Introduction

• Behavioral heterogeneity in ASD is a persistent challenge
  - (More) homogeneous subgroups could respond differentially to interventions
  - Parsing behavioral heterogeneity is a critical step toward pinpointing the biological bases of ASD
• Even after attempting to manufacture homogeneity by restricting variables such as age and IQ within study samples, children with ASD still behave very differently across contexts
  - E.g., standardized vocabulary tests vs. playground conversation

Objective

Parse **acoustic heterogeneity** in the **spontaneous speech** of children with ASD using a **latent growth curve approach**

Methods

Participants

• 35 verbally fluent children with ASD
  - IQ estimates in the average range (>75), aged 7-16.9 years

Procedure

• Language samples from an unstructured 5-minute ‘get-to-know-you’ conversation with a novel confederate who was not an autism expert
  - Time-aligned and orthographically transcribed in Xtrans using a modified Quick Transcription protocol (Parish-Morris et al., 2016)

Statistical Approach

• Children produced a total of 2,408 useable utterances (mean=68.8 utterances each)
• Machine learning with 5-fold cross-validation classified each utterance as ‘ASD’ or ‘TD’ using acoustic properties of speech (matched sample including both diagnostic groups described in Cho et al., poster #32426)
• Number of ‘ASD-like’ utterances (~1-minute windows) was tested for the presence of latent classes (‘lcm’ in R)
• Simple linear models compared class characteristics

Results

• Machine learning classification of speech utterances renders it possible to:
  1. Parse heterogeneous samples into more homogeneous subgroups and
  2. Assess dynamic changes over the course of a conversation
• Future research with an expanded sample will include language-based analyses within each class
• This ‘profiling’ approach holds promise for identifying subgroups that benefit from specific interventions and stands to advance the goal of personalized medicine

Discussion

- Behaviors of ASD-like speech revealed **two profiles**. The more talkative group sounded increasingly **atypical** over 5 mins.

- A 2-class model provided the best fit (vs. 3 or 4)
  - Two subgroups had (1) Increasing (N=23) or (2) Steady (N=12) numbers of ASD-like speech utterances over the course of the conversation (Figure)
• Group intercepts differed significantly:
  - The Increasing group produced more ASD-like utterances at the start of the conversation than the Steady group (Coefficient=−2.08, Wald test=2.40, p=.02)
  - Members of the Increasing subgroup produced growing numbers of utterances classified as ‘ASD’ over time (Coefficient=.49, Wald test=5.97, p<.0001)
  - The relationship between time and ASD-like utterances trended negative in the Steady subgroup (Coefficient=−.18, Wald test=1.65, p<.10)
• Classes did not differ on age, sex ratio, nonverbal IQ estimates,ADOS-2 calibrated severity scores, average turn length, or total number of utterances produced
• Classes differed on verbal IQ scores (Steady > Increasing; estimate=11.58, t=2.97, p=.003) and total word count (Steady < Increasing; estimate=150.58, t=−2.88, p=.007)

Acknowledgements

We gratefully acknowledge the children and families that participated in our research, as well as innumerable CAR clinicians, staff, volunteers, and students.

**Funding provided by:** NICHD U54 HD86984, the Lurie Family Foundation, and the Allerton Foundation to RTS

Questions?

Contact Julia Parish-Morris at parishmorris@email.chop.edu

Download poster

https://osf.io/xu9yc/