Background and Rationale

- Autism spectrum disorder (ASD) affects 1 in 66 Canadian children [1].
- Nearly one quarter of children with ASD have language impairments related to form and content [2].
- Language ability in children with ASD linked to social skills and adaptive behaviour later in life [3].
- Examining brain and behaviour associations in ASD may bring us closer to identifying neural mechanisms that contribute to the differing language profiles seen in some children with ASD.
- This is the first paper to systematically examine the neural correlates of language in ASD.

Methods

In this scoping review [4], we searched five databases (MEDLINE, EMBASE, PsycINFO, CINAHL, Cochrane) for peer-reviewed scientific articles that looked at neurological data and language ability in ASD.

The studies had to meet five inclusionary criteria:
1. Published in English in 2000 or later
2. Used an MRI method to take images of the brain (incl. DTI and fMRI)
3. Used a standardized language measure (e.g., CLEFT, OWLS)
4. Had an ASD group and a typically developing group
5. Both groups had participants aged 10

Results

21 studies included:

- 14 reported finding a link between neuroimaging data and language performance
- 17 were conducted in the US
- 20 examined school-age children/adolescents

Neuroimaging methods used were diffusion tensor imaging, magnetic resonance imaging, and resting state functional magnetic resonance imaging.

Language evaluations used were CLEFT (Fig. 2), OWLS, and MSEL.

Brain regions examined include temporal, frontal, and parietal lobes; and the superior longitudinal and arcuate fasciculi.

Major Findings

- In ASD, language abilities were often found to be associated with left temporal cortices.
- Higher language scores in ASD were related to greater activation of the left superior temporal gyrus.
- Studies examining language networks consistently found significant hypoactivation of left temporal cortices in ASD.
- Inconsistent brain-language associations were found in white matter tracts, particularly the superior longitudinal and arcuate fasciculi.

Discussions and Conclusion

Take-Home Message

- Although some inconsistencies were present, there were clear trends: superior language performance was linked with left STG activation (Fig. 3, left) and right BG volume (Fig. 3, right) in ASD.

Limitations

- Number of papers analyzed limited by selection criteria: only papers published 2000 and after in English, using standardized, norm-referenced language measures.
- Studies often focused on limited brain regions.
- Heterogeneity present among age groups within and between studies.
- Studies often pooled groups, rather than analyzing ASD and TD separately.
- Focus on statistical significance: ASD groups often had within-average scores on standardized language assessments even though standard score means were statistically lower than TD controls.

Recommendations

- Future studies should divide language groups based on clinical significance, rather than statistical significance.
- Whole-brain analysis should be used to avoid missing key connections.

Relevance to Holland Blooorview

- Language impairment is a common challenge for those with ASD.
- Understanding the neural correlates of language in ASD will help elucidate the exact causes of language impairments and inform development of effective treatment methods.
- This will be useful for speech-language pathologists and ASD specialists.

References


Brain and Language Associations in Autism Spectrum Disorder: A Scoping Review


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