Introduction

- Metalinguistic skills reflect the ability to think about and reflect on language.
- Children with strong metalinguistic abilities tend to be children with strong language skills (Bialystok, 1988).
- Little is known about the metalinguistic skills of children with significant language weaknesses, including children with autism spectrum disorder (ASD).
- Knowledge of metalinguistic development is important to better understand the co-development of cognitive and language skills. This knowledge may then be used to improve how language is taught to children with language-learning weaknesses.
- This longitudinal study examined changes in metalinguistic ability over 1 year, and its relationship to language and cognitive ability in children and young adults with ASD.

Participants

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
<th>Min–Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age in Years</td>
<td>13.2</td>
<td>4.6</td>
<td>6.17 – 23.42</td>
</tr>
<tr>
<td>Verbal IQ</td>
<td>92.73</td>
<td>21.79</td>
<td>51 - 125</td>
</tr>
<tr>
<td>Nonverbal IQ</td>
<td>99.68</td>
<td>20.98</td>
<td>51 - 125</td>
</tr>
<tr>
<td>Expressive Languagea</td>
<td>9.27</td>
<td>5.03</td>
<td>0 - 16</td>
</tr>
<tr>
<td>ASD Symptom Severityb</td>
<td>16.27</td>
<td>6.12</td>
<td>7 - 28</td>
</tr>
</tbody>
</table>

*Standard score with Mean = 100, SD = 15 based on the Stanford Binet. **Scaled score with Mean = 10, SD = 3 based on the CELF-4: Formulated Sentences subtest.  

Research Questions

1. After 1 year, do children and adults with ASD significantly improve performance on metalinguistic tasks?
2. Does language ability, ASD symptom severity, IQ, and/or age predict performance on metalinguistic tasks?
3. Do these variables also predict the change in scores 1 year later on the metalinguistic tasks?

Method

- Participants were a part of a 1-year longitudinal, multi-site study designed to evaluate the use of language sampling measures as outcomes measures for children with ASD.
- 22 children and young adults (17M:5F) between the ages of 6 and 23 years with ASD completed all pertinent measures for all three time points.
- Time point 1 (T1): Autism Diagnostic Observation Schedule (ADOS-2), Stanford Binet Verbal and Nonverbal Intelligence quotients, Clinical Evaluation of Language Fundamentals-4 (CELF-4) Formulated Sentences subtest.
- Time point 2 (T2) - 1 month post T1: shortened protocol of the language and communicative tasks completed at T1 and metalinguistic probe.
- Time point 3 (T3) - 1 year post T1: entire T1 protocol repeated, metalinguistic probe.

Metalinguistic Probe

**Task 1: Word Swap**

Suppose that everyone in the world agreed that from now on we will call the sun the moon and the moon will be called the sun. All we are going to do is change the names.
- What would this be? (moon)
- What will the sky look like when you see this? (blue)

**Task 2: Wug Task**

I am going to show you some pictures and say some sentences. Sometimes a word will be missing. I want you to tell me the missing word.
- This is a wug
- Now there is another one. There are two of them.
- There are two _____.

**Task 3: Grammatical Judgment**

Wobo is a creature from outer space. Sometimes she says things the wrong way. Sometimes she says things that are silly. You need to tell her when she says a sentence the wrong way.
- Apples grow on noses.
- I have two pencils.

Results

**Research Question 1**

- Paired-samples t-test revealed that the total metalinguistic score from increased from T2 to T3. Participants, on average, scored 12% better at T3 than at T2.
- Paired samples t-test by task:
  - Task 1: Mean T2: 74% Mean T3: 63% t = -1.94 p = .06 Cohen’s d = .42
  - Task 2: Mean T2: 60% Mean T3: 94% t = -4.68 p < .01 Cohen’s d = .98
  - Task 3: Mean T2: 80% Mean T3: 78% t = .03 p = 0.97 Cohen’s d = .11

**Research Questions 2 & 3**

- Multiple linear regression Model 1:
  - Collective significant effect between language ability, age, verbal IQ, nonverbal IQ, and ASD symptom severity on T2 metalinguistic performance (F(5, 21) = 15.28, p < .001, R² = 0.78).
  - Expressive Language ability significant predictors (t = -4.203, p < .001). No other variables alone significantly predicted performance.
- Model 2 examined if the same variables predicted change in scores from T2 to T3:
  - Language ability only significant predictor in the model (t = -2.56, p = .02).

Implications and Future Direction

- Metalinguistic Tasks 1 & 2 appear to be sensitive to assessing metalinguistic development in individuals with ASD.
- Symptom severity was not a significant predictor in regression models, which suggests that these tasks may be appropriate for a wide range of individuals with ASD.
- Metalinguistic performance is highly related to language ability. Future investigations should evaluate this relationship directly by examining if an intervention designed to improve metalinguistic ability leads to improved language learning.