

Sex-differences in Neural Response to Faces in Autistic Adults

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Background

- Sex differences in ASD have long been of interest given a notable male bias in prevalence estimates.
- Sex-specific biological factors may contribute to ASD etiologies and have demonstrable effects on neurodevelopmental trajectories.¹
- Much of what we know about sex differences in ASD is derived from behavioral observation, so more investigation is needed to determine the extent to which sex differences in ASD may be related to neural function.
- The N170 event-related potential is a promising neural marker of social perception in ASD.²
- Only one study to date has focused specifically on sex differences in the N170 to faces in autistic children.³
- Objective:** To evaluate sex differences in N170 response in autistic adults and non-clinical controls (NC).

Methods

Participants

	n	Age (SD)	Full Scale IQ (SD)
ASD Female	11	28.75 (6.24)	108.11 (9.99)
ASD Male	27	27.25 (6.47)	110.67 (11.30)
NC Female	16	25.67 (4.09)	119.94 (17.91)
NC Male	11	30.92 (4.13)	114.45 (11.67)

Table 1. Participant demographics; age and IQ did not differ across groups.

** Ratio of males and females differed between diagnostic groups, $\chi^2(1, N = 65) = 5.97, p = .02$.

Behavioral Measures

- ASD diagnoses were confirmed with the *Autism Diagnostic Observation Schedule (ADOS-2)* or the *Brief Observation of the Symptoms of Autism (BOSA)* and *Childhood Autism Rating Scales – High Functioning Version (CARS-2)* and clinician endorsement of DSM-5 criteria for ASD.
- The *Reading the Mind in the Eyes* task taps theory of mind. Participants are shown the eye region of faces and asked to select an internal state term that best describes what the person in the picture is thinking or feeling.
- Autism symptomatology was assessed via self report using the Social Responsiveness Scale (SRS-2).

Trial structure

- Participants viewed upright faces and houses for 1 second.
- Each stimulus was preceded by a crosshair cueing gaze to the right eye, left eye, center nose, or center mouth regions.

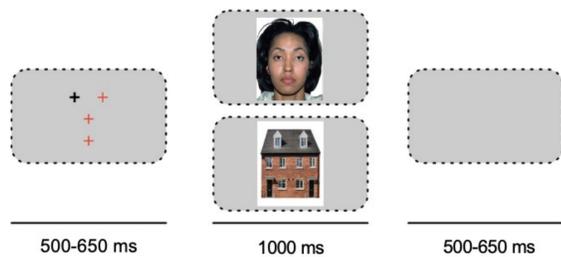


Figure 1. Experiment structure

EEG Acquisition and ERP Analysis

- EEG was recorded at 1000 Hz with a 128-channel Hydrocel Geodesic sensor net.
- Data were segmented from -100 to 500ms relative to stimulus presentation and averaged separately for face and house conditions.
- N170 latency and peak amplitude were extracted from electrodes over right occipitotemporal scalp (Figure 2).
- Co-registered eye tracking was used to monitor gaze throughout the experiment.

Methods (Continued)

Statistical Analysis

- N170 amplitude and latency were examined via 2x2x2 repeated measures ANOVA for condition, sex, and diagnosis.
- Associations with clinical-behavioral measures and gaze were explored by sex and diagnosis via Pearson and Spearman correlations based on distribution of data.

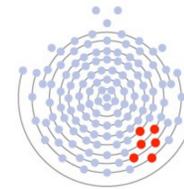


Figure 2. Region of Interest

Results

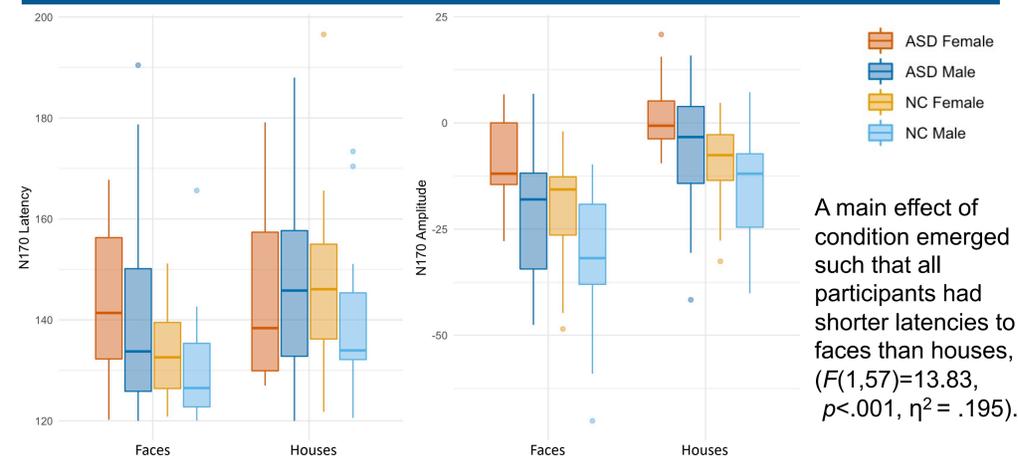


Figure 3.

Figure 4.

- A condition by diagnosis interaction trended toward significance for N170 latency to faces such that the NC groups had shorter latencies than ASD groups, replicating prior findings, ($F(1,57)=2.78, p=.1, \eta^2 = .047$).
- A condition by sex interaction emerged for N170 peak amplitude such that males had larger peak amplitudes than females and peak amplitudes were larger (i.e., more negative) for faces than houses. ($F(1,57)=4.55, p, \eta^2 = .074$).

A main effect of condition emerged such that all participants had shorter latencies to faces than houses, ($F(1,57)=13.83, p<.001, \eta^2 = .195$).

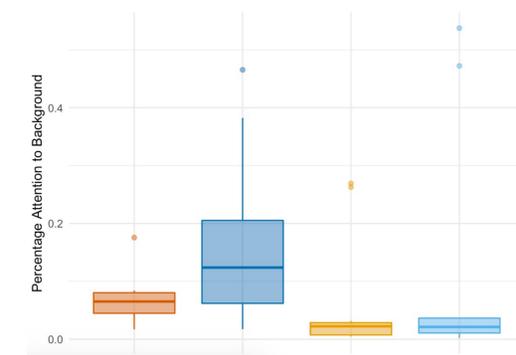


Figure 5.

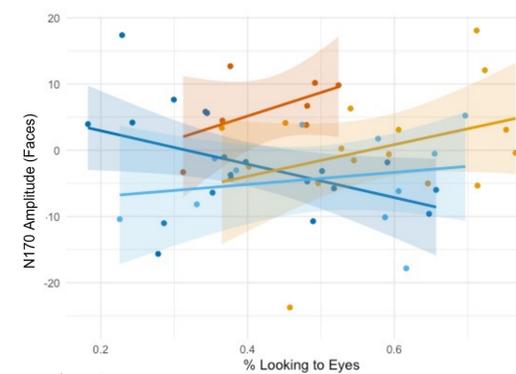


Figure 6.

- A main effect of diagnosis emerged for visual attention to right eye such that the ASD group looked less to the right eye when cued than controls ($F(3,52) = 175.93, p<.05, \eta^2 = .994$).
- Within the ASD group, autistic males looked more to background during both eye cueing conditions than autistic females, $t(22)=-2.26, p<.05$ (Figure 5).

In autistic males, greater visual attention to eye regions was associated with larger N170 amplitude, $r = -.45, p<.05$. The opposite was true for females, irrespective of diagnosis, such that greater attention to eyes was associated with smaller N170 amplitude, although these results did not reach significance ($r_s<.54, p_s>.2$).

Results (Continued)

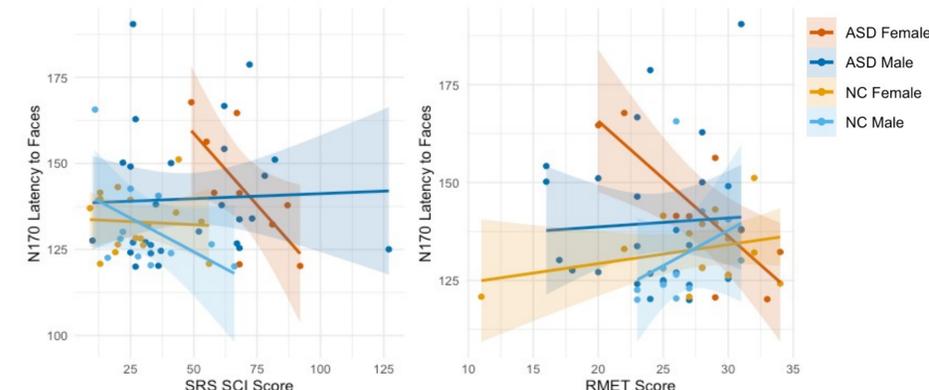


Figure 7.

Figure 8.

- In autistic females but not males, N170 latency to faces was negatively associated with the Social Communication and Interaction Score (SCI), $r=-.7, p<.05$ of the Social Responsiveness Scale (SRS) (Figure 7), as well as the RMET, $r=-.8 p=.01$ (Figure 8).

Conclusions

- Autistic women showed a unique profile of neural responses, visual attention, and self-reported social symptomatology, such that shorter N170 latencies were associated with higher self-report ratings of social ASD features but better performance on behavioral tasks of facial and emotion recognition.
- Shorter neural responses to faces, which may index greater social awareness, may lead to increased perception of ASD social symptomatology in autistic females, aligning with previous work characterizing a distinct female phenotype.⁴
- Results align with prior findings in children, reflecting attenuated N170 amplitude in females relative to male counterparts.³
- Gaze results reflect prior findings of diminished right eye bias compared to non-clinical controls and elaborate upon them by demonstrating a sex-specific relationship such that males with ASD demonstrate a more diminished right eye bias than females.⁵
 - Results in autistic females and controls may be reflective of lesser variance in looking to regions of interest.
- Future work should examine neurodevelopmental trajectories of social perception by sex throughout the lifespan.

References

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