The specificity of atypical neural responses to language in infants at risk for ASD


1McPartland Lab, Child Study Center, Yale University School of Medicine
2Section of Plastic and Reconstructive Surgery, Yale University School of Medicine
3Haskins Laboratories, New Haven, CT

Introduction

Background: Language delay and difficulties in communication are characteristic features of autism spectrum disorder (ASD). Atypical patterns of neurophysiological responses to language emerge between 6 and 12 months in infants at elevated risk for ASD (Seery et al., 2012). Delays in language are also associated with non-syndromic craniosynostosis (NSC; Magge et al., 2000). NSC is the result of premature fusion at one or more skull growth sites, and it affects roughly 1 in 2,000 live births (Cohen and MacLean, 2000). The delays observed in infants with NSC are due to impaired cranial expansion, which, in turn, restricts anatomical brain development. Preliminary evidence suggests that infants with NSC display atypical neurophysiological responses to language stimuli (Hashim et al., 2013).

It remains unclear which atypical neurophysiological responses to linguistic stimuli are specific markers of general language delay and which are specific to each of these two conditions.

Study Aims: To contrast local and global oscillatory characteristics of neurophysiological responses to language stimuli in infants at high-risk for ASD, infants with NSC, and infants at low-risk for ASD:

- Inter-temporal coherence (ITC) is a measure of localized synchronization in the EEG signal across trials that can be interpreted as an index of consistent stimulus-driven neurophysiological responses.
- Phase coherence is a measure of synchronization in the EEG signal across sites that can be interpreted as an index of functional connectivity.

Methods

Participating Groups

Table 1: Post-hoc simple effect tests following significant main effects and interactions

Conclusions

- Infants at low-risk for ASD show higher local and global synchronization in response to speech sounds, compared to both infants at high-risk for ASD and infants with NSC.
- Atypical oscillatory responses in the gamma band in response to speech sounds might be indicative of non-syndromic specific disruptions in brain development.
- Lower synchronization in neural activity might give rise to the language delays observed in infants at high-risk for ASD and infants with NSC.

Results emphasize the importance of including clinical control groups in studies of at-risk infants to provide information about the specificity of developmental differences.

Acknowledgments

This research was supported by NIH K23MH086785 (JM), Simons Foundation 94924 (JM), CTSA Grant Number 5UL1 RR024131 (JM, EB), American Society of Maxillofacial Surgeons (JM), Plastic Surgery Foundation (JM), and the Office of Student Research at the Yale School of Medicine (EB, PH).

References
