Executive Functions Assessment and Intervention

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Chapter 10: Interventions for Students with Executive Skills and Executive Functions Difficulties

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Caitlin Gilmartin
Betti Stanco
**Key Concept**

**Executive Functions:**
- Directive capacities of the mind
- Multiple in nature, not a single capacity
- Part of neural circuits that are routed through the frontal lobes
- Cue the use of other mental capacities
- Direct and control perceptions, thoughts, actions, and to some degree emotions

**The Wisdom of Kurt Lewin**

“There is nothing more practical than a good theory.”

Known for his *field theory of behavior* that posits that human behavior is a function of an individual’s psychological environment.

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**What Are Executive Functions?**

“Despite the frequency with which it is mentioned in the neuropsychological literature, the concept of executive functions is one that still awaits a formal definition. Research efforts aimed at exploring the different aspects of this construct have often yielded contradictory evidence, resulting in a lack of clarity and even controversy regarding the true nature of executive abilities.”


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**What Are Executive Functions? Varying Perspectives**

- Baddeley (1974): The central executive coordinates the processing of information by the phonological loop and the visuospatial sketchpad.
- Welsh & Pennington (1988): “The ability to maintain an appropriate problem-solving set for attainment of a future goal (p. 201).”
**What Are Executive Functions? Varying Perspectives**

- Gioia et al. (1996): The executive functions are a collection of processes that are responsible for guiding, directing, and managing cognitive, emotional, and behavioral functions.

**EF as the Conductor of the Brain’s Orchestra (i.e., EF as “g”)**

**What Are Executive Functions?**

Stuss & Alexander came the closest to offering a comprehensive definition of executive functions:

“Many of the models of brain functioning have a hierarchical component to them, and we have postulated such a model for self-awareness. ...This model has several properties: (1) There are four operational levels: arousal-attention; perceptual-motor; executive mediation; self-awareness. (2) Each operational level feeds forward to higher levels, providing a tentative digest of the analyses and associations within that level. (3) Each operational level also feeds backward to lower levels to modulate, bias, constrain or facilitate the analyses and operations that will occur. (4) Direct contact with the external environment is restricted to the perceptual-motor level. (5) The two highest levels are instantiated in frontal lobes. The executive mediation level is predominantly localized to ventrolateral and dorsolateral frontal regions. It incorporates action, planning, inhibition and facilitation of parietotemporal association cortices and working memory capacities. Open and closed neural loops through basal ganglia and cerebellum provide neural space for unfolding complex plans and for learning frequently used plans. (6) Self-awareness emerges from convergence of emotional states and memory – not simply explicit remote memory of experiences or explicit semantic knowledge – but memory of abstract mental states that allow construction of expectancy and thus memory for the future. Human consciousness is an unstable template of experience and emotion.” Stuss & Alexander (2000), page 295.

**Executive Functions Are Not a Unitary Trait**

**Appropriate Metaphors for Executive Functions:**

- The conductor and section leaders of the mind’s Orchestra
- The management structure of a multinational mind corporation
- The coaching staff of team mind
Domains of Functioning Directed by Executive Functions

**Action**
Executive control of modes of output including behavior in the external world and storage and retrieval of internal representations

**Cognition**
Executive control of thoughts and thought processing

**Perception**
Executive control of modes of perceptual input including external sensory stimuli (visual, auditory, kinesthetic) and internal (representational) stimuli

**Emotion**
Executive control of moods, feelings, and the processing of emotions

Co-Conductors in a Holarchical Model of EF

Key Concept
Executive Functions cue and direct in different ways at different levels.
Key Concept
It is important to distinguish between Executive Skills and Executive Functions.

Key Concept
Functions Are Frontal Skills are Scattered

Self Regulation Executive Skills
Executive Skills involve the use of neural networks routed throughout the brain to perform specific tasks (e.g., attending, inhibiting, modulating, planning, organizing, associating).

Self Regulation Executive Functions
Executive Functions involve the part of the executive network that is routed through the frontal lobes and that is used to cue, direct, and coordinate the use of executive skills and other mental capacities.
Co-Conductors in a Holarchical Model of EF

Executive Capacities

Executive Functions

Executive Skills

Self Activation
Initiation and “ramping up” of basic executive functions related to an awakened state of mind and to overcoming sleep inertia.

Self Regulation
A set of control capacities that cue and direct functioning across the domains of perception, emotion, cognition, and action.
The current model posits 33 self-regulation executive functions.

33 Self-Regulation EFs
- Perceive
- Focus
- Sustain
- Energize
- Initiate
- Inhibit
- Stop
- Interrupt
- Flexible
- Shift
- Modulate
- Balance
- Monitor
- Correct
- Gauge
- Anticipate
- Est Time
- Analyze
- Generate
- Associate
- Plan
- Hold
- Manipulate
- Prioritize
- Compare/Eval
- Decide
- Sense Time
- Pace
- Sequence
- Execute
- Store
- Retrieve
Executive Functions Assessment & Intervention

Key Concept

Self-regulation Executive Functions can be organized into 7 basic clusters.

Self Realization (of self & others)

- Directs cognitive processes that engage in awareness of self and others, reflection about self and others and self-analysis.
- Cues cognitive processes to access accumulated information about self and apply it in specific situations.

Self Determination

- Foresight/Long-Term Planning and Goal Generation
- Directs the use of cognitive processes to construct visions of the future and plans for action over longer periods of time. Attempts to align self-regulation with long-term goals.
Self Generation

- Directs the posing of speculative questions related to the meaning and purpose of life and/or the ultimate source(s) of reality and physical existence, mind-body relationships, spirit, and soul; contemplates existence beyond the physical plane.
- Directs the generation of a philosophy of life used to guide self-awareness, self-realization and the other levels of executive function processes; serves as a basis for an ultimate source of intentional behavior direction.

Trans-Self Integration

- Directs the engagement of mental processes that enable realization and experiencing of a trans-self state of ultimate or unity consciousness.
- In most spiritual traditions, this state is considered the highest achievement of human consciousness and therefore very different from the maladaptive states characteristic of clinical diagnoses of dissociative states.

Key Concept

Producing difficulties are different from learning difficulties; producing difficulties reflect poor use of executive functions.

Producing versus Learning

Executive Function difficulties of a severe nature (especially in the Symbol System Arena) do not result in Learning Difficulties; they result in Producing Difficulties.
A General Model for Conceptualizing Learning and Producing Difficulties

- Learning Difficulties Only
- Learning Difficulties And Producing Difficulties
- Producing Difficulties Only

Often NOT recognized as a Learning Disability, even when severe, unless an evaluation involving process assessment is done.

Recognized fairly quickly as a Learning Disability.

When severe, typically attributed to lack of motivation, character flaws, or behavior/personality problems.

Diagnosis and Classification

- Executive Function Deficit (or Executive Dysfunction) is not included in DSM-V.
- Executive Function Deficit is recognized by the World Health Organization’s code system: ICD-9 799.55 Frontal lobe and executive function deficit.

Key Concept

Virtually all individuals who struggle with psychological disorders exhibit executive function difficulties.
“Deficits in PFC [prefrontal cortex, aka frontal lobes] function are evident in every neuropsychiatric disorder (indeed, the term “psychiatric problem” seems synonymous with PFC dysfunction).”

Arnsten & Robbins 2002 in Principles of Frontal Lobe Function

- Most of the clinical conditions described in the DSM-V reflect some form of Executive Dysfunction
- The DSM-V can be thought of as “A User’s Guide to All the Things That Can Go Wrong With the Frontal Lobes”

A sampling of conditions involving EF deficits:
- Autism Asperger’s Syndrome
- ADHD and ADD
- Conduct Disorder
- Oppositional Defiant Disorder
- Depression and/or Anxiety
- Obsessive-Compulsive Disorder
- Fetal Alcohol Syndrome

All individuals with ADHD exhibit EF deficits but not all individuals that exhibit EF deficits are ADHD.
All individuals with ADHD have executive functions deficits…

…but not all individuals with executive functions deficits have ADHD.

Executive Functions and ADHD?

Executive Functions and ADHD

- EF and ADHD are not synonymous terms; rather ADHD is a condition involving EF deficits in:
  - Focus/Select, Sustain, Inhibit, Modulate
  - Nearly all persons with ADHD also have additional self-regulation difficulties; the nature of these additional difficulties is what makes ADHD so variable from one person to the next and what causes confusion in diagnosis.

Executive Functions and ADHD

- Pharmacological treatment of ADHD usually only addresses the problems associated with the EFs specific to ADHD (Inhibit, Modulate, Focus/Select, Sustain)
- Most persons with ADHD will require additional interventions to assist with the additional self-regulation difficulties that persist even when medication is being used effectively to treat the primary ADHD problems.
When thinking about how to assess executive functions, it is helpful to think about best practices in assessing for ADHD (and beyond).

**Key Concept**

**Executive Function Deficits**

**ADHD**

**The Multidimensional Nature of Executive Functions**

- Use of Executive Functions varies depending on:
  - the arena(s) of involvement in which the EF(s) are operating,
  - the domain(s) being directed by the EF(s)

**The Multidimensional Nature of EF Assessment**

- The Multidimensional Nature of the use of Executive Functions necessitates a Multidimensional approach to their assessment.
- Assessment of Executive Functions needs to address the use of Efs within all four domains of functioning and across all four arenas of involvement.

**EF Assessment Perspective x Method**

<table>
<thead>
<tr>
<th>Assessment Perspective</th>
<th>Assessment</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Indirect Perspective</strong> – does not involve direct interactions with, or observations of, the client</td>
<td>Rating Scales</td>
<td>Interviews, Records Review, Item Analysis of Ratings</td>
</tr>
<tr>
<td><strong>Direct Perspective</strong> – involves direct interactions with, or through direct observations of, the client</td>
<td>Standardized Norm-referenced Tests</td>
<td>Behavior Observations, Process-oriented Test Interpretation</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Formal Methods</strong> – make use of standards established through normative comparisons</td>
<td></td>
</tr>
<tr>
<td><strong>Informal Methods</strong> – do not make use of standards established through normative comparisons</td>
<td></td>
</tr>
</tbody>
</table>
**EF Assessment**

**Indirect Informal:**
- Interviews
- Records Reviews
- Process-oriented analysis of rating scale items

**Indirect Formal:**
- Rating Scales
  - Parent
  - Teacher
  - Self
  - Adult Informant

**Direct Formal:**
- Standardized Norm-referenced Tests
  - D-KEFS, WCST, NEPSY-II
- Cross-battery Cascading Production Decrement Analyses of N-R Tests

**Direct Informal:**
- Process-oriented interpretation of assessment performance
- Child Interview Process
- Behavior Observations
Effective EF assessment is multidimensional in nature and ideally addresses the use of EFs within all four domains of functioning and across all four arenas of involvement.

**Key Concept**

**EF Assessment Matrix**

<table>
<thead>
<tr>
<th>Perception</th>
<th>Emotion</th>
<th>Cognition</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Symbol Systems</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**EF Assessment**

Indirect Informal:
- Interviews
- Records Reviews
- Process-oriented analysis of rating scale items

**Key Concept**

The most effective approach to EF assessment involves clinical interview(s) followed by additional data collection methods to test hypotheses generated from the interview(s).
Conducting a thorough clinical interview:

- Identify arenas of involvement that are of concern, within the arenas of concern:
- Identify domains of functioning that are of concern
- Identify the specific executive function level(s) that are of concern
- Identify the specific executive functions and/or executive skills that are of concern

Conducting a thorough records review:

- Identify previously assigned diagnoses or classifications indicative of EF capacity difficulties (most DSM-V diagnoses apply)
- Identify anecdotal reports of behavior indicative of executive capacity difficulties
- Identify previous test results indicative of executive capacity difficulties

Indirect Informal:

- Interviews
- Records Reviews
- Process-oriented analysis of rating scale items

The Multidimensional Nature of EF Assessment

Minimal records were available for review prior to the evaluation. These included a teacher referral form, a parent input form, and Alan’s Speech/language IEPs. A summary of relevant statements from the teacher referral form and the likely executive functions difficulties reflected in these statements include:

- Difficulties getting along with classmates (Flexible, Awareness of Others)
- Demanding with peers (Flexible)
- Only wants to do things his way (Flexible)
- Expresses frustration in hurtful ways (Modulate, Monitor, Correct)
- Becomes obsessed with making sure work is accurate (Modulate, Balance)
- Frustrated with class rules (Modulate, Flexible)
- Difficulty recovering emotionally from disagreements (Modulate, Flexible)
A summary of relevant statements from the parent input form and the likely executive functions difficulties reflected in these statements include:

- Becomes easily frustrated with his peers (Modulate, Awareness of Others)
- Thinks he knows best (Flexible)
- Does not listen to what others have to say (Perceive, Flexible, Awareness of Others)
- Easily frustrated when things do not go according to schedule (Modulate, Flexible)
- Reacts negatively to corrective feedback (Modulate, Flexible)
- Gives up with written homework assignments (Sustain)
- Seems unable to relax as needed (Modulate, Balance)

**EF Assessment**

Indirect Informal:
- Interviews
- Records Reviews
- Process-oriented analysis of rating scale items

**The Multidimensional Nature of EF Assessment**

Analyze the item data collected with Rating Scales:
- Parent
- Teacher
- Self
- Adult Informant

**EF Assessment**

Indirect Formal:
- Rating Scales
  - Parent
  - Teacher
  - Self
  - Adult Informant
**EF Assessment**

Norm-referenced rating scales provide standardized scores, but it is important to keep in mind that the scores that are provided usually are normalized T-scores, the ratings do not distribute normally but rather are negatively skewed.

**Indirect Formal EF Assessment**

The most frequently used EF behavior rating scale, the Behavior Rating Inventory of Executive Functions (BRIEF) covers a broader range of Arenas and Domains, but items are highly nonspecific, often combining many arenas and domains at once.

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### EF Assessment Using the BRIEF

<table>
<thead>
<tr>
<th>Perception</th>
<th>Emotion</th>
<th>Cognition</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Others</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Environment</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Symbol Systems</td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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### Indirect Formal EF Assessment

Recently, 3 additional EF Rating Scales have been published:
- D-REFS (Delis Rating of Executive Function; 2012)
- BDEFS-CA (Barkley Deficits in Executive Functioning Scale; 2012)
- CEFI (Comprehensive Executive Functions Inventory; 2013)
Executive Functions Assessment & Intervention

Indirect Formal EF Assessment

These three new EF rating scales have structures similar to that of the BRIEF Scales and therefore suffer from the same content coverage weaknesses as the BRIEF; items are highly nonspecific, often combining many arenas and domains at once.

EF Assessment with the BRIEF

BRIEF Forms
- Parent, Teacher and Self-Report Forms
- Preschool, School-Age, Adult forms
- Norm-referenced scores

EF Assessment with the BRIEF

The BRIEF provides 3 Composite Scores and 8 Scale Scores:

Global Executive Control
Behavior Regulation
- Inhibit, Shift, Emotional Control
Metacognitive
- Initiate, Working Memory, Plan/Organize, Org. of Materials, Monitor

EF Assessment with the BRIEF

T-Scores and (Percentile Ranks)

<table>
<thead>
<tr>
<th>Scales</th>
<th>Mother</th>
<th>Father</th>
<th>Math Teacher</th>
<th>Social Studies Teacher</th>
<th>Language Arts Teacher</th>
<th>Learning Support Teacher</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inhibit</td>
<td>49 (65)</td>
<td>47 (55)</td>
<td>53 (75)</td>
<td>49 (65)</td>
<td>77 (96)</td>
<td>85 (98)</td>
</tr>
<tr>
<td>Shift</td>
<td>38 (14)</td>
<td>42 (28)</td>
<td>53 (78)</td>
<td>45 (50)</td>
<td>65 (92)</td>
<td>57 (85)</td>
</tr>
<tr>
<td>Emotional Control</td>
<td>37 (11)</td>
<td>39 (17)</td>
<td>50 (65)</td>
<td>46 (50)</td>
<td>54 (80)</td>
<td>46 (50)</td>
</tr>
<tr>
<td>Initiate</td>
<td>56 (80)</td>
<td>53 (71)</td>
<td>69 (95)</td>
<td>85 (&gt;99)</td>
<td>96 (&gt;99)</td>
<td>81 (&gt;99)</td>
</tr>
<tr>
<td>Working Memory</td>
<td>60 (84)</td>
<td>62 (88)</td>
<td>85 (&gt;99)</td>
<td>92 (&gt;99)</td>
<td>92 (&gt;99)</td>
<td>106 (&gt;99)</td>
</tr>
<tr>
<td>Planning/Organize</td>
<td>62 (86)</td>
<td>60 (83)</td>
<td>73 (95)</td>
<td>80 (98)</td>
<td>80 (98)</td>
<td>92 (&gt;99)</td>
</tr>
<tr>
<td>Organize Materials</td>
<td>49 (52)</td>
<td>43 (33)</td>
<td>57 (88)</td>
<td>46 (60)</td>
<td>69 (95)</td>
<td>111 (&gt;99)</td>
</tr>
<tr>
<td>Monitor</td>
<td>46 (42)</td>
<td>40 (20)</td>
<td>63 (90)</td>
<td>66 (83)</td>
<td>80 (98)</td>
<td>77 (97)</td>
</tr>
</tbody>
</table>
Executive Functions Assessment & Intervention

**EF Assessment with the BRIEF**

BRIEF Interpretive Cautions:
- Identical BRIEF Scale T-scores can result from very different response patterns.
- Critical EF difficulties may be masked by low T-scores based on aggregation of multiple items.

**EF Assessment with the BRIEF**

BRIEF Interpretive Cautions:
- An elevated T-score can result from a rating of “Sometimes” for all, or nearly all, items on a Scale, or from a rating of “Often” for a smaller subset of items on a Scale.

**EF Assessment with the BRIEF**

BRIEF Interpretive Cautions:
- Because each BRIEF Scale is an amalgam of multiple EFs, certain areas of deficit may not be reflected in the T-score.

**EF Assessment with the BRIEF**

BRIEF Interpretive Cautions:
- Example: The BRIEF Inhibit Scale combines items assessing Inhibit, Modulate, and Stop. If a client only exhibits Modulate problems, the T-score may not be clinically elevated. The low T-score will be masking the Modulate difficulties.
**Executive Functions Assessment & Intervention**

**EF Assessment**

Indirect Informal:
- Interviews
- Records Reviews
- Process-oriented analysis of rating scale items

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**BRIEF INHIBIT SCALE**

<table>
<thead>
<tr>
<th>Item Description</th>
<th>P</th>
<th>T</th>
<th>PRIMARY EF</th>
<th>SECONDARY Ef</th>
</tr>
</thead>
<tbody>
<tr>
<td>WILDER than others</td>
<td></td>
<td></td>
<td>MODULATE</td>
<td>MONITOR</td>
</tr>
<tr>
<td>INTERRUPTS others</td>
<td></td>
<td></td>
<td>INHIBIT</td>
<td>MONITOR</td>
</tr>
<tr>
<td>OUT OF SEAT</td>
<td></td>
<td></td>
<td>MODULATE</td>
<td>MONITOR</td>
</tr>
<tr>
<td>OUT OF CONTROL</td>
<td></td>
<td></td>
<td>INHIBIT</td>
<td>MONITOR</td>
</tr>
<tr>
<td>BLURTS OUT</td>
<td></td>
<td></td>
<td>INHIBIT</td>
<td>MONITOR</td>
</tr>
<tr>
<td>TOO WILD</td>
<td></td>
<td></td>
<td>MODULATE</td>
<td>MONITOR</td>
</tr>
<tr>
<td>Trouble STOPPING</td>
<td></td>
<td></td>
<td>INHIBIT</td>
<td>MODULATE</td>
</tr>
<tr>
<td>TROUBLE when NOT</td>
<td></td>
<td></td>
<td>MODULATE</td>
<td>MONITOR</td>
</tr>
<tr>
<td>SUPERV</td>
<td></td>
<td></td>
<td>INHIBIT</td>
<td>MODULATE</td>
</tr>
<tr>
<td>TOO SILLY</td>
<td></td>
<td></td>
<td>MODULATE</td>
<td>MONITOR</td>
</tr>
<tr>
<td>Talks at WRONG TIME</td>
<td></td>
<td></td>
<td>INHIBIT</td>
<td>MONITOR</td>
</tr>
<tr>
<td>NO THOUGHT BEFORE ACT</td>
<td></td>
<td></td>
<td>ANTICIPATE</td>
<td></td>
</tr>
<tr>
<td>IMPULSIVE</td>
<td></td>
<td></td>
<td>INHIBIT</td>
<td>MONITOR</td>
</tr>
<tr>
<td>TOLD to STOP</td>
<td></td>
<td></td>
<td>STOP</td>
<td>MONITOR</td>
</tr>
<tr>
<td>NO THOUGHT BEFORE ACT</td>
<td></td>
<td></td>
<td>ANTICIPATE</td>
<td></td>
</tr>
</tbody>
</table>

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**BRIEF SHIFT SCALE**

<table>
<thead>
<tr>
<th>Item Description</th>
<th>P</th>
<th>T</th>
<th>PRIMARY EF</th>
<th>SECONDARY Ef</th>
</tr>
</thead>
<tbody>
<tr>
<td>RESISTS different ways</td>
<td></td>
<td></td>
<td>FLEXIBLE</td>
<td></td>
</tr>
<tr>
<td>GETS UPSET with new situations</td>
<td></td>
<td></td>
<td>MODULATE</td>
<td>FLEXIBLE</td>
</tr>
<tr>
<td>SAME THING OVER AND OVER</td>
<td></td>
<td></td>
<td>SHIFT</td>
<td>GENERATE STOP</td>
</tr>
<tr>
<td>UPSET by change in plans</td>
<td></td>
<td></td>
<td>MODULATE</td>
<td>FLEXIBLE</td>
</tr>
<tr>
<td>DISTURBED by change of teacher</td>
<td></td>
<td></td>
<td>MODULATE</td>
<td>FLEXIBLE</td>
</tr>
<tr>
<td>RESISTS routine changes</td>
<td></td>
<td></td>
<td>FLEXIBLE</td>
<td></td>
</tr>
<tr>
<td>TROUBLE GETTING USED TO</td>
<td></td>
<td></td>
<td>FLEXIBLE</td>
<td>MODULATE</td>
</tr>
<tr>
<td>new situations</td>
<td></td>
<td></td>
<td>FLEXIBLE</td>
<td>MODULATE</td>
</tr>
<tr>
<td>Thinks too much about SAME</td>
<td></td>
<td></td>
<td>STOP</td>
<td>GENERATE Shift</td>
</tr>
<tr>
<td>TOPIC</td>
<td></td>
<td></td>
<td>STOP</td>
<td>GENERATE Shift</td>
</tr>
<tr>
<td>GETS STUCK ON ONE topic or activity</td>
<td></td>
<td></td>
<td>STOP</td>
<td>SHIFT</td>
</tr>
<tr>
<td>STAYS DISAPPOINTED</td>
<td></td>
<td></td>
<td>MODULATE</td>
<td>STOP</td>
</tr>
<tr>
<td>STAYS DISAPPOINTED</td>
<td></td>
<td></td>
<td>MODULATE</td>
<td>SHIFT</td>
</tr>
</tbody>
</table>

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**BRIEF EMOTIONAL CONTROL SCALE**

<table>
<thead>
<tr>
<th>Item Description</th>
<th>P</th>
<th>T</th>
<th>PRIMARY EF</th>
<th>SECONDARY Ef</th>
</tr>
</thead>
<tbody>
<tr>
<td>OVERREACTS to small problems</td>
<td></td>
<td></td>
<td>MODULATE</td>
<td></td>
</tr>
<tr>
<td>EXPLOSIVE angry OUTBURSTS</td>
<td></td>
<td></td>
<td>INHIBIT</td>
<td></td>
</tr>
<tr>
<td>EASILY becomes tearful</td>
<td></td>
<td></td>
<td>MODULATE</td>
<td></td>
</tr>
<tr>
<td>OUTBURSTS for little reason</td>
<td></td>
<td></td>
<td>INHIBIT</td>
<td></td>
</tr>
<tr>
<td>Mood CHANGES FREQUENTLY</td>
<td></td>
<td></td>
<td>MODULATE</td>
<td></td>
</tr>
<tr>
<td>Reacts MORE STRONGLY</td>
<td></td>
<td></td>
<td>MODULATE</td>
<td></td>
</tr>
<tr>
<td>Mood EASILY INFLUENCED</td>
<td></td>
<td></td>
<td>MODULATE</td>
<td></td>
</tr>
<tr>
<td>INTENSE OUTBURSTS over</td>
<td></td>
<td></td>
<td>INHIBIT</td>
<td></td>
</tr>
<tr>
<td>quickly</td>
<td></td>
<td></td>
<td>INHIBIT</td>
<td></td>
</tr>
<tr>
<td>BIG REACTION to small events</td>
<td></td>
<td></td>
<td>INHIBIT</td>
<td></td>
</tr>
<tr>
<td>Gets UPSET TOO EASILY</td>
<td></td>
<td></td>
<td>MODULATE</td>
<td></td>
</tr>
</tbody>
</table>
### BRIEF INITIATE SCALE

<table>
<thead>
<tr>
<th>Item Description</th>
<th>P</th>
<th>T</th>
<th>PRIMARY EF</th>
<th>SECONDARY Ef</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOT A SELF STARTER</td>
<td>x</td>
<td>x</td>
<td>INITIATE</td>
<td>GENERATE</td>
</tr>
<tr>
<td>MUST BE TOLD TO BEGIN</td>
<td>x</td>
<td>x</td>
<td>INITIATE</td>
<td>ENERGIZE</td>
</tr>
<tr>
<td>TROUBLE THINKING OF THINGS TO DO</td>
<td>x</td>
<td></td>
<td>GENERATE</td>
<td></td>
</tr>
<tr>
<td>TROUBLE GETTING STARTED</td>
<td>x</td>
<td>x</td>
<td>INITIATE</td>
<td>ENERGIZE</td>
</tr>
<tr>
<td>TROUBLE ORGANIZING</td>
<td></td>
<td></td>
<td>ORGANIZE</td>
<td>DECIDE</td>
</tr>
<tr>
<td>DOESN’T TAKE INITIATIVE</td>
<td>x</td>
<td>x</td>
<td>INITIATE</td>
<td>GENERATE</td>
</tr>
<tr>
<td>Complains NOTHING TO DO</td>
<td></td>
<td></td>
<td>GENERATE</td>
<td>ENERGIZE</td>
</tr>
<tr>
<td>LIÈS AROUND</td>
<td>x</td>
<td></td>
<td>INITIATE</td>
<td>ENERGIZE</td>
</tr>
<tr>
<td>DOESN’T SHOW CREATIVITY</td>
<td>x</td>
<td>x</td>
<td>GENERATE</td>
<td></td>
</tr>
<tr>
<td>Trouble finding NEW WAYS TO</td>
<td>x</td>
<td>x</td>
<td>GENERATE</td>
<td></td>
</tr>
<tr>
<td>SOLVE PROBLEMS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trouble finding NEW WAYS TO</td>
<td>x</td>
<td>x</td>
<td>GENERATE</td>
<td></td>
</tr>
<tr>
<td>SOLVE PROBLEMS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### BRIEF WORKING MEMORY SCALE

<table>
<thead>
<tr>
<th>Item Description</th>
<th>P</th>
<th>T</th>
<th>PRIMARY EF</th>
<th>SECONDARY Ef</th>
</tr>
</thead>
<tbody>
<tr>
<td>HOLDS ONTO only first or last</td>
<td>x</td>
<td>x</td>
<td>HOLD</td>
<td>SUSTAIN</td>
</tr>
<tr>
<td>SHORT ATTENTION SPAN</td>
<td>x</td>
<td>x</td>
<td>SUSTAIN</td>
<td>FOCUS/SEL</td>
</tr>
<tr>
<td>TROUBLE CONCENTRATING</td>
<td>x</td>
<td>x</td>
<td>SUSTAIN</td>
<td>FOCUS/SEL</td>
</tr>
<tr>
<td>EASILY DISTRACTED</td>
<td>x</td>
<td>x</td>
<td>SUSTAIN</td>
<td>FOCUS/SEL</td>
</tr>
<tr>
<td>TROUBLE with tasks having</td>
<td></td>
<td>x</td>
<td>HOLD</td>
<td>SUSTAIN</td>
</tr>
<tr>
<td>MORE THAN ONE STEP</td>
<td></td>
<td>x</td>
<td>SUSTAIN</td>
<td>FOCUS/SEL</td>
</tr>
<tr>
<td>NEEDS HELP TO STAY ON TASK</td>
<td>x</td>
<td>x</td>
<td>SUSTAIN</td>
<td>FOCUS/SEL ENERGIZE</td>
</tr>
<tr>
<td>DOESN’T HOLD ONTO what</td>
<td></td>
<td></td>
<td>HOLD</td>
<td>SUSTAIN</td>
</tr>
<tr>
<td>their doing</td>
<td></td>
<td></td>
<td>HOLD</td>
<td>SUSTAIN</td>
</tr>
<tr>
<td>DOESN’T HOLD ON TO multi-step</td>
<td>x</td>
<td>x</td>
<td>SUSTAIN</td>
<td>PACE EST TIME</td>
</tr>
<tr>
<td>directions</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TROUBLE FINISHING TASKS</td>
<td>x</td>
<td>x</td>
<td>SUSTAIN</td>
<td>PACE EST TIME</td>
</tr>
<tr>
<td>TROUBLE HOLDING</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INFORMATION for a few minutes</td>
<td>x</td>
<td>x</td>
<td>HOLD</td>
<td>SUSTAIN</td>
</tr>
</tbody>
</table>

### BRIEF PLAN/ORGANIZE SCALE

<table>
<thead>
<tr>
<th>Item Description</th>
<th>P</th>
<th>T</th>
<th>PRIMARY EF</th>
<th>SECONDARY Ef</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOESN’T REMEMBER to br</td>
<td>x</td>
<td>x</td>
<td>RETRIEVE</td>
<td>MONITOR</td>
</tr>
<tr>
<td>CAN’T GET IDEAS ONTO PA</td>
<td>x</td>
<td>x</td>
<td>MANIPULATE</td>
<td>HOLD EXECUTE</td>
</tr>
<tr>
<td>DOESN’T ASSOCIATE home</td>
<td>x</td>
<td></td>
<td>ANTICIPATE</td>
<td>ASSOCIATE</td>
</tr>
<tr>
<td>DOESN’T REMEMBER to ha</td>
<td>x</td>
<td>x</td>
<td>MONITOR</td>
<td>RETRIEVE</td>
</tr>
<tr>
<td>LIÈS AROUND</td>
<td>x</td>
<td></td>
<td>INITIATE</td>
<td>ENERGIZE</td>
</tr>
<tr>
<td>MISSES BIG PICTURE - OVE</td>
<td>x</td>
<td>x</td>
<td>GENERATE</td>
<td></td>
</tr>
<tr>
<td>DOESN’T GET JOB DONE</td>
<td>x</td>
<td>x</td>
<td>SUSTAIN</td>
<td>ENERGIZE</td>
</tr>
<tr>
<td>OVERWHELMED by large</td>
<td>x</td>
<td>x</td>
<td>MODULATE</td>
<td>ORGANIZE</td>
</tr>
<tr>
<td>UNDERESTIMATES TIME fo</td>
<td>x</td>
<td>x</td>
<td>ESTTIME</td>
<td>GAUGE</td>
</tr>
<tr>
<td>STARTS tasks AT LAST MIN</td>
<td>x</td>
<td>x</td>
<td>ESTTIME</td>
<td>GAUGE SENSE T INIT</td>
</tr>
<tr>
<td>DOESN’T PLAN AHEAD</td>
<td>x</td>
<td>x</td>
<td>PLAN</td>
<td>ANTICIPATE</td>
</tr>
<tr>
<td>POORLY ORGANIZED wrt</td>
<td>x</td>
<td>x</td>
<td>ORGANIZE</td>
<td>SEQUENCE</td>
</tr>
<tr>
<td>DOESN’T COMPLETE ACT</td>
<td>x</td>
<td>x</td>
<td>SUSTAIN</td>
<td>ENERGIZE</td>
</tr>
</tbody>
</table>

### BRIEF ORGANIZATION OF MATERIALS SCALE

<table>
<thead>
<tr>
<th>Item Description</th>
<th>P</th>
<th>T</th>
<th>PRIMARY EF</th>
<th>SECONDARY Ef</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaves room a MESS</td>
<td>x</td>
<td></td>
<td>ORGANIZE</td>
<td></td>
</tr>
<tr>
<td>Keeps a MESSY room</td>
<td>x</td>
<td></td>
<td>ORGANIZE</td>
<td></td>
</tr>
<tr>
<td>CAN’T FIND THINGS</td>
<td>x</td>
<td>x</td>
<td>RETRIEVE</td>
<td>MONITOR</td>
</tr>
<tr>
<td>LEAVES THINGS lying</td>
<td>x</td>
<td>x</td>
<td>CORRECT</td>
<td>MONITOR</td>
</tr>
<tr>
<td>Leaves MESSES for others to clean</td>
<td>x</td>
<td>x</td>
<td>CORRECT</td>
<td>MONITOR</td>
</tr>
<tr>
<td>MESSY closet</td>
<td>x</td>
<td>x</td>
<td>ORGANIZE</td>
<td></td>
</tr>
<tr>
<td>LOSES THINGS</td>
<td>x</td>
<td>x</td>
<td>RETRIEVE</td>
<td>ORGANIZE</td>
</tr>
<tr>
<td>CAN’T FIND THINGS</td>
<td>x</td>
<td>x</td>
<td>RETRIEVE</td>
<td>MONITOR</td>
</tr>
<tr>
<td>DISORGANIZED backpack</td>
<td>x</td>
<td>x</td>
<td>ORGANIZE</td>
<td></td>
</tr>
</tbody>
</table>
Indirect Formal EF Assessment

The McCloskey Executive Function Scales are being developed to assess 33 self-regulation executive functions across multiple domains of function within multiple arenas of involvement.

MEFS Rating Criteria

<table>
<thead>
<tr>
<th>Score</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>AA</td>
<td>Always or almost always does this on his or her own. Does not need to be prompted or reminded (cued) to do it.</td>
</tr>
<tr>
<td>4</td>
<td>F</td>
<td>Frequently does this on own without prompting</td>
</tr>
<tr>
<td>3</td>
<td>S</td>
<td>Seldom does this on own without being prompted, reminded, or cued to do so.</td>
</tr>
<tr>
<td>2</td>
<td>AP</td>
<td>Does this only after being prompted, reminded, or cued to do it.</td>
</tr>
<tr>
<td>1</td>
<td>DA</td>
<td>Only does it with direct assistance. Requires much more than a simple prompt or cue to be able to get it done in situations that require it.</td>
</tr>
<tr>
<td>0</td>
<td>UA</td>
<td>Unable to do this, even when direct assistance is provided.</td>
</tr>
</tbody>
</table>
Executive Functions Assessment & Intervention

**EF Assessment**

Direct Formal:
- Standardized Norm-referenced Tests
  - D-KEFS, WCST, NEPSY-II
- Cross-battery Cascading Production Decrement Analyses of N-R Tests

**Key Concept**

Standardized, individually-administered measures of executive functions only assess the use of executive functions within the Symbol System Arena.

---

**Executive Functions and Intelligence**

“Wechsler believed that performance on measures of cognitive ability reflected only a portion of what intelligence comprises. He defined intelligence as the capacity of the individual to act purposefully, to think rationally, and to deal effectively with his environment (1944, p.3). Wechsler was keenly aware that the results of factor-analytic studies accounted for only a portion of intelligence, and he believed that another group of attributes contributed to intelligent behavior. These attributes included planning and goal awareness, enthusiasm, field dependence and independence, impulsiveness, anxiety, and persistence.”


---

**Executive Functions and Intelligence**

Spearman (1927) offered this observation about factors that emerged in his studies of mental abilities:
- “Still another great functional unity has revealed its existence; this, although not in itself of cognitive nature, yet has a dominating influence upon all exercise or even estimation of cognitive ability. On trying to express it by any current name, perhaps the least unsatisfactory – though still seriously misleading – would be “self-control.” It has shown itself to be chiefly responsible for the fact of one person’s ability seeming to be more “profound” or more inclined to “common sense” than that of persons otherwise equally capable.” P. 413.
Executive Functions Assessment & Intervention

The publishers of the WISC-V emphasize in the Technical and Interpretation Manual the use of intelligence test scores to predict achievement. Other purposes are mentioned only briefly.

Research suggests that measures of self-control in preschool are better predictors of later school achievement than Full Scale IQ scores.

If measures of self-control in preschool are better predictors of later school achievement than Full Scale IQ scores, then why are we still endorsing the use of intelligence tests if their primary purpose is to predict achievement?
Executive Functions Assessment & Intervention

Executive Functions and Intelligence

- The concept of executive functions is not synonymous with the traditional concepts of intelligence or “IQ”
- Executive functions are not directly assessed with standard intelligence tests

Measuring Executive Functions with a Reasoning Task

Directions for the Wisconsin Card Sorting Test (WCST):
I can’t tell you much about how to do this task. Which of these do you think this one goes with? I’ll tell you if your answer is right or wrong.

Executive Functions and School

The more classroom instruction resembles tests of executive functions like the Wisconsin Card Sorting Test (figure out what we’re learning, I’ll tell you whether you are right or wrong), the more executive difficulties are going to impact classroom learning and performance.
Executive Functions Assessment &
Intervention

**EF Assessment Using Individually Administered Tests**

<table>
<thead>
<tr>
<th>Perception</th>
<th>Emotion</th>
<th>Cognition</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Symbol Systems</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

**Key Concept**

Although limited in scope, individually-administered assessment of executive functions can provide valuable information about the child’s capacities to self-regulate perception, cognition and action within the Symbol System arena, especially in school.

**EF Assessment**

Direct Formal:
- Standardized Norm-referenced Tests
  - D-KEFS, WCST, NEPSY-II
- Cross-battery Cascading Production Decrement Analyses of N-R Tests

**Interpretive Levels Framework**

- Global Composite Full Scale IQ Level
- GAI & Specific Composite Indexes / Clinical Clusters Level
- Subtest Level
- Item Level
- Cognitive Constructs Level
Specifying Cognitive Constructs

- An Information Processing Model provides a theoretical framework for understanding the cognitive constructs likely to be involved in the completion of a task.
- An information processing model represents a dynamic model of cognition rather than a taxonomy of cognitive abilities.

Key Concept

Assessment of Executive Functions does not occur “in a vacuum.” In order to evaluate how EFs cue and direct, they must have something (i.e., specific perceptions, emotions, thoughts, or actions) to cue and direct.

Individually-administered Assessments of EF

- Executive Functions must be assessed in tandem with other mental constructs.
- Specific measures of Executive Functions always involve the assessment, to some degree, of a construct other than executive functions.
- For the most accurate observation or measurement of EFs, the contributions of other constructs need to be minimized, controlled for, or acknowledged.
**Key Concept**

EFs in the Symbol System arena are best assessed by using methods that can reveal Cascading Production Decrements or Cascading Production Increments.

**Individually-administered Assessments of EF**

- Identify a specific cognitive construct baseline using a measure that minimizes EF involvement.
- Select and use a measure that adds executive function demands to the baseline construct and observe the results.
- Continue to add additional EF demands and observe results.

**Cascading Production Decrement**

- Start here
- Construct
- Construct + EF
- Construct + + EF
- Construct + + + EF

Progressive deterioration of performance is observed as executive function demands (+ EF) become greater.

**Increment Production Cascading**

- Start here
- Construct + EF
- Construct + + EF
- Construct + + + EF

Cascading production increment: Progressive improvement of performance is observed as task embedded executive function demands (+ EF) are lessened.
Assessing Retrieval Fluency

Examples:
- Naming animals in 60 seconds
- Naming foods in 60 seconds
- Naming words that begin with the letter “s” in 60 seconds
- Naming words that begin with the letter “f” in 60 seconds

Assessing Retrieval Fluency

Examples of response patterns:
- Semantic “Flooding” – Retrieval with minimal executive direction; uncontrolled flow of words
- Controlled Access – Executive Functions used to organize retrieval of words by semantic clusters
Assessing Retrieval Fluency

Examples of response patterns:

- Semantic “Flooding” results in uneven performance across a 60 second interval with decreased production in each successive 15 second interval.

Examples of response patterns:

- Controlled Access typically results in a more even distribution of responses across a 60 second interval. Responses are often reflect organized, sequential access of various subcategories (e.g., water animals; flying animals; farm animals; forest animals; jungle animals;
Executive Functions Assessment & Intervention

Cascading Production Decrement

Start here

Retrieval Ability: Semantic Fluency

Progressive deterioration of performance is observed as executive function demands (+ EF) become greater.

Retrieval Ability + EF: Initial Letter Fluency

Key Concept

Executive Functions are inextricably interwoven with all forms of academic production.

EF Assessment

Direct Formal:

- Standardized Norm-referenced Tests
  - D-KEFS, WCST, NEPSY-II
- Cross-battery Cascading Production Decrement Analyses of N-R Tests

Executive Functions and Reading

Executive Functions are inextricably interwoven into the act of reading.
Executive Functions Assessment & Intervention

Example of D-KEFS Color-Word Interference Word Reading task:

“Look at this page...read these words as quickly as you can without making any mistakes.”

Example of D-KEFS Color-Word Interference Inhibition task:

“Look at this page...the color names are printed in a different colored ink. You are to name the color of the ink that the letters are printed in not read word.”

Example of D-KEFS Color-Word Interference Inhibition-Switching task:

“This time, for many of the words you are to name the color of the ink and not read the words. But if a word is inside a little box, you should read the word and not the ink color.”
Executive Functions Assessment & Intervention

Cascading Production Decrement

Process: D-KEFS Color & Word Naming

Process + EF: D-KEFS CWI Inhibition

Process + + EF: D-KEFS Inhibition/Switching

Progressive deterioration of performance is observed as executive function demands (+ EF) become greater.

Executive Functions and Academic Production

In the classroom, the task most frequently impacted by executive function-driven producing difficulties is written expression.

An Integrative Model Specifying Processes, Abilities, Lexicons, Skills, Memory and Achievement in Writing

Executive Functions and Academic Production

Writing as a Holarchically Organized Process

PLAN ORGANIZE

Reviewing/Revising

Text Generation

Text Transcription

Language Representation

Idea Generation

Text Editing & Revising

Semantic Lexicon

Word & Phrase Knowledge

GraphoMotor Processing

Orthographic Processing

Phonological Processing

Visuospatial Processing

General & Specific Knowledge Lexicons

Initial Registration (Immediate Memory)

Working Memory

Retrieval from Long Term Storage

Language

Idea Generation

Reasoning

Kinesthetic
Executive Functions Assessment & Intervention

What Evan wrote for me:

My favorite game is “mabul rolling” it is fun. I like making the box to role in to. I am pretty good as well. It is really interesting. It is so fun.

What Evan told me:

“My favorite game is rolling marbles. I think it is fun. I just learned it yesterday. It can be pretty hard at times. It can be fun and it’s interesting if you make it challenging. I like making the boxes to roll the marbles into. You probably need to be pretty skilled with eye hand coordination to do it. To get up the ramp you need to roll it really fast.”
Cascading Production Decrement

- PAL-II Alphabet Writing & PAL-II Copying A & B
- Progressive deterioration of performance is observed as executive function demands (+ EF) become greater.
- WIAT-III Sentence Composition and/or PAL-II Sentence Writing
- WIAT-III Essay Composition

Direct Informal:

- Process-oriented interpretation of assessment performance
- Child Interview Process
- Behavior Observations

Interpretive Levels Framework

- Global Composite Full Scale IQ Level
- GAI & Specific Composite Indexes / Clinical Clusters Level
- Subtest Level
- Item Level
- Cognitive Constructs Level

Michael Posner
**Things that are Taught to Automaticity in Early Elementary School**

- Basic math facts and multiplication tables
- The alphabet and sight word recognition
- Graphomotor functioning for quick handwriting of letters and words

---

- Naïve: First exposure to the task; responses required immediately; high demand for executive functions (EFs)
- Practiced: Time given to rehearse responses to the task; minimal demand for EFs
- Novel: Second exposure to the task, but responses required immediately to a set of all new items; moderate demand for EFs

---

Behavior Observation and Inferences about Brain Function

What’s the difference between a Similarities Scaled Score of 12 (75th percentile) … and a Similarities Scaled Score of 12 (75th percentile)?

Key Concept

Assessment of the Use or Disuse of Executive Functions Hinges on Careful Observation of Behavior.

Executive Functions and Intelligence

- Executive functions usually are not directly assessed with standard intelligence tests
Executive Functions Assessment & Intervention

**Key Concept**

Task Performance is directed by Executive Functions or an Executive Functions substitute.

The neural networks used to perform a task depend on perceptions about how the task should be done.

**Key Concept**

Most of what a teacher says to students is intended to activate specific areas of the students’ brains.

**Key Concept**

The more specific the language used by a teacher, the more likely it is that students will be activating the necessary brain areas.

**Process Approach to EF Assessment**

The Process Approach can be applied effectively to assess a client’s use of executive functions when performing individually-administered symbol system measures.
The basic principles of the Process Approach can be applied effectively at the subtest, item and task construct levels of the Interpretive Levels Framework.

The Process Approach to cognitive assessment requires a clear understanding of what a cognitive task measures so that performance can be effectively task analyzed to characterize a child’s cognitive capacities as accurately as possible.

The Process Approach to EF assessment represents a different way of thinking about test content, assessment procedures, test session behavior, and test performance interpretation.
Accurate and effective characterization of a child’s cognitive capacities almost always requires effective application of a process approach to test administration and interpretation employed by a clinician skilled in process-oriented testing techniques.

Complex, multi-faceted tasks, such as those represented by subtests from Cognitive and Academic assessments, must be process-analyzed to identify how underlying task component processes might be affecting performance.

The input format, the internal processing demands, and the output requirements of a task all impact on performance and can produce highly variable results for any given child, even those from the “general” population.

The cognitive capacities required to perform a task can change:
- across different items of the same task.
- the age of the child attempting to perform the task.
- the ability level of the child attempting to perform the task.
Careful, systematic observations of problem solving strategies (process) en route to a solution, whether correct or incorrect, can yield more useful information about cognitive functioning than simple right-wrong scoring of the final solution (product or achievement).

Knowing what an individual does wrong is as important as knowing what they do right; it is important to examine the nature of the particular errors made and the particular context in which they were made.

Specific observations can lead to enhanced hypothesis generation and confirmation (or refutation).

What Does WISC-IV Block Design Measure?

Consider the following quote from John Carroll (Human Cognitive Abilities, 1993, page 309):
Executive Functions Assessment & Intervention

**Process Approach to Assessing EFs**

What Does WISC-IV Block Design Measure?
“…difficulty in factorial classification arises from the fact that most spatial test tasks, even the “simplest,” are actually quite complex, requiring apprehension and encoding of spatial forms, consideration and possibly mental manipulations of these forms, decisions about comparisons of other aspects of the stimuli, and making a response – often under the pressure of being required to respond quickly.”

**Process Approach to Assessing EFs**

From Carroll’s description, Block Design can be measuring at least 5 distinct cognitive processes:
- Visual perception and discrimination
- Reasoning with visual stimuli
- Visualization (optional)
- Motor dexterity
- Speed of motor response

**Process Approach to Assessing EFs**

Consider the following quote from Carroll (1993, p. 309):

...considerable confusion exists about the identification of factors in the domain of visual perception... Some sources of confusion are very real, and difficult to deal with. This is particularly true of confusion arising from the fact that test takers apparently can arrive at answers and solutions – either correct or incorrect ones – by a variety of different strategies. French (1965) demonstrated that different “cognitive styles” can cause wide variation in factor loadings; some of his most dramatic cases had to do with spatial tests, as where a sample of subjects who reported “systematizing” their approach to the Cubes test yielded a large decrease of the loading of this test on a Visualization factor (that is, decreased correlations of Cubes with other spatial tests), as compared to a sample where subjects did not report systematizing. It has been shown (Kyllonen, Lohman, & Woltz, 1984), that subjects can employ different strategies even for different items within the same test. Lohman et al. (1987) have discussed this problem of solution strategies, even rendering the judgment that factor-analytic methodology is hardly up to the task of dealing with it because a basic assumption of factor analysis is that factorial equations are consistent over subjects.
Carroll’s description leaves out a critical 6th cognitive process, or group of processes, essential for effective performance of Block Design – the ability to initiate, focus, sustain, coordinate/balance, and monitor the use of the other cognitive processes – i.e., Executive Function processes.

Process Approach to Assessing EFs

- The Picture Concepts Subtest requires the use of executive functions to cue the organization and comparison of multiple associative hypotheses
- A process approach to re-testing can reveal the difference between incorrect responses due to lack of associative reasoning or due to lack of use of executive functions

EF Assessment

Direct Informal:
- Process-oriented interpretation of assessment performance
- Child Interview
- Behavior Observations

Child Interview

At the beginning of the first assessment session, Martin unleashed a rapid-fire series of loosely connected statements, some of them in response to the psychologist’s inquiries:
- I have a bunnie named “B”…
- We’re studying spiders in Science…
- I saw a spider from the window of the Acela… (Psychologist: What is the Acela?)
- The Acela is the fastest train ever…
- I have a book about the Acela (goes to get the book)…
- I have a folder with a G… (Psychologist: What does the G stand for?)
- I go to X elementary; I’m in the third grade… (Psychologist: Do you have friends at your school?)
- My good friends are Tom, Patrick, Nick and Jake…
- Guess what? We’re moving! (Psychologist: Where are you moving to?)
- Up there! (pointing upward toward the sky).
- Guess what? Do you know how the Acela is the fastest train in the world? It goes 50 miles per hour!
- Did you hear about America’s Funniest Home Videos?
- This is a really long number line (referring to a number line on the wall in the playroom).
- Every kid calls me the boy of pranks…
- Remember last year when we were at my Aunt’s house?
- Guess what. Our play is going to be all Spanish.
**Child Interview**

Martin continued his spontaneous comments, usually talking around, but occasionally responding to, one of the direct questions asked by the psychologist about school and his interests. These occasional responses to direct questions were limited to brief phrases or a single sentence and followed quickly by a return to unrelated statements from Martin’s outwardly directed stream of consciousness narrative. As Martin delivered his statements he moved around the room picking up objects and bringing them to the psychologist as he explained how to use them, where he got them, or why he likes them. On several occasions, Martin’s statements indicated difficulties with adjusting language production to take into account characteristics of his current audience. For example, Martin repeatedly stated: “Remember last year when we were at my aunt’s house?”

**Functional Behavior Assessment**

The focus of a traditional FBA:

“Behavior support plans are designed to alter patterns of problem behavior. The process by which this is done, however, involves change in the behavior of family, teachers, staff, or managers in various settings. Plans of behavior support define what we will do differently. It is the change in our behavior that will result in improved behavior of the focus person.” (O’Neill, Horner, Albin, Sprague, Storey, & Newon, 1997, p. 65).

**EF Assessment**

Direct Informal:

- Process-oriented interpretation of assessment performance
- Child Interview Process
- Behavior Observations

**Functional Behavior Assessment**

In traditional functional behavior assessments antecedents are said to trigger the behavior that results in the consequences, but the reasons why the antecedents trigger the behavior is not really addressed.
FBA: Is A-B-C Enough?

- Since the antecedent does not trigger the same undesirable behaviors in ALL students in the same situation, there must be something about the students that differs in an important way.
- Functional behavior assessment ignores internal considerations (i.e., perceptions, emotions, thought) and focuses on applying external control to effect change in behavior.

The EF Driven FBA

Informed by knowledge of executive functions, the functional behavior assessment model can be revised as follows:

1. **Antecedents** → **EF** → **Behavior Response** → **Consequences**
2. **Perception** → **Emotion** → **Cognition** → **Action**

The goals of an EF-driven FBA are:
1. to help the child, the parents, and professionals to understand the nature of the deficit and
2. through proper intervention, to assist the child or adolescent in changing the behavior from a negative to positive.
Progress Monitoring

Progress monitoring techniques for interventions targeting the improvement of the use of executive functions.

EF Assessment Using the MEFS

<table>
<thead>
<tr>
<th>MOLDULATE</th>
<th>Internally Self-Regulated</th>
<th>Externally Guided</th>
<th>Externally Controlled</th>
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<tbody>
<tr>
<td>Perceiving</td>
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<td>3</td>
<td>2-3</td>
</tr>
<tr>
<td>Feeling</td>
<td>3</td>
<td>2-3</td>
<td>3</td>
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<tr>
<td>Thinking</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Acting</td>
<td>6</td>
<td>2</td>
<td>5</td>
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</table>

Notes: very negative about self and others; has a hard time returning to a calm state once agitated; finds academic work extremely frustrating; cannot modulate attitude toward schoolwork.
Self Regulation Goals for Lauren A College-Age Student Diagnosed with Asperger’s Disorder

Self Regulation Goal: Effectiveness Rating

1. Use appropriate problem-solving routines to reduce excessive negative emotional reactions and resistance to engagement when routines are altered or unappealing tasks must be completed.

<table>
<thead>
<tr>
<th>Internally Regulated</th>
<th>Externally Regulated</th>
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<tbody>
<tr>
<td>7 6 5 4 3 2 1</td>
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</table>

2. Work through and resolve difficult situations by using appropriate problem-solving routines to generate and compare alternate scenarios and selecting the most appropriate course of action.

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<th>Internally Regulated</th>
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3. Recognize the need to engage in self-advocacy and use an appropriate problem-solving routine to determine what to do and how to do it and then carry out the actions needed to effectively address the self-advocacy need.

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<td>7 6 5 4 3 2 1</td>
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4. Recognize the need to engage in good personal hygiene routines, learn the necessary routines, and perform the routines on a daily basis.

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<th>Internally Regulated</th>
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<tr>
<td>7 6 5 4 3 2 1</td>
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</table>

Goal 1: Managing Frustration and Engagement

1. Fully engaged without frustration
   Maintained positive engagement throughout class and no frustration was apparent.

2. Frustration managed with self-cued strategy
   Frustration was apparent but was effectively managed and positive engagement occurred likely due to self-cued use of strategies.

3. Frustration managed with teacher cue or Reset
   Frustration was apparent but was effectively managed and positive engagement occurred after teacher provided a cue for strategy use.

   Or Zach returned after using the Reset strategy.

4. Frustration not managed
   Frustration was apparent and strategy use was cued by teacher but positive engagement did not occur and student left class.

Goal 2: Focusing and Sustaining Attention During Class

1. Attended some of the time
   Attention focused and sustained occasionally during the class period, or focused often after returning from a Reset.

2. Attended most of the time
   Attention was focused and sustained often during the class period.

3. Attended the entire time
   Attention was focused and sustained during the entire class period.

4. Attended none of the time
   Attention was never focused or sustained during the class period.

Goal 3: Completing Assigned School Work

1. Some work completed
   Some assigned school work is completed during class time or after returning from a Reset.

2. Most work completed
   Most assigned class work is completed during class time.

3. All work completed
   All assigned class work is completed during class time.

4. No work completed
   No assigned school work is completed during class time.
Weekly ratings were summarized to help school staff monitor progress and provide Zach with feedback about his performance.
END OF YEAR SUMMARY ALL CLASSES

<table>
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<tr>
<td></td>
<td>Rated 0</td>
<td>30%</td>
</tr>
</tbody>
</table>

Executive Function References

- Promoting Executive Functions in the Classroom – Lynn Meltzer (2010)
- Smart but Scattered – Dawson & Guare (2009)
- Late, Lost, and Unprepared – Cooper Kahn & Deitzel (2008)
- Assessment & Intervention for Executive Function Difficulties – McCloskey, Perkins & VanDivner (2009)
- Executive Functions in the Classroom – Chris Kaufman (2010)
**Executive Function Difficulties**

- Are they the result of:
  - Disuse through Nonconscious Choice
  - Maturational Delay
  - Innate Deficiency
  - Disuse through Conscious Choice

**Interventions for EF Difficulties**

- EF Self-regulation skills eventually need to be just that—Self-regulated.
- During classroom instruction, it is necessary to find the balance between providing enough EF SR cueing to help students function, but not too much to prevent EF skill-development.
- It is easy to underestimate the multiplicity of EFs required and focus only on those related to attention and organization.

**EF Intervention Continuum**

- Orienting Strategies
- External Control Strategies
- Bridging Strategies
- Internal Control Strategies

**Interventions for EF Difficulties**

Requires keeping in mind:

- The need to increase awareness and provide goals.
- The need to move from external control to internal control through bridging strategies.
- The environment in which intervention is happening: Requires those close to child to have reasonable EF capacities and be able to model those capacities.
Executive Functions Assessment & Intervention

Key Concept
Improving students’ executive functions starts with increased awareness and goal setting and progresses from external control to internal self-regulation.

Orienting Strategies increase awareness of executive functions and expectations for their use and provide self-regulation goals for students.

Explanation of Executive Functions

Explanation of Internal Command/External Demand
External Control strategies enable students to perform more effectively but do not necessarily help to improve students’ capacity for self-regulated performance.
Rewards can be a tremendous benefit to a child who has difficulty aligning internal desires with external demands. Use rewards, but heed the following cautions:

### External Control Strategies

- Rewards do not teach the child how to reflect on and alter perceptions, emotions, thoughts or actions, they simply reward the presence of desired behaviors.
- Reward programs imply that a child can do it if he/she wants to or is motivated enough. This often leads away from the realization that many children who are motivated and do want to change their behavior don’t know what to do to change it.

Punishment in mild form can be an effective means of obtaining compliance with external demands. When choosing to use punishment, heed the following cautions:

### Using Punishment to Increase Production

- Punishment does not teach the child how to reflect on and alter perceptions, emotions, thoughts or actions, they simply punish the presence of undesired behaviors.
- Punishment implies that a child can do it if he/she wants to or is motivated enough. This often leads away from the realization that many children who are motivated and do want to change their behavior don’t know what to do to change it.
External Control Strategies

Provide predictable, consistent structure to classroom environments and routines:
- Post and discuss class rules and schedules
- Review and rehearse routines
- Maintain basic room arrangement

External Control Strategies

Provide external prompts and cues as a substitute for self-regulation.

Bridging Strategies

Teach self-regulation capacities with specific skill routines using Cognitive Strategy Instruction approaches (e.g. Graham & Harris Self-Regulated Strategy Development approach for Written Expression).

Steve Graham
Self-Regulated Strategy Development (SRSD)
1. Explain the purpose of self-regulation strategies in general and describe and discuss the specific steps of the strategy that will be taught.

2. Model the use of the strategy using language and examples that connect with the students.

3. Students memorize the steps in the strategy as well as any mnemonics that are used as part of the strategy.

4. Teacher supports the implementation of the strategy by the students, scaffolding as necessary to help the students to master the use of the strategy.
Five Stages of Strategy Instruction

1. Select a topic.
2. Brainstorm what you know and what you want to learn.
3. Organize your information using a visual web.
4. Review your visual web and identify any holes or disconnects.
5. Students independently apply the self-regulated strategy covertly (in their own minds). Students and teacher collaboratively evaluate the effectiveness of student self-directed strategy application.

Web for what I know and what I want to learn

Habits
- Active at night
- ______
- ______

Lemurs
- Large eyes
- Long tails
- Rings on tail

Looks
- ______
- ______

Live
- Jungle
- Trees
- Country??
- Zoos

Pets?
- Can they be pets?
- ______
- ______

Eat?
- What do they eat?
- ______
- ______

The Report Writing Strategy

1. Select a topic.
2. Brainstorm what you know and what you want to learn.
3. Organize your information using a visual web.
4. Review your visual web and identify any holes or disconnects.
5. Gather new information and revise your visual web.
6. Use the visual web to help construct an outline for the report or to begin writing.
7. Review, plan and revise as you write.
The Report Writing Strategy

8. Check the visual web; did you write what you wanted to write?
9. Add information that is missing; fix sentences that don’t say what you want to say.

Scaffolding Step 9

A. Read the sentence silently and/or aloud.
B. Does the sentence make sense to you? What does it mean?
C. Is that what you meant to say?

Scaffolding Step 9

D. What’s missing? What doesn’t make sense?
E. Restate what you want to write. Repeat it to yourself.
F. Write what you just said.
G. Read what you wrote; go through steps A-F if needed.

Bridging Strategies

Develop a common vocabulary and set of nonverbal symbols for describing or signifying self-regulation capacities and signaling their use (e.g., cueing flexibility with “The Coconut Story”)

George McCloskey Ph.D.
Bridging Strategies

Align external demands with internal desires to maximize motivation.

- Allow self-selection or choice of assignments whenever possible
- Use high interest material to illustrate application of new knowledge and skills

Bridging Strategies

Practice and rehearsal of the use of executive functions. This is the single best way to increase engagement and efficiency of the use of executive functions.

Bridging Strategies

Whenever possible, use game formats and game strategies to practice the use of executive functions.
Simon Says
Pay Attention: Help for Children with ADHD
Daniel Yeager & Marcie Yeager

Internal Control Strategies

Key Concept
Once learned and practiced, Internal Control Strategies enable students to effectively “run their own shows.”
Once learned, the child can use internalized “self-talk” as a means of increasing awareness of executive functions and of when and how to use them (e.g., modified Berninger mantra for writing: “What I can think I can say. What I can say I can write. What I can write I can revise.”)

Model and teach the use of self-administered reward routines to increase the use of self-regulation executive functions (e.g., teach the child how to “bargain with yourself” to get homework accomplished).

Teach the use self-monitoring routines. These routines can be used to monitor and correct perceptions, feelings, thoughts and actions.

Some specific educational programs are designed, either explicitly or implicitly, to improve students' executive functions.
Executive Functions Interventions

Specific Programs and Approaches to Improving Clients’ Executive Functions include the following:

Key Concept

Tools of the Mind (Bodrova & Leong) is an effective preschool /kindergarten curriculum that helps young children improve executive functions.

Tools of the Mind

Elena Bodrova & Deborah Leong

Bronson & Merryman discuss their observations of the Tools of the Mind curriculum in Chapter 8 Can Self-Control Be Taught?
Cognitive Strategy Instruction is an evidence-based methodology that improves students’ use of executive functions to improve academic production.

Key Concept

Cognitive Strategy Instruction emphasizes the development of thinking skills to increase learning and production. CSIs help students to become more strategic, self-reliant, flexible, and productive in their learning endeavors (Scheid, 1993). Use of these strategies have been associated with increased academic production (Borkowski, Carr, & Pressley, 1987; Garner, 1990).

Evidence Based Intervention: Cognitive Strategy Instruction

CSI techniques employ metacognition and focus on modeling and teaching students strategies for completing tasks and routines and then modeling and teaching methods for self-cueing the use of the strategies.

Evidence Based Intervention: Cognitive Strategy Instruction

Lynn Meltzer (2010) employs CSI techniques in the Drive to Thrive classroom program and the BrainCogs and Essay Express software programs.
Evidence Based Intervention: Cognitive Strategy Instruction

Drive to Thrive and BrainCogs both address five general areas of self-regulation:

- Goal Setting, Planning and Prioritizing
- Organizing
- Remembering
- Shifting and Flexible Problem-Solving
- Self-Monitoring and Self-Checking

Rueven Feuerstein’s approach to improving cognitive functioning through instrumental enrichment, mediated learning and dynamic assessment, all focused on increasing self-regulation through increased self-awareness and strategy use.
Executive Functions Assessment & Intervention

The language of Cognitive Behavior Therapy is being used to help teachers improve their ability to engage specific brains areas during classroom instruction.

**Key Concept**

Cognitive Behavior Therapy (CBT) teaches strategies for improving the use of executive functions to cue and direct effective perceiving, feeling, thinking and acting. Techniques have shown good results at the adult and adolescent levels and some early indications that the techniques can be applied effectively with children in the elementary grades.

**Evidence Based Intervention:**

Cognitive Behavioral Therapy (CBT) emphasizes collaborative reality-testing and the monitoring and modification of automatic perceptions, feelings, thoughts, and actions that cause difficulties for the child.
Outcomes of CBT with children and adolescents:
- Increased ability to monitor perceptions, feelings, thoughts and actions
- Increased engagement in positive problem-solving strategies
- Increased capacity for self-regulating perceptions, feelings, thoughts and actions

CBT variants such as Jeffrey Schwartz’s “Brain-Lock: Free Yourself from Obsessive-Compulsive Behavior; subtitled as “a four-step self-treatment method to change your brain chemistry.” This method uses CBT oriented techniques to strengthen self-regulation capacities and decrease unproductive perceptions, feelings, thoughts and actions.

Problem-solving approaches are intended to increase students’ use of executive functions to find better solutions to personal difficulties.

Ross Greene’s Collaborative Problem-solving approach featured in his books on Treating Explosive Kids. Although Greene does not specifically use the concept of executive functions, his intervention approach teaches parents techniques for improving both external control and building internal self-regulation capacities.
Ross Greene’s Collaborative Problem-Solving

Myrna B. Shure’s I Can Problem-Solve techniques for teaching young children increased self-control and improved cueing of appropriate problem-solving routines.

Executive Functions Interventions

Michelle Garcia Winner’s Social Thinking Curriculum Superflex. Uses cartoon characters to teach about self-regulation concepts (e.g., Rock Brain represents inflexible thinking). Intended for upper elementary age children diagnosed with Asperger’s, but the techniques and ideas appear to have wider application.
Computer-based technologies are beginning to show promise as techniques for improving students’ capacities for executive functions use.

Key Concept

Computer-based cognitive training programs such as CogMed and neurofeedback programs are being closely studied to determine the extent to which they can be used to improve self-regulation in settings other than the “computer lab.”

Executive Functions Interventions

Meditation is one of the most effective ways to increase access to and use of executive functions.

Key Concept
Executive Functions Interventions

Use of Meditation, especially witnessing meditation techniques. Improving all forms of self-control, especially Self-Awareness, through “quieting of the mind.”

Executive Functions Interventions

Mindfulness-based Physical Exercise Programs such as Yoga and Thai Chi are likely to have generalized effects on a number of self-regulation executive functions.
Executive Functions Assessment & Intervention

Key Concept
Because so many executive functions problems are related to maturational delays, time is an effective intervention in itself.

Executive Functions Interventions
Time - Natural maturational processes affect executive functions at all levels; time-related expectations for EF development often need to be adjusted (e.g., recall the 30% developmental delay often found with individuals with ADHD).

Key Concept
Some medications help students with severe ADHD gain greater access to some specific executive functions.

Executive Functions Interventions
Pharmacological - Medications help increase executive functions use in conditions such as ADHD, mood disorders, and OCD. In most cases, the medication does not directly enhance EFs but rather reduces the disrupting effect of less than optimal function of other neural circuitry.
Executive Functions Assessment & Intervention

Key Concept
Executive Skills coaching is a growing area. When done well, it can be used to implement all four strategies for improving executive functions.

Executive Functions Interventions
Engage the Services of a Cognitive Coach (i.e., Rent-a-Lobe) Make extensive use of an external executive function substitutes where appropriate, e.g., ADHD and Life Coaches.

Executive Functions Interventions
Encourage Symbiotic Relationships and Support Networks. Enter into relationships where there is a mutual interdependence that enables reduction of the effect of EF deficiencies (e.g., Marry-a-lobe).

Key Concept
Teachers can implement specific techniques to reduce the likelihood of executive functions difficulties affecting assessment of academic production.
Alternately, teachers can take on the challenge of teaching students how to adjust to increased demands for the use of executive functions in assessment situations.

**Key Concept**

**Strategies for Improving Assessment Methods**

1) Offer bonus points for handing in homework and assignments on time instead of taking points away
2) Point out minor errors and offer students a chance to correct them before assigning a grade

3) Offer feedback and opportunities to revise writing assignments before grading them
4) Offer students choices for ways to demonstrate content knowledge

5) Offer credit for all efforts to correct work; offer opportunities to retake failed tests
6) Deduct no more than 5-10% of total points for minor detail errors
7) Offer multiple ways to participate in classroom activities, not just oral expression
8) Use pop quizzes only as a diagnostic tool rather than a graded performance measure

9) Offer response choices (word banks) for open-ended question formats
10) Provide guidelines and progress checks for long-term projects

11) Avoid placing constraints on response modes as much as possible
12) Teach note-taking, memory strategies, and study skills when necessary