

Aimar Silvan, Lucas C. Parra, Jens Madsen
- Department of Biomedical Engineering, City College of New York -

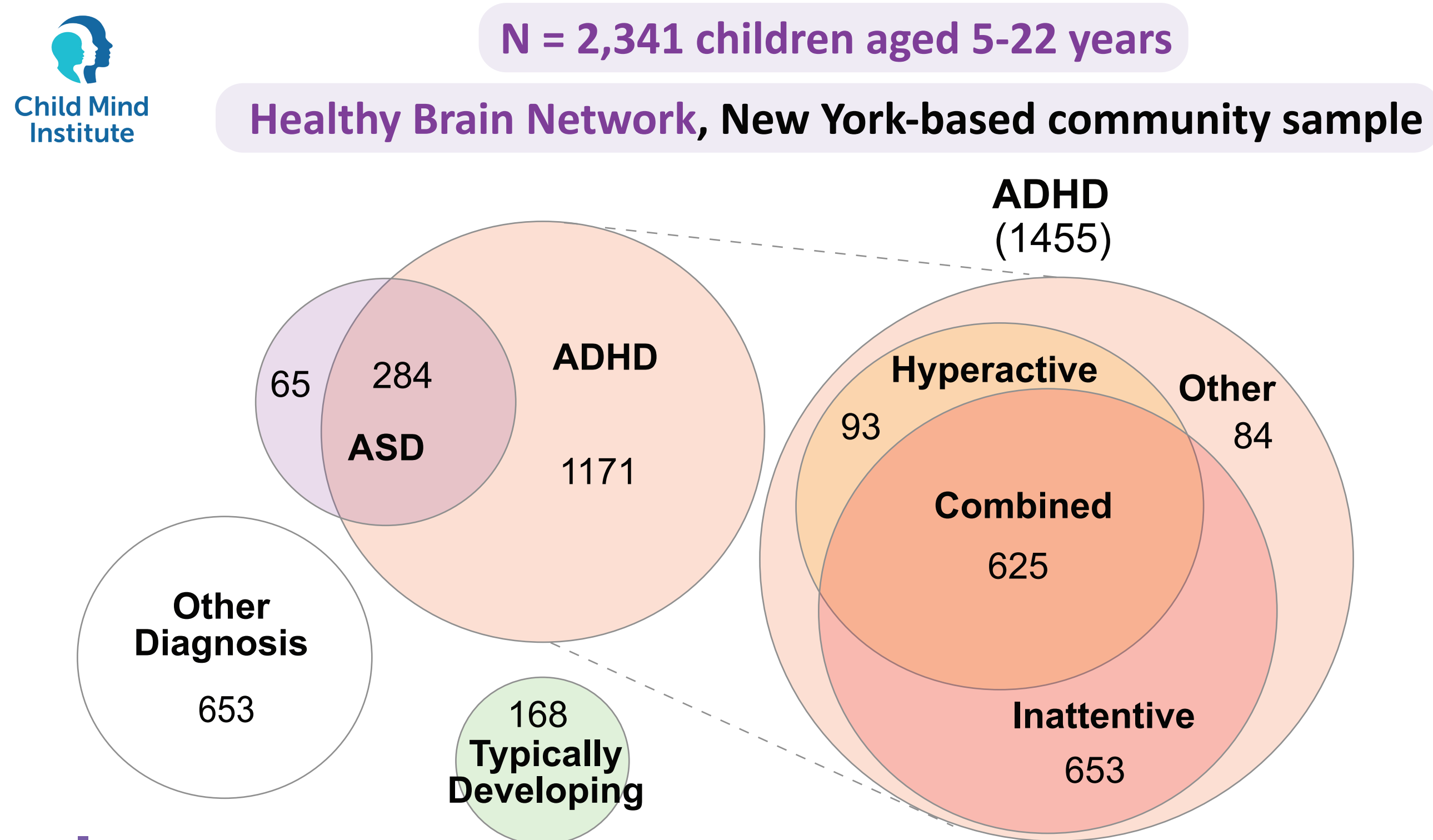
Background

- Attention-Deficit/Hyperactivity Disorder (ADHD) and Autism Spectrum Disorder (ASD) frequently co-occur, complicating diagnosis.
- Current clinical assessments are subjective and limited in scale.
- Digital phenotyping offers objective, scalable behavioral markers.

Objectives

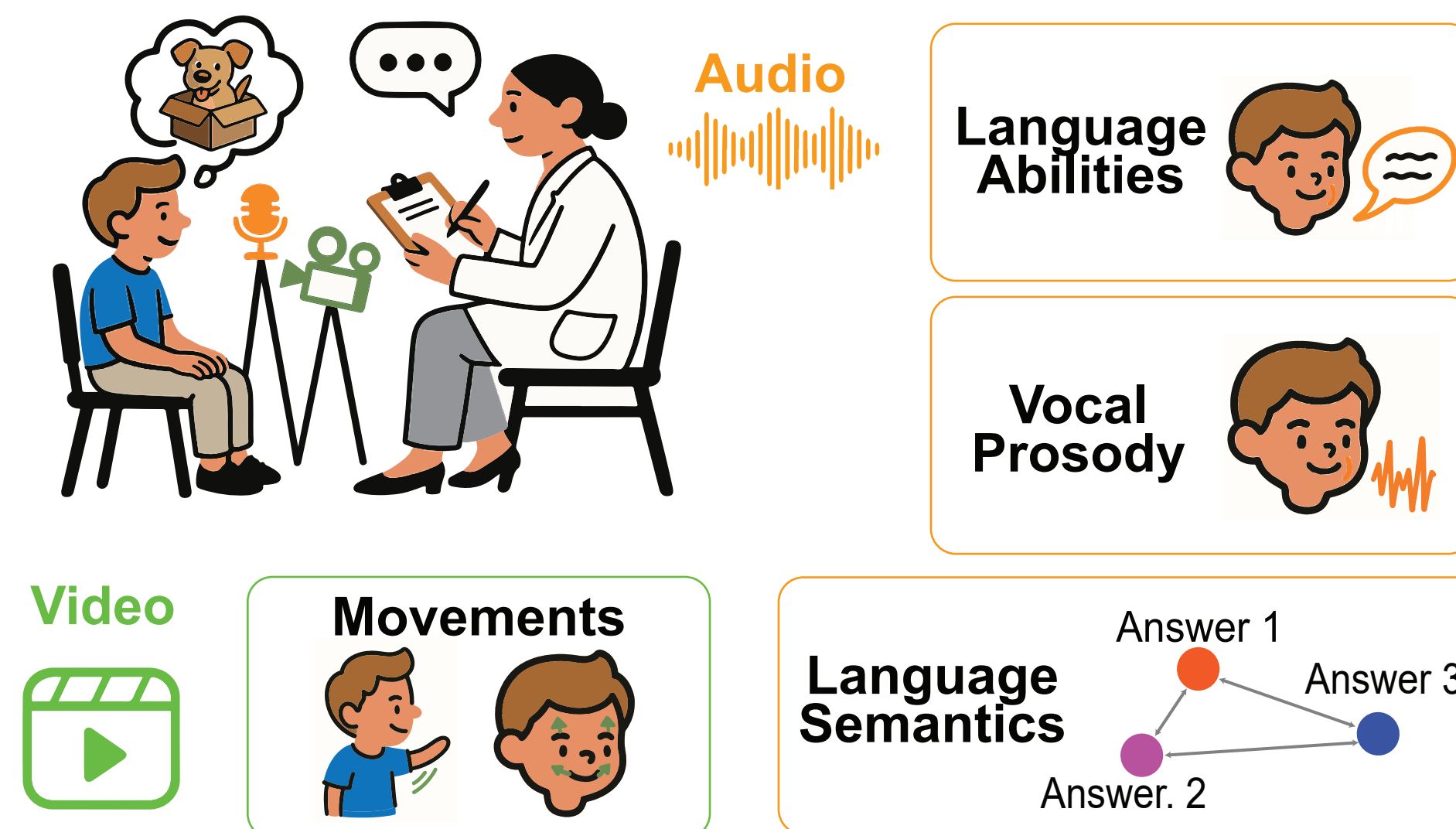
- Identify unique vs. overlapping behavioral signatures of ADHD and ASD.
- Quantify effects of age, sex, and IQ.
- Validate AI-derived markers for naturalistic behavior.

Population



Task

Describe the short film *The Present* during a semi-structured interview.



AI Tools

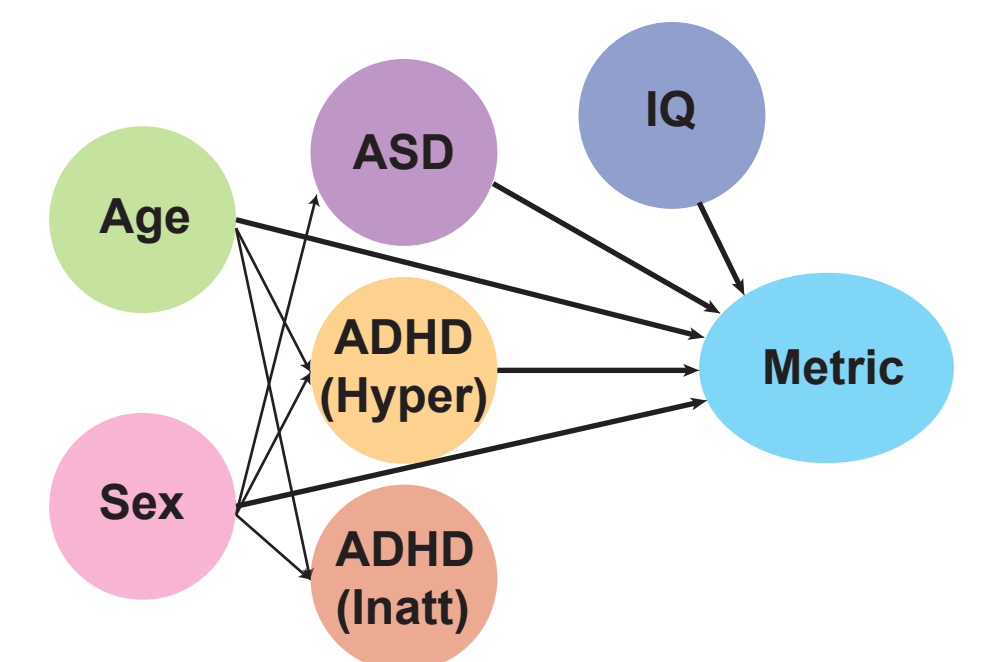
- WhisperX + Large-Language Models
 - Transcription & speaker diarization.
- Google Text Embeddings
 - Semantic analysis of responses.

- OpenWillis
 - Speech & prosody measures.
- Mediapipe Holistic Model
 - Body and Facial movement measures.

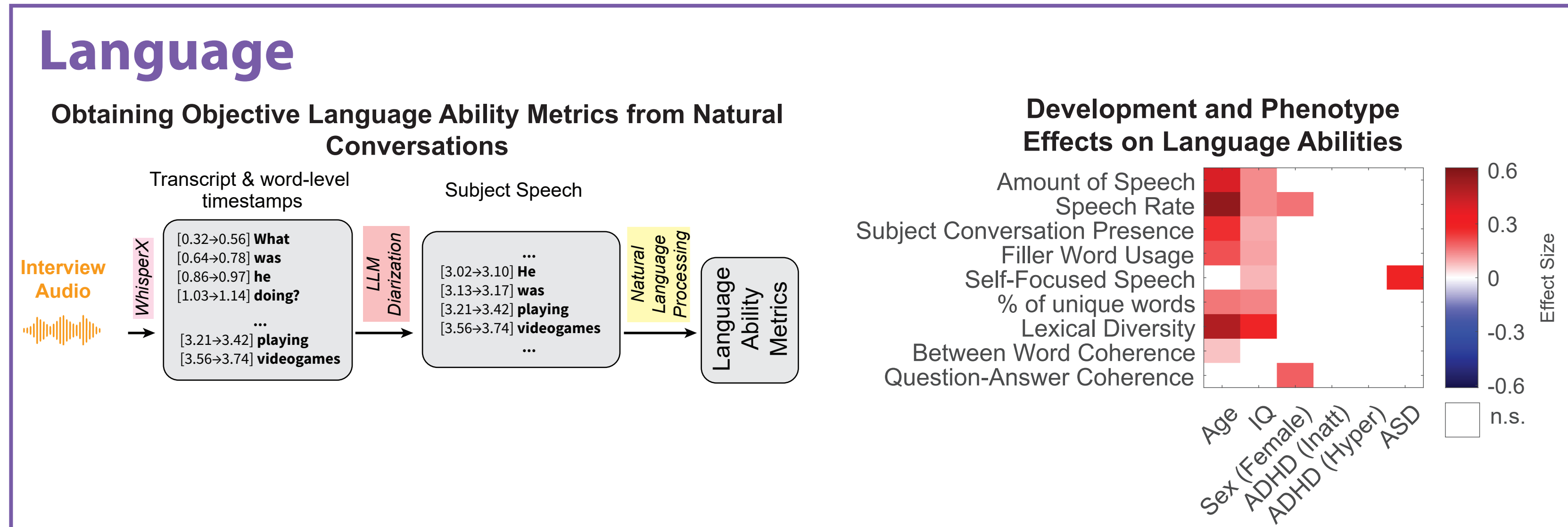
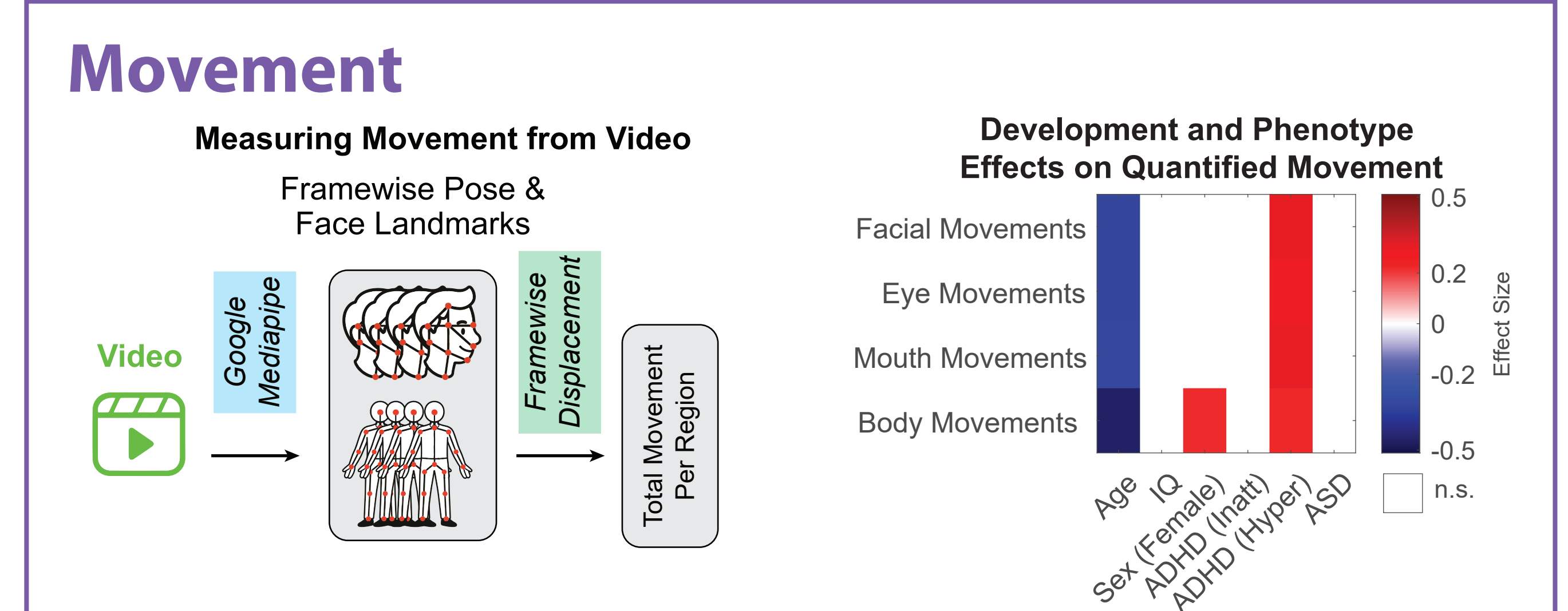
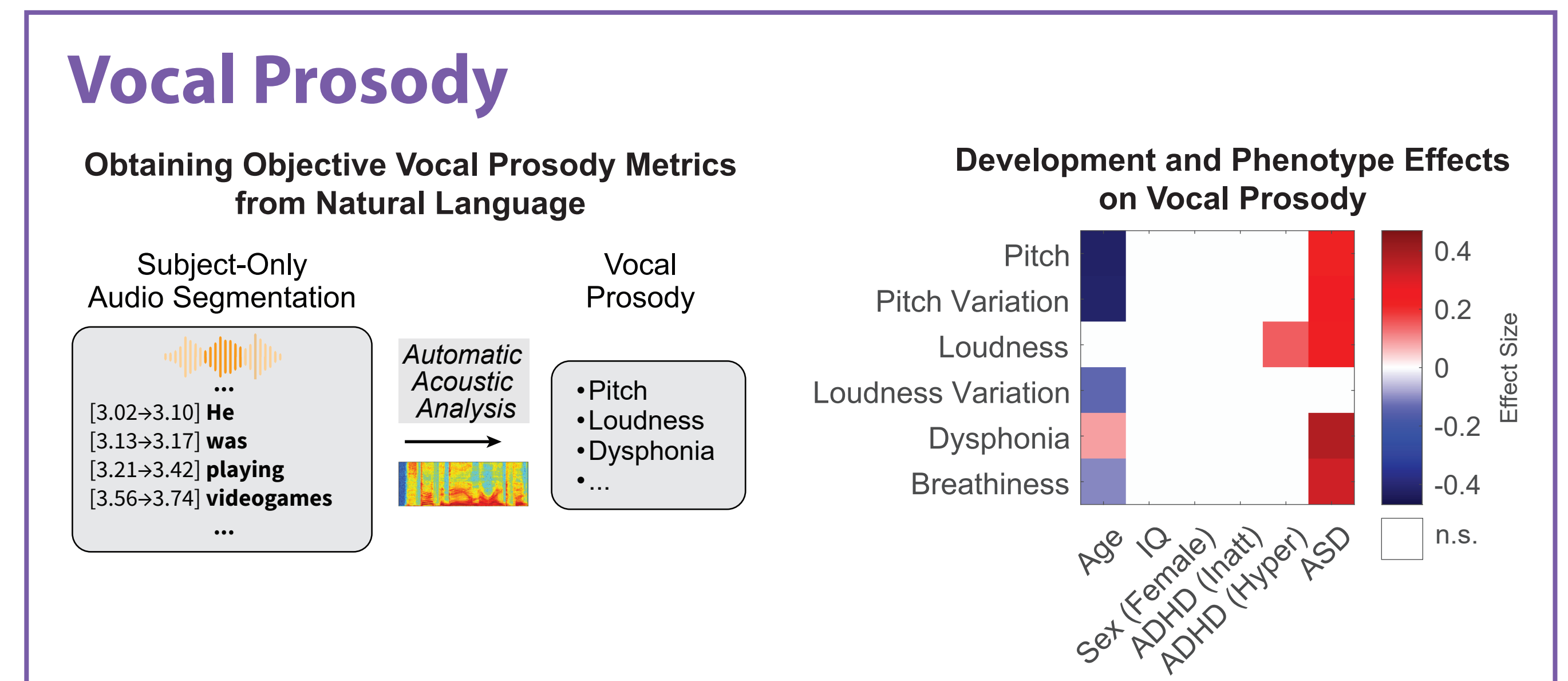
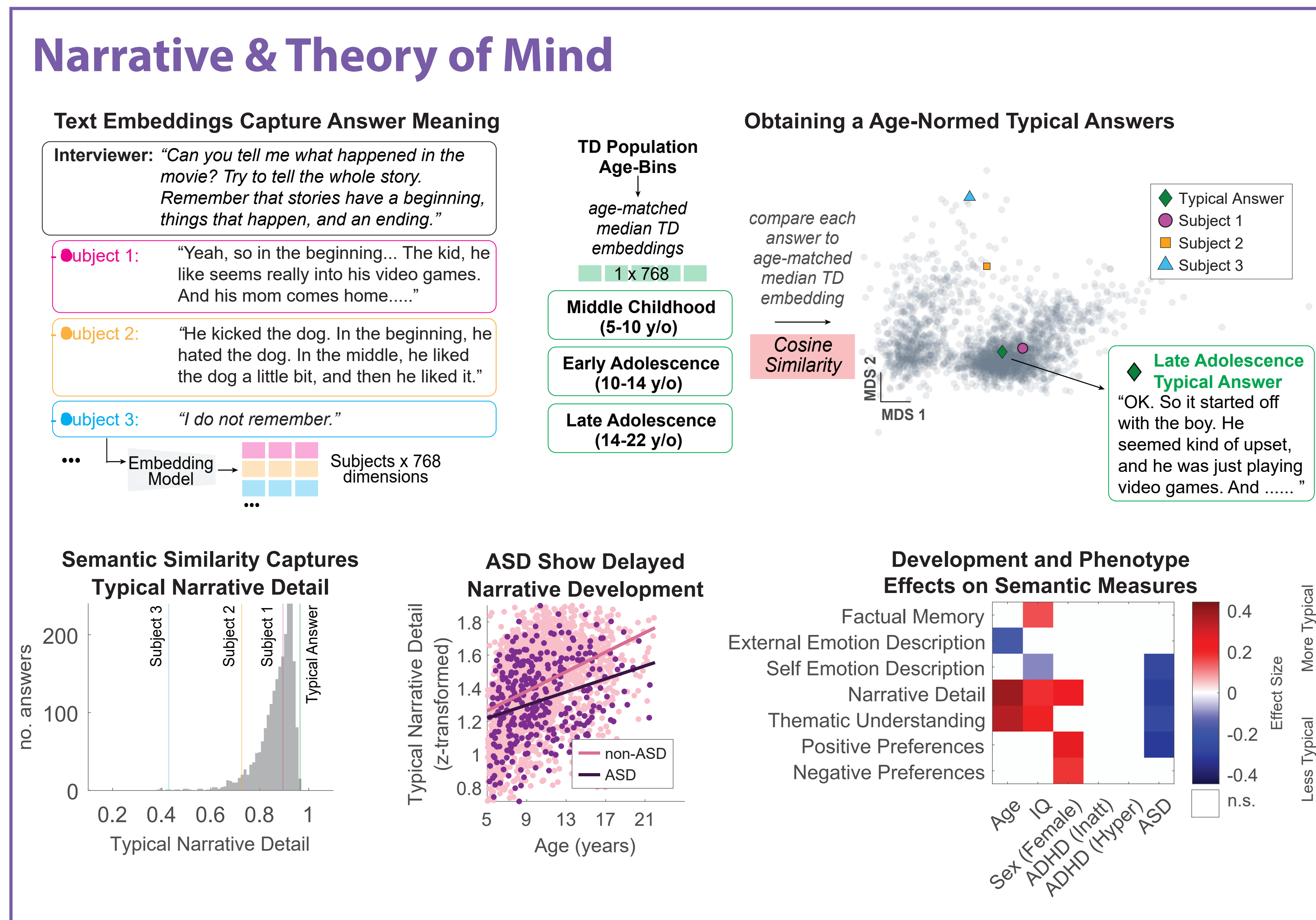
Analysis

Multivariate regression controlling for age, sex, IQ, and diagnostic co-occurrence

$$Metric \sim Age + IQ + Sex + ADHD-Inatt + ADHD-Hyper + ASD$$



Results



Highlights

- Distinct, quantifiable signatures differentiate ASD and ADHD.
- ASD: intact language structure, but impaired narrative, Theory of Mind, and atypical prosody.
- ADHD-Hyperactive: increased movement as a specific marker.
- Developmental modeling is essential to separate pathology from maturation.
- Digital phenotyping offers data-driven complement to clinical assessments.
- Scalable, objective behavioral analysis may open path for developmental diagnostics using naturalistic data.

Check it out!

Contact

asilvanortubay@ccny.cuny.edu

aimarsilvan

Code

github.com/asortubay/AI_behavioral_analysis

Acknowledgment

Work supported by NIH-NIMH P50 MH109429

Article Preprint



Live Face Tracking demo



bioRxiv