Executive Functioning Measurement: Are EF Rating Scales Ecologically and Construct Valid?

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Introduction

Executive Function (EF)
- Higher-order cognitive processing that regulates thought and behavior
  - Working Memory (WM)
  - Inhibition Control (IC)
  - Set Shifting (SS)
  - Associated with academic functioning
- EF deficits may indicate behavioral ADHD phenotypes

EF Assessments
- Two forms of assessment
  - Rating Scales
  - Performance Tasks
- Recent studies indicate weak relations between EF rating scales and performance tasks
  - EF rating scales are often thought to be the more “ecologically valid” representation of EF, but often compared to traditional EF tasks criticized for poor specificity

Purpose
- To assess the construct and ecological validity of EF tasks and multi-informant ratings for predicting academic functioning measured via both tests and ratings

Participants
- 53 children in the eastern U.S.
  - referred to an ADHD specialty clinic
  - behavioral treatment (n = 35)
  - cognitive training study (n = 15)
  - 35 males, 18 females
  - Ages 7-13 years old (M = 10.20, SD = 1.44)
  - 42 met diagnostic criteria for ADHD based on multiple informants
    - Kiddie-Schedule for Addictive Disorders and Schizophrenia (KSSADS)
    - Child Symptom Inventory - 4 (CSI – 4)
    - Behavior Assessment System for Children-2 (BASC – 2)
  - 11 did not meet diagnostic criteria for ADHD
  - 4 met for a disorder other than ADHD

Measures

Academic
- Academic Ratings
  - Academic Performance Rating (APRS)
    - Completed by teacher
- Academic Performance
  - Kaufman Test of Educational Achievement-2/3 (KTEA-2/3)
    - Comprehensive Academic Achievement/Academic Skills Battery Composite Score
    - Completed by child

Results

Figure 1. Regression models between executive function assessments and academic measures.

Figure 2. Regression models between WM assessments and academic assessment.

Figure 3. Regression models between IC assessments and academic assessment.

Table 1. Descriptive statistics (N = 53).

<table>
<thead>
<tr>
<th>Variables</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent</td>
<td>67.21</td>
<td>14.75</td>
</tr>
<tr>
<td>Teacher</td>
<td>66.68</td>
<td>14.33</td>
</tr>
<tr>
<td>Inhibitory Control (ms)</td>
<td>267.69</td>
<td>62.03</td>
</tr>
<tr>
<td>Working Memory (stimulus correct/trial)</td>
<td>3.21</td>
<td>0.73</td>
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<tr>
<td>VS Small</td>
<td>2.57</td>
<td>0.84</td>
</tr>
<tr>
<td>Academic Achievement (standard score)</td>
<td>106.94</td>
<td>15.74</td>
</tr>
<tr>
<td>Academic Functioning (T-score)</td>
<td>46.58</td>
<td>8.43</td>
</tr>
</tbody>
</table>

Discussion

EF Measures
- Both EF and WM Performance variables were not significantly correlated with their corresponding Performance variables

EF Measures and Academic Measures
- Both EF and WM Rating variables uniquely predicted both Academic Performance and Academic Ratings
- Both EF and WM Rating variables failed to predict Academic Performance but predicted Academic Ratings
- IC Performance variables only uniquely predicted Academic Ratings but not Academic Performance

Conclusions

Implications
- In a clinic-referred sample, replicates developmental evidence regarding importance of executive functions for children’s academic attainment
- Contradicts previous claims regarding superior ecological validity of EF ratings over lab-based EF performance tasks
- Suggests concurrent validity of EF ratings for predicting academic outcomes may be limited to mono-informant, mono-method bias

Limitations
- Small but rigorously characterized clinical sample
- No measurement of set shifting