

Introduction

- Autism spectrum disorder (ASD) is a neurodevelopmental condition, characterized by difficulties in social communication alongside narrow interests, repetitive behaviors, and sensory sensitivities.
- Electroencephalography (EEG) is an effective tool for examining social cognition, with the N170 event-related potential (ERPs) serving as an index of face-sensitive processing.
- Previous research showed that individuals with ASD exhibit longer N170 latencies to faces compared to typically developing (TD) individuals and fail to show delayed latency to inverted faces (McPartland *et al.*, 2004).
- Delayed processing of upright faces is thought to contribute to social deficits in ASD (Kang *et al.*, 2018). Thus, examining the impact of the physiology of the N170 to other facial features may shed light on the mechanisms of social difficulty in ASD.

Research Questions

- Is temporal processing of upright faces delayed in individuals with ASD, irrespective of the type of stimuli presented in a given block?
- Are there differential response patterns for classes of facial stimuli across TD and ASD groups?

Behavioral Methods

Cognitive assessments were conducted by licensed psychologists and final diagnosis was determined by the senior author.

Standard Psychometric Measures of Social and Cognitive Functioning

- Wechsler Intelligence Scale for Children, 3rd Edition (WISC-III)
- Wechsler Adult Intelligence Scale, 3rd Edition (WAIS-III)
- Autism Diagnostic Interview-Revised (ADI-R)

Exclusion Criteria

- Adolescents and adults with a full-scale IQ < 70.

Participant Demographics

Clinical Diagnosis	N	Sex (M,F)	Mean Age (SD)	Mean IQ (SD)
TD	19	16,3	26.0 (8.0)	113 (3.4)
ASD	11	10,1	25.4 (11.8)	104 (6.2)

Figure 1. Clinical Criteria. Groups were matched on age and full-scale IQ ($p > 0.05$).

EEG Methods

Experimental Paradigm

- Stimuli were presented randomly within blocks composed of 60 each of four different stimulus categories. The first block was composed of hands, noses, lips, and faces. The second block included eyes, upright faces, inverted faces, and distorted faces.

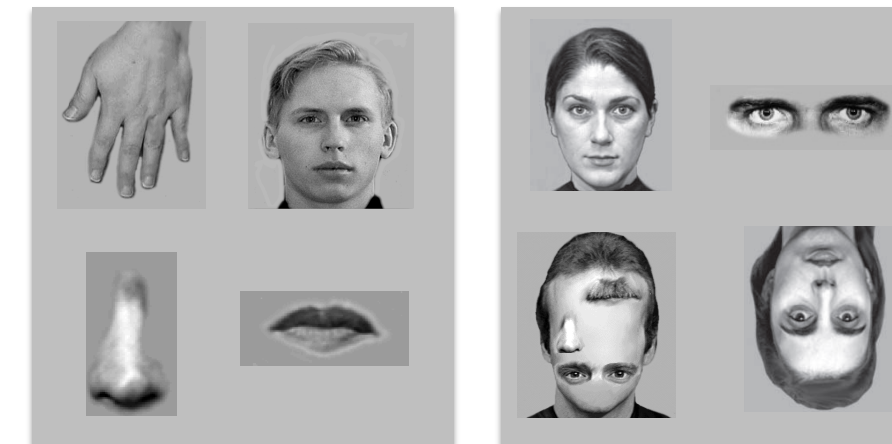


Figure 2. Block 1. Figure 3. Block 2.

EEG Acquisition, Pre-processing, and Analysis

- EEG was recorded at 250 Hz with a 128-channel Geodesic Sensor net.
- Data was low-pass filtered at 30 Hz and segmented from -200 to 800 ms. Participants with less than 15 good trials per condition were excluded from analysis.
- The N170 (120-240 ms) was extracted from electrodes over the left and right occipitotemporal scalp.
- Peak amplitude and latency were analyzed for response to each facial stimulus.

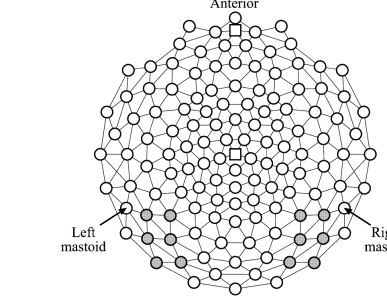


Figure 4. Selection of electrodes for analysis.

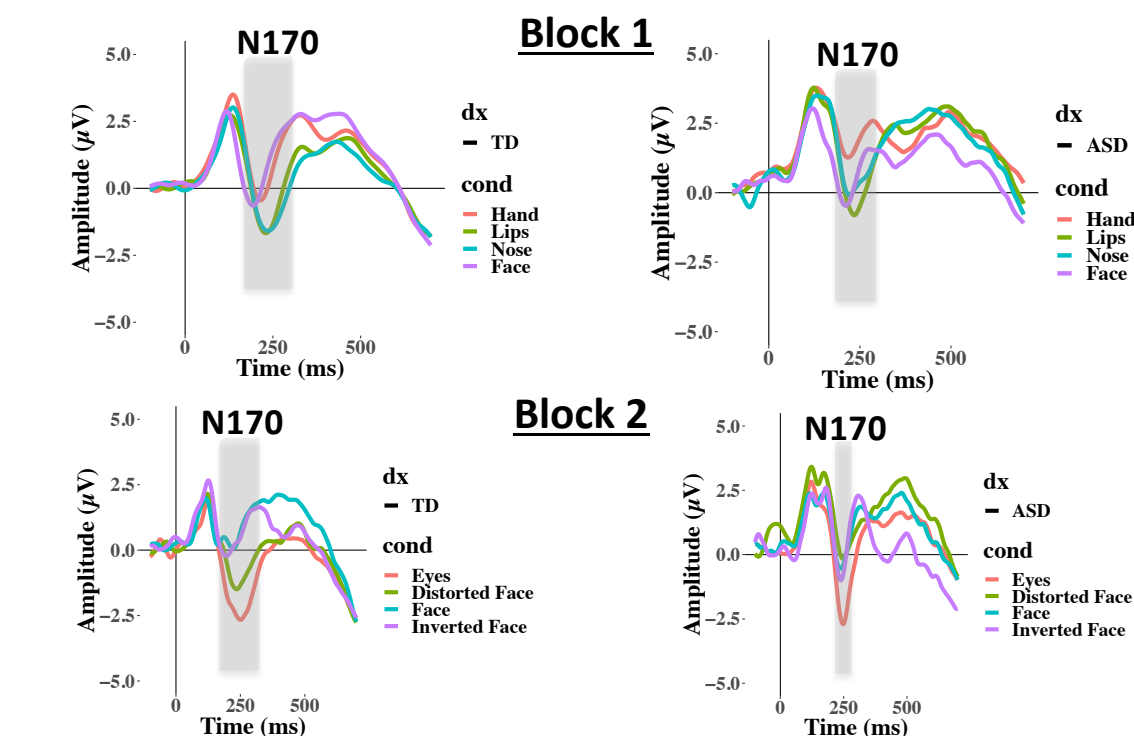


Figure 5. Grand averaged waveforms over the right occipitotemporal scalp [Left: TD, Right: ASD].

Results

Block 1

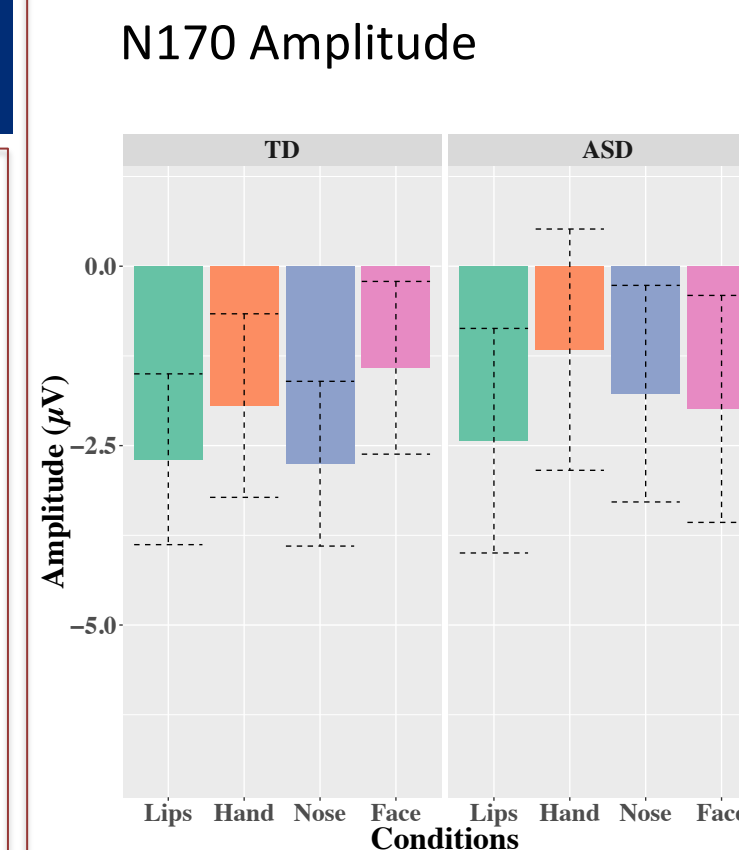


Figure 6. No significant effects were observed for N170 amplitude.

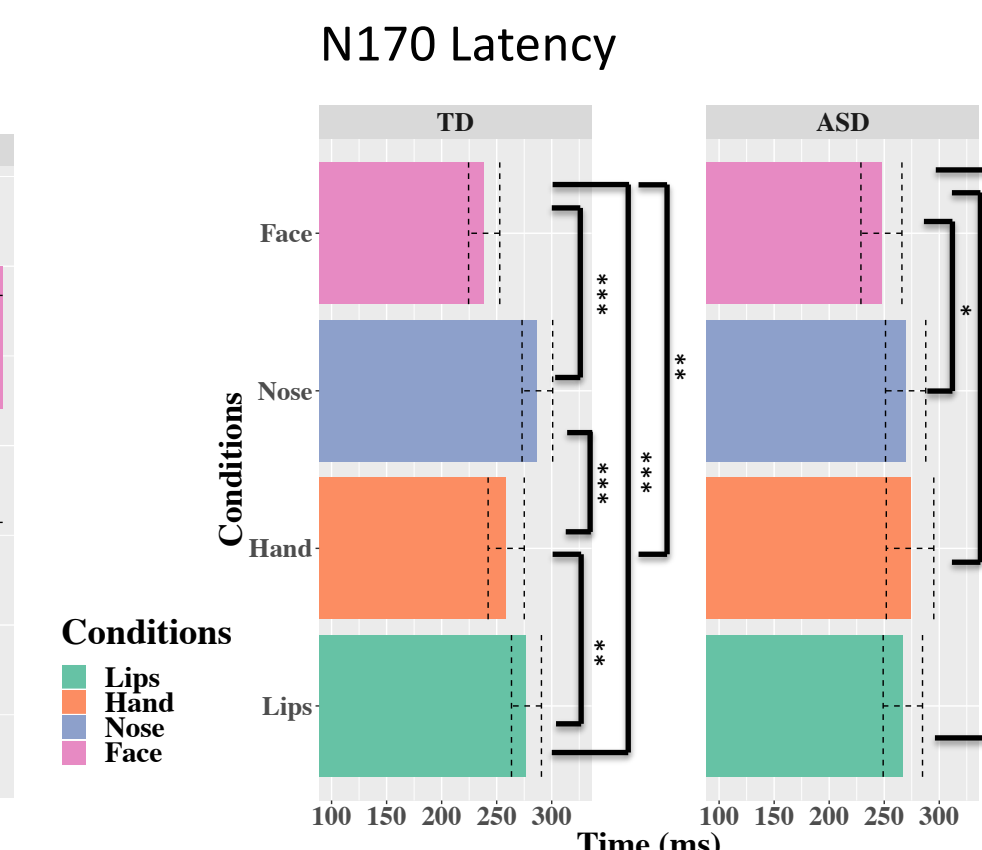


Figure 7. A significant interaction was found between condition and group for N170 latency ($F(3,26)=3.421, p=0.032$). Individuals with ASD did not differentiate hands, lips, and noses.

Block 2

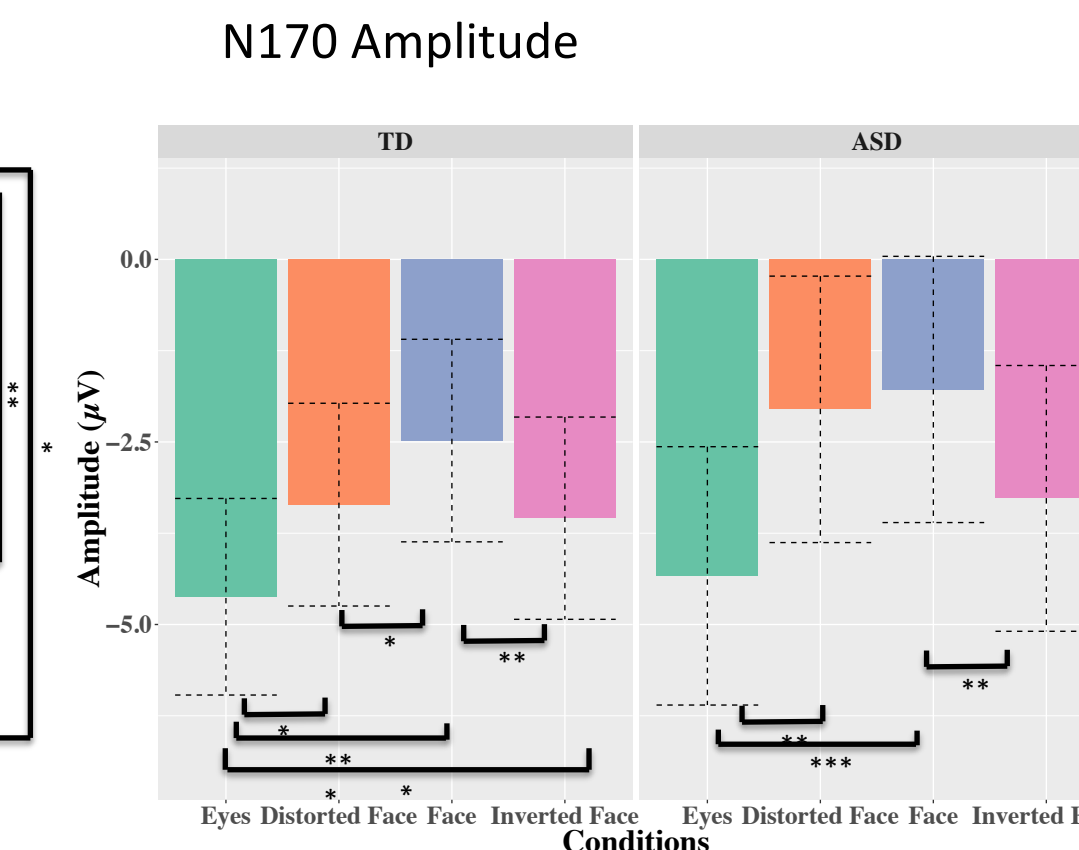


Figure 8. A significant main effect of condition was found for N170 amplitude ($F(3,34)=9.701, p > 0.0005$). Specifically, N170 amplitude was largest to eye conditions in both groups.

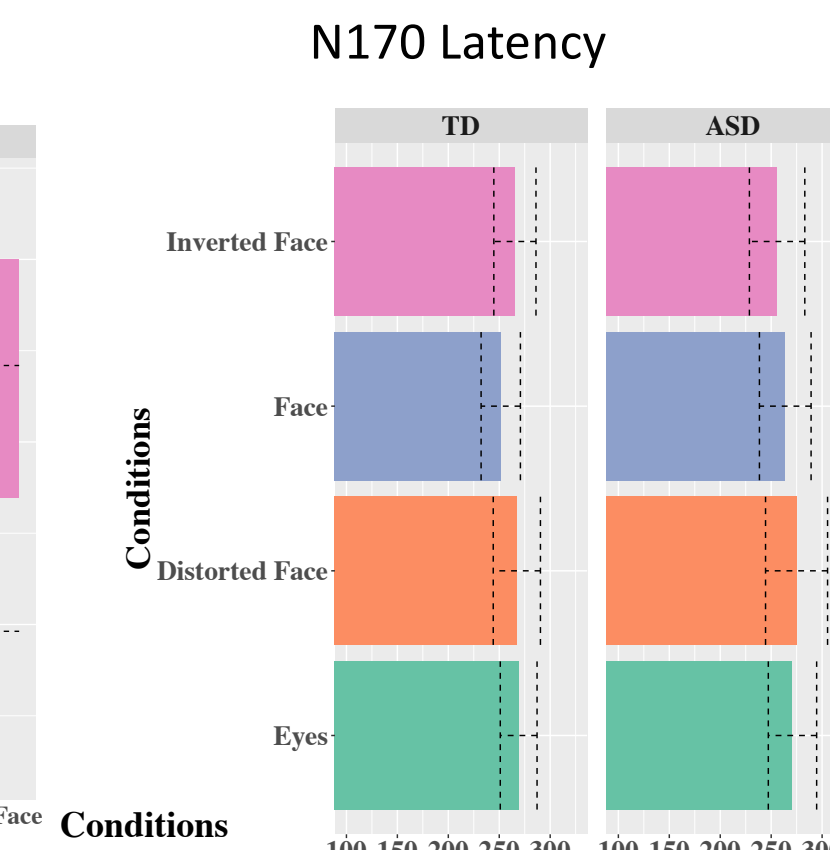


Figure 9. No significant effects were observed for N170 latency.

Conclusions & Future Directions

Conclusions

- Our findings also show that both groups display enhanced response to eye conditions, suggesting shared sensitivity to eye stimuli.
- Comparable neural responses between isolated facial features and body parts suggests atypical neural responses to featural facial information in ASD.

Future Directions

- Study attention-sensitive P300 and late positive potential (LPP) components

References

- McPartland, J. *et al.* (2004). Event-related brain potentials reveal anomalies in temporal processing of faces in autism spectrum disorder. *Journal of Child Psychological Psychiatry*, v. 45, n. 7, p. 1235-45.
- Kang, E. *et al.* (2018). Atypicality of the N170 Event-Related Potential in Autism Spectrum Disorder: Meta-analysis. *Biological Psychiatry: Cognitive Neuroscience*, 8: 657-666.

Acknowledgments

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