Background

- Individuals with ASD exhibit atypical facial processing and eye contact\(^1\).
- The P100, N170, and P300 are event-related potentials (ERPs) that index distinct stages of face perception.
- Previous ERP studies indicate that face perception is affected in individuals with ASD\(^3\).
- Social difficulties are most apparent in interactive contexts\(^3\).
- This study examined brain response to interactive eye contact in relation to social function and dysfunction in ASD and typical development (TD).

Method

Participants

Age- and IQ-matched children with ASD (n = 27), unaffected siblings (US; n = 8), and TD controls (n = 25) participated in the study.

Characterization

- Autism diagnosis was ascertained using the Autism Diagnostic Observation Schedule (ADOS).
- Cognitive ability was measured with the Differential Abilities Scale – Second Edition (DAS-II).
- Anxiety symptomatology was characterized using the Multidimensional Anxiety Scale for Children – Parent (MASC-P).

Experimental Paradigm

- EEG (128 channel HydroCel Geodesic Sensor Net) and eye-tracking (SR-Research Eyelink 1000) data were collected concurrently, such that onscreen faces responded to participant gaze.
- Participants looked to dynamic face stimuli in four conditions:
  - Looked to eyes and eyes opened (Eye: Eye)
  - Looked to eyes and mouth opened (Eye: Mouth)
  - Looked to mouth and mouth opened (Mouth: Mouth)
  - Looked to mouth and eyes opened (Mouth: Eye)

Data Extraction

- Amplitude and latency extracted for P100 and N170 at central sites and for P300 at central sites (Fig. 5).
- These data emphasize the importance of measuring anxious symptomatology in understanding face perception in ASD.

Preliminary Results

- P100 Amplitude
  - Main effect of condition
    - F(3, 48) = 11.20, p < 0.01
  - Eye: Eye = Mouth: Mouth > Eye: Mouth = Mouth: Eye (ps < 0.01)
- N170 Amplitude
  - Main effect of condition
    - F(3, 48) = 14.63, p < 0.01
  - Eye: Eye > Mouth: Mouth = Eye: Mouth = Eye: Mouth (ps < 0.01)
- N170 Latency
  - Main effect of condition
    - F(3, 48) = 4.25, p < 0.01
  - Eye: Eye = Mouth: Mouth = Eye: Mouth > Eye: Mouth (ps < 0.05)
- P300 Mean Amplitude
  - Marginal main effect of condition
    - F(3, 48) = 2.35, p = 0.08
  - Mouth: Mouth = Eye: Eye = Mouth: Eye > Eye: Mouth (ps < 0.05)

- Higher levels of anxiety as measured by the MASC-P Total Score were correlated with greater gaze sensitivity at the N170 (r = 0.29, p < 0.05)

Conclusions and Future Directions

Conclusions

- This is the first investigation of the temporal dynamics of face perception in the context of interactive eye contact.
- ERPs to contingent facial movement revealed distinct response patterns representing indices of social cognition:
  - P100: Early perceptual attention to motion; Enhanced amplitude in response to changes in attended facial movement (Eye: Eye, Mouth: Mouth).
  - N170: Enhanced amplitude and increased efficiency to reciprocal eye contact (Eye: Eye).
- P300: Saliency of biological motion; Enhanced amplitude to (a) any attended facial movement or (b) eye movements, irrespective of attention (Mouth: Mouth, Eye: Eye, Eye: Mouth).
- Enhanced N170 response to eye contact was associated with higher levels of anxiety.
- These data emphasize the importance of measuring anxious symptomatology in understanding face perception in ASD.

Future Directions

- Continue data collection to increase sample size.
- Explore the utility of gaze-contingent interactive protocols to drive attention to the eyes and examine plasticity of neural response to eye contact.

References
