Neural Responses and Sensory Responsivity in Infants with Fragile X Syndrome and Familial Autism Risk

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Background

- Atypical sensory responsivity is widely reported in research on autism spectrum disorder (ASD) and fragile X syndrome (FXS).
- It has been proposed that sensory responsivity may result from atypical sensory processing at the neural level (Sinclair et al., 2017).
- Examination of sensory processing and responsivity in infancy could provide insight into the development of atypical sensory responsivity.
- Event-related potentials (ERPs) can provide insight into development of sensory pathways by examining neural correlates of sensory processing.
- In particular, the infant P1 ERP component is associated with visual sensory orienting, providing a sensitive index to examine early occurring neural responses in relation to observed behavioral sensory responsivity.

Objective

To investigate neural correlates of sensory processing in 12-month-old infants at elevated risk for ASD in relation to clinical measures of sensory responsivity measured concurrently and in early childhood.

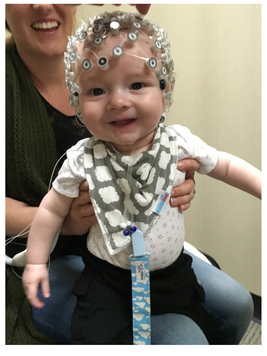
Methods

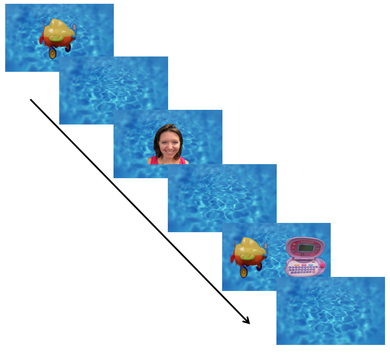
Participants

- 12-month-old infants with FXS (n = 15), siblings of children with ASD (i.e., ASIBs; n = 21), and low-risk control (LRC) infants (n = 21)

Event-related potentials (ERPs)

- Infants were seated on their parent's lap in a darkened room and fitted with an EGI high-density EEG net
- ERP responses were measured to photos of the mother's face, stranger's face, and toys (Guy et al., 2018)
- Measured P1 amplitude and latency
- ANOVAs conducted examining factors of participant group (3) and stimulus type (3) in relation to the P1





References
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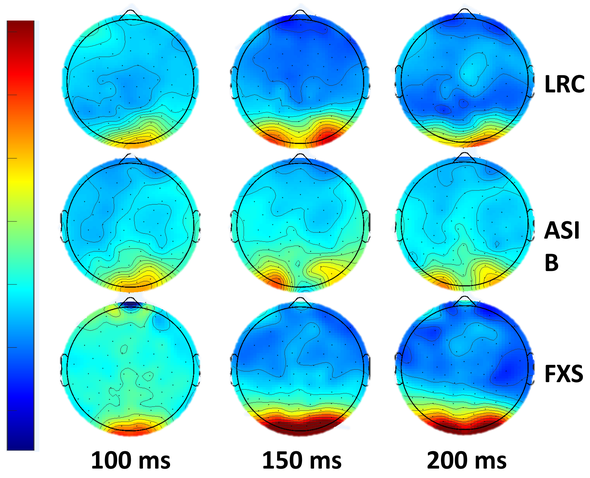
Sensory Experience Questionnaire (SEQ)

- Used to measure sensory responsivity (Baranek et al., 2006) in participants at 12 months and early childhood (M = 43.15 months)
- Examines 3 response patterns (hyper-responsiveness, hypo-responsiveness, sensory seeking) across 5 sensory modalities (auditory, tactile, visual, vestibular/ proprioceptive, & gustatory/olfactory)
- Amplitude of the P1 ERP component based on stimulus type (3) and group (3) were examined in association with Total Mean SEQ scores using ANCOVAs and regressions.

Results

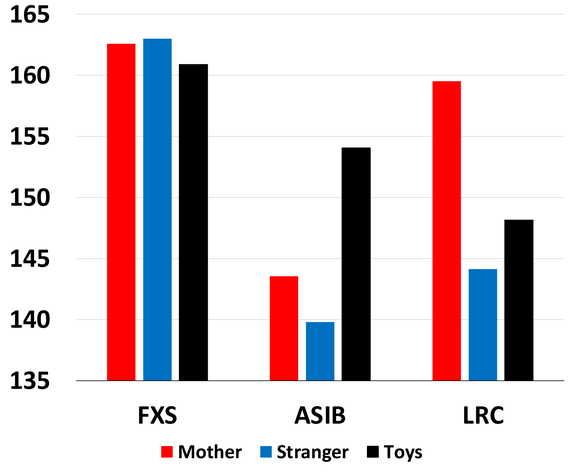
P1 Amplitude

P1 amplitude was **greater among participants with FXS**, M = 18.39 μV, than ASIBs, M = 10.71 μV, or LRC participants, M = 11.01 μV, $F(2, 972) = 55.97$, $p < .001$, $n_p^2 = .10$.



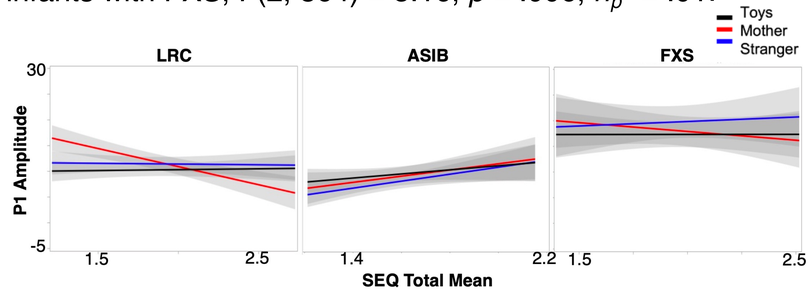
P1 Latency

P1 latency was **longer in the FXS group** than other groups, $F(2, 972) = 9.92$, $p < .001$, $n_p^2 = .02$. There was a marginally significant interaction of trial type and group, $F(4, 972) = 2.32$, $p = .055$, $n_p^2 = .01$. Latency showed sensitivity to stimulus type for the ASIB and LRC groups.



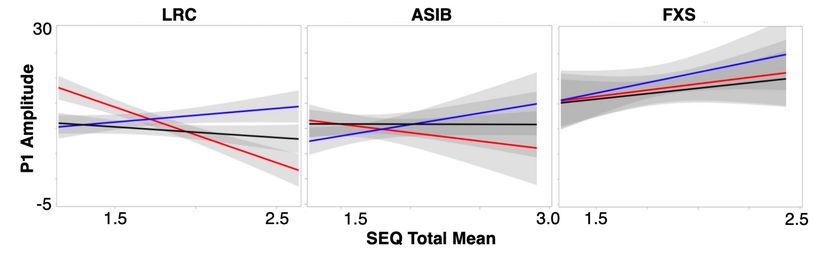
P1 Amplitude and SEQ in Infancy

There was an interaction, such that **higher SEQ scores were associated with greater concurrent P1 amplitude responses for ASIBs**, however, the opposite pattern was observed in LRC infants, and no relation was seen for infants with FXS, $F(2, 864) = 5.16$, $p = .006$, $n_p^2 = .01$.



P1 and SEQ in Childhood

There was an interaction of SEQ score, group, and stimulus type, $F(4, 882) = 2.45$, $p = .045$, $n_p^2 = .01$. Participants with **FXS showed greater amplitude P1 associated with higher SEQ scores** across stimulus type, while LRC participants showed relations between P1 amplitude and SEQ varied based on stimulus type. There were no significant effects for ASIBs.



Conclusions

- High-risk infant groups demonstrated unique patterns of P1 activation, which were uniquely associated with sensory responsivity concurrently during infancy and as a predictor during early childhood.
- Although infants with FXS demonstrated greater P1 amplitude responses than ASIBs or LRC infants, greater SEQ scores were observed only as a predictor of elevated sensory responsivity in early childhood.
- In contrast, elevated sensory responsivity was associated with greater P1 amplitude during infancy for ASIBs, despite not displaying elevated atypical P1 responses.
- Results indicate that P1 amplitude is associated with sensory responsivity, but that the nature and developmental timing at which these relations are observed varies based on risk group.

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