Hierarchical Acoustic Structure During Parent-Child Interactions of Toddlers with Typical Development and Autism Spectrum Disorder

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Background

- Timing is essential in successful social interactions that support communication development in children with and without ASD [1,2].
- Infant-Directed Speech shows greater temporal clustering of acoustic events than Adult-Directed Speech across timescales [3].
- Greater temporal clustering also occurs in conversations with reduced reciprocity [4].

Research Questions

- Does the hierarchical temporal structure (HTS) of parent-child interactions change as a result of linguistic and social development?
- Does it differ for children with ASD who show reduced social engagement and communication?

Method

51 TD parent-child dyads recorded at 9, 12 and 18 months.
19 ASD parent-toddler dyads (27.9 ± 4.5 months), 36 non-verbally matched 18-month TD dyads, and 19 Expressive Language matched

7-minute parent-child free-play session with quiet toys.

Mullen Scales of Early Learning to measure developmental level.

Method

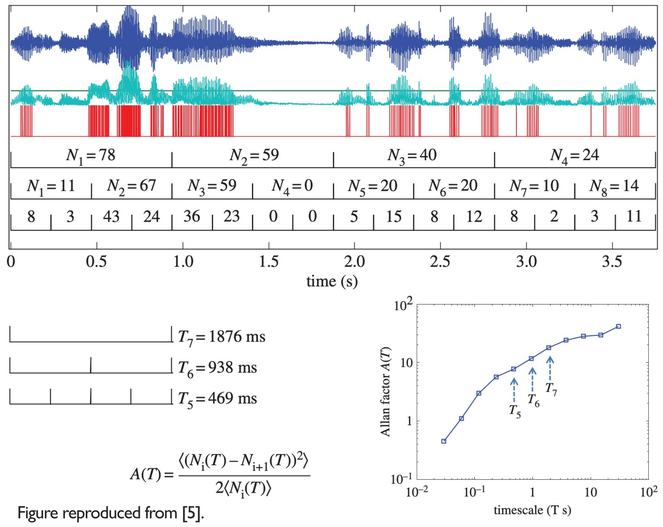
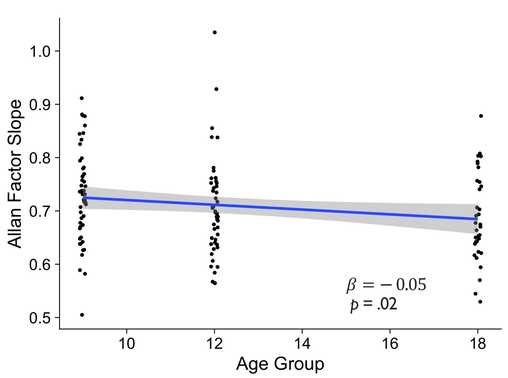


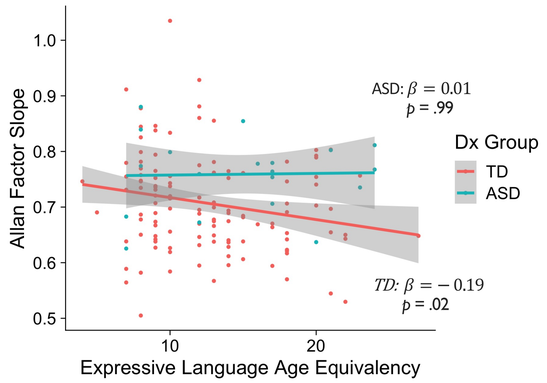
Figure reproduced from [5].

Allan Factor variance A(T) of acoustic events was measured across timescales to determine the level of HTS in the audio recordings of the interactions.

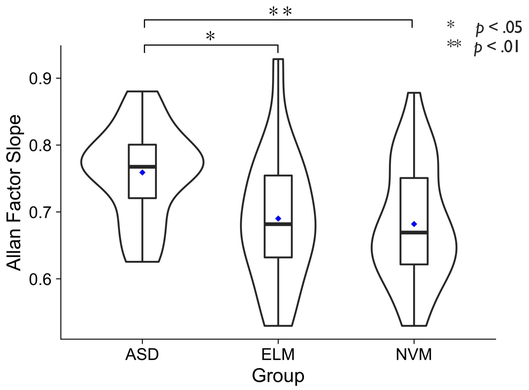
Results

Change in HTS as a function of age and language development





HTS for ASD vs. Non-Verbally and Expressive-Language Matched TD dyads



Expressive-Language Age Equivalence (months)	Mean	SD	Range
ASD Group	14.9	5.88	7 - 24
ELM-TD Group	14.7	5.54	7 - 22

Non-Verbal Age Equivalence (months)	Mean	SD	Range
ASD Group	21.05	3.93	13-27
NVM-TD Group	20.13	3.95	13-30

Conclusions

- As expressive language skills grow in TD children, the HTS in the interaction with their parents is reduced, slowly shifting towards a more adult-like temporal organization of the interaction.
- Parent-child dyads of children with ASD have greater HTS in their interactions than both non-verbally and expressive-language matched TD parent-child dyads.
- Taken together, the preliminary results suggest that while language development is an important driver of change in the acoustic temporal structure of TD children's dyadic interactions, it is not for children with ASD.

Future Directions

- Explore what other developmental or interaction relevant factors might help explain the greater acoustic temporal clustering observed in the interactions of children with ASD and their parents.
- Explore whether the Allan Factor slopes of early interactions can be used to predict language development later in infancy.

Acknowledgements

This work was supported by the National Institute on Deafness and Other Communication Disorders (R21DC016710) and the National Institute of Mental Health (R61MH123029)

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