Executive Functioning: From Assessment to Intervention

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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

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

The Curious Story of Phineas Gage

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

The Curious Story of Phineas Gage

- September 13, 1848 26 year old Phineas Gage 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
Fleishman (2002, p 70)

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

The Curious Story of Phineas Gage

- 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

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

A Bit of EF Neuroanatomy

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

More Specifically

- The dorsolateral prefrontal cortex (DLPFC) is involved with integrating different dimensions of cognition and behavior.
- This area is associated with verbal and design fluency, ability to maintain and shift set, planning, response inhibition, working memory, organizational skills, reasoning, problem solving and abstract thinking.

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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Frontal Lobes and Executive Function(s)

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

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

Executive Functions

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

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...”

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
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 prefrontal areas of the frontal lobes.
- We found more than 30 definitions of EF(s).

### 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).

### What is Executive Function(s)

5. Pribram (1973): "executive programmes ...to maintain brain organization " (p. 301).
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).
7. Stuss & Benson (1986): "a variety of different capacities that enable ... behavioral regulation, working memory, planning and organizational skills, and self-monitoring” (p. 272).
10. Luria (1966): “… ability to correctly evaluate their own behavior and the adequacy of their actions” (p. 227).
3/3/2015

Executive Function(s)

- Executive Function
  - 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 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 Functions is a multidimensional model (Friedman et al., 2006; Miyake et al., 2000).

- Executive Functions
  - EF has independent abilities (Wiebe, Espy, & Charak, 2008).
  - Executive Function(s) is a multidimensional model (Friedman et al., 2006; Miyake et al., 2000).

Presentation Outline

- Executive Function(s)
  - Given all these definitions of EF(s) we wanted to address the question...
    - Executive Functions ... or Executive Function?
    - Development of a behavior rating scale to measure Executive Function(s)

CEFI Authors

CEFI (Naglieri & Goldstein, 2012)
**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

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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**

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

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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.
Item Factor Analyses – Part 2

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

EXPLORATORY FACTOR ANALYSES

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

EXPLORATORY FACTOR ANALYSES

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EF and its components

- Abilities, cognitive processes, and behaviors

Naglieri & Goldstein, 2012

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

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
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.

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 & Goldstein, 2014)
  - EF Social Emotional Skills - Devereux Student Strength Assessment K-8th Grade (DESSA; LeBuffe, Sharpiro & Naglieri, 2012)

PASS Comprehensive System (Naglieri, Das, & Goldstein, 2014)

- CAS2 Rating Scale (4 subtests)
- CAS2 Brief (4 subtests)
- CAS2 Core (8 subtests)
- CAS2 Extended (12 subtests)

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

- Added: A Visual and Auditory comparison

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
DESSA has 8 scales and a Total

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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.

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

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!

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.
A look at some EF Rating Scales

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.

Structure of the Brief

Factor analysis of BRIEF
- The Inhibit scale does not load on Behavioral Regulation
- Emotional Control loadings are >1.0 on the Behavioral Regulation factor

Review of Rating Scales
Assessment of Executive Function Using Rating Scales: Psychometric Considerations
Jack A. Naglieri and Sam Goldstein

From Handbook of Executive Function (Goldstein & Naglieri, 2014)
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. 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 (Tcheketra, 2000).

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, parental 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.

Educational Attainment

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

<table>
<thead>
<tr>
<th>State</th>
<th>High school graduate or more</th>
<th>Bachelor’s degree or more</th>
<th>Advanced degree or more</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>85.3</td>
<td>27.9</td>
<td>10.3</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>88.9</td>
<td>38.2</td>
<td>16.4</td>
</tr>
<tr>
<td>Maryland</td>
<td>88.2</td>
<td>35.7</td>
<td>18.0</td>
</tr>
<tr>
<td>Connecticut</td>
<td>88.6</td>
<td>35.6</td>
<td>15.5</td>
</tr>
<tr>
<td>Virginia</td>
<td>86.6</td>
<td>34.0</td>
<td>14.1</td>
</tr>
<tr>
<td>New York</td>
<td>84.7</td>
<td>32.4</td>
<td>14.0</td>
</tr>
<tr>
<td>Vermont</td>
<td>91.0</td>
<td>33.1</td>
<td>13.3</td>
</tr>
<tr>
<td>New Jersey</td>
<td>87.4</td>
<td>34.5</td>
<td>12.9</td>
</tr>
<tr>
<td>Colorado</td>
<td>89.3</td>
<td>35.9</td>
<td>12.7</td>
</tr>
<tr>
<td>Illinois</td>
<td>86.4</td>
<td>30.6</td>
<td>11.7</td>
</tr>
<tr>
<td>Rhode Island</td>
<td>84.7</td>
<td>30.5</td>
<td>11.7</td>
</tr>
</tbody>
</table>

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

Delis-Rating of Executive Function

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 3–18 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 committees were
Barkley's EF Scale

What is the problem with not scoring 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)

Importance of a National Norm

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

Russell A. Barkley

Parent Form (N = 500)

Teacher Form (N = 342)

Self Form (N = 220)
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).

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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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.

Three CEFI Rating Forms
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)

CEFI Items by Scale

Table C.4. Emotion Regulation (10 Items)

<table>
<thead>
<tr>
<th>Item #</th>
<th>Parent/Teacher Form (During the past 4 weeks, how often did the child...)</th>
<th>Self-Report Item (During the past 4 weeks, how often did you...)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>How often did you lose control?</td>
<td>How often did you lose control?</td>
</tr>
<tr>
<td>2.</td>
<td>How often did you get upset when things did not go as planned?</td>
<td>How often did you get upset when things did not go as planned?</td>
</tr>
<tr>
<td>3.</td>
<td>How often did you stay calm while handling minor problems?</td>
<td>How often did you stay calm while handling minor problems?</td>
</tr>
<tr>
<td>4.</td>
<td>How often did you stay calm while handling major problems?</td>
<td>How often did you stay calm while handling major problems?</td>
</tr>
<tr>
<td>5.</td>
<td>How often did you stay calm when there was a high level of stress?</td>
<td>How often did you stay calm when there was a high level of stress?</td>
</tr>
</tbody>
</table>

Table C.5. Flexibility (5 Items)

<table>
<thead>
<tr>
<th>Item #</th>
<th>Parent/Teacher Form (During the past 4 weeks, how often did the child...)</th>
<th>Self-Report Item (During the past 4 weeks, how often did you...)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>How often did you come up with a new way to reach a goal?</td>
<td>How often did you come up with a new way to reach a goal?</td>
</tr>
<tr>
<td>2.</td>
<td>How often did you come up with different ways to solve problems?</td>
<td>How often did you come up with different ways to solve problems?</td>
</tr>
<tr>
<td>3.</td>
<td>How many ideas do you have about how to do things?</td>
<td>How many ideas do you have about how to do things?</td>
</tr>
<tr>
<td>4.</td>
<td>How many ideas do you have about how to do things?</td>
<td>How many ideas do you have about how to do things?</td>
</tr>
</tbody>
</table>

Table C.6. Initiative (10 Items)

<table>
<thead>
<tr>
<th>Item #</th>
<th>Parent/Teacher Form (During the past 4 weeks, how often did the child...)</th>
<th>Self-Report Item (During the past 4 weeks, how often did you...)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>How often did you take on new projects?</td>
<td>How often did you take on new projects?</td>
</tr>
<tr>
<td>2.</td>
<td>How often did you take on new projects?</td>
<td>How often did you take on new projects?</td>
</tr>
<tr>
<td>3.</td>
<td>How often did you take on new projects?</td>
<td>How often did you take on new projects?</td>
</tr>
<tr>
<td>4.</td>
<td>How often did you take on new projects?</td>
<td>How often did you take on new projects?</td>
</tr>
</tbody>
</table>

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
CEFI Administration & Scoring

CEFI Administration & Scoring Methods

Paper and Pencil Administration

Hand Scoring Using CEFI Record Form

Online Administration

Examiner enters responses in MHS Online Assessment Center: Automated scoring and report

Examiner enters responses into CEFI Scoring Software Program: Automated scoring and report

Fee Use of CEFI: mhs.com/cefi

CEFI Rating Form

CEFIRatingForm-1.pdf

CEFI Rating Form

CEFIRatingForm-2.pdf

CEFIRatingForm-3.pdf

CEFIRatingForm-4.pdf

CEFIRatingForm-5.pdf

CEFIRatingForm-6.pdf
**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 |
|-----------------|-----------------|-----------------|
|                | T (Online) | T (Paper) | Cohen’s d |
| Parent          | 0.00       | 0.00       | 0.00    |
| Teacher         | 0.04       | 0.04       | 0.00    |
| Self            | 0.00       | 0.00       | 0.00    |

**CEFI Normative Samples**

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

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**CEFI Scale Reliability**

<table>
<thead>
<tr>
<th>CEFI Internal Reliability Coefficients for the Normative Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Full Scale</td>
</tr>
<tr>
<td>Attention</td>
</tr>
<tr>
<td>Emotion Regulation</td>
</tr>
<tr>
<td>Flexibility</td>
</tr>
<tr>
<td>Inhibitory Control</td>
</tr>
<tr>
<td>Initiation</td>
</tr>
<tr>
<td>Organization</td>
</tr>
<tr>
<td>Planning</td>
</tr>
<tr>
<td>Self-Monitoring</td>
</tr>
<tr>
<td>Working Memory</td>
</tr>
</tbody>
</table>

**CEFI Interpretation**

Step 1: Examine Quality of the Ratings: Consistency, Positive and Negative Impression
Step 2: Interpret Scale Scores
Step 3: Compare CEFI Scale Scores
Step 4: Examine Item-Level Responses
Step 5: Compare Results Across Raters
Step 6: Compare Results Over Time
Step 1: Consistency Index

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

Step 1: Impression Scales

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

CEFI Interpretive Report

- Step 1: Examine Quality of the ratings: Consistency, Positive and Negative Impression
- Step 2: Interpret Scale Scores
- Step 3: Compare CEFI Scale Scores
- Step 4: Examine Item-Level Responses
- Step 5: Compare Results Across Raters
- Step 6: Compare Results Over Time
Step 2: Interpret Scale Scores

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

Table 4.3: Interpretation Guidelines for Examining Scale Scores

<table>
<thead>
<tr>
<th>Scale</th>
<th>Interpretation Guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Scale</td>
<td>Reflects overall executive function. The Full Scale score is made up of 99 items from nine different areas that are conceptually related to executive function (i.e., Attention, Emotion Regulation, Flexibility, Short-Cut Initiation, Organization, Planning, Self-Monitoring, Inhibitory Control, and Working Memory). For the purposes of simplicity, the Full Scale score is divided into higher and other scores. For all scales on these areas, however, the Full Scale score is a good description of a child/youth's executive function behaviors if there is no significant variation among the CEFI scores.</td>
</tr>
<tr>
<td>Attention</td>
<td>Indicates the child/youth's ability to attend to tasks, concentrate, and sustain attention.</td>
</tr>
<tr>
<td>Emotion Regulation</td>
<td>Indicates the child/youth's control and management of emotions, including staying calm when handling stress and coping with the level of emotion.</td>
</tr>
<tr>
<td>Flexibility</td>
<td>Reflects a child/youth's ability to adjust behavior to meet circumstances, including coming up with different ways to solve problems, having novel ideas about how to do things, and being able to solve problems using different approaches.</td>
</tr>
</tbody>
</table>

CFI Interpretive Report

Overview of Results for Brittany Ambers
Scores in Relation to the Norm
Brittany Ambers's scores are provided in the graph below:

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 < .05) Denoting Statistically Significant Differences Between Parent, Teacher, and Self-Report Forms

<table>
<thead>
<tr>
<th>Scale</th>
<th>Parent to Parent</th>
<th>Parent to Teacher</th>
<th>Parent to Self-Report</th>
<th>Teacher to Self-Report</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Scale</td>
<td>5-11</td>
<td>12-18</td>
<td>5-11</td>
<td>12-18</td>
</tr>
<tr>
<td>Error</td>
<td>12-18</td>
<td>5-11</td>
<td>12-18</td>
<td>5-11</td>
</tr>
<tr>
<td>Emotion Regulation</td>
<td>12-18</td>
<td>5-11</td>
<td>12-18</td>
<td>5-11</td>
</tr>
<tr>
<td>Paradox</td>
<td>12-18</td>
<td>5-11</td>
<td>12-18</td>
<td>5-11</td>
</tr>
<tr>
<td>Inhibition</td>
<td>12-18</td>
<td>5-11</td>
<td>12-18</td>
<td>5-11</td>
</tr>
<tr>
<td>Organization</td>
<td>12-18</td>
<td>5-11</td>
<td>12-18</td>
<td>5-11</td>
</tr>
<tr>
<td>Planning</td>
<td>12-18</td>
<td>5-11</td>
<td>12-18</td>
<td>5-11</td>
</tr>
<tr>
<td>Self-Monitoring</td>
<td>12-18</td>
<td>5-11</td>
<td>12-18</td>
<td>5-11</td>
</tr>
<tr>
<td>Working Memory</td>
<td>12-18</td>
<td>5-11</td>
<td>12-18</td>
<td>5-11</td>
</tr>
</tbody>
</table>

CEFI Interpretation

Step 1: Examine Quality of the ratings: Consistency, Positive and Negative Impression
Step 2: Interpret Scale Scores
Step 3: Compare CEFI Scale Scores
Step 4: Examine Item-Level Responses
Step 5: Compare Results Across Raters
Step 6: Compare Results Over Time

Step 6: Compare Results Over Time

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

Table 4.6. Critical Values Denoting Statistically Significant Changes Over Time

<table>
<thead>
<tr>
<th>Scale</th>
<th>Parent Form</th>
<th>Teacher Form</th>
<th>Self-Report Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Scale</td>
<td>5-11</td>
<td>12-18</td>
<td>5-11</td>
</tr>
<tr>
<td>Error</td>
<td>12-18</td>
<td>5-11</td>
<td>12-18</td>
</tr>
<tr>
<td>Emotion Regulation</td>
<td>12-18</td>
<td>5-11</td>
<td>12-18</td>
</tr>
<tr>
<td>Paradox</td>
<td>12-18</td>
<td>5-11</td>
<td>12-18</td>
</tr>
<tr>
<td>Inhibition</td>
<td>12-18</td>
<td>5-11</td>
<td>12-18</td>
</tr>
<tr>
<td>Organization</td>
<td>12-18</td>
<td>5-11</td>
<td>12-18</td>
</tr>
<tr>
<td>Planning</td>
<td>12-18</td>
<td>5-11</td>
<td>12-18</td>
</tr>
<tr>
<td>Self-Monitoring</td>
<td>12-18</td>
<td>5-11</td>
<td>12-18</td>
</tr>
<tr>
<td>Working Memory</td>
<td>12-18</td>
<td>5-11</td>
<td>12-18</td>
</tr>
</tbody>
</table>

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

Group Differences: ADHD

Average Range

Parent | Teacher | Self-Report

Group Differences: ADHD and Matched General Population Sample: (CEFI Full Scale)

Table 3.10. Differences Between ADHD and Matched General Population Sample: (CEFI Full Scale)

<table>
<thead>
<tr>
<th>Source</th>
<th>Mean</th>
<th>T-Value</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent</td>
<td>31.1</td>
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<td>&lt;.001</td>
</tr>
<tr>
<td>Teacher</td>
<td>31.9</td>
<td>-3.50</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Self-Report</td>
<td>31.3</td>
<td>-3.50</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>
conclusions

CEFI Executive Function & CEFI Group Differences: ASD

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

<table>
<thead>
<tr>
<th>Form</th>
<th>ASD</th>
<th>Matched Gen. Pop.</th>
<th>t</th>
<th>d</th>
<th>F(d)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent</td>
<td>82.4</td>
<td>87.7</td>
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<tr>
<td>Teacher</td>
<td>86.5</td>
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<td>-0.99</td>
<td>25.11</td>
<td>&lt; .001</td>
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</table>

conclusions

CEFI Executive Function & CEFI Group Differences: Learning Disabilities

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

<table>
<thead>
<tr>
<th>Form</th>
<th>LD</th>
<th>Matched Gen. Pop.</th>
<th>t</th>
<th>d</th>
<th>F(d)</th>
<th>P</th>
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</thead>
<tbody>
<tr>
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<td>-0.2</td>
<td>19.88</td>
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</tr>
<tr>
<td>Teacher</td>
<td>14.4</td>
<td>14.4</td>
<td>0.01</td>
<td>7.24</td>
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</tr>
<tr>
<td>Self-Report</td>
<td>15.5</td>
<td>15.5</td>
<td>0.01</td>
<td>7.24</td>
<td>&lt; .001</td>
<td></td>
</tr>
</tbody>
</table>

conclusions

CEFI Executive Function & CEFI Group Differences: Mood Disorders

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

<table>
<thead>
<tr>
<th>Form</th>
<th>Mood Disorder</th>
<th>Matched Gen. Pop.</th>
<th>t</th>
<th>d</th>
<th>F(d)</th>
<th>P</th>
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</thead>
<tbody>
<tr>
<td>Parent</td>
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<td>-0.01</td>
<td>0.56</td>
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</tr>
<tr>
<td>Teacher</td>
<td>101.7</td>
<td>101.7</td>
<td>0.00</td>
<td>0.56</td>
<td>&lt; .001</td>
<td></td>
</tr>
<tr>
<td>Self-Report</td>
<td>101.7</td>
<td>101.7</td>
<td>0.00</td>
<td>0.56</td>
<td>&lt; .001</td>
<td></td>
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</table>

conclusions

Gender Differences: Parent Raters

Girls are better EF than Boys

Parents

<table>
<thead>
<tr>
<th>Ages</th>
<th>N</th>
<th>MMn</th>
<th>SD N</th>
<th>F(d)</th>
<th>SD</th>
<th>ES</th>
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</thead>
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<tr>
<td>5-18</td>
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<td>15.0</td>
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<td>5-11</td>
<td>350</td>
<td>98.2</td>
<td>14.3</td>
<td>349</td>
<td>101.6</td>
<td>15.6</td>
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<tr>
<td>12-18</td>
<td>350</td>
<td>97.9</td>
<td>15.4</td>
<td>350</td>
<td>102.0</td>
<td>14.4</td>
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</table>

conclusions

Gender Differences: Teacher Raters

Girls are better EF than Boys

Teachers

<table>
<thead>
<tr>
<th>Teachers</th>
<th>N</th>
<th>MMn</th>
<th>SD</th>
<th>N</th>
<th>F(d)</th>
<th>SD</th>
<th>ES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ages 5-18</td>
<td>700</td>
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<td>14.4</td>
<td>700</td>
<td>103.2</td>
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<td>-0.44</td>
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<tr>
<td>Ages 5-11</td>
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<td>350</td>
<td>103.5</td>
<td>14.9</td>
<td>-0.49</td>
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<tr>
<td>Ages 12-18</td>
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<td>14.4</td>
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<td>102.9</td>
<td>15.0</td>
<td>-0.40</td>
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conclusions

Gender Differences: Self Raters

Girls are better EF than Boys

Mean | SD | N
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>98.9</td>
<td>15.4</td>
</tr>
<tr>
<td>Female</td>
<td>101.0</td>
<td>14.6</td>
</tr>
</tbody>
</table>

conclusions
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

John Toolbox
Ohio State University

Planning = .3 and Attention = .35

Girls are Smarter than Boys

Executive Function & CEFI

Sex Differences: Ability

Executive Function

Sex Differences: Social Emotional

DESSA values are

T-scores (Mn= 50, SD = 10).

Parent & Teacher Raters Females

Notes: N = 2,477

DESSA and BRIEF

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

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)

Areas Operationalized: CEFI vs. BRIEF

Emotion Regulation

Control of emotions, staying calm when dealing with emotional problems, motivating self, and managing anxiety.

Emotional Control

Control or emotional impulses or reactions.

Shift

Flexible thinking, changing strategies or plans to suit different situations.

Inhibit

Control or emotional impulses or reactions.

Initiate

Begin activity, generate ideas, start new tasks.

Inhibit

Control or emotional impulses or reactions.

Organization

Organize materials, complete tasks, and set goals.

Organize of Materials

Organize materials, complete tasks, and set goals.

Planning

Plan to accomplish tasks and overcome obstacles.

Plan/organize

Plan to accomplish tasks and overcome obstacles.

Self-Performance Monitoring

Monitor self, improve performance, and set goals.

Monitor

Monitor self, improve performance, and set goals.
### Sample Characteristics

Table 6.2: Demographic Characteristics of the CEFI and BRIEF Validity Samples

<table>
<thead>
<tr>
<th>Demographic</th>
<th>CEFI</th>
<th>BRIEF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
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</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education Level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mn</td>
<td>74.9</td>
<td>68.4</td>
</tr>
<tr>
<td>SD</td>
<td>16.8</td>
<td>19.5</td>
</tr>
</tbody>
</table>

### CEFI and BRIEF Means ADHD

<table>
<thead>
<tr>
<th>Form</th>
<th>CEFI</th>
<th>BRIEF</th>
<th>Effect Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent</td>
<td>57</td>
<td>57</td>
<td>13.7 .79</td>
</tr>
<tr>
<td>Teacher</td>
<td>51</td>
<td>51</td>
<td>23.7 .88</td>
</tr>
<tr>
<td>Self-Rating</td>
<td>32</td>
<td>32</td>
<td>15.9 .23</td>
</tr>
</tbody>
</table>

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

### CEFI and BRIEF: ADHD

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

### CEFI and BRIEF Mixed Sample

<table>
<thead>
<tr>
<th>Mixed Group</th>
<th>CEFI</th>
<th>BRIEF</th>
<th>Effect Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form</td>
<td>N</td>
<td>Mn</td>
<td>SD</td>
</tr>
<tr>
<td>Parent</td>
<td>53</td>
<td>83.9</td>
<td>12.9</td>
</tr>
<tr>
<td>Teacher</td>
<td>55</td>
<td>90.8</td>
<td>13.5</td>
</tr>
<tr>
<td>Self-Rating</td>
<td>30</td>
<td>96.6</td>
<td>19.7</td>
</tr>
</tbody>
</table>

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

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

CEFI and BRIEF Correlations

<table>
<thead>
<tr>
<th>Form</th>
<th>ADHD N</th>
<th>ADHD r</th>
<th>Mixed Group N</th>
<th>Mixed Group r</th>
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</thead>
<tbody>
<tr>
<td>Parent</td>
<td>57</td>
<td>.85</td>
<td>53</td>
<td>.78</td>
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<tr>
<td>Teacher</td>
<td>51</td>
<td>.64</td>
<td>55</td>
<td>.66</td>
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<tr>
<td>Self-Rating</td>
<td>32</td>
<td>.68</td>
<td>30</td>
<td>.63</td>
</tr>
</tbody>
</table>

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

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.

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 WJ III achievement (N = 58) as part of the typical test battery
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.

Presentation Outline

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

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 ...

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

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.”

Formula for Success (Kryza, 2013)

Mindsets plus Skill Sets equals RESULTS!
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.

CEFI Scales and Intervention

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

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.

Planning

Teaching Students About Planning

Planning is a learned ability. It is a process for organizing information in your mind and for thinking through problems. Planning helps you think about what you want to do, how to do it, and what to expect. Planning involves paying attention and focusing on the task at hand.

Planning Facilitation for Math Calculation

Math calculation is a complex activity that involves reading, basic math facts, following procedures, working carefully, and checking your work. Math calculation requires careful and patient attention. Math calculation can be more difficult for children who have trouble with math calculation. Planning helps students approach the task more carefully and to do it more effectively. Planning facilitation helps students develop useful strategies for managing their time and for solving math problems.

Planning Facilitation: Step 1

1. Think and use a plan!
2. Use a plan.

Planning Facilitation: Step 2

Think smart and use a plan!

Planning Facilitation: Step 3

Think smart and use a plan!

Planning Facilitation: Step 4

Think smart and use a plan!

Planning Facilitation: Step 5

Think smart and use a plan!

Planning Facilitation: Step 6

Think smart and use a plan!

Planning Facilitation: Step 7

Think smart and use a plan!

Planning Facilitation: Step 8

Think smart and use a plan!

Planning Facilitation: Step 9

Think smart and use a plan!

Planning Facilitation: Step 10

Think smart and use a plan!

Planning Facilitation: Step 11

Think smart and use a plan!

Planning Facilitation: Step 12

Think smart and use a plan!
Effectiveness of a Cognitive Strategy Intervention in Improving Arithmetic Computation Based on the PASS Theory

Jack A. Naglieri and Duane Johnson

Abstract

The purpose of this study was to determine if an instructional strategy designed to facilitate planning, goal-setting, and problem-solving in children who are at risk for learning disabilities and mild mental impairments was effective. An intervention study was conducted using a pre-test/post-test design. A control group and an experimental group were compared on a pre-assessment, post-assessment, and follow-up assessments. The results indicated that children who participated in the intervention showed significant increases in computation accuracy and computation speed. The results also showed that children who were identified as having a cognitive weakness in Planning, a cognitive domain of the PASS (Processing and Attentional Styles) model, improved significantly on the post-assessment and follow-up assessments. The results suggest that a brief, intensive intervention can be effective in improving the computation skills of children who are at risk for learning disabilities and mild mental impairments.

Planning Facilitation in Math - Naglieri & Gottling (1997)

- Students were encouraged to:
  - determine how they did the pages
  - verbalize and discuss their methods
  - be self-reflective

- Teachers asked questions to facilitate:
  - How did you do the problems & why?
  - What will you do next time?
  - What did you notice on this page?

Planning Facilitation in Math - Naglieri & Gottling (1997)

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

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

Illustration of a Math Worksheet Used in This Study.

<table>
<thead>
<tr>
<th>Name:</th>
<th>Page 1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
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<td>10</td>
<td>4</td>
<td>1</td>
</tr>
</tbody>
</table>

Illustration of a Math Worksheet Used in This Study.

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

Jackie S. Isemann and Jack A. Naglieri

Abstract

The aims examined the effectiveness of cognitive strategy instruction (successes) given by special education teachers to students with ADHD, experimental group were exposed to a brief cognitive strategy intervention, planning and application of effective strategies to solve mathematical problems. Standardized tests of cognitive and planning and application intervention for subjects in the experimental group (10th grade) were higher than those in the control group (11th grade; p < 0.05). Planning and problem-solving intervention for teachers in the experimental group (10th grade) were higher than those in the control group (11th grade; p < 0.05). Planning and problem-solving intervention for students with ADHD provided greater improvement in math word problems measured as the skill of generating and using learned strategies to solve problems when provided the PASS-based cognitive strategy instruction.

Design of the Study

Experimental and Comparison Groups

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

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

<table>
<thead>
<tr>
<th>Segment</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning Facilitation</td>
<td>10 minutes</td>
</tr>
<tr>
<td>Planning Facilitation or Normal Instruction</td>
<td>10 minutes</td>
</tr>
<tr>
<td>10 minute math worksheet</td>
<td>10 minutes</td>
</tr>
</tbody>
</table>

Children with PASS Profiles

<table>
<thead>
<tr>
<th># Correct</th>
<th>Intervention</th>
<th>% Change</th>
<th>Effect Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plan</td>
<td>Baseline</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Sim</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Att</td>
<td></td>
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<tr>
<td>Suc</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NoCW</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

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.

Normal Instruction and Planning Facilitation Sessions

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

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

Student Plans

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

Worksheet Means and Effect Sizes for the Students with ADHD

<table>
<thead>
<tr>
<th>Normal Instruction</th>
<th>Planning Facilitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>32.79</td>
<td>42.66</td>
</tr>
</tbody>
</table>

Baseline: ES = 0.6
Intervention: ES = 2.4
Reminder: < 0.2 = no effect
0.2 - 0.5 = small
0.6 - 0.8 = medium
> 0.8 = large

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

<table>
<thead>
<tr>
<th>Normal Instruction</th>
<th>Planning Facilitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>75.5</td>
<td>86.1</td>
</tr>
</tbody>
</table>

Baseline: ES = 0.1
Intervention: ES = 1.3
Reminder: < 0.2 = no effect
0.2 - 0.5 = small
0.6 - 0.8 = medium
> 0.8 = large

WIAT Numerical Operation Means and Effect Sizes for Students with ADHD

<table>
<thead>
<tr>
<th>Normal Instruction</th>
<th>Planning Facilitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>16.6</td>
</tr>
</tbody>
</table>

Baseline: ES = -0.2
Intervention: ES = 0.4
Reminder: < 0.2 = no effect
0.2 - 0.5 = small
0.6 - 0.8 = medium
> 0.8 = large

Iseman (2005)

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

Baseline Mean Intervention Mean
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 ($M = 3.21$, $SD = 18.21$, $d = 0.09$).

www.efintheclassroom.net

Mountain View Alternative HS

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.

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)

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.
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.”

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.

Themes & structure of the lessons

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

STEP 3 – Share your ideas

Planning Lesson

Phrase of the week: What is your plan?
[Link: http://www.youtube.com/watch?v=bQLC2OG20z]

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.

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)

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)

Q4: What should you do if a plan isn’t working?
1. Fix it (self-correction)
2. Go home! (a bad plan)
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

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

EF Instruction

Working Memory Lesson

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)
  - Phonological loop
  - Visual-spatial scratch pad

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)

http://www.enchantedlearning.com/wordlist/far.shtml
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.

One Factor and 9 Scales?

- NOTE: EF is 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

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”

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”

Efintheclassroom.net

Response Inhibition

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

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.

EF Instruction

Promoting Executive Function in the Classroom (What Works for Special Needs Learners) Print 9.25 x 11" Softcover 104 pages

Executive Skills in Children and Adolescents: A Practical Guide to Assessment and Intervention (The Surface of Practical Intervention in Schools Series/Profiler) Print 9.25 x 11" Softcover 96 pages

http://www.enchantedlearning.com/wordlist/far.shtml
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=CT-snmpl00W&list=PL4w9a6XhGe_3](http://www.youtube.com/watch?v=CT-snmpl00W&list=PL4w9a6XhGe_3)

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 5A 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.
**Kryza Practical EF Instruction**

Kryza Practical EF Instruction

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

Kathleen Kryza

It’s the first week of school for Mrs. Smith, a middle school teacher in charge of a small class of fifth graders. She’s been preparing for the first day of school for weeks, picking the room, and making sure everything is set up. On the day of the first day, Mrs. Smith is nervous but excited. She knows her students will be learning in small groups with an emphasis on collaboration. The classroom is set up with two small tables, each with four chairs. Mrs. Smith walks in and starts to help the students settle in. She introduces the concept of Executive Functioning to the class and explains its importance. Mrs. Smith explains that Executive Functioning is about managing one’s own learning and behavior, and that it’s crucial for academic success.

**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

**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

**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

**Kryza et al (2011)**

- Activities that reveal students’ mindset
  - Use questions that help the teacher draw out the students’ feelings
  - The following are possible questions you could use to have students feel their “mindsets” (Developing Growth Mindset in the Improving Classroom, Kryza, Sheilpore, & Pinilla, 2011)
  - Take a Quiz (Psychographics): Give students a surprise quiz on what they’ve been learning in your class.
  - Try a Toothpick Puzzles (Visual); Have students try to solve a toothpick puzzle. Many examples and solutions at various levels can be found at: http://www.mathwire.com/school/department/elementary/ toothpick/world/toothpick13.html.
  - The Knobs (Visual/behavioral): Provide maps and written directions with no pictures and have students try using knobs.

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

**Kryza et al (2011)**

- What parts are going well? What parts are not going well?
- Why do you think this part is challenging for you? What do you need help with? Do you need more information? More practice? A different way to approach it?
- How can you make the task easier for yourself? What did you do when it got hard? Did you give up? Why or why not?
- What can you do to stick with it when something gets tough?
Social Emotional Skills = EF

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


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

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)
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)

Relations between Cognitive Ability, Socioemotional Competency, and Achievement Variables

Hierarchical regression analyses were conducted to determine which scales and subscales predicted the most variance in the dependent achievement variables. Composites CogAT scores were not found to significantly predict composite achievement, $R^2 = .03, F(1, 121) = 3.27, p > .05$, reading, language, or math scores. 

IQ (CogAT) scores over- and above the DESSA Total scores (Table 13). On the other hand, the DESSA Total scores significantly predicted composite achievement, $R^2 = .05, F(1, 121) = 6.99, p < .05$, language scores, $R^2 = .03, F(1, 121) = 4.26, p < .05$, and math scores, $R^2 = .05, F(1, 121) = 6.99, p < .05$.

Thank you for attending

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