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Background

- **Attention-Deficit/Hyperactivity Disorder (ADHD)** and **Autism Spectrum Disorder (ASD)** frequently co-occur, highlighting a critical need for objective, scalable biomarkers.
- Traditional eyetracking studies often use static, isolated stimuli. **Naturalistic viewing provides greater ecological validity.**
- Recent research demonstrates that typical brains synchronize their activity, and synchronized viewing patterns measure attention during engaging videos.

Objectives

- Compare gaze synchronization patterns across **Typically Developing (TD)** children and those diagnosed with **ASD** and/or **ADHD**.
- Identify unique vs. overlapping behavioral signatures of **ADHD** and **ASD**.
- Validate gaze-based Inter-Subject Correlation (ISC) as a robust metric for tracking visual attention in a pediatric population.

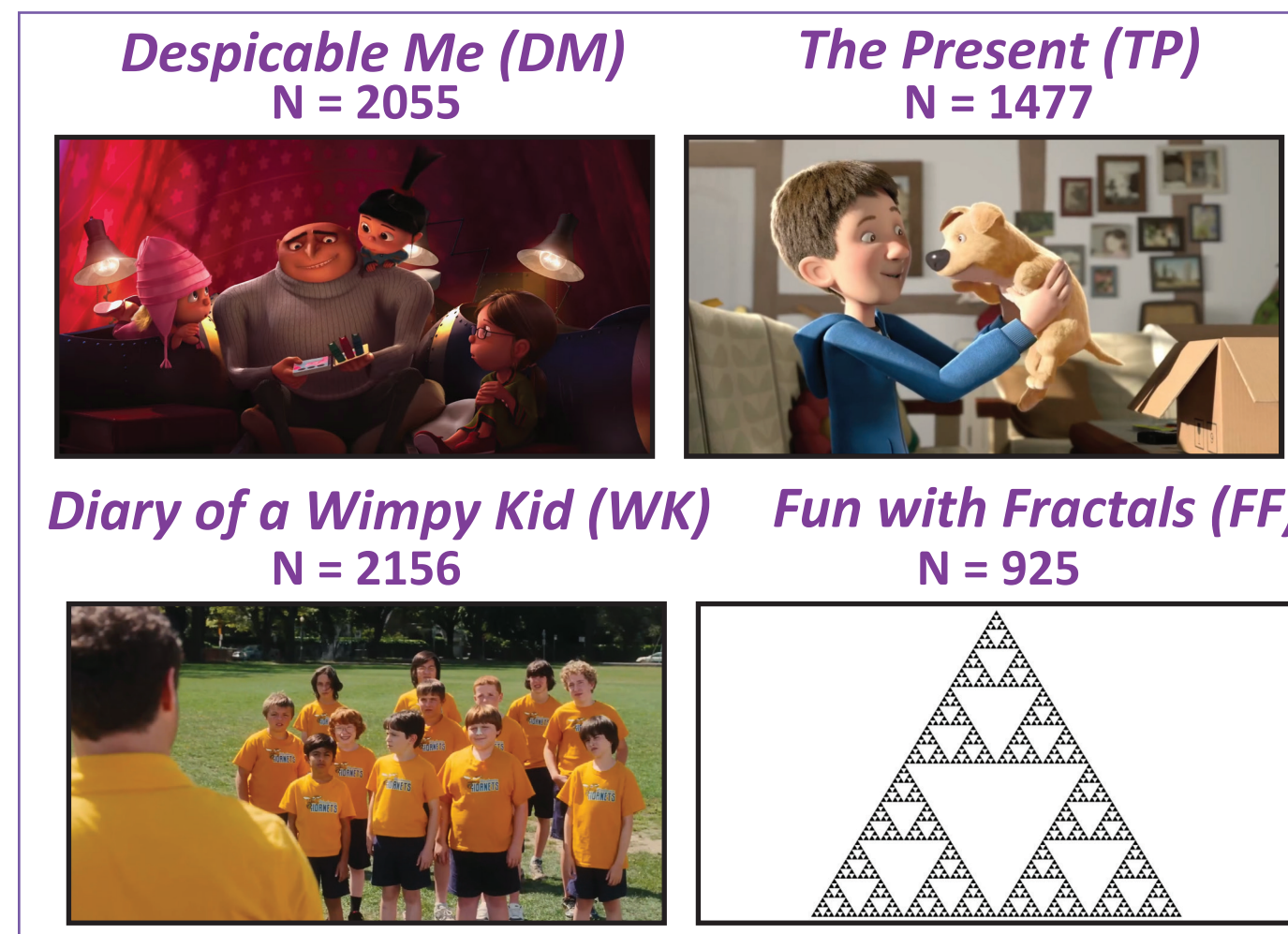
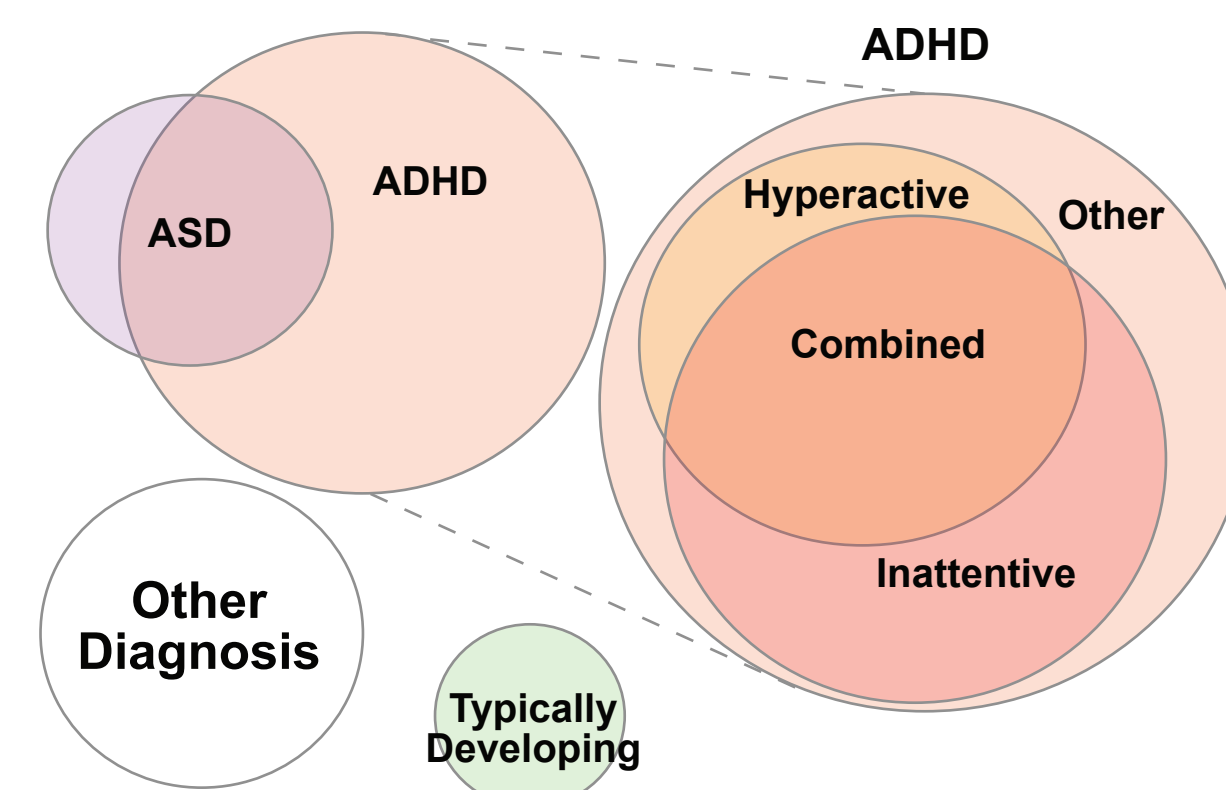
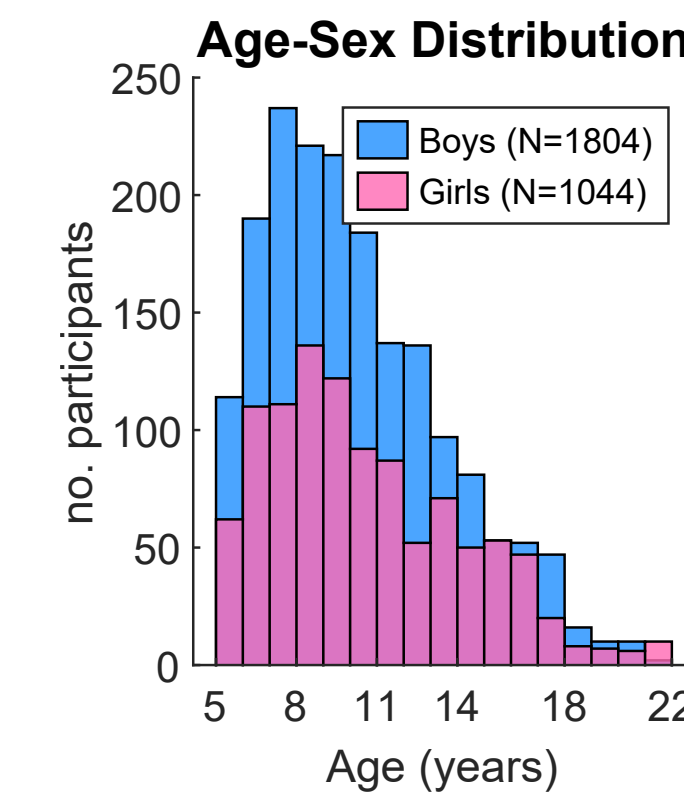
Task & Population

N = 2848 children aged 5-22 years

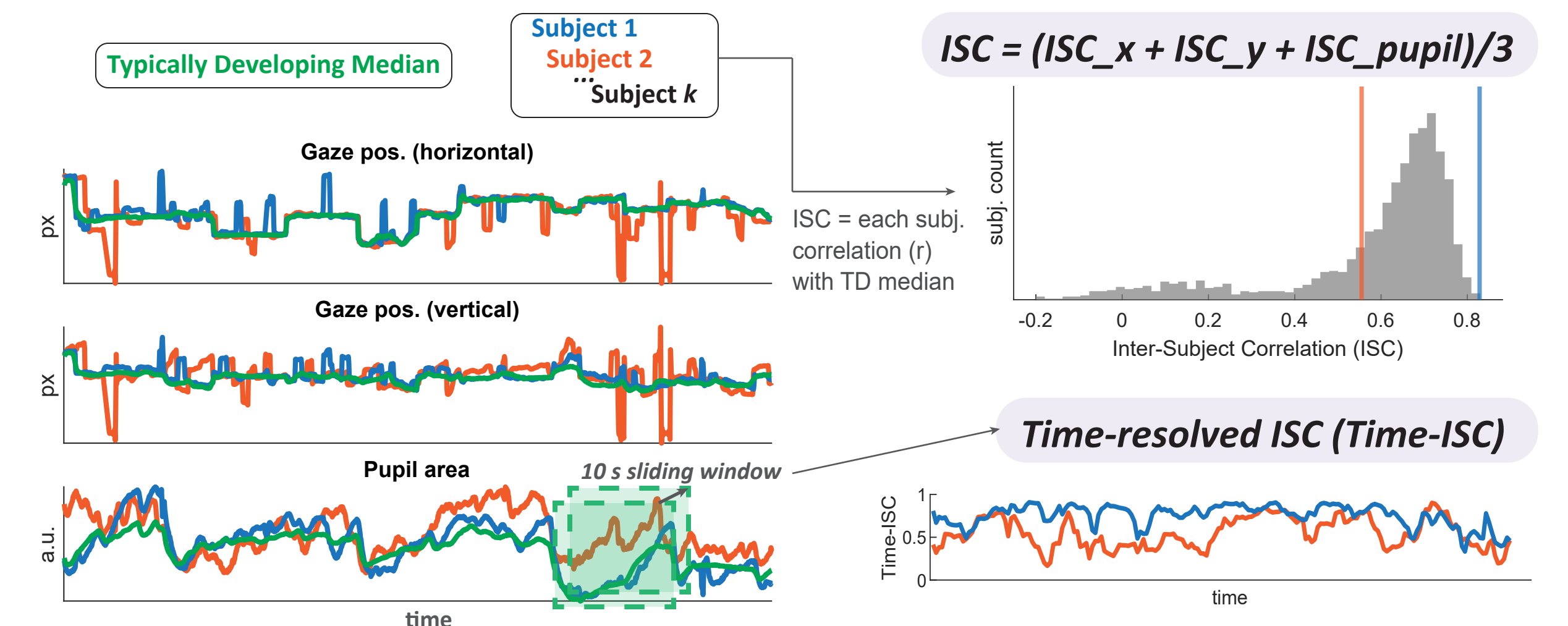


Healthy Brain Network, New York-based community sample

Watch *four different-style short videos*, eyetracking-based gaze and pupil measure



Measuring typical viewing patterns with Inter-Subject Correlation (ISC)

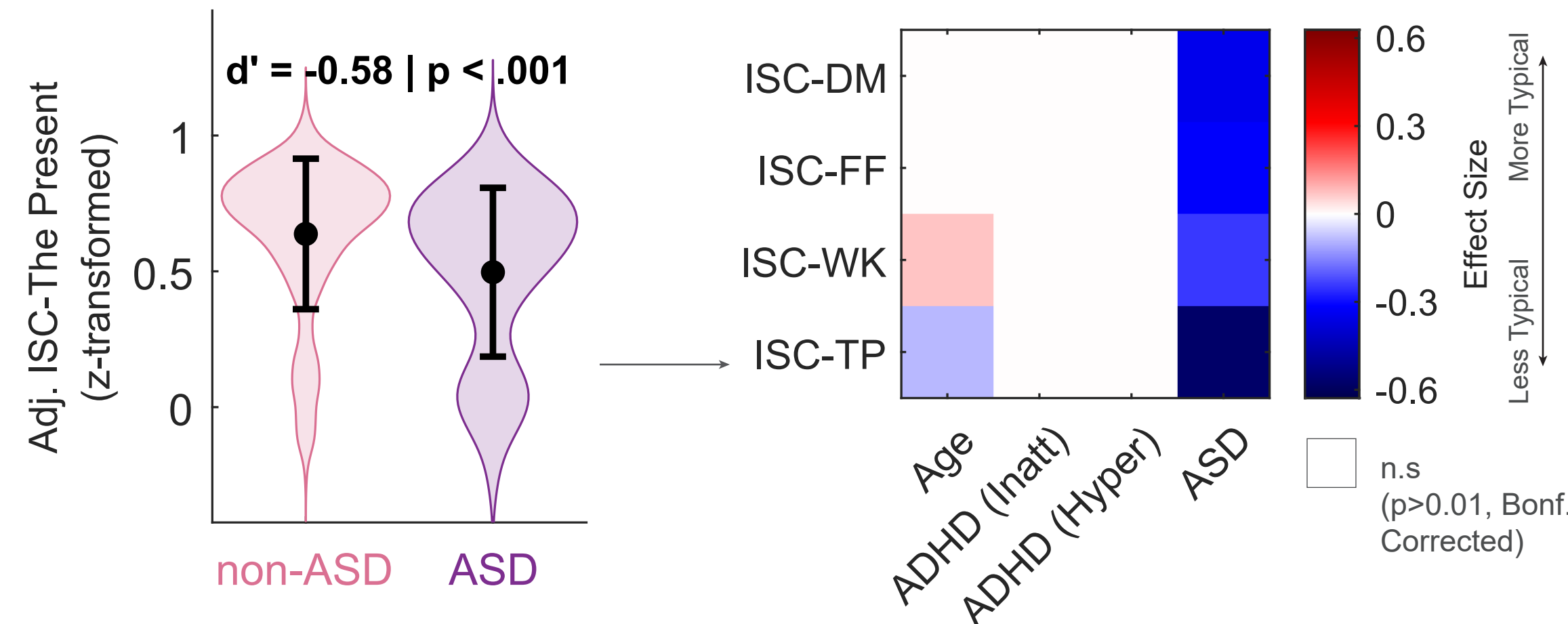


Analysis

Multivariate regression controlling for age and diagnostic co-occurrence

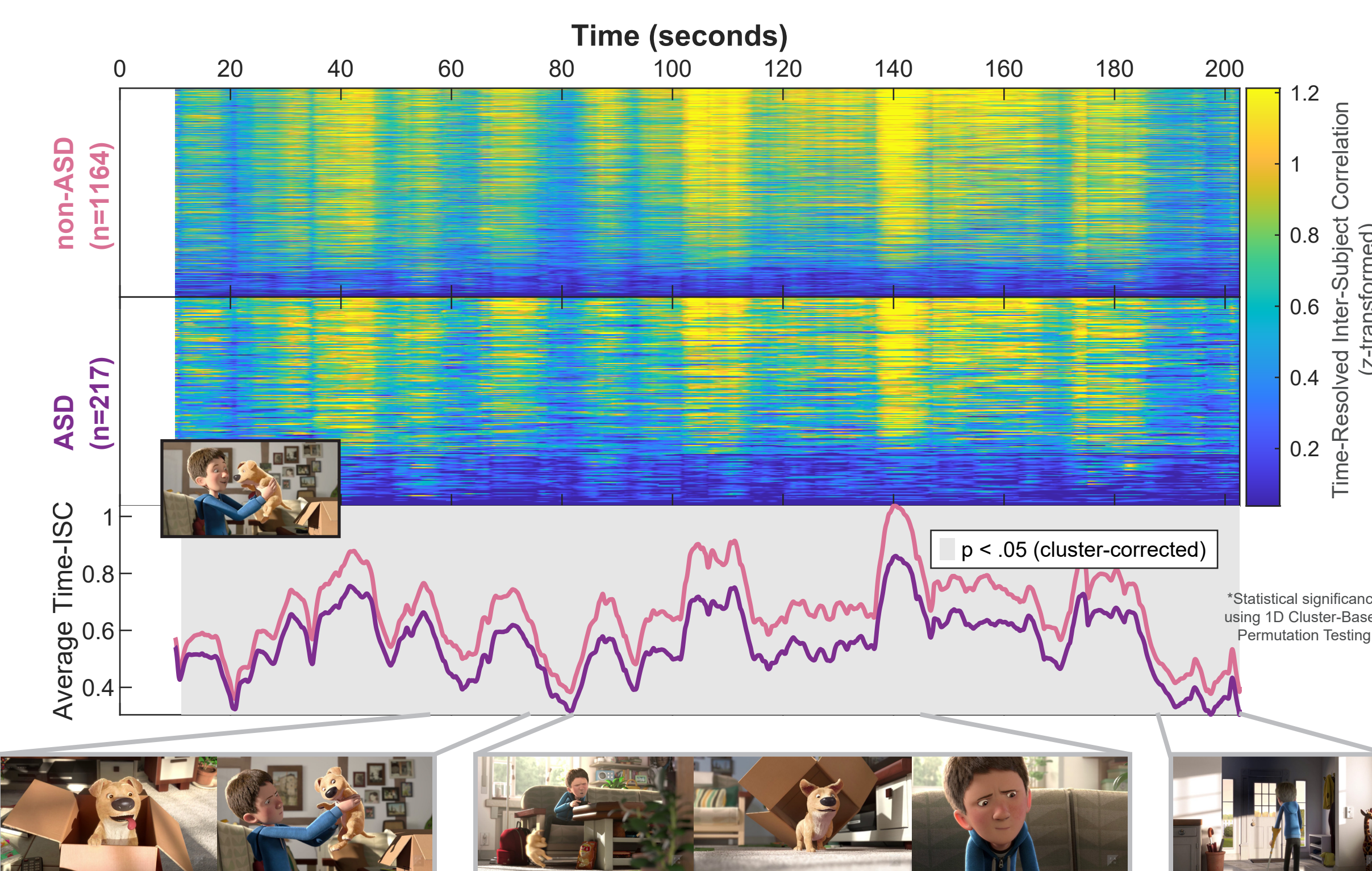
$$\text{atanh}(\text{ISC}) \sim \text{Age} + \text{ADHD-Inatt} + \text{ADHD-Hyper} + \text{ASD}$$

ASD, not ADHD, show atypical viewing patterns

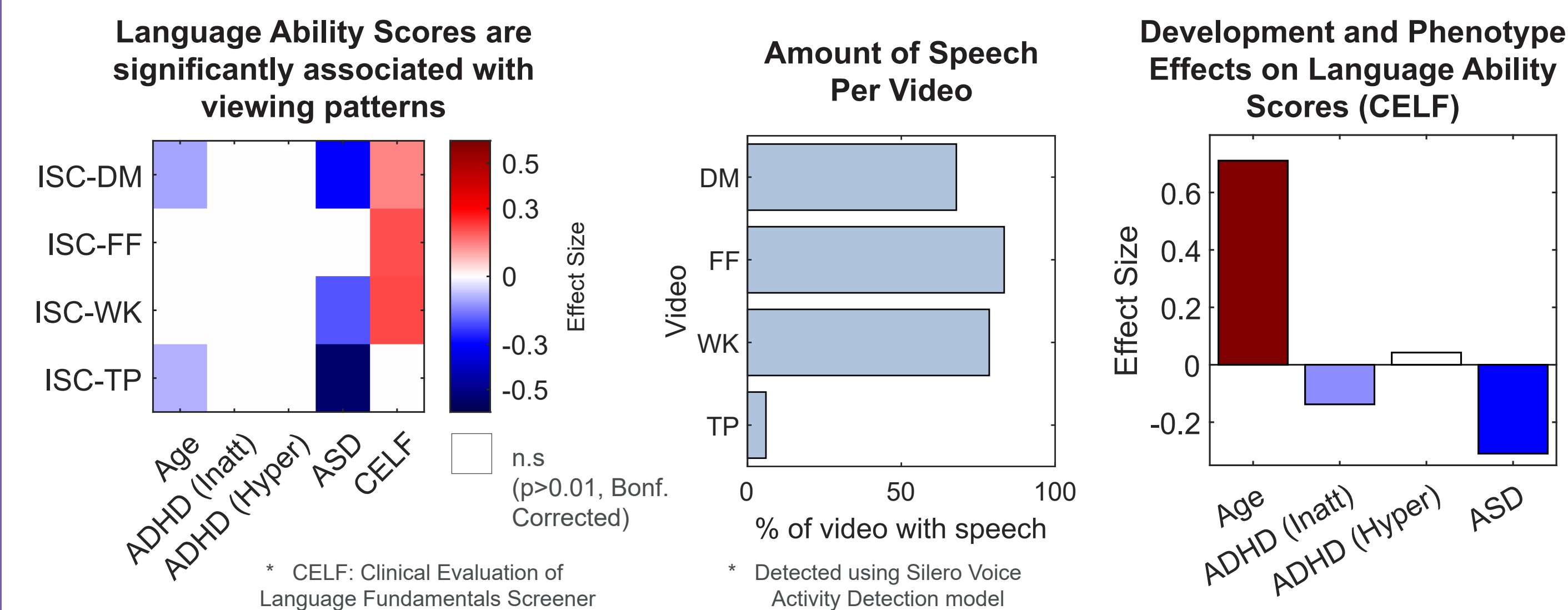


- **ASD** show less typical viewing patterns compared to **non-ASD**, especially in more emotionally-charged videos.
- **ADHD** do not show any difference compared to **non-ADHD**.

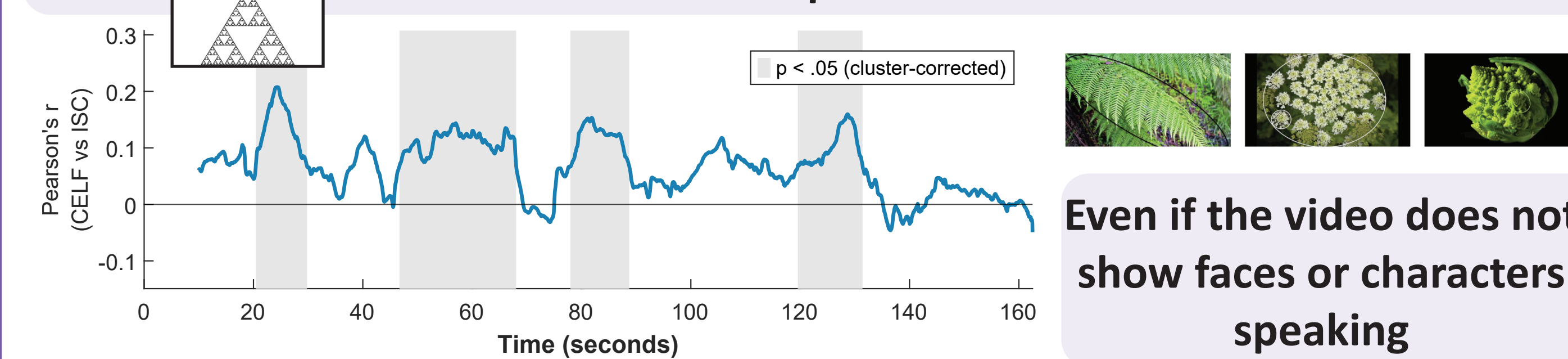
Visual attention shifts over time



Language abilities modulate viewing patterns

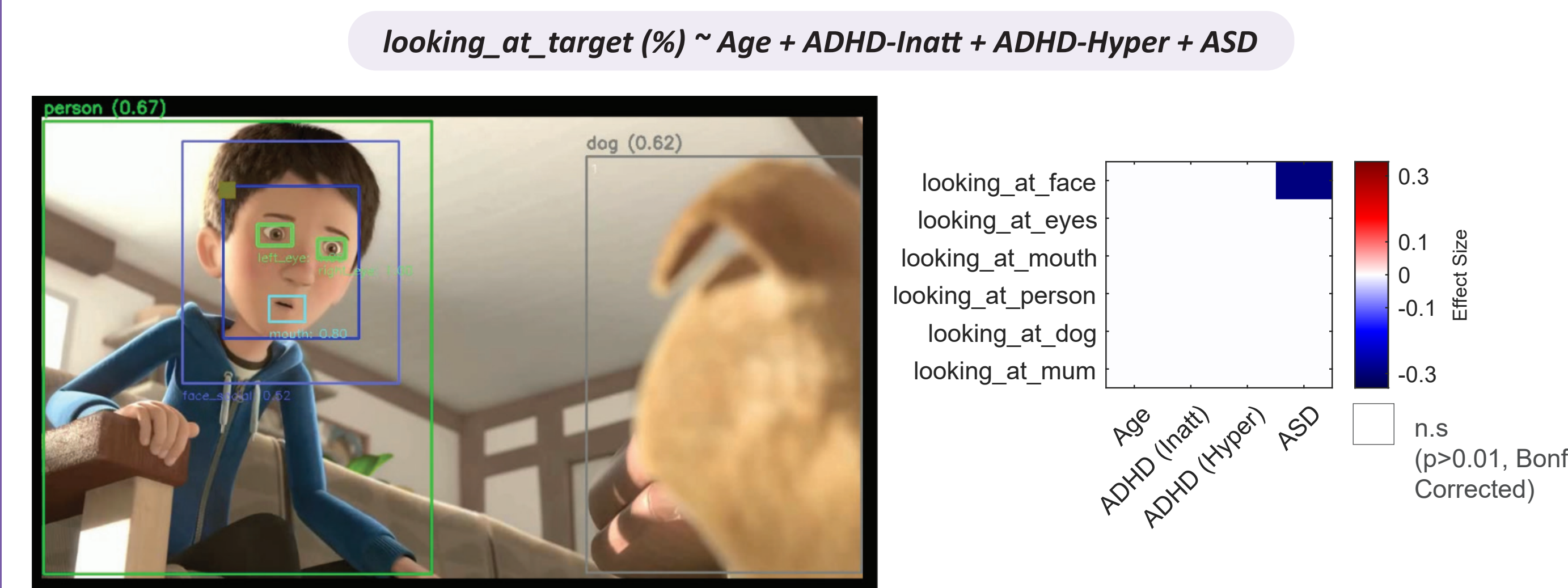


The strength of the language ability-gaze pattern association depends on the total amount of speech within a video



Even if the video does not show faces or characters speaking

ASD allocate attention differently to faces



Highlights

- **ADHD** do not show distinct viewing patterns to **non-ADHD**
 - Pointing to no attentional difficulties in short-form videos?
- **ASD** show atypical viewing patterns, that are dependant on the video content.
- Language abilities (CELF) are significantly associated with typical viewing patterns, **in videos with speech.**
 - Language understanding may be an essential factor for effective visual attention.

Future Questions

- What about language is most important to guide visual attention? Is this mechanism altered in ASD?
- Do ASD find different salient visual features that "distract" them from socially-relevant areas?

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Relevant Article Preprint

