Sex Differences in Response to Emotional Faces in Children with ASD


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**Background**

- Females with autism spectrum disorder (ASD) exhibit more social motivation and have a greater tendency to mimic peers in social interactions than males with ASD\(^2\).
- The differences in neural activity that underpin observed sex differences in social function are poorly understood\(^3\).
- The N170 is an event-related potential (ERP) observed ~170 ms after a face is presented. It reflects the structural encoding of faces and may index emotional facial information. Prior work indicates that females with ASD show decreased N170 amplitude in response to static, neutral faces.\(^5\)
- Sex differences in neural response to dynamic, emotional faces have not been assessed.

**Objective:** To characterize the relationship between sex and N170 response to dynamic, emotional faces in children with ASD and typically developing (TD) children.

**Method**

**Participants**

<table>
<thead>
<tr>
<th>Group</th>
<th>n</th>
<th>Age (SD)</th>
<th>Full Scale IQ (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASD males</td>
<td>24</td>
<td>13.94 (2.66)</td>
<td>105.95 (21.07)</td>
</tr>
<tr>
<td>ASD females</td>
<td>6</td>
<td>13.13 (3.63)</td>
<td>113.4 (19.14)</td>
</tr>
<tr>
<td>TD males</td>
<td>14</td>
<td>13.48 (2.98)</td>
<td>108.64 (13.28)</td>
</tr>
<tr>
<td>TD females</td>
<td>10</td>
<td>11.92 (2.78)</td>
<td>111.30 (8.23)</td>
</tr>
</tbody>
</table>

All groups were matched on age and full-scale IQ, \(p < .05\).

**Figure 1.** Trial Structure.

Participants were presented with 80 distinct photographs of faces matched for low-level visual features. Trials began with a counterbalanced fixation crosshair at the left or right side of the screen for 400-600ms (A), followed by a centrally presented neutral face (B). After the participant directly fixated on the eyes of the neutral face for ~500ms, the face shifted to the fear or happy condition for 600ms (C). A 500ms blank screen separated each trial.

**EEG and ET Data Acquisition and Collection:**

- EEG recorded at 1000Hz with 128-channel Geodesic Sensor Net.
- ET data collected using an SR Eyelink-1000 remote camera.

**ERP Processing:**

- Data were filtered from 0.1-30Hz, re-referenced to the average reference, segmented from 100 to 500ms relative to shift in stimulus expression, baseline corrected, and artifact detected.
- ERP components were extracted from occipitotemporal electrodes (Figure 2).

**Results**

<table>
<thead>
<tr>
<th>Hemisphere</th>
<th>ASD</th>
<th>TD</th>
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<tbody>
<tr>
<td>Left</td>
<td></td>
<td></td>
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<tr>
<td>Right</td>
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</table>

**Clinical Measures:**

- The Autism Diagnostic Observation Schedule, Second Edition (ADOS-2) and the Autism Diagnostic Interview-Revised (ADI-R) were administered by research-relievable clinicians with expertise in ASD.
- The Differential Abilities Scale, Second Edition (DAS-II) was used to assess cognitive functioning.

**Statistical Analyses:**

- Participants with fewer than 10 valid trials per condition were excluded from analysis.
- A two-way ANOVA was performed for each hemisphere to detect any significant main effect of sex or diagnosis or interaction between the two. Post-hoc independent samples T-tests were performed with Bonferroni correction.

**Conclusions**

- Females with ASD showed a larger response to fearful relative to happy faces than males with ASD, but no sex differences were found in typically developing individuals’ response to emotional faces.
- It is notable that sex differences were only observed in the left hemisphere, given that the N170 is lateralized and traditionally most prominent in the right hemisphere.
- These results may reflect sex differences in social motivation and behavior that are observed in children with ASD but not typically developing children.
- Sex differences in neural activity when viewing emotionally salient stimuli may help in identifying new, specific therapeutic targets for individuals with autism of both sexes.
- One of the current study’s limitations is its small sample size, particularly of females with ASD.
- Future studies should:
  - Confirm these results in a larger sample of participants.
  - Explore associations between sex differences in neural response to emotionally salient stimuli and factors such as ADOS calibrated severity and social affect scores.

**References**


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