Executive Function and Decision Making Capacity

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Disclosure

The presenter has no relevant financial conflicts of interest regarding this presentation.

The Executive Interview (EXIT25) was developed at UTHSCSA by the presenter's direct supervisor.

Executive Function

- DSM IV: 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
Prefrontal Circuits

Psychiatric Illness and Executive Impairment
- Dementia
- Depression
- Bipolar Disorder
- ADHD
- Substance Disorders
- Schizophrenia
- Personality Disorders

Medical Illness and Executive Impairment
- Peripheral arterial disease
- Hypertension
- Diabetes
- COPD
- Obstructive sleep apnea
- Congestive heart failure
- HIV
- Lung cancer
- ESRD (dialysis)
Executive Function Measures

- Wisconsin Card Sort Task
- Trailmaking Test Part B
- Verbal fluency tasks
- Stroop Test
- Tower of London/Hanoi
- The Executive Interview
- Clock drawing tasks (CLOX1)

The Executive Interview (EXIT25)

- 25 item bedside scale
- Items derived from frontal lobe sequelae
- 15 minutes, lay interviewers
- Scored 0-50, higher scores worse
- 15/50 best discriminates healthy elderly from demented subjects (ROC, c=.93)
- Normal young adults rarely >07/50

Executive Function and Decision Making Capacity in Elders with Alzheimer’s or Parkinson’s Disease

- LS1: The capacity to evidence a treatment choice
- LS2: The capacity to make the reasonable treatment choice (when the alternative is manifestly unreasonable)
- LS3: The capacity to appreciate the emotional, cognitive, and personal consequences of a treatment choice
- LS4: The capacity to provide rational reasons for a treatment choice
- LS5: The capacity to understand the treatment situation and choices
Neuropsych Battery

- Orientation: orientation items of the Wechsler Memory Scale-Revised (WMS-R)
- Attention/concentration: Mental Control and Digit Span subtests of the WMS-R, and the Attention subscale of the DRS.
- Executive function: Boston Naming Test (BNT)
- Receptive language: Simple Auditory Comprehension test (SAC), Token Test
- Visuoperceptual skills: Construction subscale of the DRS.
- Memory: Logical Memory I subscale of the WMS-R, the Memory subscale of the DRS, Logical Memory II subscale of the WMS-R.
- Executive function: Executive Interview (EXIT-25), the Initiation/Persuasion subscale of the DRS, Trails A of the Halstead-Reitan battery, Trails B, Controlled Oral Word Fluency (COWF) and Animal Naming.
- Verbal conceptconservation and perseveration: the Similarities subscale of the Wechsler Adult Intelligence Scale-Revised (WAIS-R), and the Conceptualization subscale of the DRS.
- Judgment: Comprehension subscale of the WAIS-R.
- Mood: Geriatric Depression Scale (GDS).

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Decision Making Capacity and Alzheimer’s Disease

<table>
<thead>
<tr>
<th>Condition</th>
<th>Orientation</th>
<th>Attention/concentration</th>
<th>Executive function</th>
<th>Memory</th>
<th>Judgment</th>
<th>Mood</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alzheimer</td>
<td>0.96 0.957 0.84 0.75</td>
<td>0.76 0.70 0.61 0.54</td>
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<td>0.76 0.70 0.61 0.54</td>
</tr>
</tbody>
</table>

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Decision Making Capacity and Parkinson’s Disease

<table>
<thead>
<tr>
<th>Condition</th>
<th>Orientation</th>
<th>Attention/concentration</th>
<th>Executive function</th>
<th>Memory</th>
<th>Judgment</th>
<th>Mood</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parkinson</td>
<td>0.96 0.957 0.84 0.75</td>
<td>0.76 0.70 0.61 0.54</td>
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</tr>
</tbody>
</table>
Executive Function and Decision Making Capacity in Elderly Retirees

- N=105 elders living in a continuing care retirement community were administered:
  - Hopkins Competency Assessment Test (HCAT)
  - The Executive Interview (EXIT25)
  - Mini Mental State Exam (MMSE)

Results

<table>
<thead>
<tr>
<th>Variable</th>
<th>Step</th>
<th>Multiple R²</th>
<th>R² change</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>HCAT 1 (12th grade level)</td>
<td>1</td>
<td>.63</td>
<td>.63</td>
<td>151.32</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>EXIT25</td>
<td>1</td>
<td>.67</td>
<td>.67</td>
<td>177.46</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>MMSE</td>
<td>2</td>
<td>.71</td>
<td>.08</td>
<td>22.56</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Age</td>
<td>3</td>
<td>.72</td>
<td>.02</td>
<td>4.89</td>
<td>.03</td>
</tr>
<tr>
<td>Education</td>
<td>4</td>
<td>.73</td>
<td>.01</td>
<td>3.44</td>
<td>ns</td>
</tr>
</tbody>
</table>

Executive Function and Decision Making Capacity in Inpatients seen for Neuropsychiatric Consultation

- N=31 referrals were administered a decision making capacity evaluation blind to a neuropsych battery consisting of:
  - HCAT
  - EXIT25
  - Trailmaking Part A and B
  - MMSE
Executive Function and Capacity to Consent to a Minimally Invasive Research Protocol

- N = 21 subjects were administered the MacCAT to assess decision-making capacity to participate in a minimally invasive research protocol.
- Subjects were administered the EXIT25, CLOX1, CLOX2, and the MMSE.
- A subject was considered to have failed the MacCAT if they failed one or more of the following categories:
  - understanding (<4),
  - reasoning (<3),
  - appreciation of disorder and treatment benefit (0 for each).
Results

Demographic and cognitive test means in patients passing and failing the MacCAT.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pass MacCAT (n=11)</th>
<th>Fail MacCAT (n=10)</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>61.3 (5.7)</td>
<td>68.6 (10.7)</td>
<td>p = .03</td>
</tr>
<tr>
<td>Education</td>
<td>13.9 (2.5)</td>
<td>11.7 (2.2)</td>
<td>p = .02</td>
</tr>
<tr>
<td>EXIT25</td>
<td>11.5 (4.1)</td>
<td>15.5 (5.0)</td>
<td>p = .03</td>
</tr>
<tr>
<td>CLOX1</td>
<td>11.5 (2.3)</td>
<td>10.4 (2.6)</td>
<td>p = .15</td>
</tr>
<tr>
<td>CLOX2</td>
<td>13.1 (1.3)</td>
<td>13.4 (0.7)</td>
<td>p = .26</td>
</tr>
<tr>
<td>MMSE</td>
<td>28.8 (1.5)</td>
<td>27.9 (1.6)</td>
<td>p = .10</td>
</tr>
</tbody>
</table>


Results

TABLE 1. Spearman Correlation Coefficients for Modified MacCAT T Performance

<table>
<thead>
<tr>
<th>Variable</th>
<th>Understanding</th>
<th>Appreciation</th>
<th>Reasoning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>-0.45</td>
<td>-0.19</td>
<td>-0.44</td>
</tr>
<tr>
<td>Education</td>
<td>0.04</td>
<td>0.09</td>
<td>0.77</td>
</tr>
<tr>
<td>EXIT25</td>
<td>-0.46</td>
<td>-0.18</td>
<td>-0.56</td>
</tr>
<tr>
<td>CLOX1</td>
<td>0.25</td>
<td>-0.03</td>
<td>0.13</td>
</tr>
<tr>
<td>CLOX2</td>
<td>-0.12</td>
<td>0.06</td>
<td>0.12</td>
</tr>
<tr>
<td>MMSE</td>
<td>0.45</td>
<td>-0.02</td>
<td>0.59</td>
</tr>
</tbody>
</table>

*p < .01  **p < .05  Age = 19; Education = 20; EXIT25, CLOX1, CLOX2, and MMSE = 21. EXIT25: Executive Interview; CLOX: Executive Clock Drawing Test; MMSE: Mini-Mental State Examination.


MMSE and MacCAT

![Graph showing MMSE and MacCAT test results]

N=30 inhaler naïve elders were scored on their ability to learn how to use a metered dose inhaler for COPD.

<table>
<thead>
<tr>
<th>Item</th>
<th>MDI score</th>
</tr>
</thead>
<tbody>
<tr>
<td>No breath heard</td>
<td>10</td>
</tr>
<tr>
<td>No breath heard</td>
<td>8</td>
</tr>
<tr>
<td>Actuates late but full before exhalation</td>
<td>7</td>
</tr>
<tr>
<td>Actuates too late, too early</td>
<td>6</td>
</tr>
<tr>
<td>Poor inspiratory effort with late/early actuation</td>
<td>4</td>
</tr>
<tr>
<td>Fingers poorer coordination of inspiratory actuation</td>
<td>3</td>
</tr>
<tr>
<td>Fingers too much or no response</td>
<td>2</td>
</tr>
<tr>
<td>Unable also able to use the inhaler</td>
<td>1</td>
</tr>
<tr>
<td>No idea what to do with the inhaler</td>
<td>0</td>
</tr>
</tbody>
</table>


Table 2. Correlation between the MDI score and MMSE and EXIT25 on days 1 and 2

<table>
<thead>
<tr>
<th>MDI score</th>
<th>MMSE</th>
<th>EXIT25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 1</td>
<td>0.482</td>
<td>-0.061</td>
</tr>
<tr>
<td>Day 2</td>
<td>0.549</td>
<td>-0.072</td>
</tr>
</tbody>
</table>

Capacity to Learn How to Use Inhaler

Table 4. Threshold relationship between day 2 Turbhaler technique (competent/incompetent threshold) and MMSE (23/24 threshold) and EXIT25 (14/15 threshold)

<table>
<thead>
<tr>
<th></th>
<th>Competent</th>
<th>Incompetent</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMSE &gt; 23</td>
<td>21</td>
<td>3</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>MMSE &lt; 24</td>
<td>0</td>
<td>6</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>EXIT25 &lt; 15</td>
<td>21</td>
<td>0</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>EXIT25 &gt; 15</td>
<td>0</td>
<td>9</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>

Dilemmas

- The prevalence of executive function impairment as measured by the EXIT25 is high. How much impaired decision making can society bear?
- Not all executive measures are equally sensitive to decision making capacity.
- Executive function and decision making capacity are rarely used as outcome measures in clinical trials.

EXIT25 Failure Rates

- 64% of elders presenting to an academic geriatric psychiatry clinic
- 38% of healthy elderly retirees
- 62% of medical/surgical inpatients referred for psychiatric consultation
- 42% of consecutive medical inpatients
- 28% of elders with cancer referred for radiotherapy
Future Directions

- Is executive function (EXIT25) sensitive to an underlying decision making capacity construct?
- Which executive domains best predict decision making capacity? Are there neuroanatomic correlates?
- What EXIT25 threshold best predicts decision making capacity?
- Does improving executive function improve decision making capacity? How do we do that?