

# Is Autism Left-Handed?

Exploring abnormal lateralization in handedness and language among individuals with ASD

Andrea Diaz-Stransky, Max Rolison, Kathryn McNaughton, Talena Day, Brianna Lewis, Julie Wolf,  
Kimberly Ellison, Elzbieta Jarzabek, Adam Naples, James McPartland

McPartland Lab, School of Medicine, Yale University, New Haven, CT

## Background

- Language and fine-motor function are typically lateralized to the left hemisphere. Neurologic lateralization during brain development underlies handedness and communication asymmetry.
- Atypical lateralization has been observed in individuals with autism spectrum disorder (ASD) and other neurodevelopmental disorders<sup>1</sup>.
- Handedness research in individuals with ASD suggests a less lateralization (lower handedness score) than typically developing (TD) children<sup>2</sup>.
- A recent study reported a small effect of handedness on language, in that right-handed children had better language scores than non-right-handed subjects<sup>3</sup>.

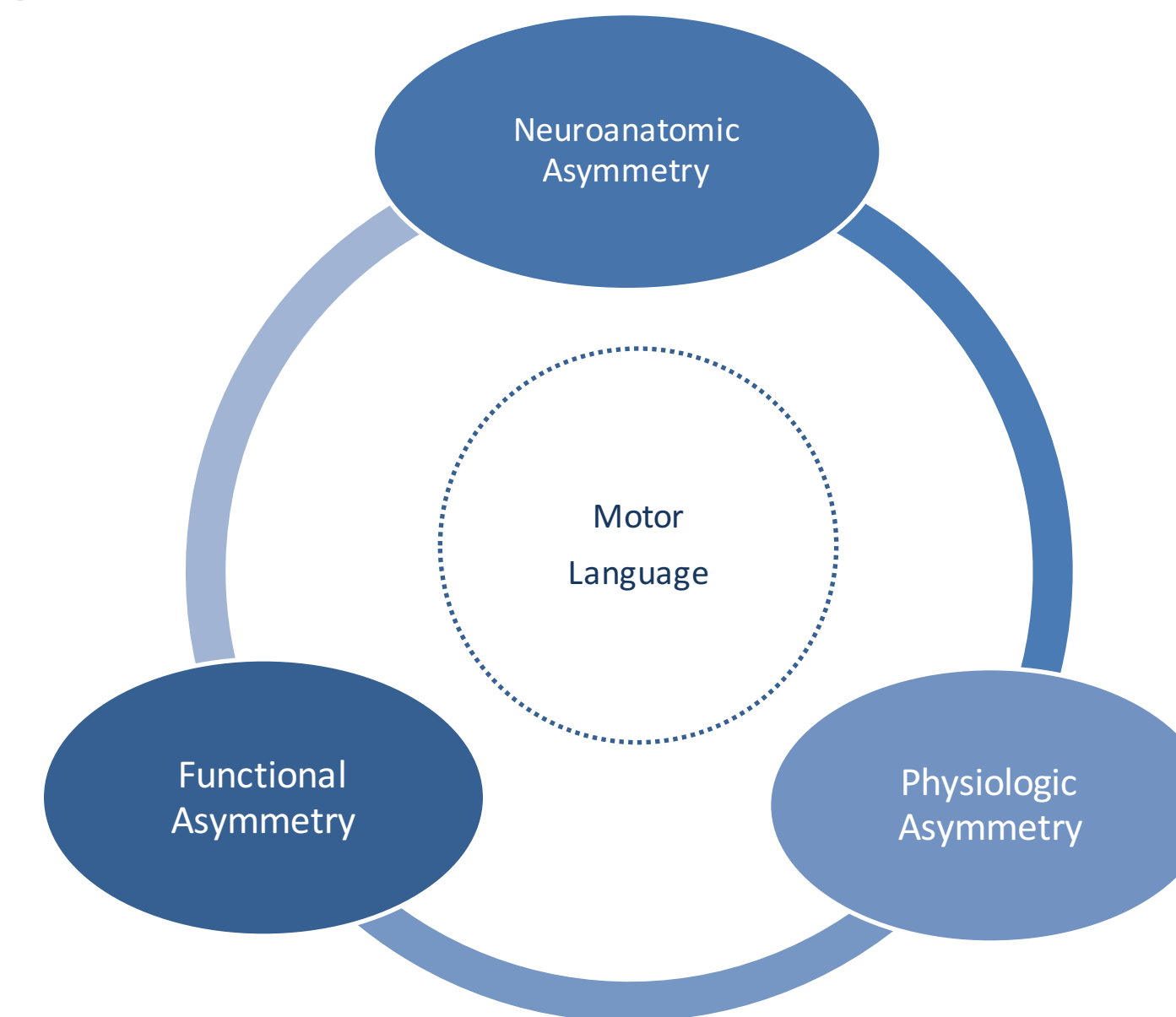
## Objectives

- To explore the difference in handedness score between individuals with ASD vs. TD.
- To investigate the association between handedness and language function among individuals with ASD.
- To explore the association between handedness and communication separately for different facets of a handedness assessment.

## Methods

- Seventy-four children diagnosed with ASD and thirty-four TD children aged 5-18 years old underwent testing for handedness and communicative function.
- Handedness was measured utilizing the Edinburgh inventory, which measures the degree of dominance of an individual's right or left hand based on eye, hand, and foot laterality. The index ranges from -100 to 100, with -100 being perfectly left handed and 100 being perfectly right handed. Communicative function was assessed with the Vineland Adaptive Behavior Scales – Second Edition, Communication Domain (VABS-CD).

Figure 1. Proposed Relationship between Handedness And Language Lateralization



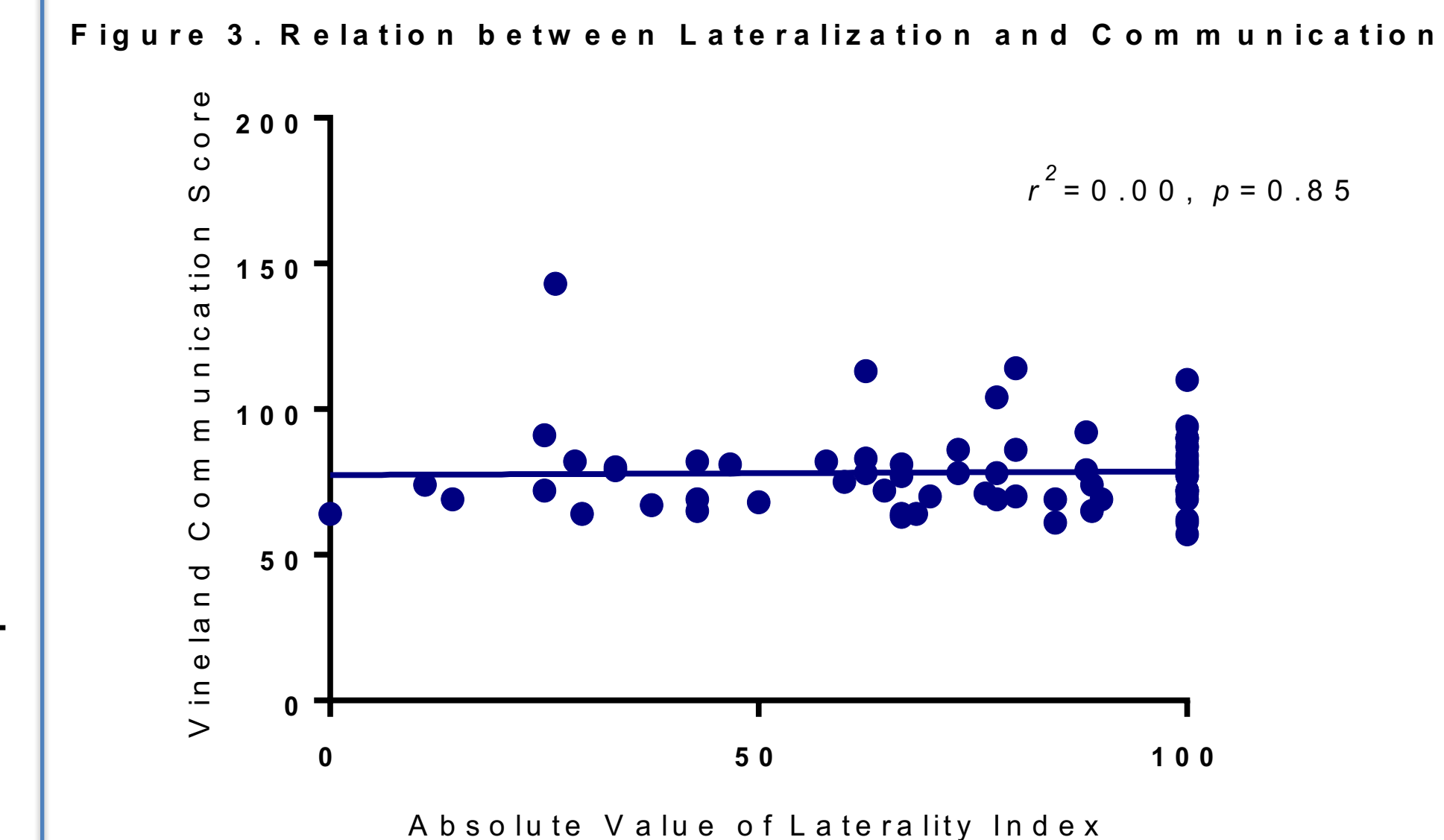
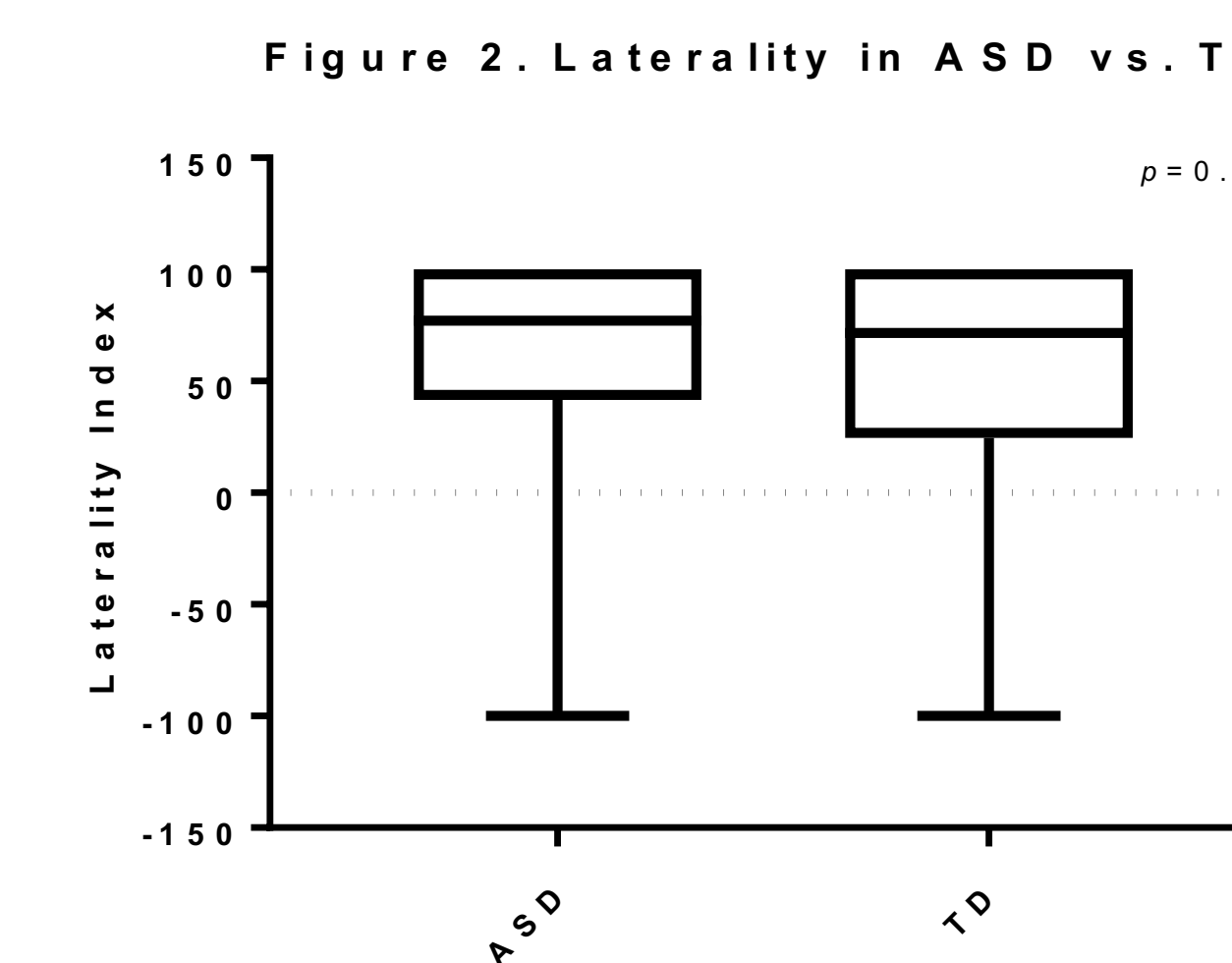
## Statistical Analysis

- Linear regression analysis was performed to explore the relationship between Edinburgh handedness quotient and communication scores.
- T-test comparisons of VABS-CD standard scores between right-handed and non right-handed individuals with ASD were completed for each item in the Edinburgh scale, as well as global Laterality Quotient.

## Results

The difference in laterality index between individuals with ASD (median 77.12) and TD (median 71.57) did not reach significance (see Figure 2). There was no significant correlation between degree of lateralization (absolute value of laterality index) and VABS-CD scores (see Figure 3). Furthermore, there was no significant difference between VABS-CD scores among individuals with ASD who were right-handed vs. those who were left handed or ambidextrous/undifferentiated ( $p=0.62$ ). No differences emerged when communication scores were compared based on laterality of each item on Edinburgh handedness quotient scale (lowest  $p$ -value was 0.20).

## Results



## Conclusions

- This study failed to replicate the reported association between handedness and communicative function among individuals with ASD.
- Studies controlling for non-verbal intellectual quotient are necessary to explore whether individual differences in cognition may account for discrepant results.
- Further studies investigating the interrelation between abnormal lateralization of communication and motor function may inform the neurobiologic basis of autism and other neurodevelopmental disorders.

## References

1. Nielsen, J.A., et al. (2014) Abnormal lateralization of functional connectivity between language and default mode regions in autism. *Molecular Autism*, 5(1);8.
2. Rysstad, A.L., Pedersen, A.V. (2016) Brief report: Non-right-handedness within the autism spectrum disorder. *Journal of Autism and Developmental Disorders*, 46;1110-1117.
3. Knaus, T.A., Kamps, J., Foundas, A.L. (2016) Handedness in Children with Autism Spectrum Disorder. *Perceptual and Motor Skills*, 122(2);542-559.

**Acknowledgements:** The authors acknowledge the support of the National Institutes of Mental Health **NIMH R01 MH100173 (McPartland)**

**McPartland Lab:** [mcp.lab@yale.edu](mailto:mcp.lab@yale.edu)  
<https://medicine.yale.edu/lab/mcpartland/>