S. population ages 5–18 years. Tables 3.1, 3.2, and 3.3 provide a comparison of the sample demographics to U.S. census targets for the Parent, Teacher, and Self rating forms. An analysis of data gathered in 2010 by the U.S. Bureau of the Census provided the basis for stratification according to the following variables: age, sex, race/ethnicity, and education level. All examinees were

Exe Fun

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Standardization Sample

Age Groups

For the D-REF normative sample, six age bands were collected: 5–6, 7–8, 9–10, 11–12, 13–14, and 15–18. Only ages 11–18 were collected for the Self Rating Form sample. Table 3.4 provides the number of rating forms collected for each age group.

Table 3.4
Rating Form Sample Size by Age Group

Age Group	Rating Form		
	Parent	Teacher	Self
5–6	100	76	–
7–8	100	76	–
9–10	70	40	–
11–12	70	50	50
13–14	60	50	50
15–18	100	50	120

Executive Function & CEFI

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Parent Form (N = 500)

Demographic Characteristics of the Normative Sample by Parent Education Level, Race/Ethnicity, Geographic Region, and Sex, by Age Group: Parent Form

	5–6 Sample (%)	5–6 U.S. Pop.[a] (%)	7–8 Sample (%)	7–8 U.S. Pop.[a] (%)	9–10 Sample (%)	9–10 U.S. Pop.[a] (%)	11–12 Sample (%)	11–12 U.S. Pop.[a] (%)	13–14 Sample (%)	13–14 U.S. Pop.[a] (%)	15–18 Sample (%)	15–18 U.S. Pop.[a] (%)
Parent Education Level												
Grade 11 or Less	13.0	11.7	11.0	11.7	8.6	10.7	5.7	10.4	6.7	10.2	10.0	9.8
High School or GED	23.0	24.1	25.0	26.0	28.6	26.5	27.1	25.7	25.0	26.9	27.0	26.1
Post Secondary	64.0	64.2	64.0	62.3	62.9	62.8	67.1	64.0	68.3	62.8	63.0	64.0
Race/Ethnicity												
African American	29.0	12.7	26.0	13.5	8.6	13.1	12.9	14.0	16.7	14.3	6.0	14.3
Hispanic	20.0	24.7	18.0	23.5	17.1	23.0	20.0	20.2	10.0	19.7	30.0	18.2
White	47.0	54.3	50.0	54.8	67.1	56.7	57.1	58.3	70.0	58.1	57.0	60.4
Other[b]	4.0	8.3	6.0	8.3	7.1	7.3	10.0	7.5	3.3	7.9	7.0	7.1
Geographic Region												
Northeast	31.0	15.8	37.0	17.3	12.9	16.7	5.7	16.8	1.7	18.6	8.0	17.6
Midwest	6.0	21.2	8.0	21.9	30.0	22.2	25.7	21.3	21.7	21.4	2.0	22.8
South	51.0	38.1	37.0	36.5	38.6	37.3	64.3	38.3	76.7	36.0	84.0	36.6
West	12.0	25.0	18.0	24.3	18.6	23.8	4.3	23.6	–	24.0	6.0	22.9
Sex												
Female	56.0	48.9	48.0	49.4	50.0	49.2	51.4	48.1	45.0	48.7	52.0	48.7
Male	44.0	51.1	52.0	50.6	50.0	50.8	48.6	51.9	55.0	51.3	48.0	51.3

Teacher Form (N = 342)

Table 3.2
Demographic Characteristics of the Normative Sample by Parent Education Level, Race/Ethnicity, Geographic Region, and Sex, by Age Group: Teacher Form

	5–6 Sample (%)	5–6 U.S. Pop.[a] (%)	7–8 Sample (%)	7–8 U.S. Pop.[a] (%)	9–10 Sample (%)	9–10 U.S. Pop.[a] (%)	11–12 Sample (%)	11–12 U.S. Pop.[a] (%)	13–14 Sample (%)	13–14 U.S. Pop.[a] (%)	15–18 Sample (%)	15–18 U.S. Pop.[a] (%)
Parent Education Level												
Grade 11 or Less	9.2	11.7	10.5	11.7	10.0	10.7	6.0	10.4	10.0	10.2	14.0	9.8
High School or GED	25.0	24.1	25.0	26.0	27.5	26.5	28.0	25.7	28.0	26.9	40.0	26.1
Post Secondary	65.8	64.2	64.5	62.3	62.5	62.8	66.0	64.0	62.0	62.8	46.0	64.0
Race/Ethnicity												
African American	39.5	12.7	36.8	13.5	12.5	13.1	14.0	14.0	8.0	14.3	8.0	14.3
Hispanic	10.5	24.7	17.1	23.5	15.0	23.0	12.0	20.2	6.0	19.7	34.0	18.2
White	44.7	54.3	39.5	54.8	60.0	56.7	64.0	58.3	80.0	58.1	50.0	60.4
Other[b]	5.3	8.3	6.6	8.3	12.5	7.3	10.0	7.5	6.0	7.9	8.0	7.1
Geographic Region												
Northeast	32.9	15.8	38.2	17.3	–	16.7	–	16.8	–	18.6	2.0	17.6
Midwest	6.6	21.2	5.3	21.9	40.0	22.2	32.9	21.3	30.0	21.4	2.0	22.8
South	42.1	38.1	27.6	36.5	47.5	37.3	66.0	38.3	70.0	36.0	90.0	36.6
West	18.4	25.0	28.9	24.3	12.5	23.8	–	23.6	–	24.0	6.0	22.9
Sex												
Female	53.9	48.9	48.7	49.4	52.5	49.2	52.0	48.1	48.0	48.7	40.0	48.7
Male	46.1	51.1	51.3	50.6	47.5	50.8	48.0	51.9	52.0	51.3	60.0	51.3

Self Form (N = 220)

	11–12 Sample (%)	11–12 U.S. Pop.[a] (%)	13–14 Sample (%)	13–14 U.S. Pop.[a] (%)	15–18 Sample (%)	15–18 U.S. Pop.[a] (%)
Parent Education Level						
Grade 11 or Less	4.0	10.4	8.0	10.2	11.7	9.8
High School or GED	30.0	25.7	24.0	26.9	25.8	26.1
Post Secondary	66.0	64.0	68.0	62.8	62.5	64.0
Race/Ethnicity						
African American	16.0	14.0	16.0	14.3	7.5	14.3
Hispanic	16.0	20.2	22.0	19.7	32.5	18.2
White	64.0	58.3	60.0	58.1	54.2	60.4
Other[b]	4.0	7.5	2.0	7.9	5.8	7.1
Geographic Region						
Northeast	6.0	16.8	2.0	18.6	8.3	17.6
Midwest	26.0	21.3	14.0	21.4	1.7	22.8
South	66.0	38.3	84.0	36.0	83.3	36.6
West	2.0	23.6	–	24.0	6.7	22.9
Sex						
Female	50.0	48.1	46.0	48.7	52.5	48.7
Male	50.0	51.9	54.0	51.3	47.5	51.3

Barkley's EF Scale

Barkley Deficits in Executive Functioning Scale— Children and Adolescents (BDEFS-CA)

Russell A. Barkley

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Barkley's EF Scale

Education

The breakdown in educational categories for the parent respondents in comparison with the 2000 U.S. Census (*www.census.gov*) is shown in the following:

Education category	Normative sample	U.S. Census
Less than high school	4.1%	19.1%
High school (diploma or equivalency)	28.1%	28.6%
Some college, no degree	20.6%	21.0%
Associates degree	9.2%	6.3%
Bachelor's degree	22.5%	15.5%
Graduate degree	15.4%	8.9%

The present sample is generally comparable to the U.S. population in the percentage having high school diplomas or equivalency, some college, or associate's degrees but has a slight overrepresentation of individuals with bachelor's or graduate degrees. The sample also contains a lower percentage of those having less than a high school education than appear in the U.S. Census. The breakdown of educational levels of the nonrespondent parents follows: less than high school, 6.6%; high school, 20.6%; some college, no degree, 20.6%; associate's degree, 10.2%; bachelor's degree, 22.8%; graduate degree, 14.8%. These percentages are very similar to those for the respondent parents. The mean educational level for the children in the sample was 7.4 years (*SD* = 3.5, range = kindergarten [1] to 12th grade [13]), or roughly a mid-5th-grade education.

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Importance of a National Norm

➤ What is the problem with not 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 …

➤ I created norms for groups of children based on PEL levels to see just how much influence this variable could have on a standard score (Mean = 100, SD = 15)

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3/3/2015

Importance of a National Norm

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

Raw Score	<HS	HS Grad	Some Coll	Coll Grad	National
230	96	91	88	85	90
235	97	9 **10 points** 9	87	91
240	98	95	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	10 **8 points** 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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Take Away Messages

➢ Scores are only as good as the tests we use.
➢ The quality of the reference group can make a huge difference in the conclusions reached.
➢ Norms that represent a typical population are needed for all assessment tools.
➢ Only scores based on nationally representative samples can provide the accuracy and precision that we must have.

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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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Presentation Outline

➢ Historical Perspective
➢ 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

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Comprehensive Executive Function Inventory (CEFI)

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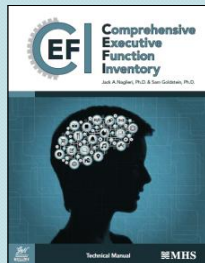
A rating scale designed to measure behaviors association with Executive Function for ages 5-18 years rated by a parent, teacher, or the child/youth.

conclusions

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)

Executive Function & CEFI

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CEFI Forms

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

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

Executive Function & CEFI

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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?

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)

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?

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CEFI Items by Scale

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 di...
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?

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?

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?

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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?

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?

Table C.12. Working Memory (11 items)

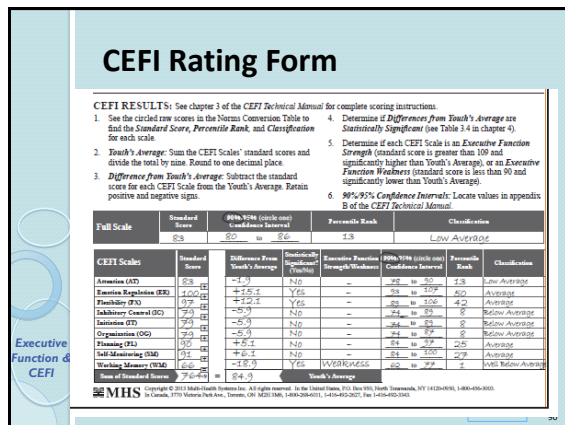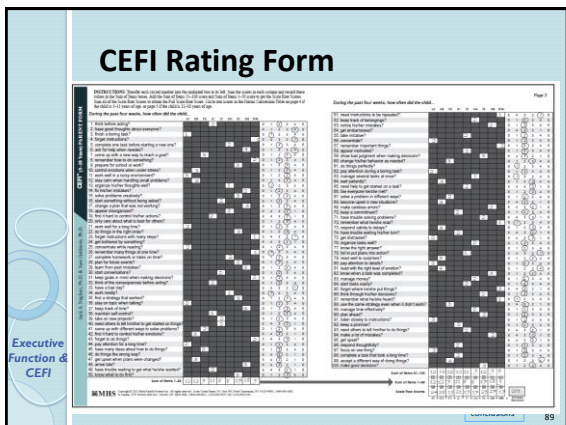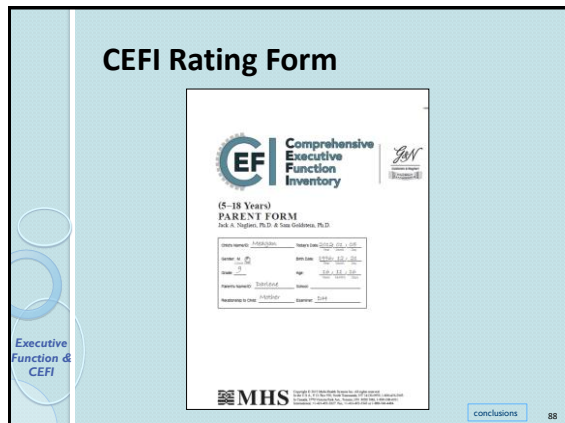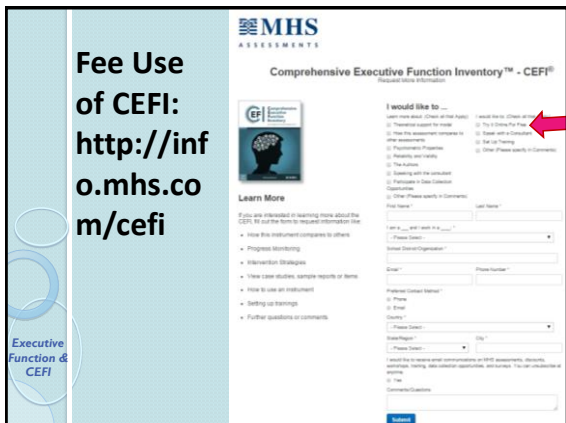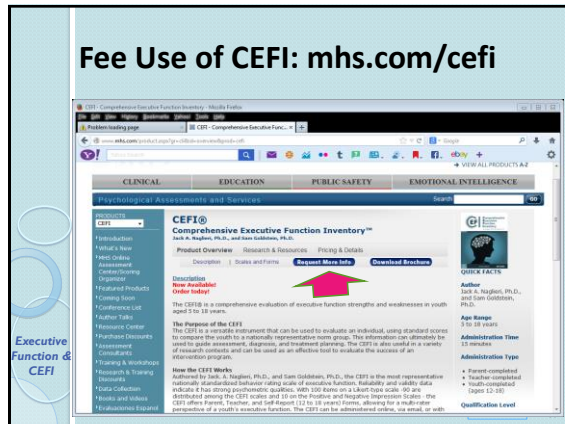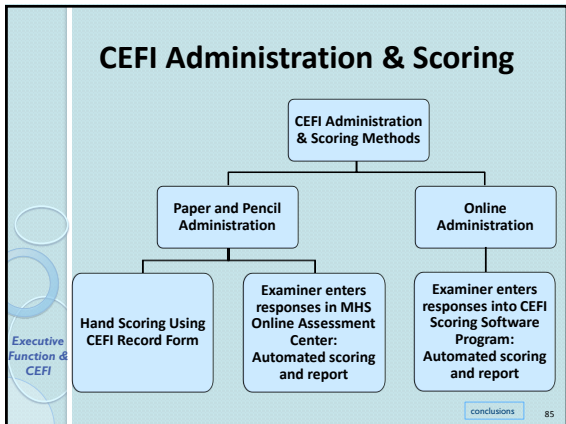| Item #	Parent/Teacher Item — During the past 4 weeks, how often did the child...	Self-Report Item — During the past 4 weeks, how often did you...
4.	forget instructions? (R)	forget instructions? (R)
8.	remember how to do something?	remember how to do something?
23.	forget instructions with many steps?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

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One Factor and 9 Scales?

➢ We view EF as a unidimensional concept
➢ Use the Full Scale to answer the question "Is the child poor in EF or not?"
➢ Use the 9 scales to identify the specific groups of items that represent 9 different types of behaviors that can be addressed by Intervention

Executive Function & CEFI

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CEFI Administration & Scoring

Fee Use of CEFI: mhs.com/cefi

Fee Use of CEFI: http://info.mhs.com/cefi

CEFI Rating Form

CEFI Rating Form

CEFI Rating Form

CEFI Standardization

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

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

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

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

CEFI Normative Samples

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

Executive Function & CEFI

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Presentation Outline

- Historical Perspective
- 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

Executive Function & CEFI

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CEFI Scale Reliability

CEFI Internal Reliability Coefficients for the Normative Sample

	Parent (N = 1,396)	Teacher (N=1,400)	Self (N = 700)
Full Scale	.99	.99	.97
Attention	.93	.96	.86
Emotion Regulation	.89	.93	.78
Flexibility	.85	.90	.77
Inhibitory Control	.90	.94	.80
Initiation	.89	.93	.80
Organization	.91	.94	.85
Planning	.92	.96	.85
Self-Monitoring	.87	.92	.78
Working Memory	.89	.94	.83

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Presentation Outline

- Historical Perspective
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  - Validity
- EF and instruction

Executive Function & CEFI

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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

Executive Function & CEFI

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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.

Executive Function & CEFI

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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.	The pattern of ratings is typical.
Positive Impression Scale	The pattern of ratings may over-estimate the child's behavior. This rating pattern is not typical and should be further investigated.	The pattern of ratings is typical.
Time to Completion	The rater spent considerably less time than is usual completing the CEFI.	The time the rater took to complete the CEFI was typical.

Time to Completion is only for online administration

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CEFI Interpretive Report

Comprehensive Executive Function Inventory

(5–18 Years)
Parent Form

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

Interpretive Report

Youth's Name/ID: **Brittany Ambers**
Age: 12 years
Gender: Female
Birth Date: November 18, 1999
Grade: 6
School: K.H.S.
Parent's Name/ID: Mrs. Z
Relationship to Youth: Mother
Administration Date: May 19, 2012
Examiner: DH
Data Entered By: MT

Executive Function & CEFI

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CEFI Interpretive Report

CEFI (5–18 Years) Parent Interpretive Report for Brittany Ambers   Admin Date: 05/19/2012

About the Ratings

This section of the report provides an evaluation of the ratings provided by this rater. Item scores were examined for consistency, negative impression, positive impression, and number of omitted items. This information can be used to determine whether responses should be reviewed with the rater to explore possible reasons response bias is indicated, and the amount of confidence one can have in the results.

Description	Indicated	Not Indicated	
Consistency			110
Negative Impression		89	
Positive Impression			111

| Standard Score | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | ≥130 |
| Percentile Rank | 1st | 1st | 2nd | 9th | 25th | 50th | 75th | 91st | ±98th |

Scores

Consistency Index	Standard Score = 110 Inconsistent response style is not indicated.
Negative Impression Scale	Standard Score = 89 Negative impression response style is not indicated.
Positive Impression Scale	Standard Score = 111 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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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

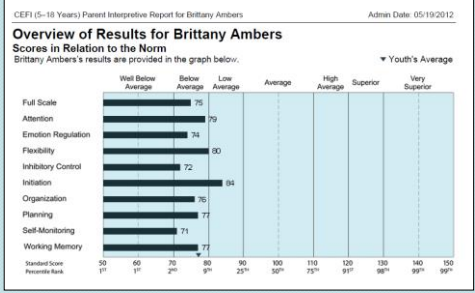*Executive Function & CEFI*

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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.

CEFI Interpretive Report

CEFI Interpretive Report

CEFI Interpretation

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

Step 2: Interpret Scale Scores

Step 3: Compare CEFI Scale Scores

Step 4: Examine Item-Level Responses

Step 5: Compare Results Across Raters

Step 6: Compare Results Over Time

Step 3: Compare CEFI Scale Scores

Figure 4.1. Illustration of Executive Function Weakness and Strengths on the CEFI (5–18 Year 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 $p < .10$.

CEFI Interpretation

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

Step 2: Interpret Scale Scores

Step 3: Compare CEFI Scale Scores

Step 4: Examine Item-Level Responses

Step 5: Compare Results Across Raters

Step 6: Compare Results Over Time

Step 5: Between Rater Comparisons

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

Scale	Parent to Parent 5–11 Years	Parent to Parent 12–18 Years	Teacher to Teacher 5–11 Years	Teacher to Teacher 12–18 Years	Parent to Teacher 5–11 Years	Parent to Teacher 12–18 Years	Parent to Self-Report 12–18 Years	Teacher to Self-Report 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

Executive Function & CEFI
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 5–11 Years p < .05	Parent Form 5–11 Years p < .10	Parent Form 12–18 Years p < .05	Parent Form 12–18 Years p < .10	Teacher Form 5–11 Years p < .05	Teacher Form 5–11 Years p < .10	Teacher Form 12–18 Years p < .05	Teacher Form 12–18 Years p < .10	Self-Report Form 12–18 Years p < .05	Self-Report Form 12–18 Years 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

Presentation Outline

➤ Historical Perspective
➤ 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

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CEFI Scores by Diagnosis

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

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

Group Differences: ADHD

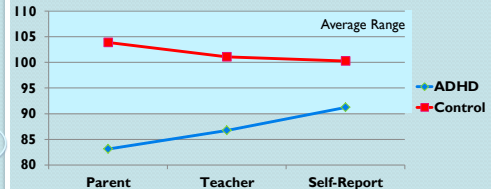**Table 8.19 Differences Between ADHD and Matched General Population Samples: CEFI Full Scale**

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

conclusions 114
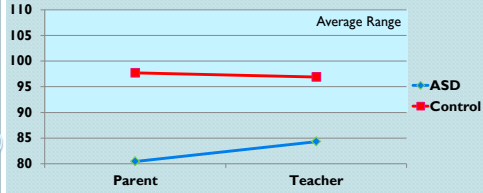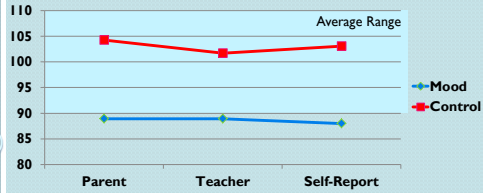
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Group Differences: ASD

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			

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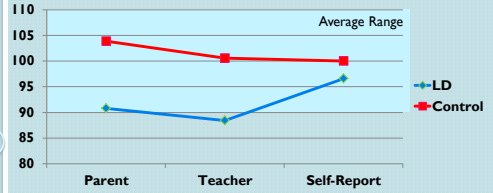
Table 8.22 Differences Between LD and Matched General Population Samples: CEFI Full Scale

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			

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			

Gender Differences: Parent Raters

➤ Girls are have better EF than Boys

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

Executive Function & CEFI

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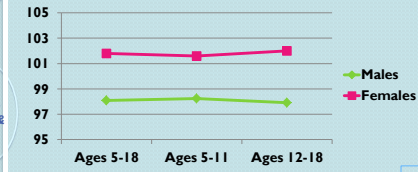
Gender Differences: Teacher Raters

➤ Girls are better EF than Boys

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

Executive Function & CEFI

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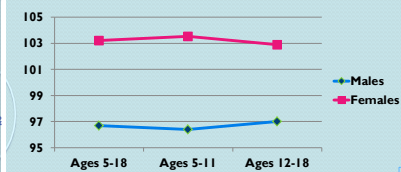
Gender Differences: Self Raters

➤ Girls are better EF than Boys
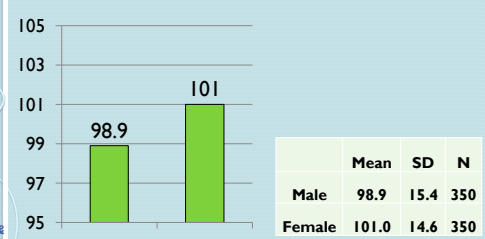
	Mean	SD	N
Male	98.9	15.4	350
Female	101.0	14.6	350

Executive Function & CEFI

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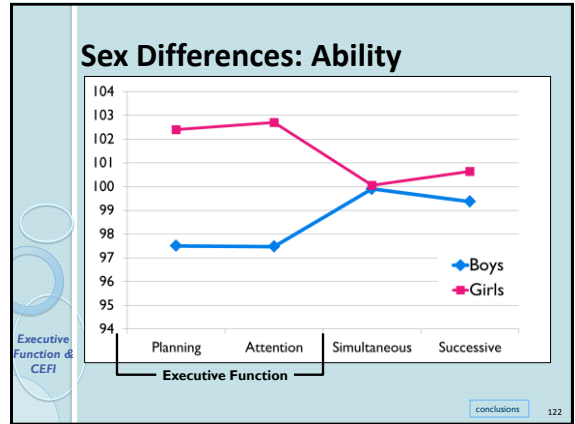
Girls are Better EF Than Boys

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

Jack A. Naglieri
George Mason University

Johannes Rojahn
Ohio State University

Planning = .3 and Attention = .35

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

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Sex Differences: Ability

Executive Function & CEFI

Executive Function

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Sex Differences: Social Emotional

DESSA
DEVEREUX STUDENT STRENGTHS ASSESSMENT
K-8TH GRADE

A MEASURE OF SOCIAL-EMOTIONAL COMPETENCIES OF CHILDREN IN KINDERGARTEN THROUGH EIGHTH GRADE

Paul A. LeBuffe, Valerie B. Shapiro, & Jack A. Naglieri

KPRESS

Devereux Elementary Student Strength Assessment (DESSA, LeBuffe Shapiro & Naglieri, 2009)

Executive Function & CEFI

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Sex Differences: Social Emotional

Parent & Teacher Raters Females

Parent & Teacher Raters Males

Notes:
N = 2,477
DESSA values are T-scores (Mn= 50, SD = 10).

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CEFI and BRIEF

➤ The CEFI and BRIEF were compared using 320 parent, teacher, and self-ratings

➤ BRIEF yields T scores (50;10) scaled so that high scores indicate poor EF

• These scores were converted to the 100 & 15 metric and inverted so that both tests have the same scaling

➤ One group was diagnosed with ADHD

➤ Second group was diverse (Anxiety, ADD, Mood Disorders, other (see table 8.23)

Executive Function & CEFI

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Areas Operationalized: CEFI vs. BRIEF

CEFI		BRIEF	
Emotion Regulation	Control of emotions, staying calm when dealing with small problems, reacting with the right amount of emotion.	Emotional Control	Modulate emotional responses/mood appropriately
Flexibility	Ability to respond appropriately to changing or altered situations or different people/circumstances	Shift	Transition smoothly between or adapt to new activities/ situations; problem-solve flexibly
Impulse Control	Restraining impulses, reactions, or behavior	Inhibit	Control, delay or stop impulses/ behavior
Initiate	Willing exertion of physical or mental effort in pursuit of a goal	Initiate	Begin activity; generate ideas; start new tasks
Memory	Ability to store, retain, manipulate, & recall information	Working Memory	Hold information in mind to complete a task; sustain focus
Organization	Applying a structure or system for arranging or classifying objects & tasks; methodical and efficient behavior	Organization of Materials	Clean up after oneself
Planning	Holding a mental representation of intended action that guides behavior; outline of steps to complete a task/solve a problem	Plan/Organize	Anticipate future events; set goals; develop steps; grasp main ideas; think prospectively; follow a plan
Self/Performance Monitoring	Ability to attend to & evaluate ongoing behavior/outcomes to make necessary corrections for successful goal completion	Monitor	Check work; assess performance; monitor effect of behavior on others

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Sample Characteristics

Table 8.23. Demographic Characteristics of the CEFI and BRIEF Validity Samples

			Sample					
			Parent		Teacher		Self-Report	
Demographic			N'	%	N'	%	N'	%
Gender	Male		75	66.4	67	62.6	42	66.7
	Female		38	33.6	40	37.4	21	33.3
Race/Ethnic Group	Hispanic		8	7.1	5	4.7	4	6.3
	Asian		1	0.9	1	0.9	0	0.0
	Black		7	6.2	6	5.6	12	19.0
	White		90	79.6	89	83.2	44	69.8
	Other		7	6.2	6	5.6	3	4.8
Region	Northeast		29	24.2	34	30.1	20	30.3
	Midwest		2	1.7	2	1.8	6	9.1
	South		14	11.7	13	11.5	33	50.0
	West		68	56.7	58	51.3	4	6.1
Parental Education Level	High school diploma or less		22	19.5	n/a	n/a	17	27.0
	Some college or associate's degree		31	27.4	n/a	n/a	21	33.3
	Bachelor's degree or higher		53	46.9	n/a	n/a	19	30.2
	Missing		7	6.2	n/a	n/a	6	9.5
Diagnostic or Educational Group	ADHD		59	52.2	52	48.6	33	52.4
	Mixed Clinical	Anxiety	15	13.3	14	13.1	0	0.0
		ASD	10	8.8	8	7.5	0	0.0
		LD	15	13.3	24	22.4	25	39.7
		Mood	6	5.3	2	1.9	5	7.9
		Other	8	7.1	7	6.5	0	0.0
Total			113	100.0	107	100.0	63	100.0
Age M (SD)			11.3 (3.6)		11.6 (3.4)		14.8 (2.2)	

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

CEFI and BRIEF Means ADHD

ADHD

		CEFI			BRIEF		Effect Size
Form	N	Mn	SD	N	Mn	SD	
Parent	57	81.9	11.7	57	71.8	13.7	.79
Teacher	51	87.4	11.1	51	71.2	23.7	.88
Self-Rating	32	90.2	14.2	32	86.7	15.9	.23

Note: Effect Sizes of .2 are considered small, .5 medium, and .8 large.
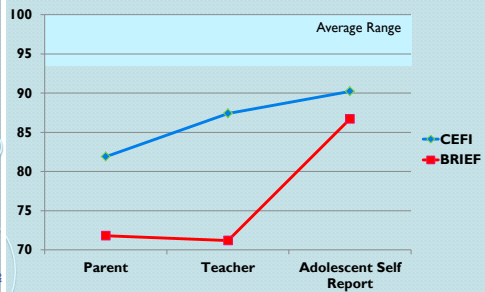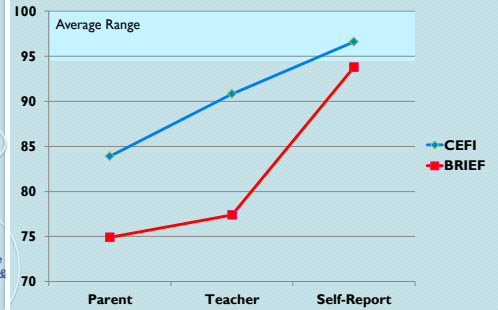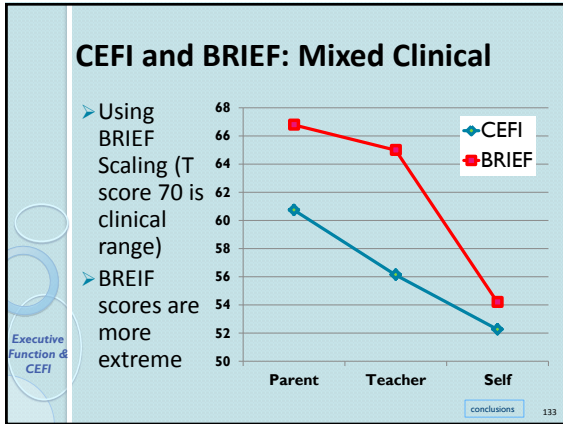

CEFI and BRIEF: ADHD

CEFI and BRIEF: ADHD

➢ Using BRIEF Scaling (T score 70 is clinical range)
➢ BREIF scores are more extreme
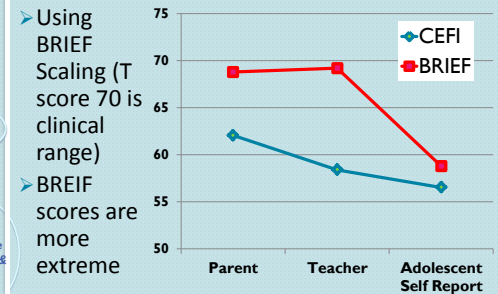
CEFI and BRIEF Mixed Sample

Mixed Group

		CEFI			BRIEF		Effect Size
Form	N	Mn	SD	N	Mn	SD	
Parent	53	83.9	12.9	53	74.9	16.8	.60
Teacher	55	90.8	13.5	55	77.4	23.9	.69
Self-Rating	30	96.6	19.7	30	93.8	22	.13

Note: Effect Sizes of .2 are considered small, .5 medium, and .8 large.

CEFI and BRIEF: Mixed Clinical Sample

CEFI and BRIEF: Mixed Clinical

- Using BRIEF Scaling (T score 70 is clinical range)
- BRIEF scores are more extreme

Executive Function & CEFI

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CEFI and BRIEF Correlations

	ADHD		Mixed Group	
Form	N	r	N	r
Parent	57	.85	53	.78
Teacher	51	.64	55	.66
Self-Rating	32	.68	30	.63

Note: All correlations are significant, p < .01.
All correlations were corrected for range instability.

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CEFI and BRIEF

- Conclusions
- The strong correlations between the CEFI and BRIEF provide evidence of validity.
- The mean score differences (BRIEF scores are more extreme) illustrate the importance of a nationally representative normative reference group.

Executive Function & CEFI

Delis Rating of Executive Functions   79

most complex D-REF index is the Abstract Thinking/Problem-Solving Index, which relates to a number of executive functions. In general, the BRIEF parent and teacher rating forms tend to have higher scores and more variability in symptoms reported. Given that this was a nonclinical sample, it is not clear why the differences would be observed.

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CEFI: WISC-IV, CAS, Achievement

- Data from Sam Goldstein's evaluation center in Salt Lake City, UT
- Children given the WISC-IV (N = 43), CAS (N = 62), and the WJIII achievement (N = 58) as part of the 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

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

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

CEFI & Achievement

	WJ-III Achievement Tests				
CEFI Scales	Total	Broad Reading	Broad Math	Broad Written Language	Median
Full Scale	.51	.48	.49	.47	.49

	WISC-IV						
	FS	VC	PR	WM	PS	CEFI	
						Mn	SD
CEFI							
Full Scale	.39	.44	.27	.30	.34	93.0	11.9

	CAS						
	FS	Plan	Sim	Att	Suc	CEFI	
						Mn	SD
CEFI							
Full Scale	.45	.49	.43	.37	.32	91.4	13.2

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CEFI, WISC-IV, & CAS Implications

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

Executive Function & CEFI

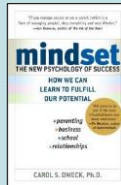conclusions   139

Presentation Outline

- ➤ Historical Perspective
- ➤ 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

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EF and Mindset

- ➤ The first step is to help students understand that they CAN DO BETTER in school (and in life) if they use their EF
- ➤ This gives hope
- ➤ This instills persistence
- ➤ Or else we have …

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Two Mindsets

Fixed mindset:
- ◇ Effort will not make a difference
- ◇ You either get it or you don't

Growth mindset:
- ❖ Enjoy effort and the process of learning
- ❖ You can always grow and learn

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conclusions

Dweck's web site: www.brainology.us
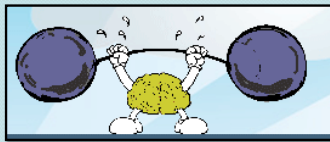
"**The growth mindset…reveals *that thinking skills can be developed*, and expertise can be built by means of deliberate practice.**"

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conclusions

Formula for Success (Kryza, 2013)

Mindsets **plus** **Skill Sets** **equals** **RESULTS!**

conclusions   PG 12

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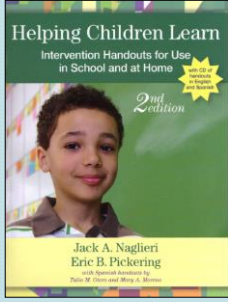
Teaching Children to use EF

- 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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CEFI Scales and Intervention

- ➢ CEFI yields 9 separate content scales
- ➢ Use these for treatment planning and treatment evaluation

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

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Step 1 – Talk with Students

How to Be Smart: Planning

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

What Does Being Smart Mean?

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

Step 1 – Talk with Students

How Can You Be Smarter?

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

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

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

Think smart and use a plan!

I figured out how to do it!

Use a plan.

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

Planning

Teaching Students About Planning

How Learning Depends on Planning Ability

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

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

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

How to Teach Planning

Think smart and use a plan!

I figured out how to do it!

Use a plan.

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

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

page 1 of 2

Helping Children Learn: Intervention Handouts for Use in School and at Home, Second Edition, by Jack A. Naglieri & Eric B. Pickering. Copyright © 2010 by Paul H. Brookes Publishing Co., Inc. All rights reserved.

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Planning

Planning Facilitation for Math Calculation

Math calculation is a complex activity that involves recalling basic math facts, following procedures, working carefully, and checking one's work. Math calculation requires a careful (i.e., planful) approach to follow all of the necessary steps. Children who are good at math calculation can move on to more difficult math concepts and problem solving with greater ease than those who are having problems in this area. For children who have trouble with math calculation, a technique that helps them approach the task planfully is likely to be useful. Planning facilitation is such a technique.

Planning facilitation helps students develop useful strategies to carefully complete math problems through discussion and shared discovery. It encourages students to think about how they solve problems, rather than just think about whether their answers are correct. This helps them develop careful ways of doing math.

How to Teach Planning Facilitation

Planning facilitation is provided in three 10-minute time periods: 1) 10 minutes of math, 2) 10 minutes of discussion, and 3) 10 more minutes of math. These steps can be described in more detail:

Step 1: The teacher should provide math worksheets for the students to complete in the first 10-minute session. This gives the children exposure to the problems and ways to solve them. The teacher gives each child a worksheet and says, "Here is a math worksheet for you to do. Please try to get as many of the problems correct as you can. You will have 10 minutes." Slight variations on this instruction are okay, but do not give any additional information.

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Slide 151

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

Jack A. Naglieri and Deanne Johnson

Abstract

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

conclusions 151

Slide 152 — Children with PASS Profiles

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

conclusions 152

Slide 153 — Planning Facilitation in Math – Naglieri & Gottling (1997)

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

conclusions 153

Slide 154 — Planning Facilitation in Math - Naglieri & Gottling (1997)

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

conclusions 154

**Slide 155 — Illustration of a Math Worksheet Used in this Study.**

Name: ___ Page 1

Date: ___

```
      988        98,923       7,344
-     335           287    -  3,740
      ___           ___       ___

       15           50         154
X       1   X        2   X      68
      ___          ___         ___

      864       99,979        9,424
+     192   +      241   +    6,430
      ___          ___         ___

   83,052       71,085       81,747
-  44,247       24,408    -  12,688
      ___          ___         ___

    1304          934         1918
X     39   X      533   X      767
```

```
   2   12    5    1    2
   2   12   14   10    3
   +    +    +    +    +
   5    6    3    3   13
   5   13    3    5   26
  ___  ___  ___  ___  ___

   5   18   24   25   13
   -    -    -    -    -
  11    1    3    3    5
  11    5    6    3    9
  ___  ___  ___  ___  ___

   9    9    7    7    8
   9   13   11   11    9
   -    -    -    -    -
   3   10    4    1    4
   5   14    9    6    7
```

Slide 156 — Children with PASS Profiles

- Naglieri & Johnson (1998)
  - Seven 10-minute Baseline sessions
  - Fourteen 10-minute Intervention sessions
  - Children completed math computation worksheets that came from the curriculum
  - Children with a cognitive weakness in each of the PASS areas were identified
  - Cognitive Weakness = significant PASS ipsative score *and* the weakness must be a score < 90.
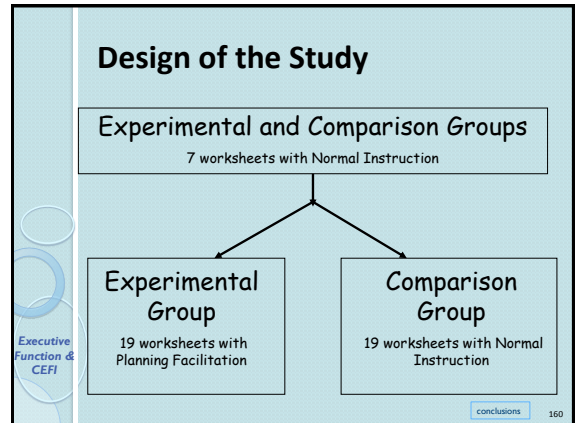
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Slide 157

Cognitive Weakness in Simultaneous

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Slide 158
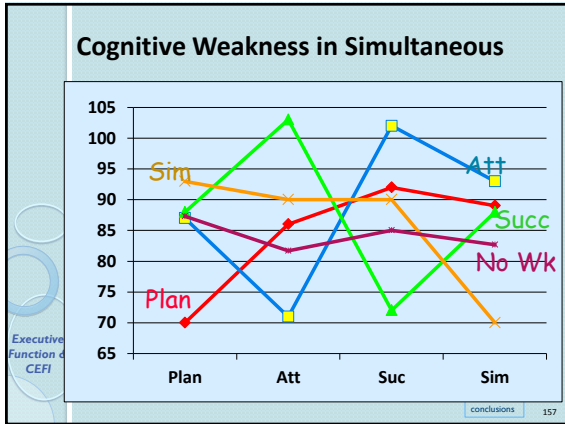
Children with PASS Profiles

	# Correct Baseline	Inter-vention	% Change	Effect Size
Plan				
Sim				
Att				
Suc				
NoCW	26	29	11	0.2

Note: Total number correct for all 7 sessions. 7 baseline, 14 intervention sessions (intervention number correct was weighted by .5). The % change = (Int - Base) /Base. Effect sizes are averages across subjects using (mean Int - mean Base) / SD baseline.

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Slide (left)

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

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

Abstract
The authors examined the effectiveness of cognitive strategy instruction (Successive) given by special education teachers to students with ADHD experimental group were exposed to a brief cognitive strategy instruction development and application of effective planning for mathematical comp standard math instruction. Standardized tests of cognitive processes a students completed math worksheets throughout the experimental p Johnson Tests of Achievement, Third Edition, Math Fluency and Wechsl Numerical Operations) were administered pre- and postintervention, a follow-up. Large pre–post effect sizes were found for students in the exp math worksheets (0.85 and 0.26), Math Fluency (1.17 and 0.09), and Nu At 1 year follow-up, the experimental group continued to outperform t students with ADHD evidenced greater improvement in math works (which measured the skill of generalizing learned strategies to other sin when provided the PASS-based cognitive strategy instruction.

Slide 160

Design of the Study

Experimental and Comparison Groups
7 worksheets with Normal Instruction

Experimental Group	Comparison Group
19 worksheets with Planning Facilitation	19 worksheets with Normal Instruction

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Slide 161

Instructional Sessions

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

10 minutes	10-20 minutes	10 minutes
10 minute math worksheet	Planning Facilitation or Normal Instruction	10 minute math worksheet

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Slide 162

Normal Instruction and Planning Facilitation Sessions

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

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Planning Strategy Instruction

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

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Student Plans

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

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Worksheet Means and Effect Sizes for the Students with ADHD

Raw Scores for Worksheets

ES = 0.6
ES = 2.4
32.79 37.81 29 42.66

■ Baseline
□ Intervention

Normal Instruction   Planning Facilitation

Reminder
< .2 = no effect
.2 - .5 = small
.6 - .8 = medium
➤ .8 = large
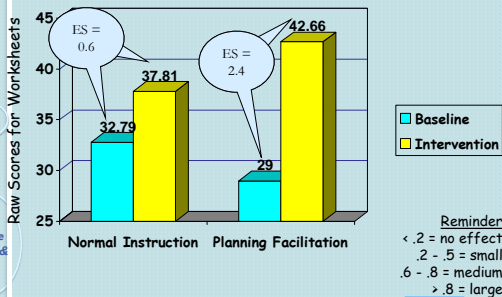
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WJ Math Fluency Means and Effect Sizes for the Students with ADHD

Standard Scores for WJ Math Fluency

ES = 0.1
ES = 1.3
75.5 79.4 60.9 86.1

■ Baseline
□ Intervention

Normal Instruction   Planning Facilitation

Reminder
< .2 = no effect
.2 - .5 = small
.6 - .8 = medium
➤ .8 = large
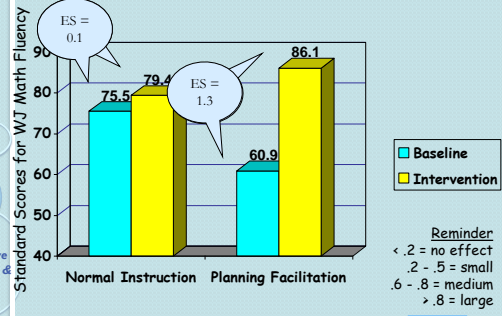
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WIAT Numerical Operation Means and Effect Sizes for Students with ADHD

Raw Scores for WIAT

ES = -0.2
ES = 0.4
15 14 14.4 16.6

■ Baseline
□ Intervention

Normal Instruction   Planning Facilitation

Reminder
< .2 = no effect
.2 - .5 = small
.6 - .8 = medium
➤ .8 = large
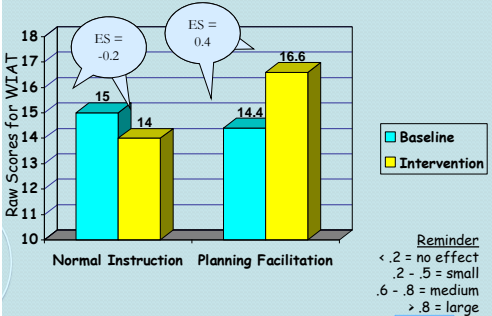
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Iseman (2005)

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

◆ LowP
■ LowSim
▲ LowAtt
◆ LowSuc

Baseline Mean   Intervention Mean
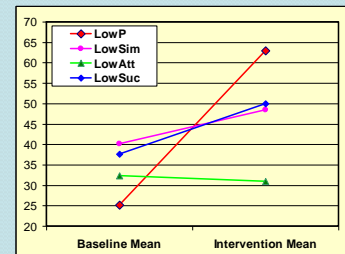
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One Year Follow-up

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

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Instructional Implications

➢ Planning Strategy Instruction is easily implemented in the classroom and can be used to improve Executive Functioning
➢ The method yields substantial results within a minimal of time (10 half-hour sessions over 10 days)
➢ Planning Strategy Instruction can be applied in math as well as other content areas (e.g., reading comprehension)

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www.efintheclassroom.net
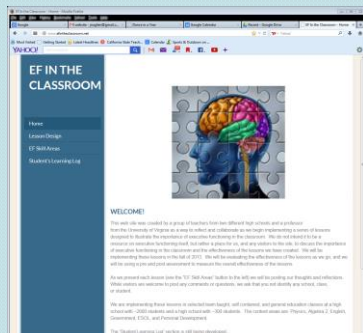
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Mountain View Alternative HS

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Comments about Efintheclassroom

➢ Student #1: My teachers taught me things not only about the subject they teach but something I can hold on to when I leave this place. For example, thinking about my thinking, having a growth mindset, working my memory and so on. They have taught me how to avoid distraction and complete a task.

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Comments about Efintheclassroom

➢ *Student #2: Mountain View High School* prepared me on my post-secondary success by helping me improve my executive functions, which are planning, time management, and goal directed persistence. I learned that to complete a task I must create a reasonable plan and follow it. I used to overload my plans and I could not complete them on time. My plans did not always work and I had to learn to be flexible and reschedule them. One plan I made was to stay during lunch or after school when necessary, and to take my time to do the important things. Together all these steps helped me move toward my goals and achieve them.

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Stuck on the Escalator:
Kids GET It!

➢ "A student in 4th period was working in my Chemistry class spontaneously said, "Man, I am stuck on the escalator" even though that phrase is not used in Chemistry class.

➢ I took this as evidence that the (cuing) skills being learned in one class are transferring to another. It is encouraging."

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www.kathleenkryza.com   conclusions

EF Lesson Plan Logistics

1. At the start of the week, teachers *facilitate* the discussion beginning with some kind of an illustration of a *theme*.
2. The discussion should emphasize the theme which the students are reminded about from that point on.
3. The theme can be entered into a notebook and/or placed someone visible in the classroom
4. At the end of the week there is another discussion about the *theme* and how it influenced them

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Themes & structure of the lessons

➢ Attention
➢ Flexibility
➢ Inhibition
➢ Initiation
➢ Self-Monitoring
➢ Working Memory
➢ Organization
➢ Planning
➢ Emotional Regulation

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STEP 3 – Share your ideas

Planning Lesson

Phrase of the week: What is your plan?

http://www.youtube.com/watch?v=bQLCZOG202k

1. What had to happen so that the people could dance together in this video?
2. What are the parts of a good plan?
3. How do you know if a plan is any good?
4. What should you do if a plan isn't working?
5. How do we use planning in this class?

Go to student learning log and create a plan for the week.

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Planning Lesson Student responses

➢ Q: What would you have to plan out?
  • They had to learn the dance steps (knowledge)
  • Someone had to start dancing (initiation)
  • Permission from train station (planning)
➢ Q: What are the parts of a good plan?
  • Think of possible problems (strategy generation)
  • Organize the dance (organization)
  • Practice the dance steps (initiation)
  • Have a good idea of what to do (knowledge)

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Planning Lesson Student responses

➢ Q3: How do you know if a plan is any good?
  • Put the plan in action and see if it works (self-monitoring)
  • Give it a try (perhaps learn by failing)
1. Q4: What should you do if a plan isn't working?
  1. Fix it. (self-correction)
  2. Go home ! (a bad plan)

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Planning Lesson Student responses

Q5: How do you use planning in this class?
1. We don't plan in this class
2. Mrs. XXX does all the planning in this class so you don't have to think about planning

How might students react to being told that now they have to think and planning?

Like the Seinfeld video

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EF Lesson Plan

➤ *Presentation of the Theme* -   Students are given a task to do or video to what that provides a stimulus about the theme related to a specific executive functioning skill.
  • This activity and the resulting discussion will engage them in the learning process
➤ *Discussion* is facilitated by the teacher – This means getting the students to think about the message
  • Teacher encourages a discussion about the theme (what it means, is it important, how might this help you do better, etc).
  • The teacher could present or ask the students to provide other examples related to the theme
➤ *Reflection Period* –
  ➤ The teacher presents a summary of what was said and what was learned.
  ➤ The students might make an entry in their EF DIARY about what they learned
➤ After this session, the students should be reminded about the theme whenever appropriate

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EF Instruction

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Working Memory Lesson

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conclusions

What IS Working Memory

➤ Digit Span?
➤ Any test that requires memory?
➤ How is memory defined?
➤ What does not require memory?
➤ What are the exemplary research tests that have been used (see by Baddeley & Hitch, 1974; Engle & Conway, 1998)
  • Phonologial loop
  • Visual-spatial scratch pad

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What is Working Memory

➤ Georgiou, Das, and Hayward (2008) described *working memory* as the capacity of the individual to store information for a short period of time and manipulate it using a phonological loop and visual–spatial sketchpad (Baddeley & Hitch, 1974)
➤ The *visual–spatial sketchpad* is described as a mental image of visual and spatial features (Engle & Conway, 1998)
➤ The *phonological loop* refers to retention of information from speech-based systems that are particularly important when order of information is required (Engle & Conway, 1998)

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conclusions

Working Memory Game

➤ You will see a series of words presented at 2 per second. The words are from two different categories. For example, Man - Hammer - Boat - Woman, would be organized into Man and Woman (people), Hammer and Saw (tools)

➤ When you see the STOP sign, that is the time for you will write the words down in two columns.

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conclusions

One Factor and 9 Scales?

➤ NOTE: EF is a unidimensional concept

➤ Use the Full Scale to answer the question "Is the child poo

➤ Use the specific groups of items that represent 9 different types of behaviors that can be addressed by Intervention

If a problem with Inhibitory Control

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

Executive Function & CEFI

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Efintheclassroom.net

Response Inhibition

Question of the week: Can you resist the urge to respond?

Marshmallow Experiment

1. Which of the kids reminds you of you and why?
2. When do you need to think before you act?
3. When is a small immediate reward better than a big long term reward.
4. When do you not need to think before you act?

Wrap-Up: This week we are going to resist the urge to act before we should.
 Have the students talk about when they chose what gives a long term gain rather than the short term reward.

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Q: When do you need to think before acting?

➤ "All the time"

➤ "Like when your friend asks you to do something bad, you have to think on it"

➤ "We often act on impulse – I do that all the time"

➤ "There are certain things you just do without thinking – like when you hear a shot you run in swivels"

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Q: When is it better to wait?

➤ "But it's worth it to wait, wait for more marshmallows - For a whole bag I'd wait"

➤ "I'd wait longer if it was for money!"

➤ "I know that when it comes to money, I should save for tomorrow, but if I want something, I want it now."

➤ "Some times you don't want to overthink"

➤ "My phone is my marshmallow"

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EF Instruction

Promoting Executive Function in the Classroom (What Works for Special-Needs Learners) [Paperback]
Lynn Meltzer PhD (Author)
★★★★★ (1 customer review) |
List Price: $35.00
Price: $30.45 & this item ships for FREE with Super Saver Shipping. Details
You Save: $4.55 (13%)
In Stock.
Ships from and sold by Amazon.com. Gift-wrap available.
Want it delivered Tuesday, November 29? Order it in the next 29 hours and 9 minutes, and choose One-Day Shipping at checkout. Details
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Executive Skills in Children and Adolescents: A Practical Guide to Assessment and Intervention (The Guilford Practical Intervention in Schools Series) [Paperback]
Peg Dawson EdD (Author), Richard Guare PhD (Author)
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Cognitive Strategy = EF Instruction

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.

Cognitive Instructional Methods
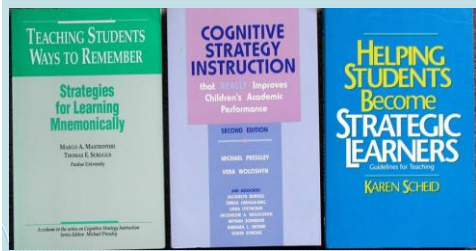
Step 3 – Share your thoughts

Sustained Attention Lesson

Phrase of the week: Where is your focus?

Video: http://www.youtube.com/watch?v=jKCT-simmBo&noredirect=1

Q1: Why do you think you were tricked by this video?

Q2: How do you decide what to pay attention to, and what not to, in this class?

Q3: What are you biggest distractions in class? What will you have the hardest time ignoring?

Hand out Learning Logs:

Students go to SA section and create a list they (or the class as a whole) will try to ignore this week.

Kryza et al (2011)

Intentional and Transparent

- YOU know WHY you are teaching what you are teaching (Intentional).
- STUDENTS know why they are learning what they are learning (Transparent).
- Talk the talk! Tell students:
  - What they are learning
  - Why it's important to learn
  - What strategies grow effective learners
  - Reflect on learning *with* your students
  - Notice and name how they learn and what strategies help them win the learning game.

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Kryza Practical EF Instruction

Practical Strategies for Developing Executive Functioning Skills for ALL Learners in the Differentiated Classroom

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Kathleen Kryza

It's the first week of school for Alicia, a middle school teacher in a large school district in Michigan. She's been prepping for the first days of school for weeks, getting her room ready, and planning lessons. Last week she attended staff development sessions to learn about the new district and state initiatives and mandates that must be followed this year. Starting tomorrow, she will be immersed for the next 180 school days with a full day's schedule of three different preps—seven 50-minute classes with at least 32 students in each class. She can't imagine adding one more thing to her already overfull "To Do" list. But over the summer, Alicia read a book on teaching executive functioning skills to special needs learners. She really sees the value in teaching these important skills to her most at-risk students, but when can she possibly find time to do this? And how?
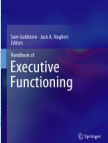
Alicia, like many teachers, understands the importance of developing executive functioning skills in her students, but given the full schedule of required academic content she needs to teach, According to Judy Willis, a neurologist turned middle school teacher and international educational consultant, "We can identify the practices that benefit all learners by looking at the skills

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Mindset Matters

➢This work is about changing "HOW YOU DO WHAT YOU DO" (i.e. Executive Function)
➢**Fixed mindset:**
• Effort will not make a difference
• You either get it or you don't.
➢**Growth mindset:**
• Dedication and hard work will pay off
• A love of learning and a persistence is essential
• Consistent effort makes a difference EVEN in the face of failure

MINDSET

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Kryza et al (2011)

• Activities that reveal students' mindset

The following are possible activities you could use to have students feel their mindsets (*Developing Growth Mindsets in the Inspiring Classroom*, Kryza, Stephens, & Duncan, 2011):
• **Take a Quiz** (linguistic or logical): Give students a surprise quiz on what they've been learning in your class.
• **Try Toothpick Puzzles** (logical): Have students try to solve a toothpick puzzle. Many examples and solutions at various levels can be found at: http://www.madras.fife.sch.uk/departments/maths/toothpickworld/toothpick13s.html.
• **Tie Knots** (visual/tactile): Provide rope and written directions with no pictures and have students try tying knots.

• Questions that help the teacher draw our the students' feelings

Reflection: After each activity, ask students to respond to the following questions:
• So, how did you feel before you started this activity? What were you saying to yourself?
• What did you feel and say to yourself during the activity?
• How did you feel and speak to yourself after the activity?
Students then categorize their comments into growth or fixed mindset categories.

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Kryza et al (2011)

• Guidelines for talking about mindset before, during and after working on a hard task

Before Learning
• Today you might find there are some things that are new to you and you are going to get to grow from trying them.
• Does this remind you of something you've done before? How can you use that experience to help you with this new learning?
• Looking at today's work, what part do you think will be the most challenging for you? What can you do when learning gets to the GOOD part (the hard part) to help you continue learning?

During Learning
• What parts are going well? What parts are making you grow?
• Why do you think this part is challenging for you? What do you need to help you? Do you need more information? More practice? A different way to practice?
• Have you done something like this before? What did you do when it got hard? Can you do it again?
• What do you know about yourself as a learner that can help you continue learning?

After Learning
• How did you grow as a learner?
• Did you learn something new about yourself and how you learn?
• How can you use that in the future when something gets tough?

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Conclusions

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

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Bottom Line About Teaching EF

➢Students CAN learn to FUNCTION better by teaching them to use strategies
➢Their level of *ability* (as measured by a test) may not change but their *behavior* can change through instructions that helps them use Executive Function
➢EXECUTIVE= The control mechanism
➢FUNCTION = how you do what you do

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Social Emotional Skills = EF

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conclusions

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www.casel.org

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Skills for Social and Academic Success

Research Links SEL to Higher Success

- 23% gain in SE skills
- 9% gain in attitudes about self/others/school
- 9% gain in pro-social behavior
- 11% gain on academic performance via standardized tests (math and reading)

And Reduced Risks for Failure

- 9% difference in problem behaviors
- 10% difference in emotional distress

Source: Durlak, J.A., Weissberg, R.P., Dymnicki, A.B., Taylor, R.D., and Schellinger, K. (2011). The Impact of Enhancing Students' Social and Emotional Learning: A Meta-Analysis of School-Based Universal Interventions. *Child Development, 82,* 405-432.

Function & CEFI

conclusions

Social Emotional Skills

Five key social-emotional skills from CASEL

These are in many state and local standards

What is Social and Emotional Learning?

The Collaborative for Academic, Social, and Emotional Learning (CASEL) describes SEL as the process of developing the following five sets of core competencies in the context of safe, caring, well-managed, academically rigorous, and engaging learning environments:

1. **Self-awareness**—being able to accurately assess one's feelings, interests, values, and strengths; maintaining a well-grounded sense of self-confidence
2. **Self-management**—being able to regulate one's emotions to handle stress, control impulses, and persevere in overcoming obstacles; setting and monitoring progress toward personal and academic goals; expressing emotions effectively
3. **Social awareness**—being able to take the perspective of and empathize with others; recognizing and appreciating individual and group similarities and differences; recognizing and using family, school, and community resources
4. **Relationship skills**—being able to establish and maintain healthy and rewarding relationships based on cooperation; resisting inappropriate social pressure; preventing, managing, and resolving interpersonal conflict; seeking help when needed
5. **Responsible decision-making**—being able to make decisions based on consideration of reason, ethical standards, safety concerns, social norms, respect for self and others, and likely consequences of various actions; applying decision-making skills to academic and social situations; contributing to the well-being of one's school and community.[1]

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Kong (2013): IQ, SEL & Achievement

➤ Tiffany Kong studied CogAT, DESSA, and achievement scores for 276 elementary students grades K-8

➤ All gifted based on scores on verbal, quantitative, or nonverbal test scores at least 97th percentile

Socioemotional Competencies, Cognitive Ability, and Achievement in Gifted Students

by

Tiffany Kong

A Dissertation Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy

Approved November 2013 by the Graduate Supervisory Committee:

Linda Caterino Kulhavy, Chair
Jack Naglieri
Dina Brulles

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Kong (2013): IQ, SEL & Achievement

➤ Mean IQ score = 129.6 nearly 2 SDs above the normative mean (achievement also high)

➤ Mean SEL score on DESSA was only ½ SD above the normative mean (T = 55.5)

Table 1

Means and Standard Deviations of Study Variables

Construct	Mean	SD
Age	10.96	1.81
DESSA Total	55.51	9.41
Verbal	125.69	13.74
Quantitative	124.41	10.34
Nonverbal	125.10	12.56
CogAT Composite	129.61	8.22
Reading	75.56	15.72
Language	69.46	19.60
Math	76.30	17.13
SAT10 Achievement Composite	73.77	12.66

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Kong (2013): IQ, SEL & Achievement

➤ DESSA Total correlated .44 and CogAT Total correlated .36 with Total Achievement (reading, math, language)

• A clearer picture of the relationships between IQ (CogAT) and SEL (DESSA) with achievement was obtained from hierarchical regression analysis…

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Kong (2013) SEL Predicts Beyond IQ (p. 44)

DESSA predicted reading, language and math scores over IQ (CogAt) scores

Relations between Cognitive Ability, Socioemotional Competency, and Achievement Variables

Hierarchical regression analyses were conducted to determine which scales and subtests predicted the most variance in the dependent achievement variables. Composite CogAT scores were not found to significantly predict composite achievement, $R^2\Delta = .03$, $F(1, 121) = 3.27$, $p > .05$, reading, language, or math scores over-and-above the DESSA Total scores (Table 11). On the other hand, the DESSA Total scores significantly predicted composite achievement, $R^2\Delta = .05$, $F(1, 121) = 6.99$, $p < .05$; language scores, $R^2\Delta = .03$, $F(1, 121) = 4.26$, $p < .05$; and math scores, $R^2\Delta = .05$, $F(1, 121) = 6.09$, $p < .05$, over-and-above the composite CogAT scores.

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Thank you for attending

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