

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 percepts will shed light on the mechanisms of social difficulty in ASD.

Central Questions

Is temporal processing of upright faces delayed in individuals with ASD?
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.
- Adolescents and adults who did not meet ADI-R criteria for ASD.

Participant Demographics

Clinical Diagnosis	N	Sex (M,F)	Mean Age	Mean IQ
TD	21	18,3	25.57	112.81
ASD	11	10,1	23.59	101.82

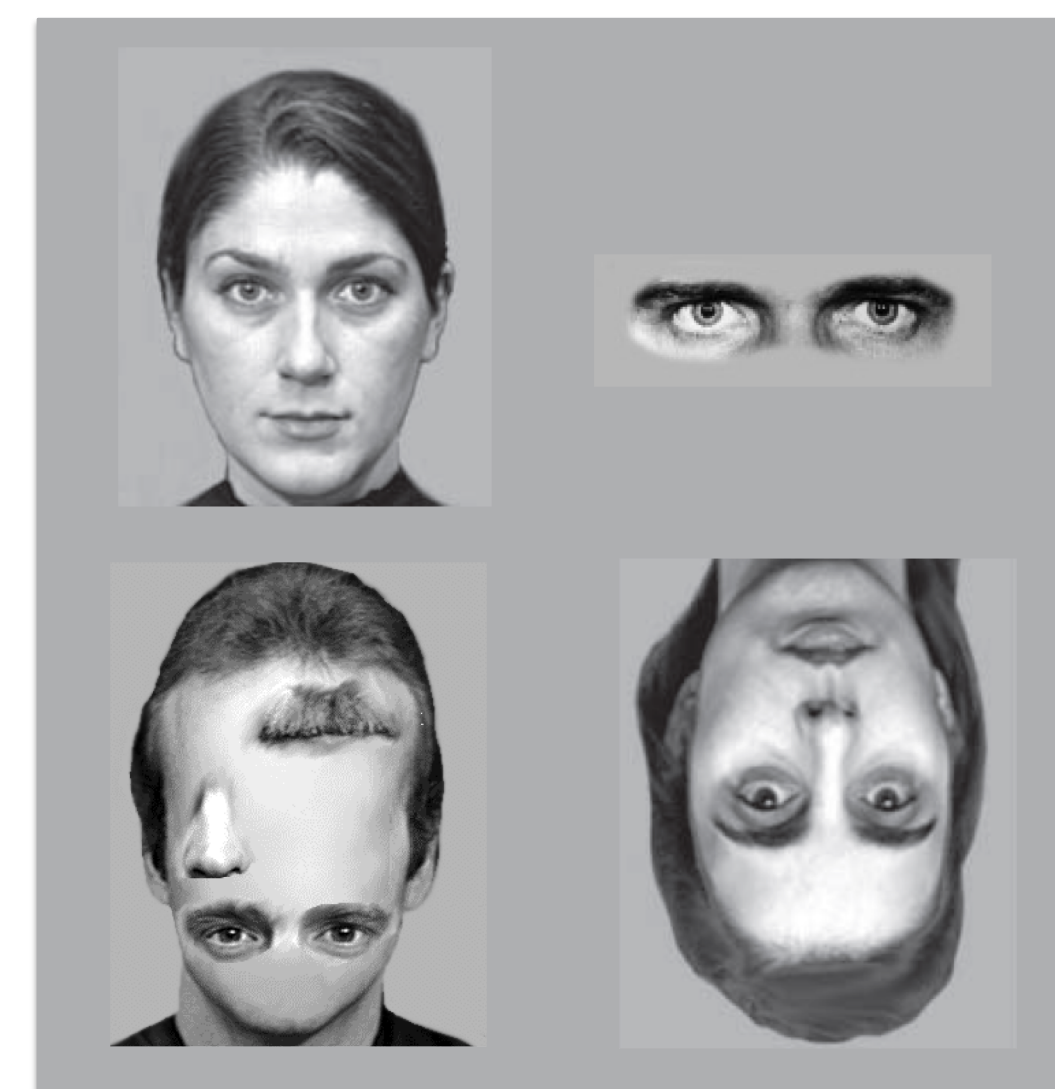
Figure 1. Clinical Criteria. Groups were matched on age and full-scale IQ ($p > 0.05$).

EEG Methods

Experimental Paradigm

- Stimuli were presented randomly in a single block composed of 60 each of four different stimulus categories: upright faces, inverted faces, distorted faces, and eyes.

Figure 2. Stimuli presented.



- 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 were excluded in the study if they had less than 15 good trials per condition.
- The N170 (130-200 ms) was extracted from six electrodes over the right occipitotemporal scalp.
- Peak amplitude and latency were analyzed for response to each facial stimulus.

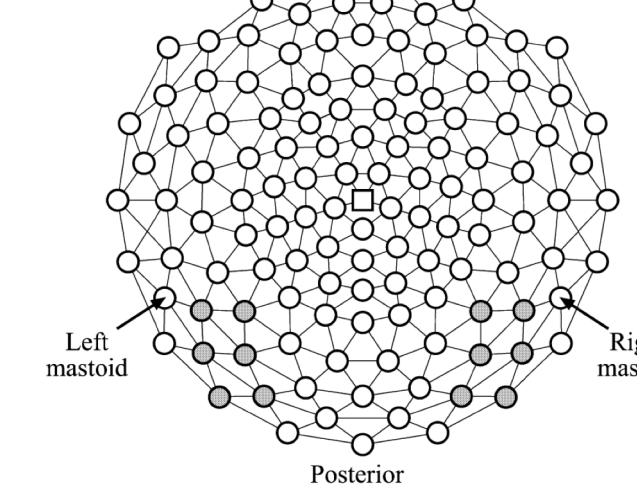


Figure 3. Selection of electrodes for analysis.

EEG Acquisition, Pre-processing, and Analysis

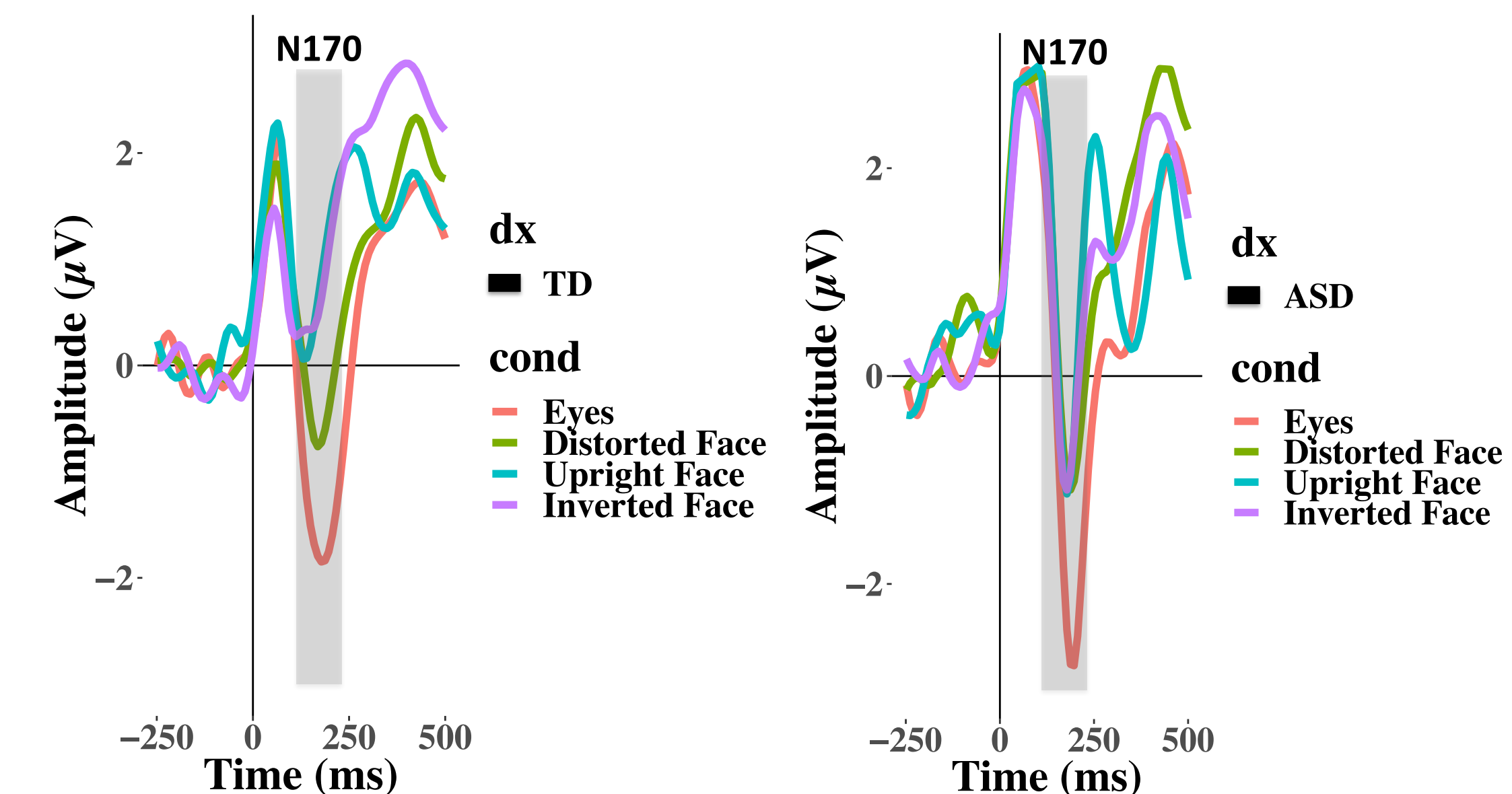


Figure 4. Grand averaged waveforms over the right occipitotemporal scalp [Left: TD, Right: ASD].

Results

N170 Latency

Planned Comparison for N170 latency (Right Hemisphere)

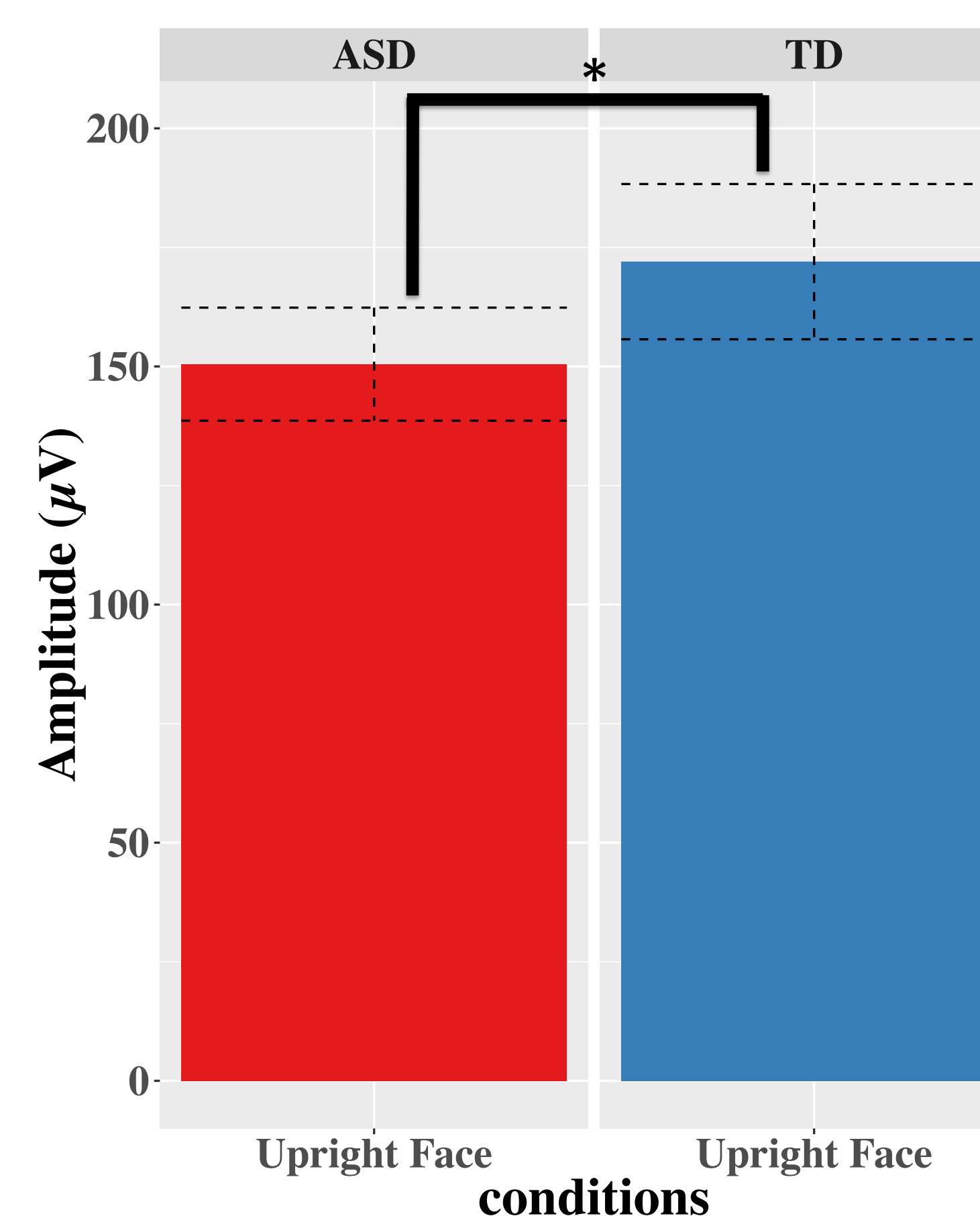


Figure 5. Slower right N170 latency for upright faces [ASD: 150.48 ± 26.09 ms; TD: 172.00 ± 24.27 ms, $p = 0.031$].

N170 Amplitude

Pairwise Comparisons for N170 amplitude (Right Hemisphere)

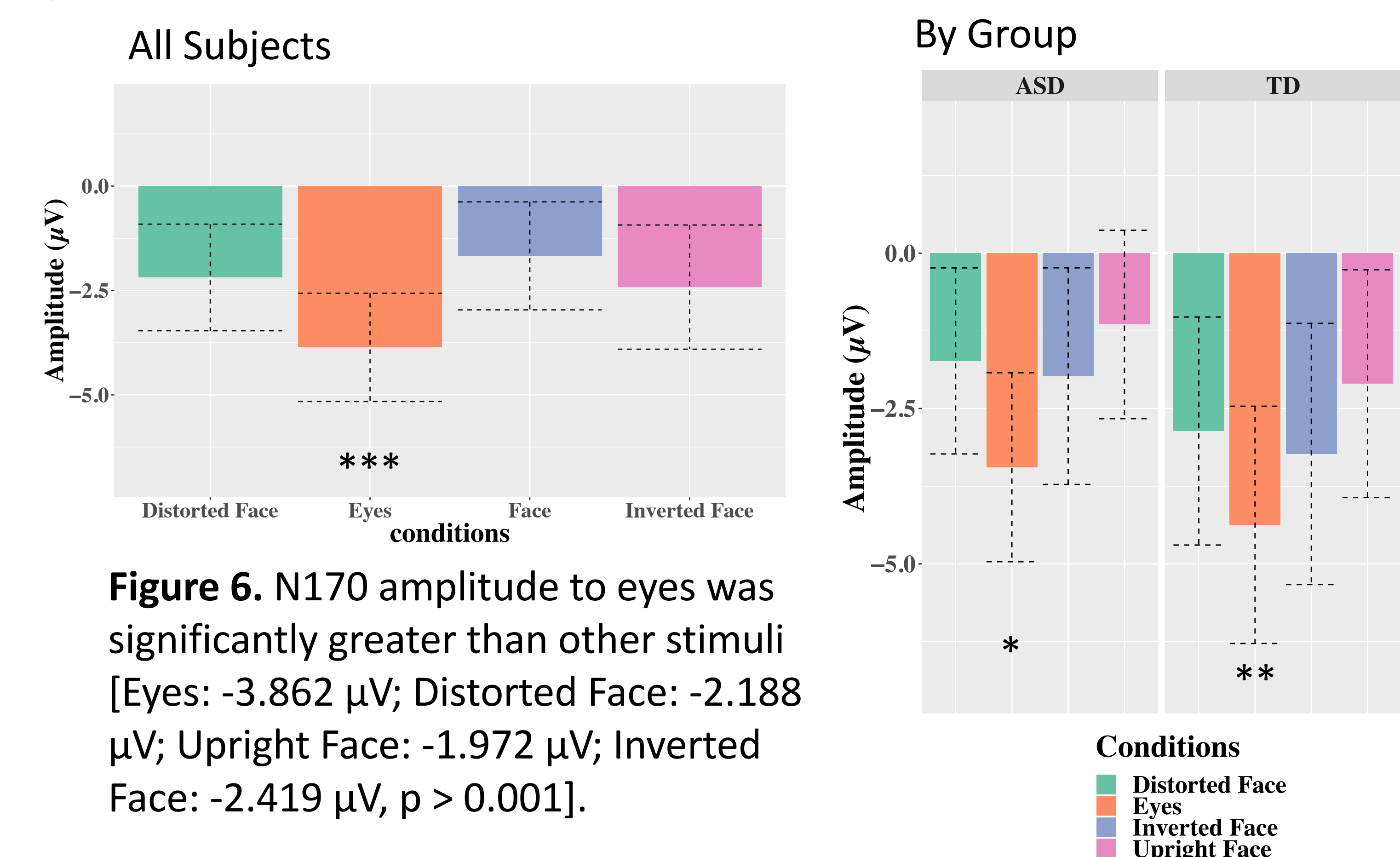


Figure 6. N170 amplitude to eyes was significantly greater than other stimuli [Eyes: $-3.862 \mu\text{V}$; Distorted Face: $-2.188 \mu\text{V}$; Upright Face: $-1.972 \mu\text{V}$; Inverted Face: $-2.419 \mu\text{V}$, $p > 0.001$].

Figure 7. N170 amplitude was significantly larger to eyes in both groups [ASD: $p < 0.05$, TD: $p < 0.01$]. There were no significant differences between groups ($p > 0.05$).

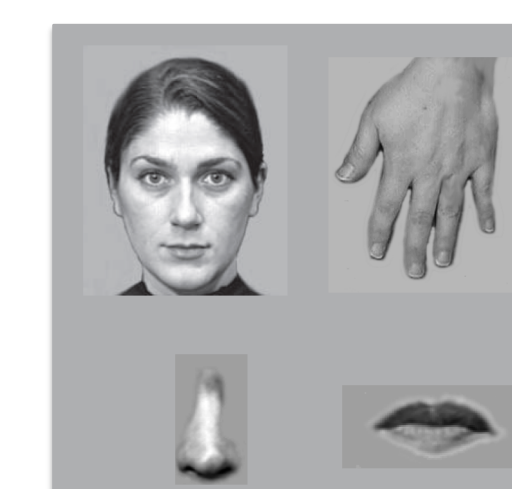
Preliminary Conclusions & Future Directions

Preliminary Conclusions

- We replicated the finding that individuals with autism exhibit longer N170 latencies to upright faces than typical individuals.
- Both groups display enhanced response to eye stimuli, suggesting shared salience of eye percepts.

Future Directions

- Analyses are in progress examining N170 amplitude and latency to isolated facial features and body parts.



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

This work was supported by the National Institute of Child Health and Human Development and the National Institute on Deafness and Communication Disability (PO1HD345650) and the National Institute of Mental Health (U54MH066399).

