The Construct of Executive Functioning

- Executive Functioning: The ability to think abstractly and to plan, initiate, sequence, monitor, and stop complex behavior. (VA report 2010)
- Higher-level cognitive skills used to control and coordinate other cognitive abilities and behaviors.
The Construct of Executive Functioning
- Involved in processes such as planning, abstract thinking, rule acquisition, initiating appropriate actions and inhibiting inappropriate actions, and selecting relevant sensory information

The Construct of Executive Functioning
- Activate, organize, integrate and manage
- Evaluate and reevaluate actions and consequences
- Integrate information at higher level across cognitive domains

What is Executive Functioning?
- A.R. Luria (1973)
- Russ Barkley
- Andrewes (2001)
- Miyake et al. (2000)
Early conceptualizations of EF

- Luira – Ability to maintain an appropriate set to achieve a future goal.
- Baddeley – mechanisms by which performance is optimized in situations requiring simultaneous operation of a number of cognitive processes.

- Welsh and Pennington – involving strategic planning, impulse control, organized search, and flexibility of thought and action.

- Denckla – the ability to plan and sequence complex behaviors and simultaneously attend to multiple sources of information. Also the ability to grasp the gist of complex situations, resist distraction and interference, inhibit inappropriate responses, and sustain behavior for long periods.
Dimensional Aspects of EF
• Can be divided into organizational and regulatory abilities:
  • Organizational – attention, planning, sequencing, problem solving, working memory, cognitive flexibility, abstract thinking, rule acquisition, selecting relevant sensory information

Lezak’s 4 Domain Model of Executive Function
• Volition & Inhibition

• Planning & Attention

• Purposive Action & Self-Regulation

• Effective Performance & Self-Monitoring

(Lamar et al., 2002; Lezak et al., 2004)

Dimensional Aspects of EF
• Regulation – initiation of action, self-control, emotional regulation, monitoring internal and external stimuli, initiating and inhibiting context-specific behavior, moral reasoning, decision-making.
**Russell Barkley, Ph.D.**

- Executive Function – four areas
  - Nonverbal working memory
  - Internalization of speech (verbal working memory)
  - Self-regulation of affect/motivation/arousal
  - Reconstitution (planning and generativity)

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**Tom Brown, Ph.D.**

- Executive Functions – six clusters
  1. Organizing, prioritizing and activating for tasks
  2. Focusing, sustaining and shifting attention to task
  3. Regulating alertness, sustaining effort and processing speed
  4. Managing frustration and modulating emotions
  5. Utilizing working memory and accessing recall
  6. Monitoring and self-regulating action

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**Tom Brown, Ph.D.**

- Difficulties in these areas lead to attentional deficits, difficulty organizing tasks, getting started, remaining engaged, remaining alert, maintaining a level emotional state, applying working memory and recall, and self-monitoring and regulating actions.

- People with ADHD have impairments in some aspects of each of these clusters, which Brown believes are clinically related.
DSM-IV Executive Function

• The ability to think abstractly and to plan, initiate, sequence, monitor, and inhibit complex goal directed behavior

• That set of cognitive processes that allow one to behave independent of the environment instead of having behaviors mediated by the environment.

Examples:
  - Cooking
  - Driving
  - Riding a bike

“Hot” and “Cold” executive functions

• Hot
  – Tasks with affective components, in which rewards and punishment are often present
  – Involve traits such as impulsivity and response inhibition

• Cold
  – Involving tasks that are mostly cognitive in nature
  – Working memory, sustained attention, and organization
Application to Teens and Young Adults/College Students

- SAT/ACT testing
- Selecting college and career choices
  - Self-advocate
- Driving
- Living in a dorm or apartment setting with others
- Functioning with less supervision from parents/significant adults

Executive Control Functions

- Can be difficult to assess directly b/c they coordinate other skills.
- Damage to other areas of cognition (memory, language, visuospatial ability) can impact performance on tests of executive function.

Executive control functions (ECF)

- Set of cognitive skills that command and control complex goal directed action
- ECF impairment strongly associated with functional outcomes, disability, and specific problem behaviors

(Royall, et al., 2002)
Behavior Associated with Deficits in Executive Functions

- Disinhibition - lacks behavioral control, impulsive
- Perseveration - repeats non-functional behavior, inability to change behavior despite corrective feedback, difficulties learning from experience
- Forgetfulness - off-task behaviors, mental errors, loses track of what they were doing
- Anticipatory Behavior - failure to shift to new demands of situation

Behavior Associated with Deficits in Executive Functions

- Inefficiency - takes more steps to complete task than necessary
- Difficulty understanding consequences and cause-effect relationships
- Frequently violate rules despite apparent knowledge of the rules
- Apathetic - lacks motivation, does not set goals, engages in behavior only when prodded

Behavior Associated with Deficits in Executive Functions

- Difficulties accessing knowledge
- Concrete thinking
- Emotional lability
- Poor frustration tolerance
- Disorganized
- Inconsistent performance on tasks within ability range
- Difficulties coping with change
- Poor judgment
**Executive Dysfunction**

**BREAKDOWN OF GOAL DIRECTED BEHAVIORS:**

- Can wash a dish but cannot do the dishes
- Can write a check but cannot pay the bills
- Can shower, but cannot shower, get dressed, catch the bus, and do the shopping

**Psychiatric and Developmental Disorders Associated with Executive Dysfunction**

- Depression
- Anxiety
- Schizophrenia
- OCD
- Tourette’s Syndrome
- Addition
- ADHD
- Autism

**Medical Diagnosis Associated with Executive Dysfunction:**

- Dementia
- Diabetes
- Parkinson’s
- Alcohol/drug use
- Delirium
- Depression
- Psychosis
- Brain Trauma
- Cerebral Vascular Disease
Effects of Executive Dysfunction

- Functional disability
- Requirement of supervision/care
- Neuropsychiatric disturbances

Executive Dysfunction

- Executive Dysfunction can occur in the absence of other cognitive dysfunction
  - 50% of elderly retirees failed the EXIT test but had normal MMSE’s
  - 20% of septuagenarians failed the EXIT test but passed the MMSE

EF and Dementia

- Dementia: The development of multiple cognitive deficits that include memory impairment and at least one of the following cognitive disturbances: agnosia, aphasia, apraxia, or a disturbance in executive functioning. Deficits must be severe enough to cause significant decline in social or occupational functioning and must represent a decline from previous baseline functioning.

1 Royall et al. Neuro N Behav Neurol, 1993
**EF is Relevant to Decision Making Capacity**

- EF associated with frontal systems
- Frontal lesions affect planning, hypothesis testing, judgment and insight
- Frontal impairment can be demonstrated in many medical /psychiatric disorders

**Damage to frontal lobes**

- Typically involve a cluster of deficits instead of just one ability. Loss of administrative control affects several abilities (ability to organize and regulate multiple types of information and behaviors)

**Damage to frontal lobes**

- Typically leads to
  - Socially inappropriate behavior
  - Inability to apply consequences
  - Difficulty with abstract concepts
  - Difficulty in planning and initiation
  - Difficulty with verbal fluency
Relevance to AD

- Executive or “frontal lobe” issues
  - problems with judgment, problem solving, planning, and abstract thought are common in early AD.
  - These problems are frequently masked by or confused with more overt memory problems.

Neuropsychological Testing and Executive Function

- Because neuropsychological testing is often required for patients with some clinical evidence of executive dysfunction but normal cognitive testing on other screening, we invite you to our sessions that follow this introduction
  - March 27, 2012 (4PM Eastern) Teens and College
  - April 25, 2012 (4PM Eastern) Adults and the Elderly

References

- Welch, and Pennington.
Contact Information

- Anne-Marie.Kimbell@Pearson.com
- Amy.Gabel@Pearson.com

- Customer Support
  - US: 800-627-7271
  - Canada: 866-335-8418