Assessment Methods in Identifying Morphosyntactic Deficits in Children and Adolescents with Fragile X Syndrome and Autism Spectrum Disorder

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Background
Fragile X syndrome (FXS) is the leading cause of inherited intellectual disability, affecting approximately 1 in every 2,500 males (Hagerman, 2002). A significant number of males with FXS also meet the criteria for autism (25-30%), while the remaining display autist-like behaviors (e.g., repetitive behaviors, language perseverations, etc.). The FXS phenotype is associated with cognitive and language delays. The language phenotype is quite variable in the syntactic domain. Both children with fragile X syndrome and autism spectrum disorders (ASD) have language deficits, including difficulties with grammatical morphemes (Kjelgaard & Tager-Flusberg, 2001; Roberts et al., 2004; Sterling et al., 2012); however, there is currently no standard assessment method for morphosyntax in these populations. It is important that clinicians properly assess morphosyntax in order to identify appropriate therapy targets. This study aimed to compare two assessment methods: an experimental sentence imitation task (SIT) and a standardized measure (TEGI) in adolescents with FXS and ASD. While alike in many ways, we note critical differences that could have important clinical implications.

Methods
Sixteen adolescents with FXS and five adolescents with ASD participated as part of a broader study assessing grammatical abilities. The children were given a battery of assessment measures.

- Cognition
  - Leiter – R Brief IQ

- Language
  - Test of Early Grammatical Impairment (TEGI; Rice & Weider, 2001)
  - Sentence Imitation Task (SIT)

Constructions Tested: third-person singular, regular and irregular past tense, be and do

There were significant correlations between performance on the TEGI and the SIT in the adolescents with FXS on the following measures:

- Chronological Age
- Leiter-R Brief IQ
- TEGI Third-Person Singular
- TEGI Regular Past Tense Probe
- TEGI Be Probe
- TEGI Do Probe
- SIT Third-Person Singular
- SIT Regular Past Tense
- SIT Irregular Past Tense
- SIT Be
- SIT Do

There were no correlations between the two assessments in the adolescents with ASD.

Performance on tasks also was assessed by the number of scorable items. Several adolescents produced responses that could not be analyzed (e.g., production of a non-target form such as “She is smelling flowers,” instead of “She smells flowers.”).

Results
Table 1 presents the percentage of scorable items in each assessment and Figure 1 for third-person singular.

Table 1: Participant Characteristics & TEGI and SIT Task Performance

<table>
<thead>
<tr>
<th>Measure</th>
<th>FXS (N=16)</th>
<th>ASD (N=5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>SD Range</td>
<td>Mean</td>
</tr>
<tr>
<td>Chronological Age</td>
<td>12.6 ± 2.3</td>
<td>9.0-16.4</td>
</tr>
<tr>
<td>Leiter-R Brief IQ</td>
<td>46.5 ± 7.9</td>
<td>36-60</td>
</tr>
<tr>
<td>TEGI Third-Person Singular</td>
<td>88.4 ± 26.3</td>
<td>0-100</td>
</tr>
<tr>
<td>TEGI Regular Past Tense Probe</td>
<td>60.4 ± 36.6</td>
<td>0-100</td>
</tr>
<tr>
<td>TEGI Be Probe</td>
<td>46.3 ± 23.7</td>
<td>0.14-86</td>
</tr>
<tr>
<td>TEGI Do Probe</td>
<td>81.7 ± 30.5</td>
<td>0-100</td>
</tr>
</tbody>
</table>

Table 2 presents the percentage of unscorable items in each subtest measure.

Table 2 Average Percentage of Unscorable Items in Subtest Performance

<table>
<thead>
<tr>
<th>Measure</th>
<th>FXS</th>
<th>ASD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Third-Person Singular</td>
<td>17%</td>
<td>38%</td>
</tr>
<tr>
<td>TEGI Past Tense</td>
<td>12%</td>
<td>51%</td>
</tr>
<tr>
<td>Be</td>
<td>38%</td>
<td>41%</td>
</tr>
<tr>
<td>TEGI Be Probe</td>
<td>26%</td>
<td>2.5%</td>
</tr>
<tr>
<td>Regular Past Tense</td>
<td>34%</td>
<td>0%</td>
</tr>
<tr>
<td>SIT Irregular Past Tense</td>
<td>25%</td>
<td>0%</td>
</tr>
<tr>
<td>SIT Be</td>
<td>31%</td>
<td>0%</td>
</tr>
<tr>
<td>SIT Do</td>
<td>85%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Discussion
Preliminary data from the adolescents with ASD indicate similar performance on grammatical abilities as adolescents with FXS despite disparate IQ scores. Variation also is seen between tests that assess the same morphosyntax marker. Performance on the TEGI and SIT differed according to group. More features were correlated on the two assessments in the group with FXS than ASD. Adolescents with FXS produced more unscorable responses on the SIT than the TEGI; adolescents with ASD demonstrated the opposite pattern.

Adolescents with ASD performed at ceiling on irregular past tense, be, and do items on the SIT, precluding correlational analyses. Performance may be explained by known repetitive features observed in individuals with ASD (e.g., echolalia). The ability to provide scorable responses should be considered when selecting appropriate assessments.

Acknowledgments
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References

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