

Immediate Social Context in Face Processing: An ERP Study of Autism



Sarah Shultz, Warren Jones, Ami Klin, & James McPartland



Yale Child Study Center, Yale University School of Medicine, New Haven, CT

Introduction

Face-related neural activity is indexed by a negative going event-related potential occurring 170 ms after seeing a face (N170). Anomalous face processing, shown by reduced N170 amplitude and increased latency, has been found in autism¹.

Our previous work revealed that typical individuals, but not individuals with autism, showed enhanced N170 amplitude in response to ambiguous stimuli subsequent to viewing of face-relevant contextual cues.

Functional neuroimaging studies indicate that face sensitive areas of the fusiform gyrus also activate in the absence of intrinsic facial features when a face is implied by the context of a human form². This suggests that typically-developing people imbue ambiguous stimuli with social meaning when presented in a social context. Research has not addressed whether individuals with autism imbue social meaning in this way.

This study is the first to investigate the N170 as an electrophysiological index of imputation of social meaning in typically-developing children and children with autism.

Questions

- Will findings of anomalous N170 amplitude and latency in autism be replicated?
- Will there be a difference in N170 response to an ambiguous stimulus before and after exposure to cues that the stimulus is a degraded face?
- Will face-specific N170 responses be elicited in the absence of intrinsic facial features when a face is implied by the context of a human form?

Participants

Autism Group n = 18		Typical Group n = 15	
Age (years)	11.91 (3.17)	12.97 (2.44)	
Full-scale IQ	101.56 (22.7)	112.36 (14.61)	
# Male (%)	18(100)	12(80)	
# Right Handed (%)	15(83)	13(87)	

Clinical participants met Autism Spectrum Disorder criteria on:
- Autism Diagnostic Observation Schedule
- Autism Diagnostic Interview
- DSM IV-TR Clinical Diagnosis

Stimuli and Experimental Design



• Subjects viewed 100 stimuli from each category in 6 blocks

• Trials consist of:

- Fixation cross (250-750 ms) → Stimulus (500 ms) → Blank Screen (500ms)

• All subjects performed a target detection task

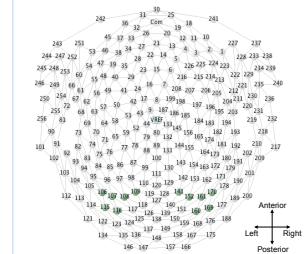
Poster presented May 7, 2009 at the International Meeting for Autism Research in Chicago, IL. This research was supported by funding from NIH (KL2RR024138) and NIMH (R03MH079908) to James McPartland.

Methods

Data Acquisition

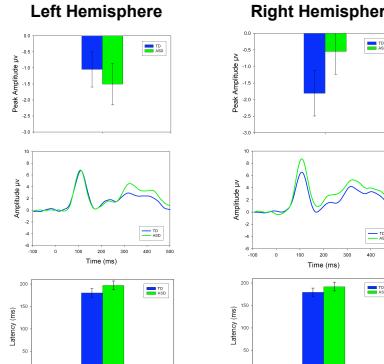
- ERP recorded continuously at 250 Hz
- Electrical Geodesics 256 channel sensor net
- N170 amplitude and latency extracted from averaged data

Electrode Selection

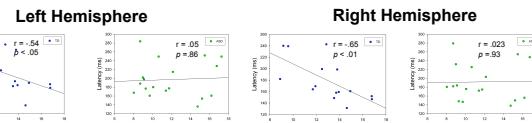


Results: Face Processing

Amplitude in response to Face Only condition.
TD group shows a right lateralized N170 in response to faces.



Latency in response to Face Only condition.
Trend towards shorter N170 latency in the TD group.



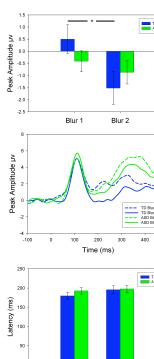
TD group showed shorter N170 latencies with increasing age, a developmental trend not observed in the ASD group.

References and Acknowledgments

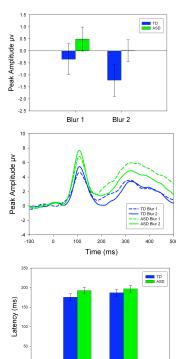
1. O'Connor et al., *Brain Cogn* 59, 82 (2005)
 2. D Cox et al., *Science* 304, 115 (2004).
- We gratefully acknowledge Christopher Bailey, Jia Wu, Joshua Diehl, Michael Crowley, Anna Krasno, Casey Zampella, Peter Lewis, Laura Edwards, Jessie Northrup, and Jose Paredes. Data were collected in the Developmental Electrophysiology Lab, Linda Mayes, Director.

Results: Visual Experience

Left Hemisphere



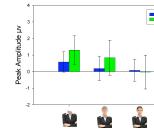
Right Hemisphere



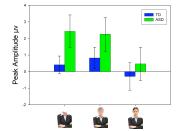
Latency: the TD group showed trend toward longer latencies to Blur 2 relative to Blur 1 in the left hemisphere. The ASD group showed no difference in latency between Blur 1 and Blur 2.

Results: Immediate Social Context

Left Hemisphere



Right Hemisphere



Amplitude: Trend suggests enhanced N170 amplitude as more face-congruent visual information is provided.

Latency: Trend suggests that N170 latency varies with the degree of face-congruent visual information provided for both groups.

Conclusions

This study replicated findings of shorter N170 latencies and right lateralized N170 amplitudes to faces in typically-developing participants relative to individuals with autism.

Relative to children with autism, typically-developing individuals showed larger N170 amplitudes to:

- 1) ambiguous stimuli subsequent to visual experience with face-relevant cues.
- 2) ambiguous stimuli presented in the context of a human form.

The difficulty in autism of attributing social meaning to ambiguous stimuli may result in highly disparate mental representations of the world, thereby precluding adaptive responses to social stimuli.