The Role of Anxiety in Predicting Visual Attention to Faces Among Autistic Children: Results from the Autism Biomarkers Consortium for Clinical Trials (ABC-CT)

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Background

- Children with autism spectrum disorder (ASD) experience higher rates of anxiety disorders than typically developing (TD) peers, with roughly 40% of autistic youth having at least one co-occurring anxiety disorder.[1]
- Research using eye-tracking technology indicates that many autistic children look less to faces[2] and eyes.[3] Similarly, individuals with anxiety may avoid fixations to the eye.[4]
  - For example, recent work by Franke et al. (2024)[5] found that autistic youth looked less at faces than TD youth and that higher self-reported social anxiety was linked to reduced attention to the eyes across both groups.
- However, the specific influence of anxiety symptomatology on visual attention to social stimuli in ASD remains incompletely understood.[6]

Objectives

- Investigate the relationship between social and generalized anxiety symptoms and visual attention to faces in children with and without ASD.
- Confirm and extend the findings of Franke et al. (2024)[5] in a larger sample using naturalistic social scene images.

Methods

Participants

- N=395 children ages 6-11 that participated in the Autism Biomarkers Consortium for Clinical Trials (ABC-CT).

Table 1. Participant demographics

	n (Female)	Age	FSIQ	CASI-5 General Anxiety	CASI-5 Social Anxiety
ASD	276 (65)	8.37 (1.65)	96.73 (18.19)	68.45 (16.07)	61.10 (17.30)
TD	119 (36)	8.36 (1.65)	115.11 (12.55)	47.35 (6.20)	46.60 (7.97)

Note. M (SD) reported. Age reported in years. *T*-scores reported for CASI-5 subscales. Diagnostic groups did not differ on age [*t*(223)=-0.08, *p*=.935], but did significantly differ on full-scale IQ (FSIQ) as measured by the Differential Ability Scales-II (DAS-II) [t(317)=11.57, *p*=<.001].

- Age was not significantly associated with percent looking to faces in the ASD group [*r*(270)=.09, *p*=.136] or in the TD group [*r*(117)=.10, *p*=.276].

Clinical Measures

- *Child and Adolescent Symptom Inventory, Fifth Edition* (CASI-5)
  - Caregiver-reported behavior rating scale for DSM-5 emotional and behavioral disorders in children.
  - General Anxiety *T*-scores and Social Anxiety *T*-scores were used for analyses.

Eye-tracking Acquisition and Experiment

- Binocular eye-tracking data were collected at 500 Hz using a SR Eyelink 1000 Plus.
- Participants were presented with six photographs of solitary or social-interactive activities of children or of children and adults for 20 seconds each (Figure 1).

**Figure 1.** Example eye-tracking stimuli

Data Analysis

- Percent looking to faces was calculated as the number of valid gaze samples in a pre-defined region around the face content divided by the total number of onscreen gaze samples.
- Multiple linear regressions were conducted to determine relationships between anxiety type and percent looking to faces by diagnostic group, covarying for age.

Results

Social Anxiety

- Social anxiety significantly predicted percent looking to faces in the ASD group (β=0.005, *p*=.008) such that increased social anxiety was associated with increased attention to faces.
  - No significant relationships between social anxiety and percent looking to faces were found among the TD group (β=-0.0005, *p*=.945).
- Child age was significantly predictive of increased looking to faces in the ASD group (β=0.003, *p*=.004).
  - Both social anxiety (β=0.005, *p*=.023) and child age (β=0.004, *p*=.024) remained significant predictors after excluding participants with social anxiety *T*-scores at floor (*T*-scores≤50) (Figure 2).

Figure 2. The relationship between social anxiety (*T*-scores>50) and percent looking to faces in the ASD group covarying for age
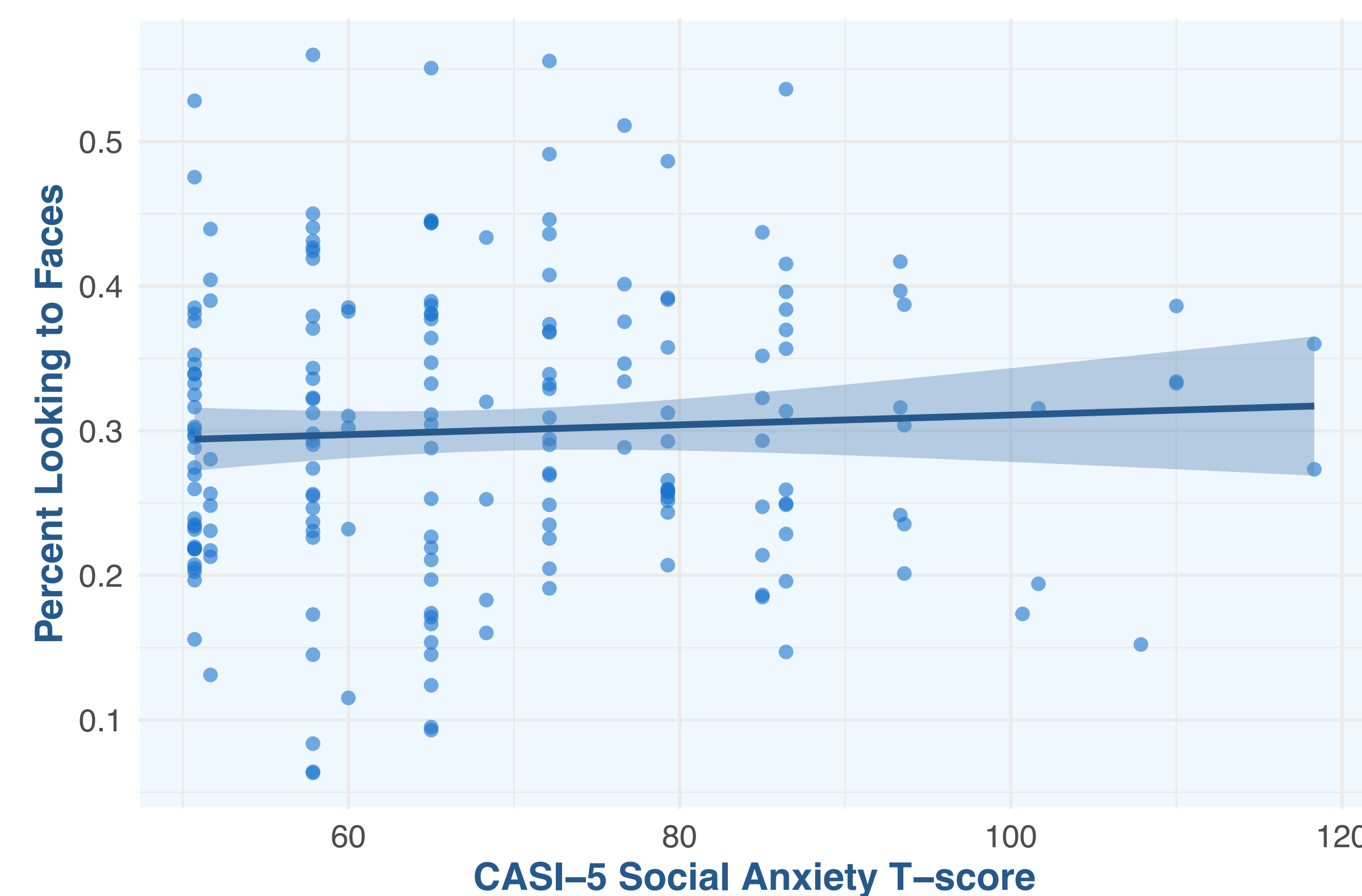
- The interaction between social anxiety and age in the ASD group was significant (β=-0.00004, *p*=.011) such that with increasing age, the positive association between social anxiety and looking to faces was reduced (Figure 3).
  - This effect remained significant after excluding participants with social anxiety *T*-scores at floor (*T*-scores≤50) (β=-0.00005, *p*=.029).

Figure 3. Model predictions of the interaction between social anxiety and child age on percent looking to faces in the ASD group

Child Age
- — + 1 SD (10.01)
- -- Mean (8.36)
- ·· − 1 SD (6.72)
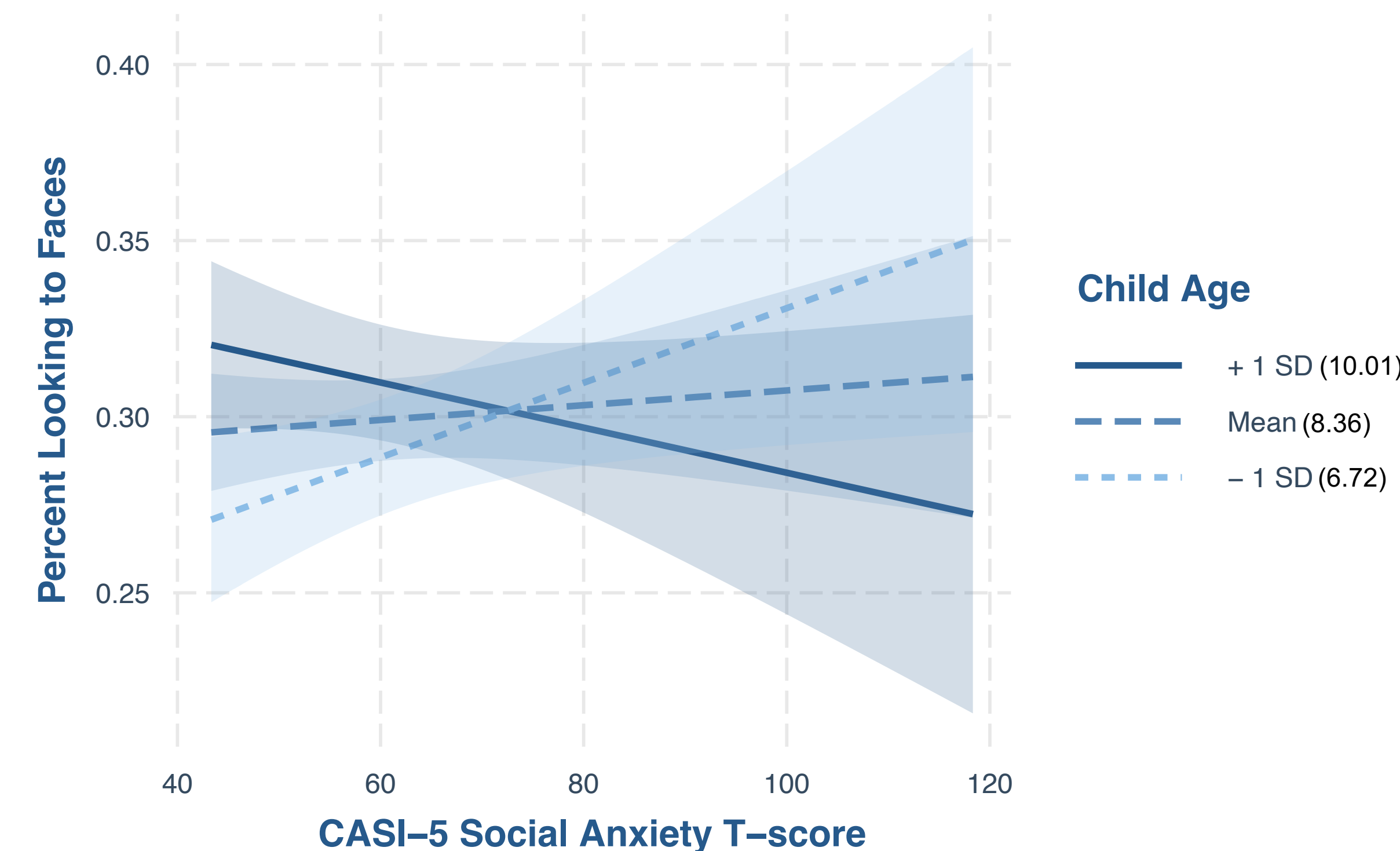
Note. Age reported in years. Predicted values indicate that on average, among younger autistic children (-1 SD of child age), higher social anxiety is associated with increased looking to faces. However, on average, this positive association is not observed among older autistic children (+1 SD of child age).

Results

General Anxiety

- General anxiety did not predict percent looking to faces in the ASD group covarying for age (β=0.003, *p*=.195) (Figure 4).
- No significant relationships between general anxiety and percent looking to faces were found among the TD group (β=0.004, *p*=.546).

Figure 4. The relationship between general anxiety and percent looking to faces in the ASD group covarying for age
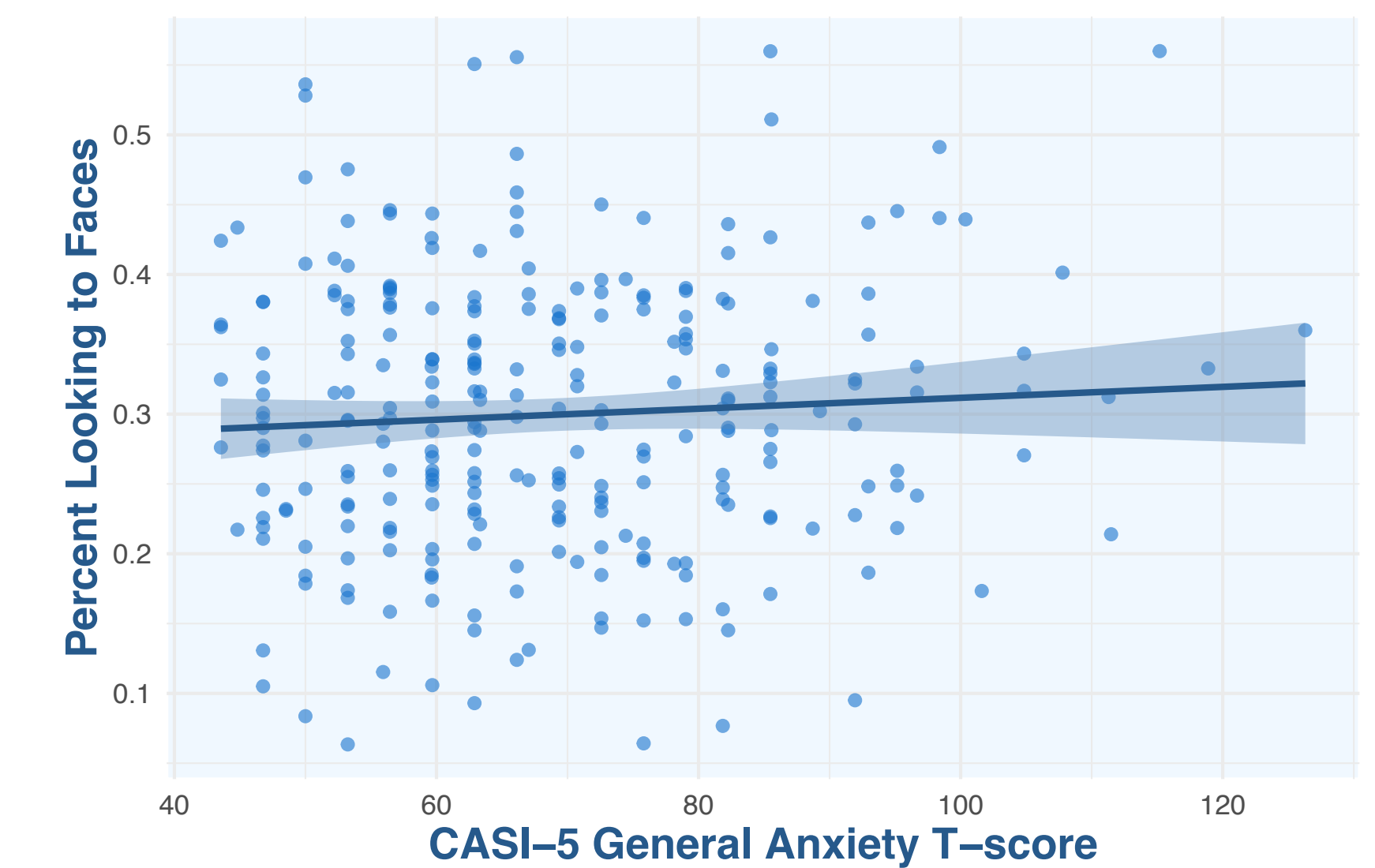
Conclusions

- Social anxiety was significantly predictive of looking to faces in the ASD group but not the TD group.
  - This relationship differed by age such that social anxiety was more strongly associated with increased looking to faces in younger compared to older autistic children.
- Findings diverge from Franke et al. (2024)[5], as social anxiety was related to increased looking to faces among autistic children, though this effect diminished with age. Differences may reflect the use of naturalistic stimuli (vs. isolated face images), a younger sample, and a focus on looking to faces rather than looking to eyes.
- Results are consistent with previous findings that social anxiety differentially influences visual attention to social stimuli across development.[7]
- Group differences and relationships to social attention were not observed for general anxiety, suggesting specific relevance of social anxiety to social visual attention.

Implications

- Characterizing the distinct ways in which social anxiety influences social behavior in autistic children may inform development of supports for autistic individuals.
  - For example, these data suggest that treating anxiety might impact social differences in ASD.

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Funding Sources

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