Complex Task Performance Assessment

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Executive Function Definitions

- Executive function is the ability to integrate various component cognitive abilities to produce meaningful task performance.

- Executive dysfunction is the *relative inability* to:
  - Plan, organize, and initiate new solutions.
  - Identify and correct errors
  - Suppress habitual responses
  - Devise novel responses
Distinction

• Executive functions are distinguished from basic cognitive functions.

• Executive functions cue and facilitate the individual cognitive functions such as short-term memory, auditory processing, and visual representation.

• Executive functions are “higher order” abilities that control emotions and coordinate cognitive processes.
Clinical Executive Function

• Essentially, higher-level cognitive processes refer to the “if” and “how” of performance
  • Higher-level cognitive processes refer to *if* a person will perform an action and *how* the person will perform that action

• EFs involve several parallel processes and interacting associations in various parts of the brain.
  • Optimally, these associations are collaborative.

• No longer “Frontal Lobe Syndrome”
  • Damage to the frontal lobes often creates executive dysfunction
  • Executive dysfunction also occurs when other parts of the brain are damaged or dysfunctional and the frontal lobes are intact, e.g. Parkinson’s Disease.
mTBI/mCVA Functional Consequences

- Routine behaviors/tasks are typically spared
  - “Overlearned activities”
    - Example-ADL; weapon assembly
- Capable of new cognitive learning
  - Basic attention and memory processes are typically spared
  - Behavioral learning strategies typically not necessary
  - Can learn new behaviors with practice
- Generalization and transfer is impacted
  - Problems with novel activities
    - Changing context
    - Changing task demands
    - Dynamic environments
    - Example: work, driving, financial management
mTBI/mCVA Functional Consequences

• Executive Functions
  • Self-monitor
  • Cognitive flexibility
  • Emotional control
  • Initiation
  • Plan/Organize/Sequence
  • Poor decision making
  • Task Monitoring
  • Initiation
  • Working Memory

• Common Manifestations
  • Impulsivity
  • Confabulation
  • Difficulty planning
  • Poor sequencing
  • Lack of insight
  • Apathy
  • Disinhibition
  • Aggression
  • Perservation
  • Poor decision making
Challenges for Assessment

• Traditional Cognitive Assessment
  • Short in duration
  • Clearly defined goals and outcomes
  • Well-structured
  • Designed to evaluate isolated cognitive components
    • Example: DKEFS Trailmaking
  • Effective in identifying specific cognitive deficits
  • Contradicts defined components of executive function

• Can have performance-based executive function deficits in absence of identified impairment on traditional cognitive assessments
  • Development of performance-based executive function assessments to supplement traditional assessment
Performance-Based Measures

• “Ecologically Valid”
  • Designed to simulate how a person would perform an activity in everyday life that requires executive functioning

• Multiple Errands Task
  • MET, MET-SV, MET-HV
  • Shopping task in a hospital district
  • List of tasks and rules provided without instructions on how to complete
  • Client determines when finished
  • Performance observed and scored
    • Task failures, task inefficiencies, rule breaks, interpretation failures
  • Has been showed to discriminate between those with and without executive dysfunction
Performance-Based Measures

- Limitations
  - Only provide insight into that activity
  - Activities have to be novel but not new
    - Important to client
  - Can’t retest without alternate forms
  - Community based measures have to be redeveloped at each site
Performance-Based Measures

- Framework for development
  - Paul Burgess
    - Multitasking Criteria
      - Many tasks
      - Interleaving required
      - One task at a time
      - Interruptions and unexpected outcomes
      - Delayed intentions
      - Differing tasks characteristics
      - Self-determined targets
      - No immediate feedback
  - Complex Task Performance Assessment (CTPA)—work-focused
CTPA

• Work-simulation-Library
  • Primary task
    • Inventory Control
  • Secondary task
    • Phone messages
    • Delayed intentions
      • Tell time
    • Give examiner message
  • Rules
<table>
<thead>
<tr>
<th>Multitasking Construct</th>
<th>Operational Definition</th>
<th>CTPA Component</th>
</tr>
</thead>
<tbody>
<tr>
<td>Many Tasks</td>
<td>A number of discrete and different tasks have to be completed.</td>
<td>Inventory control sheet, answer all phone messages, respond to appropriate phone messages, time and event prospective memory tasks</td>
</tr>
<tr>
<td>Interleaving required</td>
<td>Performance on these tasks needs to be dovetailed in order to be time-effective.</td>
<td>Phone messages are dovetailed with inventory control activity</td>
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<tr>
<td>One task at a time</td>
<td>Due to either cognitive or physical constraints, only one task can be performed at any one time</td>
<td>Can not physically write the phone message while recording on inventory control.</td>
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<tr>
<td>Interruptions and unexpected outcomes</td>
<td>Unforeseen interruptions, sometimes of high priority will occasionally occur, and things will not always go as planned.</td>
<td>Phone messages are intermittently spaced throughout the CD</td>
</tr>
<tr>
<td>Delayed intentions</td>
<td>The time for a return to a task that is already running is not signaled directly by the situation</td>
<td>Time and event prospective memory tasks, i.e. tell examiner when 10 minutes has past.</td>
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<tr>
<td>Differing task characteristics</td>
<td>Tasks usually differ in terms of priority, difficulty and the length of time they will occupy.</td>
<td>All tasks require a different amount of time. The inventory control is the main focus of the activity.</td>
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<td>Self-determined targets</td>
<td>People decide for themselves what constitutes adequate performance.</td>
<td>Participant informs examiner when they are finished.</td>
</tr>
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<td>No immediate feedback</td>
<td>There is no minute-by-minute performance feedback of the sort that participants in many laboratory experiments will receive. Typically, failures are not signaled at the time they occur</td>
<td>No feedback from examiner on correct or incorrect performance during the assessment. Participant makes their own determination.</td>
</tr>
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Example: “Joe”

- Joe is a 46 year executive for a telecommunications company who had a mild stroke
- Scored WNL on all neuropsychological measures of EF
  - Scaled by age
  - Joe had graduate level education
    - Strong tie to intelligence
- CTPA
  - Did not complete before time limit was reached
  - Task failures: phone messages, inventory control, time-based prospective memory task
  - Asked several questions which is against the rules
  - Did not have a strategy to complete the tasks (difficulty planning/poor decision making)
    - Perseverate on a phone message and have to start over on inventory control (perseveration/poor sequencing)
  - Stated that he thought he did “okay” but did not see the connection to his job because he did not work at a library (insight)
Revisions and further work

- Two revisions
  - First-focused on decreasing the time demand
    - Limited number of titles
    - Limited number of messages
  - Second-focused on clarifying the instructions and decreased time demand for validation
    - Focus ultimately on clinical utility
      - Needed to be administered in a feasible time frame
    - Shorten number of messages
    - Rewrote the instructions to be more clear
      - Revisions based on numerous administrations by five administrators

- Currently
  - Testing individuals with mild stroke and community controls
  - Reliability and validity