

# Neural Correlates of Face Processing Associated with Risk of Autism Spectrum Disorders in Infancy

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<http://jerlab.psych.sc.edu/jerpdf/icis2016neuralcorrelatesofASDrisk.pdf>

## Abstract

Neural correlates of face processing were examined in two groups of 12-month-old infants at high-risk for autism spectrum disorders (ASD), infant siblings of children with ASD (ASIBs) and infants with fragile X syndrome (FXS), as well as a group of typically developing (TD) controls. Event-related potentials (ERPs) were recorded to familiar and novel face and toy stimuli. Atypical processing of faces has been well documented in ASD<sup>1</sup> and research suggests that ASIBs may display different ERP responses from TD infants in the first year of life<sup>2,3</sup>. Examination of the early emergence of ASD-associated features in FXS may inform early risk factors specific to FXS, as well as broader heterogeneous pathways of ASD emergence. Our expectation that distinct electrophysiological responses would differentiate the high-risk ASD groups from each other and the TD group was supported. The Nc response was significantly greater in TD and FXS groups than ASIBs. Different patterns of Nc responses to familiar and novel stimuli indicated ASIBs were less responsive to the stimuli than other groups and infants with FXS may show immature stimulus processing. Greater amplitude N290 in response to faces than toys across participant groups reflects the developing specialization of face processing despite risk factor. Despite shared risk for ASD, infants with FXS and ASIBs exhibit distinct patterns of attention and face processing, potentially reflecting syndrome-specific pathways to similar behavioral outcomes.

## Methods

### Participants

- 12-month-old infants: 21 TD, 21 ASIBs, 15 with FXS

### Stimuli

- Images of the infant's own mother, stranger, own toy novel toy

### Procedure

- Infant passively viewed brief stimulus presentations (500 ms) & paired comparison trials (4 s) while seated on parent's lap in darkened room
- Recorded EEG from high-density EGI HGSN/GSN nets

### ERP Analyses

- Electrodes clustered into virtual "10-10" electrodes
  - N290: individualized time windows identified to capture each infant's peak at lateral parietal electrode sites
  - P400: mean amplitude from 350-450 ms post-stimulus onset at medial & parietal occipital electrode sites
  - Nc: mean amplitude from 350-700 ms post-stimulus onset at midline frontal & central sites

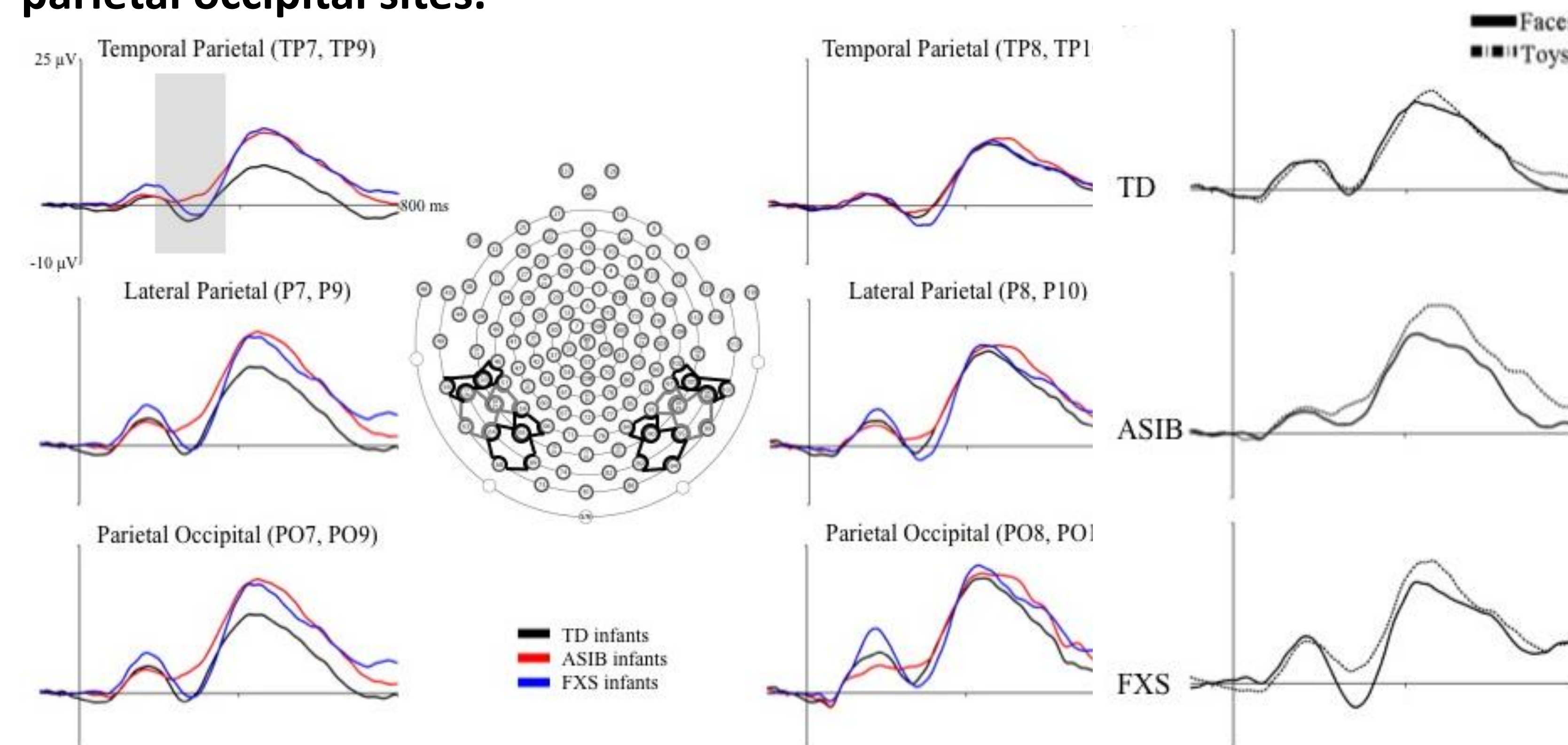
### Statistical Analyses

- Calculated mixed ANOVAs including age, electrode cluster, electrode hemisphere, stimulus type, familiarity, and attention phase as factors

## Results

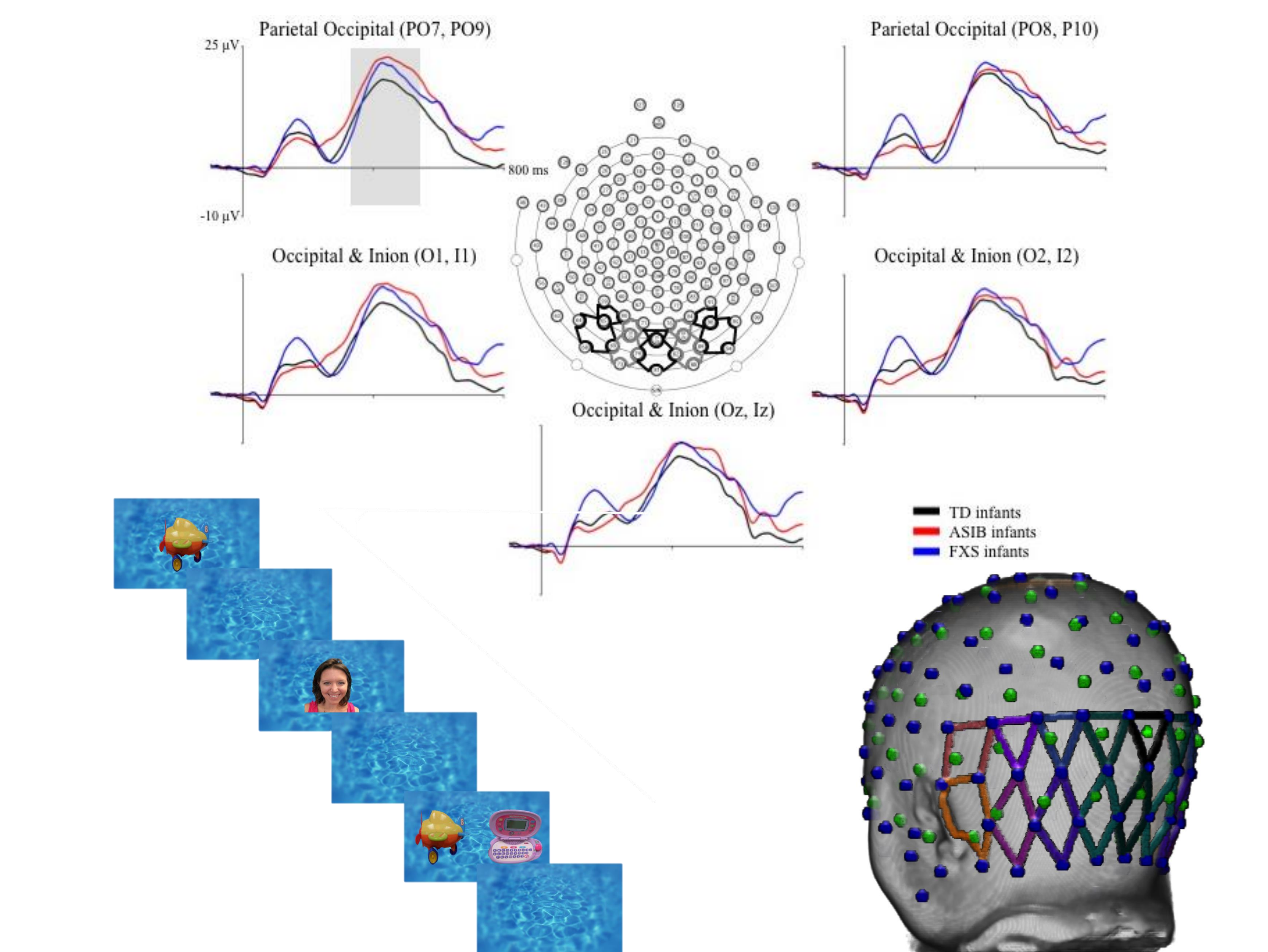
### N290

There was a significant effect of stimulus type on N290 amplitude,  $F(1, 54) = 11.92, p = .0011$ . Amplitude was greater in response to faces than toys. A significant interaction of group, cluster, and hemisphere,  $F(2, 108) = 2.94, p = .0236$ , reflected greater amplitude responses in FXS infants at right parietal occipital sites.



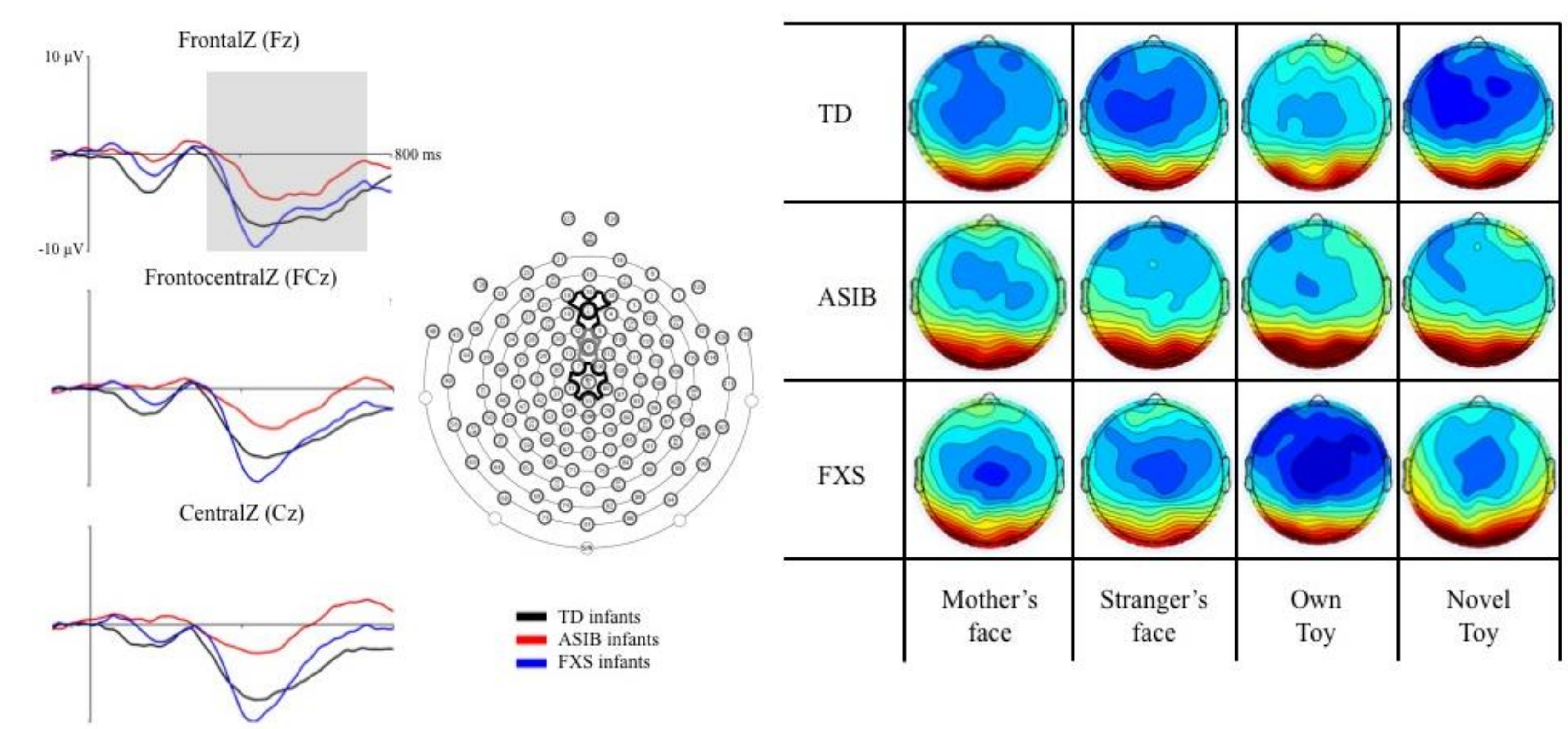
### P400

There was an interaction of group and electrode cluster on P400 latency,  $F(2, 54) = 3.49, p = .0375$ . Latency was shortest in FXS infants and varied between ASIBs and TD infants based on electrode cluster.



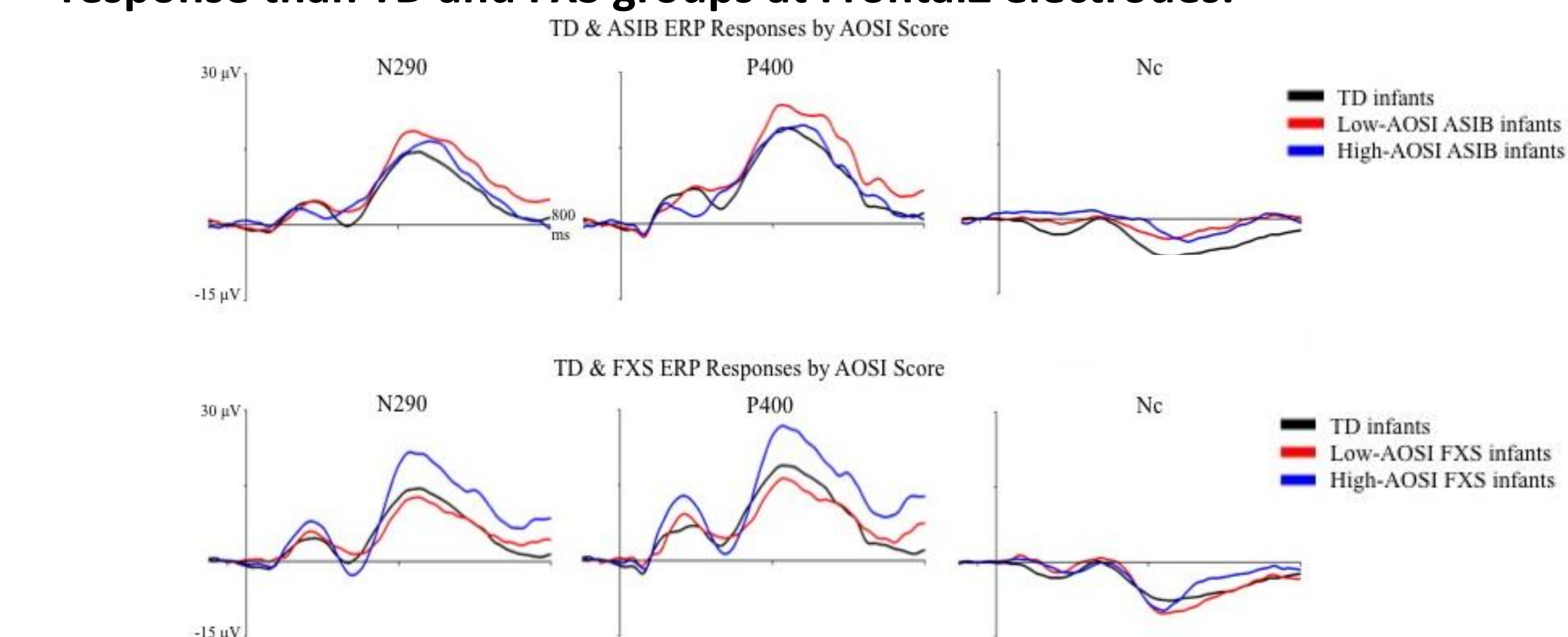
### Nc

Significant differences in Nc amplitude were seen across groups,  $F(2, 54) = 3.36, p = .0421$ . Amplitude was greater in TD and FXS infants than ASIBs. There was a significant interaction of group and stimulus familiarity,  $F(2, 48) = 3.88, p = .0274$ . TD infants showed a greater response to novel than familiar stimuli, while ASIBs showed a similar response across stimuli, and FXS infants showed a greater response to familiar than novel stimuli.



## ASD Risk & ERP Responses

Relations between ERP data and behavioral risk factors of ASD (AOSI<sup>4</sup>) were investigated. At the N290, there was an interaction of group, electrode cluster, and electrode hemisphere,  $F(8, 102) = 2.49, p = .0164$ . FXS infants with high AOSI scores had the most negative responses at left electrodes. At the Nc, there was an interaction of group and electrode cluster,  $F(2, 47) = 4.40, p = .0178$ . ASIBs with low AOSI scores displayed a lower amplitude response than TD and FXS groups at FrontalZ electrodes.



## References

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- <sup>2</sup>McCleery, J. P., Akshoomoff, N., Dobkins, K. R., & Carver, L. J. (2009). Atypical face versus object processing and hemispheric asymmetries in 10-month-old infants at risk for autism. *Biological Psychiatry*, 66, 950-957.
- <sup>3</sup>Luyster, R. J., Wagner, J. B., Vogel-Farley, V., Tager-Flusberg, H., & Nelson, C. A. (2011). Neural correlates of familiar and unfamiliar face processing in infants at risk for autism spectrum disorders. *Brain Topography*.
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