Sensitivity to Speech Distributional Information in Children with Autism: A MEG Study

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Introduction

- The majority of individuals with ASD exhibit delay in language acquisition (Tager-Flusberg, 2006; Dawson et al., 2002).
- 25 – 30% of children with ASD fail to acquire language.
- Typical language learning requires sophisticated ability to capture the distributional information embedded in speech (Saffran et al., 1996; Newport & Aslin, 2004).
- Children with ASD: P(A|B)?
- Impaired sequence learning (Gordon & Stark, 2007; Gidley-Larson & Mostofsky, 2008)
- Reduced neural sensitivity to probabilistic cues (Scott-Van Zeeland et al., 2010; Jeste et al., 2014)

Are children with ASD insensitive to information about frequency of occurrence (i.e., P(A|B)) in the first place? If so, how specific is such deficit?

Participants

<table>
<thead>
<tr>
<th></th>
<th>ASD</th>
<th>Typically Developing (TD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Age</td>
<td>10.9 (3.63)</td>
<td>9.8 (2.30)</td>
</tr>
<tr>
<td>IQ</td>
<td>103.7 (17.06)</td>
<td>* 121.8 (16.96)</td>
</tr>
<tr>
<td>Autism Severity</td>
<td>7.0 (3.16)</td>
<td>** 1.13 (0.35)</td>
</tr>
<tr>
<td>Spoken Language</td>
<td>88.5 (15.13)</td>
<td>** 111.3 (7.39)</td>
</tr>
<tr>
<td>Written Language</td>
<td>97.8 (12.31)</td>
<td>*** 123.1 (9.54)</td>
</tr>
<tr>
<td>Phonological Awareness</td>
<td>8.9 (3.38)</td>
<td>** 12.9 (2.01)</td>
</tr>
</tbody>
</table>

MEG Recording

306 channels (204 planar gradiometers and 102 magnetometers, Elekta Neuromag TRIUX, Elekta, Stockholm)

Task: Find These Robots!

Results

- Voice vs. Syllable MMF
- Topography at 180 ms
- Source Activity at 180 ms

Response to Syllable deviants (15% vs. 8%)
- MMF: TD > ASD in Left STG, related with written language skills within ASD

ASD group is sensitive to the probabilistic information about speech content, i.e., syllable. LH sensitivity is related to the severity of language impairment.

Conclusion

- High-functioning school-age children with ASD are not generally indifferent to speech.
- However, they show specific strengths and deficits in their sensitivity to probabilistic information in speech.

Reference