Use of a novel online cortical test in HIV infected subjects undergoing screening for neurocognitive impairment

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Introduction
HIV associated neurocognitive disorders (HAND) are a spectrum of impairments diagnosed by neuropsychological testing and interference in daily functioning¹. Existing screening tools concentrate on subcortical features. Additional cortical testing, especially in an aging HIV infected population, may enhance detection rates. It may also detect non-HIV-related causes of dementia such as Alzheimer’s Disease. An online screening test for mild cognitive impairment recently made front page news in the UK for use in those aged 50-70². We aimed to pilot this online test in our HIV cohort presenting for screening for HAND.

Methods
Subjects from our HIV Neurocognitive Clinic were given details about the foodforthebrain.org Cognitive Function Test (CFT) to complete at home. Our standard tests include screening for depression (PHQ9) and anxiety (GAD7), Brief Neurocognitive Screen (BNCS), International HIV Dementia Scale (IHDS), and Everyday Memory Questionnaire (EMQ). Results of the CFT were emailed in and compared with HIV neurocognitive screening results. Normal scores were defined using standard criteria for each test.

Table 1. Domains Tested by Neurocognitive Tests.

<table>
<thead>
<tr>
<th>Test</th>
<th>Domains Tested</th>
</tr>
</thead>
<tbody>
<tr>
<td>BNCS</td>
<td>Cognitive Processing Speed</td>
</tr>
<tr>
<td></td>
<td>Executive Functioning</td>
</tr>
<tr>
<td></td>
<td>Processing Speed</td>
</tr>
<tr>
<td>IHDS</td>
<td>Psychomotor Speed</td>
</tr>
<tr>
<td></td>
<td>Motor Speed</td>
</tr>
<tr>
<td></td>
<td>Memory Recall</td>
</tr>
<tr>
<td>EMQ</td>
<td>Memory Retrieval</td>
</tr>
<tr>
<td></td>
<td>Attentional Tracking</td>
</tr>
<tr>
<td>CFT</td>
<td>Executive Functioning</td>
</tr>
<tr>
<td></td>
<td>Processing Speed</td>
</tr>
<tr>
<td></td>
<td>Episodic Memory</td>
</tr>
<tr>
<td>PHQ-9</td>
<td>Depression symptoms and functional impairment</td>
</tr>
<tr>
<td>GAD-7</td>
<td>Anxiety symptoms</td>
</tr>
</tbody>
</table>

Results
7/30 (23%) patients (median 46 years, range 37-69) completed the CFT (mean score 46, range 17-71). 3/7 (43%) showed impairment on the CFT. Of those, 2/3 (66%) were impaired on components of the BNCS as well as the IHDS, and 1/3 (33%) was impaired on the EMQ. Interestingly, the person scoring lowest on the CFT had no impairment on any of our neurocognitive screening tests.

Conclusion:
There appears to be some correlation between an abnormal cortical test result and our clinic based subcortical screening test. Analysis was limited by the small sample population and low uptake rate. Online testing has logistical and financial benefits. Interpretation of online tests at home should take into account non-standardised conditions and selection bias of computer literacy and equipment speed. Incorporating a cortical test into neurocognitive screening may be beneficial in the setting of HIV to enhance detection of HAND.

Future Directions:
- Provide more online neurocognitive testing for our patients
- Investigate reasons for low uptake of CFT
- Compare results of cortical and subcortical tests in more patients

References:

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All members of the research group.

Table 3. Potential factors for poor results and low uptake of CFT.

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logistics</td>
<td>Non-standardised testing conditions</td>
</tr>
<tr>
<td>Financial</td>
<td>Computer literacy</td>
</tr>
<tr>
<td>User flexibility</td>
<td>Access to computer and internet</td>
</tr>
<tr>
<td></td>
<td>Repeated testing</td>
</tr>
</tbody>
</table>

Table 4. Benefits and Limitations of Online Testing.

<table>
<thead>
<tr>
<th>Subjects</th>
<th>CFT</th>
<th>BNCS-TMA</th>
<th>BNCS-TMB</th>
<th>BNCS-DST</th>
<th>IHDS</th>
<th>EMQ (Total)</th>
<th>EMQ-R</th>
<th>EMQ-A</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>17</td>
<td>52</td>
<td>118</td>
<td>34</td>
<td>11</td>
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<td>13</td>
<td>2</td>
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<tr>
<td>S2</td>
<td>36</td>
<td>33</td>
<td>177</td>
<td>33</td>
<td>7.5</td>
<td>32</td>
<td>21</td>
<td>7</td>
</tr>
<tr>
<td>S3</td>
<td>33</td>
<td>58</td>
<td>74</td>
<td>32</td>
<td>9.5</td>
<td>9</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>S4</td>
<td>48</td>
<td>24</td>
<td>82</td>
<td>54</td>
<td>12</td>
<td>10</td>
<td>9</td>
<td>0</td>
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<tr>
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<td>57</td>
<td>20</td>
<td>82</td>
<td>59</td>
<td>12</td>
<td>26</td>
<td>13</td>
<td>10</td>
</tr>
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<td>26</td>
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<td>53</td>
<td>12</td>
<td>18</td>
<td>14</td>
<td>4</td>
</tr>
<tr>
<td>S7</td>
<td>71</td>
<td>37</td>
<td>65</td>
<td>56</td>
<td>12</td>
<td>13</td>
<td>8</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 2. Performances on Neurocognitive Testing.

Abnormal scores in red

CFT: 54.2±11.0; BNCS-TMA: 39.0±20.3; BNCS-TMB: 94.7±9.7; BNCS-DST: 47.4±13.7; IHDS: >10; EMQ Total: 13±2.07; EMQ-R: 7±2.68, EMQ-A:4±4.79

Normal ranges defined as:
CFT: 54-92; BNCS-TMA: 39-90; BNCS-TMB: 90-105; BNCS-DST: 47-62; IHDS: >10; EMQ Total: 11-23; EMQ-R: 6-12; EMQ-A: 3-9