# Can the OWLS-II assess language and brain connectivity in neurodivergent children?

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## Background

Verbal language impairments are common in children with neurodevelopmental disorders, such as ASD and ADHD

The Oral and Written Language Scales, 2nd ed. (OWLS-II) is a commonly used test for determining language ability
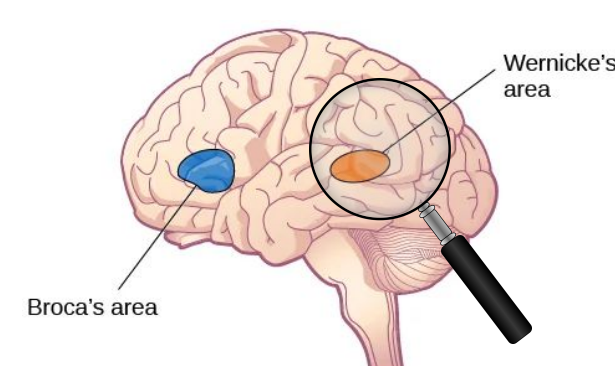
It assesses three categories

Expressive language | Receptive language | Overall language functionality

## Objective

Determine the relationship between oral language functioning using the OWLS-II and brain connectivity in neurodivergent (ND) compared to typically developing (TD) children

Wernicke's area

Broca's area

## Methods

Population →

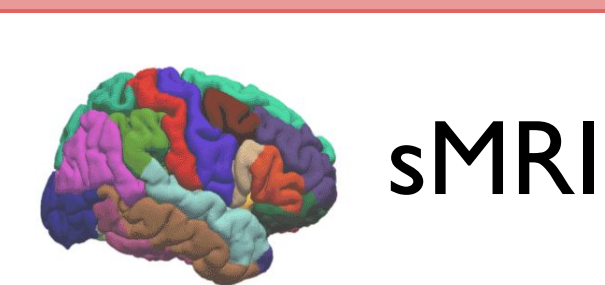| ADHD | ASD | TD |
|------|-----|-----|
| n=493 | n=1062 | n=472 |

### Neuroimaging Measures

Functional Activity
fMRI

Structural Activity
sMRI

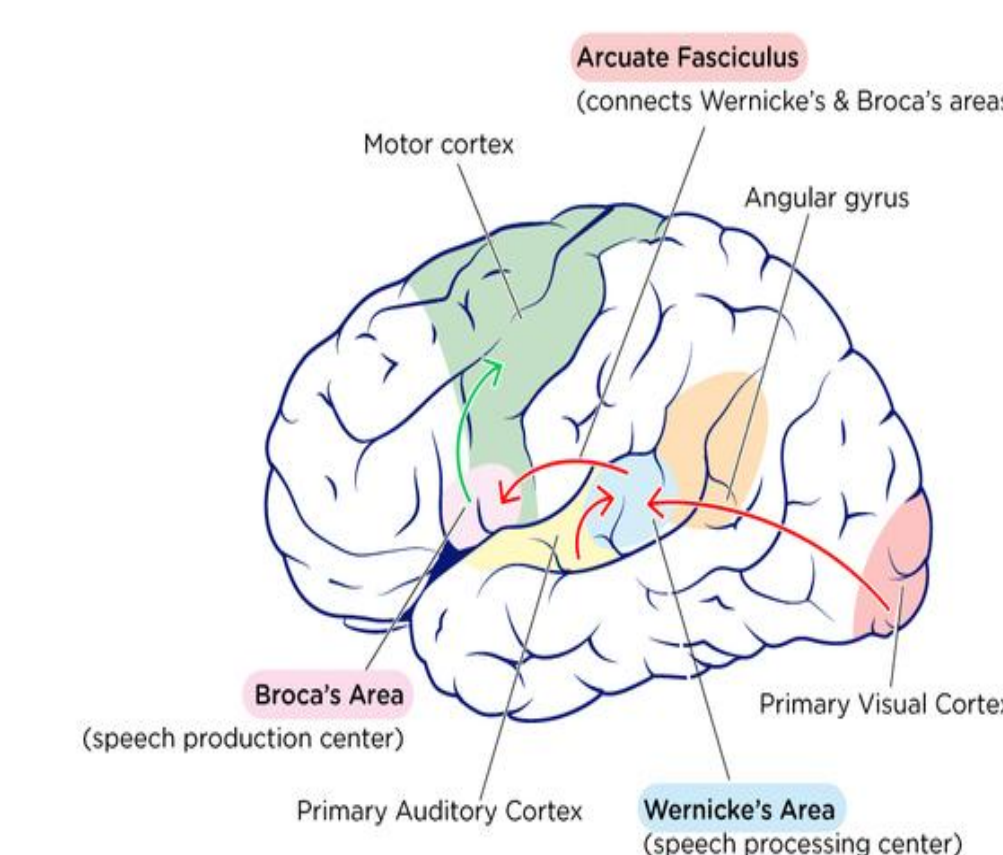## Preliminary Results

- **Significant associations** in language scores and brain volume and/ or area and diagnosis in **14 regions** across the brain

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**The Classical Language Network**

Arcuate Fasciculus (connects Wernicke's & Broca's areas)

Motor cortex | Angular gyrus

Broca's Area (speech production center) | Primary Visual Cortex

Primary Auditory Cortex | Wernicke's Area (speech processing center)

Areas typically involved in language functionality

**Regions where trends in ND children differed from TD**

- Left Calcarine Fissure
- Right Lingual Gyrus
- Left Middle Occipital Gyrus
- Left Cuneus
- Right Gyrus Rectus
- Right Insula
- Right Supramarginal Gyrus
- Right Inferior Frontal Gyrus

- The results are **consistent** in all categories using the OWLS-II and the conventional Clinical Evaluation of Language Fundamentals, 5 ed. (CELF)

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## In Typically Developing Children, Increased Area in the Left Middle Occipital Gyrus Is Inversely Correlated With Speaking Ability, but in ASD and ADHD, the Relationship Is Positive.

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## Conclusion

The OWLS-II is an effective measure of language ability and its associated connectivity

ASD and ADHD show language score correlation in both expected **unexpected regions not typically associated with language**, such as the left middle occipital gyrus.
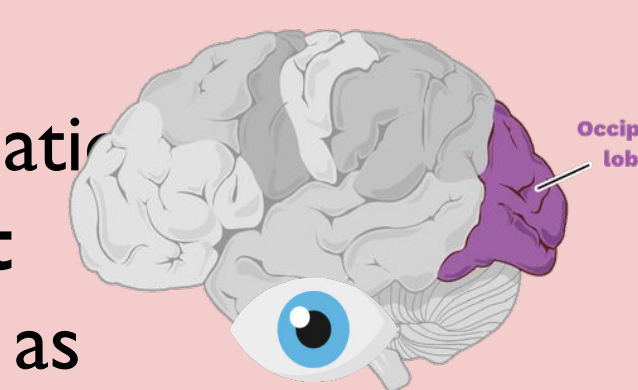
Some brain regions may have a different influence on language functionality in ND and TD children

## Next Steps

- Combine remaining neuroimaging data once it is processed for a full overview of language ability across brain conditions
- Determine the influence of enrichment activities and other demographic factors on this trend
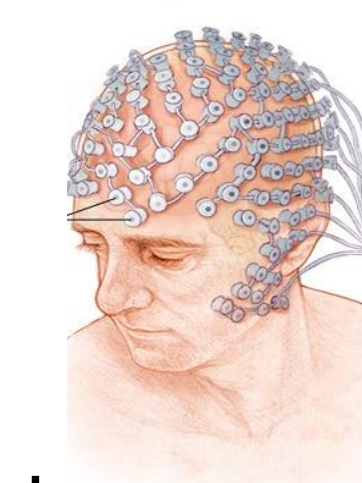
## Relevance

- Supports the use of OWLS-II for determining language functionality
- Suggests brain regions for further research

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