Comparison of the *Leiter International Performance Scale-Revised* and the *Stanford-Binet Intelligence Scales, 5th edition* in Children with Autism Spectrum Disorders

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Autism Spectrum Disorders

Developmental disorders characterized by:

1. Impaired social interaction
2. Deficits in communication
3. Restrictive, repetitive patterns of behavior

- Autism is associated with intellectual disability
Intelligence Tests

- Used during the diagnosis process
- Standardized so $m=100$, $sd=15$
- Stanford-Binet Intelligence Scales, 5th Edition (SB5) – verbal measure
- Leiter International Performance Scale-Revised (Leiter-R) – nonverbal measure
- In typical kids, these measures are believed to be equivalent
- Used to make important recommendations
The Sample

- Nationwide Children’s Hospital’s Child Development Center Database
  - 1071 patients
- Inclusion criteria
  - ASD diagnosis
  - Scores on the full-scale of both SB5 and Leiter-R
  - Within the 3-12 year age range
- There were no exclusion criteria
The Sample

- 50 children met this criteria
- 41 males, 9 females
- Mean age = 66.67 months, SD = 24.12, range 36 - 131 months
- 26 with Autistic Disorder (AD), 21 with PDD-NOS, 3 with Aspergers
- PDD-NOS and Aspergers was combined and formed a “non-AD” group
The Game Plan

- Full scale comparison
- Diagnostic Categories
- Age Group
- Level of Functioning
- Gender
- SB5 subscales
Full Scale Comparison

- **Leiter-R**
  Mean = 88.20, SD = 26.26
  Range from 41-145

- **Stanford-Binet**
  Mean = 66.42, SD = 21.02
  Range from 40-114

Difference of almost 22 points, > 1 SD

- $t(49) = 10.465, p < .0001$
- Intraclass correlation coefficient, $r = .57$
## Diagnostic Comparison

<table>
<thead>
<tr>
<th>Group</th>
<th>Leiter-R</th>
<th>SB5</th>
<th>Difference</th>
<th>t-test</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>AD</td>
<td>79.42(24.99)</td>
<td>59.12(17.51)</td>
<td>20.30</td>
<td>7.15</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>n = 26</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-AD</td>
<td>97.71(24.68)</td>
<td>74.33(21.96)</td>
<td>23.38</td>
<td>7.58</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>n = 24</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Main effect for Test (Leiter-R higher),**
  - $F(1,48) = 108.91, p < .001$
- **Main effect for Diagnosis (Non-AD higher)**
  - $F(1,48) = 7.8, p < .007$
- **No interaction, $F(1,48) = .537, p = .467$**
Diagnostic Comparison
## Age Group Comparison

<table>
<thead>
<tr>
<th>Groups</th>
<th>Leiter-R</th>
<th>SB5</th>
<th>Difference</th>
<th>t-test</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;60 months</td>
<td>99.44</td>
<td>71.92</td>
<td>27.52</td>
<td>9.93</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>n = 25</td>
<td>(19.21)</td>
<td>(18.52)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;60 months</td>
<td>76.96</td>
<td>60.92</td>
<td>16.04</td>
<td>5.95</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>n = 25</td>
<td>(22.27)</td>
<td>(22.27)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Main effect for Test (Leiter-R higher)**
  - $F(1,48) = 126.99, p < .001$

- **Main effect for Age (<60 months higher)**
  - $F(1,48) = 7.79, p < .007$

- **Significant interaction, $F(1,48) = 8.82, p < .005$**
  - Larger discrepancy for younger children
Age Group Comparison
## Level of Functioning Comparison

<table>
<thead>
<tr>
<th>Group</th>
<th>Leiter-R</th>
<th>SB5</th>
<th>Difference</th>
<th>t-test</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low L-R</td>
<td>51.91 (9.62)</td>
<td>44.18 (5.08)</td>
<td>7.73</td>
<td>2.80</td>
<td>&lt; .019</td>
</tr>
<tr>
<td>n = 11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High L-R</td>
<td>98.44 (19.39)</td>
<td>72.69 (19.47)</td>
<td>25.75</td>
<td>11.86</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>n = 39</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- For Leiter-R, main effect of Test (Leiter-R higher)
  - $F(1,48) = 58.94, p < .001$
- For Leiter-R, main effect of functioning
  - $F(1,48) = 44.65, p < .001$
- Significant interaction, $F(1,48) = 17.08, p < .001$
  - Larger discrepancy for higher functioning children
Leiter-R Level of Functioning
Level of Functioning Comparison

<table>
<thead>
<tr>
<th>Group</th>
<th>Leiter-R</th>
<th>SB5</th>
<th>Difference</th>
<th>t-test</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low SB5</td>
<td>75.28(20.84)</td>
<td>53.09(8.96)</td>
<td>22.19</td>
<td>8.12</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>n = 32</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High SB5</td>
<td>111.17(17.98)</td>
<td>90.11(14.07)</td>
<td>21.06</td>
<td>6.52</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>n = 18</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- For SB5, main effect of Test (L-R higher)
  - $F(1,48) = 97.57, p < .001$

- For SB5, main effect of functioning
  - $F(1,48) = 75.31, p < .001$

- No interaction for SB5, $F(1,48) = .07, p = .797$
SB5 Level of Functioning
Gender Comparison

<table>
<thead>
<tr>
<th>Group</th>
<th>Leiter-R</th>
<th>SB5</th>
<th>Difference</th>
<th>t-test</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males n = 41</td>
<td>86.78 (27.26)</td>
<td>64.59 (20.68)</td>
<td>22.19</td>
<td>9.50</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Females n = 9</td>
<td>94.67 (21.24)</td>
<td>74.78 (21.71)</td>
<td>19.89</td>
<td>4.19</td>
<td>&lt; .003</td>
</tr>
</tbody>
</table>

- Main effect of Test (Leiter-R higher)
  - $F(1,48) = 59.34, p < .001$
- No main effect of Gender, $F(1,48) = 1.18, p = .282$
- No interaction effect, $F(1,48) = .18, p = .675$
Gender Comparison
SB5 Subscales

<table>
<thead>
<tr>
<th>Group</th>
<th>Leiter-R</th>
<th>SB5</th>
<th>Difference</th>
<th>t-test</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonverbal</td>
<td>88.20</td>
<td>72.02</td>
<td>16.18</td>
<td>7.76</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>n = 50</td>
<td>(26.26)</td>
<td>(22.36)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Verbal</td>
<td>88.38</td>
<td>63.81</td>
<td>24.56</td>
<td>10.24</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>n = 48</td>
<td>(26.17)</td>
<td>(19.47)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full Scale</td>
<td>88.20</td>
<td>66.42</td>
<td>21.78</td>
<td>10.47</td>
<td>&lt; .001</td>
</tr>
<tr>
<td></td>
<td>(26.26)</td>
<td>(21.02)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Nonverbal intraclass correlation, $r = .67$
- Verbal intraclass correlation, $r = .47$
- Full scale intraclass correlation, $r = .57$
Limitations

- Utilization of an existing database
  - Unable to include additional measures, scores
- Limited sample size
- Unable to determine why children were administered these tests
  - Possible selection bias?
- Unable to guarantee standardization
Conclusions

• These measure are not equivalent in ASD
  ◦ Unable to determine whether the Leiter-R is inflating IQ or SB5 is hindering performance, could be task specific
  ◦ Unable to speak on “accuracy” of measures

• Recommendation: Include both for a complete intelligence profile
Conclusions

- Administering both tests should be done:
  - Regardless of suspected ASD classification
  - Especially when evaluating children under five
  - Regardless of suspected level of functioning
  - Regardless of gender

- Using the “nonverbal” subtest of SB5 and other traditional measure is not an appropriate substitute for a nonverbal test
Thanks! Questions?

Email me with additional questions, comments, or if you want the really long list of references at grondhuis.1@osu.edu