

Background

- Individuals with autism spectrum disorder (ASD) exhibit varying levels of social communication difficulties, impacting both their language and gesture skills^{1,2}.
- Prior research indicates that decreased attention to faces when viewing social interactions correlates with lower social and language abilities in ASD^{3,4}.
- However, it remains unclear how the presence of spoken language during viewed social interactions influences looking patterns.

Objective: To investigate relationships among linguistic and gestural abilities with looking patterns to videos of social interactions with and without spoken language.

Methods

ABC-CT Study Details

- Methodologically rigorous, multi-site evaluation of potential biomarkers in a large sample of children with and without ASD.
- Longitudinal study evaluating children across 6 months, including clinical assessment, electroencephalogram (EEG), and eye-tracking (ET).

Inclusion/Exclusion Criteria

- ASD Group:** Age 6-11; met criteria for ASD based on ADOS-2, ADI-R, and DSM-5; IQ 60-150; stable medication for 8 weeks; no sensory/motor impairments, epilepsy, or genetic/neurological conditions.
- Typically Developing (TD) Group:** Age 6-11; IQ 80-150; stable medication for 8 weeks; no sibling with ASD; no sensory/motor impairments, epilepsy, or genetic/neurological conditions; no clinically significant scores on the *Child and Adolescent Symptom Inventory, 5th Edition (CASI-5)*.

Participant Demographics

	n (Female)	Age (SD)	IQ (SD)
ASD	161 (30)	8.71 (1.62)	95.80 (18.91)
TD	64 (22)	8.73 (1.77)	114.64(13.53)

**Diagnostic groups did not differ on age but were significantly different on sex ($F(1,223)=6.514, p=0.01$) and IQ ($F(1,223)=52.746, p=0.001$).

Measures

- Vineland Adaptive Behavior Scales, 3rd Edition:* Clinician-administered caregiver interview used to assess adaptive behavior functioning, including communication.
 - Expressive v-score
 - Receptive v-score
- Autism Diagnostic Observation Schedule, 2nd Edition (ADOS-2):* Semi-structured, play-based assessment used to evaluate and diagnose ASD across age, developmental level, and language skills.
 - Gesture Codes

ET Acquisition

- Binocular eye-tracking data were collected at 500 Hz using SR EyeLink 1000 Plus.

Methods, cont.

ET Experiment

- Children were presented with videos of two people engaged in a shared activity.
- In the first paradigm, two adult actors played together while looking at each other or at the shared activity (Figure 1)⁵. In the second paradigm, two school-age actors played together or in parallel and did not speak (Figure 2)⁶.
- The log of the ratio of percent looking to *activity* compared to percent looking to *faces* was calculated for valid gaze samples.



Figure 1. ET paradigm in which actors speak during a shared activity.



Figure 2. ET paradigm in which actors do not speak during a shared activity.

Statistical Analysis

- Repeated measures ANOVAs compared the log-ratio of percent looking to activity to percent looking to faces between ET paradigms.
- The relationship between the log-ratio and the *Vineland-3* Communication Scores was analyzed using Pearson's correlations; gesture scores were analyzed using Spearman's correlations.

Results

Speech and Attention to Faces Compared to Activity

- Across both paradigms, children with ASD looked significantly less to faces compared to activity than TD children ($F(1,223)=7.625, p=0.006$).
- Children with ASD looked significantly less to faces compared to activity during videos with speech ($F(1,223)=32.931, p=0.001$).
- In the TD group, there was no significant difference in looking time to faces compared to activity between speech and non speech videos.

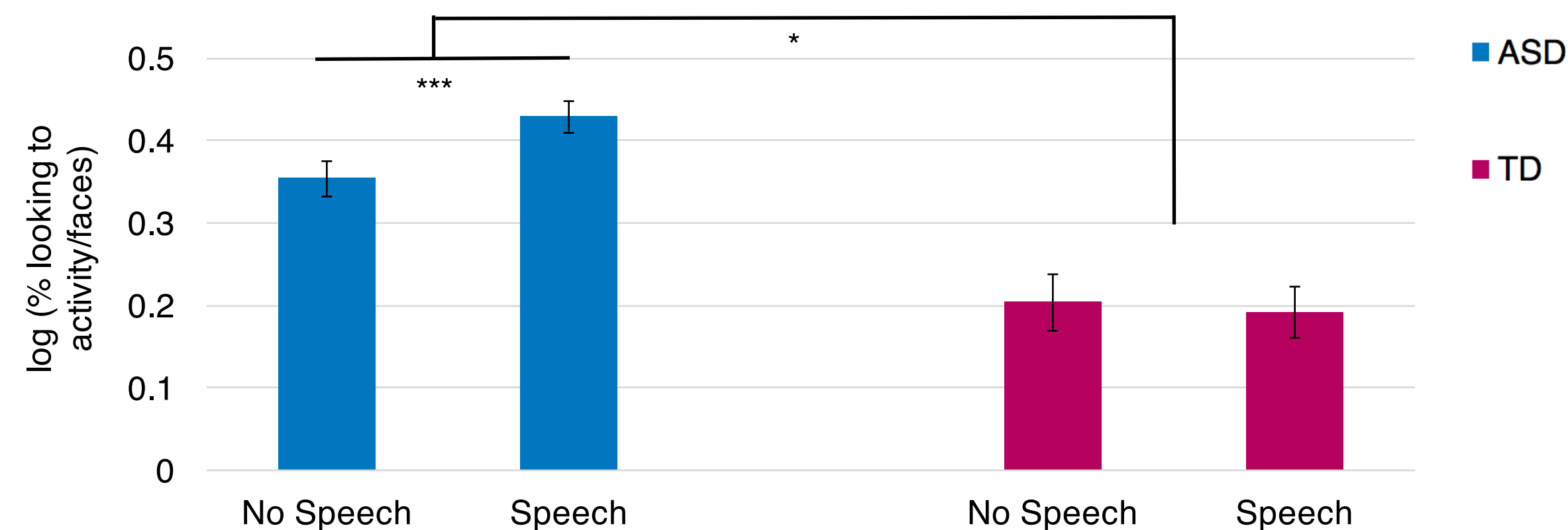


Figure 3. The relationship between attention to faces compared to activity and presence of speech during videos of social interactions. Greater values mean more looking to activity compared to faces. ** $p<0.01$, *** $p<0.001$.

Results, cont.

Language/Gesture Skills and Attention to Faces

- In children with ASD, higher *Vineland-3* expressive language scores significantly correlated with greater looking time to faces during the videos with speech ($r(161)=0.203, p=0.010$).
- In TD children, higher *Vineland-3* receptive language scores significantly correlated with greater looking time to faces during the videos with speech ($r(63)=0.269, p=0.033$).
- ADOS-2* gesture scores did not significantly correlate with looking time to faces during non-speech or speech videos in either diagnostic group.

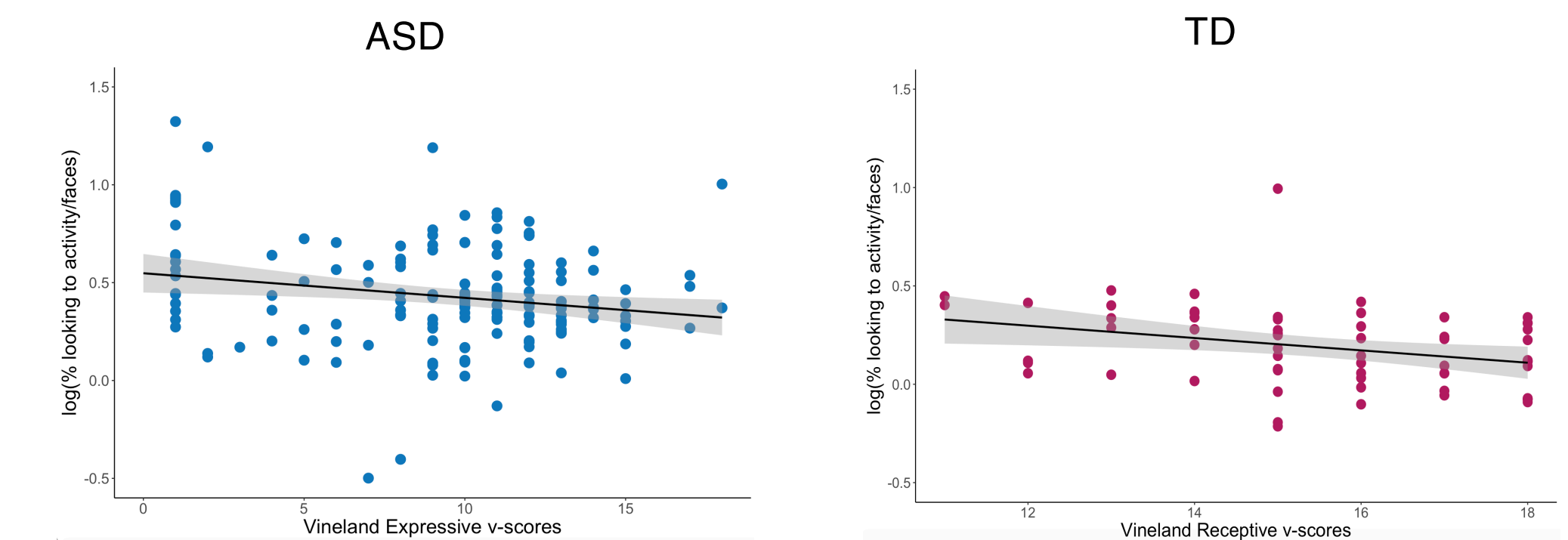


Figure 5. The relationship between receptive and expressive language abilities and looking time to faces during videos with speech.

Discussion

- In children with ASD, the presence of language in videos of social interactions was associated with decreased attention to faces, suggesting that stimuli with spoken language may emulate a social demand; however, greater expressive language functioning in this group was related to increased attention to faces.
- There was no significant difference in attention to faces between the two paradigms in the TD group, demonstrating that the presence of speech in social interaction stimuli does not alter attention to faces.
- These results suggest that speech may modulate visual attention to faces in ASD and that ET studies should carefully consider content of stimuli.
- A limitation of this study is that the sample is not matched on sex or IQ. Future studies should investigate how associated features of ASD, such as social anxiety, impact attention to faces while viewing verbal and nonverbal interactions.

References

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