Relative Contributions of Autistic Traits versus Alexithymic Traits In the Neural Processing of Social Information

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BACKGROUND

- ASD is a neurodevelopmental disorder characterized by impairments in social interaction.
- Face processing is a well-studied and focal domain of social behavior that is impacted in ASD.
  - Individuals with ASD display hypoactivation in regions associated with face processing, such as the fusiform gyrus.
  - Studies of event-related potentials (ERPs) reveal slowed processing for faces in ASD, evidenced by longer N170 latencies.
- Alexithymia is a trait characterized by difficulties in recognizing and describing emotions.
  - Alexithymia is present in ASD **(50%)** and typical development **(10%).**
  - Behavioral studies suggest that alexithymia accounts for anomalous face processing in ASD.
- The influence of alexithymic versus autistic traits on the neural bases of face processing remains unexplored.
- The current study used **event-related potentials (ERPs)** to examine the relative contributions of autistic traits versus alexithymic traits on emotional face perception.

Hypotheses:

- In line with previous studies, alexithymic traits rather than autistic traits will be more predictive of facial emotion processing.
- Alexithymic and autistic traits will differentially contribute to stages of perceptual processing.
  - Level of autistic traits will be more predictive of basic structural encoding of faces, indexed by the N170.
  - Level of alexithymic traits will be more predictive of higher-order emotion processing, indexed by the N250.

METHOD

Participants:

- Typically developing adults recruited from the Yale Community (N=26)
  - 18 female

Behavioral Measures:

Autistic Symptomatology:

1. Autism Quotient (AQ)
2. Broad Autism Phenotype Questionnaire (BAPQ)
3. Social Responsiveness Scale for Adults (SRS-A)

Alexithymic Traits:

1. Toronto Alexithymia Scale – 20 (TAS-20)
2. Bermond-Vorst Alexithymia Questionnaire (BVAQ)

Table 1: Demographics

	Mean	SD	Range
Age (yrs)	22.85	2.62	19-28

Table 2: Questionnaire data

	Mean	SD	Min	Max
AQ	14.96	5.7	6	27
BAPQ	85.85	18.3	43	132
SRS-A	38.08	21.9	7	84
TAS-20	39.35	11.1	24	64
BVAQ	45.15	9.7	28	69

ERP components of interest:

Right N170

- Extracted from the grand average using a time window of 132-200ms

N250

- Extracted from the grand average using a time window of 190-258ms

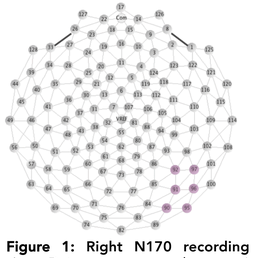


Figure 1: Right N170 recording sites. Data were averaged across 6 electrodes approximating T6

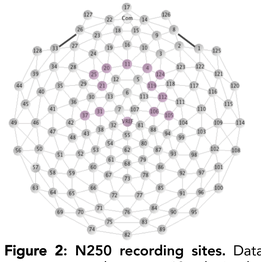


Figure 2: N250 recording sites. Data were averaged across 13 electrodes approximating F3, F4, FC1, FC2, C3, C4

METHOD

Experimental Paradigm:

- 210 computer-generated faces presented in static and dynamic form.
- Conditions:
  1. Affective movement (fear face); 2. Neutral movement (puffed cheeks); 3. Biologically Impossible movement (upward displacement of eyes and mouth)
- Each condition was presented in forward and reverse order (neutral static to affective movement and vice versa).

ERP data acquisition and collection:

- 128 electrode Geodesic Sensor net.
- Recorded continuously at a sampling rate of 500 Hz.
- Referenced to Cz.
- Re-referenced offline to average reference.
- Impedances < 40kΩ.

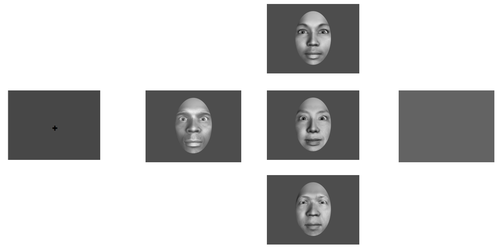
ERP analyses:

- Current analyses focused exclusively on ERPs evoked by static stimuli.

Statistical analyses:

- **Bivariate correlations** contrasted:
  - Measures assessing autistic traits (AQ, BAPQ, SRS-A) and alexithymic traits (TAS, BVAQ).
  - Amplitude/latencies of the ERP components and the behavioral measures.
- **Multiple regression analyses** were used to measure the relative contribution of alexithymic vs. autistic traits to any variability found in the ERP amplitude/latency.

Figure 3: Experimental Paradigm



RESULTS

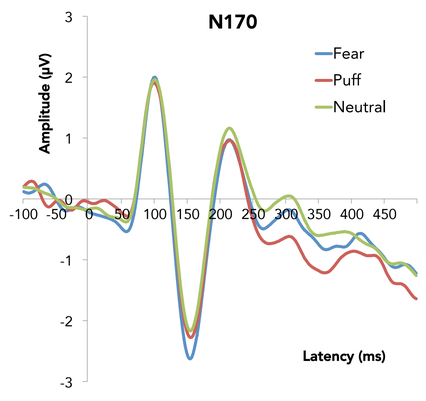


Figure 4: Grand average waveform, depicting the N170, across all participants (N=26) for fear faces, puff faces and neutral faces. Waveforms were averaged across 6 electrodes in the right hemisphere.

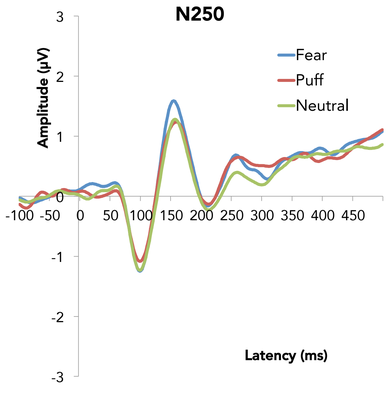


Figure 5: Grand average waveform, depicting the N250, across all participants (N=26) for fear faces, puff faces and neutral faces. Waveforms were averaged across 13 electrodes in both hemispheres.

RESULTS

Correlations between autistic and alexithymic traits:

- AQ scores correlated positively with scores on the TAS [r=.428, p<.05]
- BAPQ scores correlated positively with scores on the TAS [r=.664, p<.01] and BVAQ [r=.469, p<.05]
- SRS-A scores correlated positively with scores on the TAS [r=.754, p<.01] and BVAQ [r=.542, p<.01]

Correlations between ERP components and behavioral measures:

- AQ scores correlated negatively with right N170 amplitude for fear faces [r=-.547, p<.01]
- BVAQ scores correlated negatively with N250 latency for fear faces [r=-.389, p<.05]

Main effect of ERP components on experimental conditions:

- Significant main effect of right N170 amplitude [F(2,50)=4.383, p<.05]
  - Fear>Puff>Neutral

Influence of autistic traits on face processing:

- AQ scores predicted right N170 amplitude for fear faces [β =.401, t(25)= -4.117, p<.01]
  - Level of autistic traits accounted for 49.3% of the variance in the right N170 amplitude for fear faces, compared to alexithymic traits [R^2= .493, F(25,20)=3.883, p<.05]
- AQ scores predicted right N170 latency for fear faces [β =-1.479, t(25)=-2.557, p<.05]

Influence of alexithymic traits on face processing:

- BVAQ scores predicted N250 latency for fear faces [β =-1.024, t(25)=-2.196, p<.05]

CONCLUSIONS

- Autistic traits and alexithymic traits were highly correlated on the AQ, BAPQ, SRS-A and the TAS-20.
- **In contrast**, the AQ and the BVAQ were not found to be correlated, indicating that they measure unique dimensions of social behavior.
- The temporal sensitivity of ERPs revealed distinct contributions of autistic and alexithymic traits at different stages of face processing.
  - Autistic traits predicted strength and efficiency at early stage processing of faces, representing structural encoding of faces (N170).
    - Autistic traits are associated with basic social perception
  - Level of alexithymic traits was more predictive of a later component, marking emotion decoding (N250).
    - Alexithymic traits are associated with higher-order emotional perception

Study results emphasize the importance of alexithymia in explaining phenotypic **heterogeneity in ASD.** While basic problems in social perception may be universal to ASD, specific difficulties with emotion perception may be evident in a specific subgroup of individuals with ASD and alexithymia. Future research investigating emotional perception in ASD should account for level of alexithymic traits.

References

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