

## Background

- Males are 3.5 to 4 times more likely than females to be diagnosed with autism spectrum disorder (ASD), with substantial variation in cognitive abilities.<sup>1</sup>
- Reasons for sex difference in diagnoses:
  - Biology → Need to evaluate sex differences on diagnostic tools.<sup>2,3</sup>
  - Socialization →
  - Behavior →
  - Criteria based on males
- Previous research on the gold standard ADOS:
  - ADOS-G (original ADOS based on DSM-IV criteria): Higher rates of restricted, repetitive behaviors, and interests (RRBs) in males.<sup>4,5</sup>
  - ADOS-2 (based on DSM-5 criteria): No differences in overall scores, higher rates of RRBs,<sup>6</sup> excessive interest, hyperactivity among males. More atypicality in direction of facial expressions for females.<sup>7</sup>

## Objective

Ascertain differences in ASD traits by conducting exploratory analyses of how ADOS-2 item scores are impacted by sex, IQ, and overall symptom severity.

## Methods

**Participants:** 228 participants (43.5% female;  $M_{age}=12.78$ ,  $M_{IQ}=102.01$ ,  $SD=19.01$ ) completed the ADOS-2 modules 3 and 4 as part of a multisite NIMH study on sex differences in ASD. Sex was defined as sex assigned at birth.

**Data Analysis:** Item scores were dichotomized such that about half the population fell in each group. Logistic regressions for each ADOS item were run including sex, calibrated severity score (CSS), IQ, and the two- and three-way interactions of variables.

## Acknowledgements

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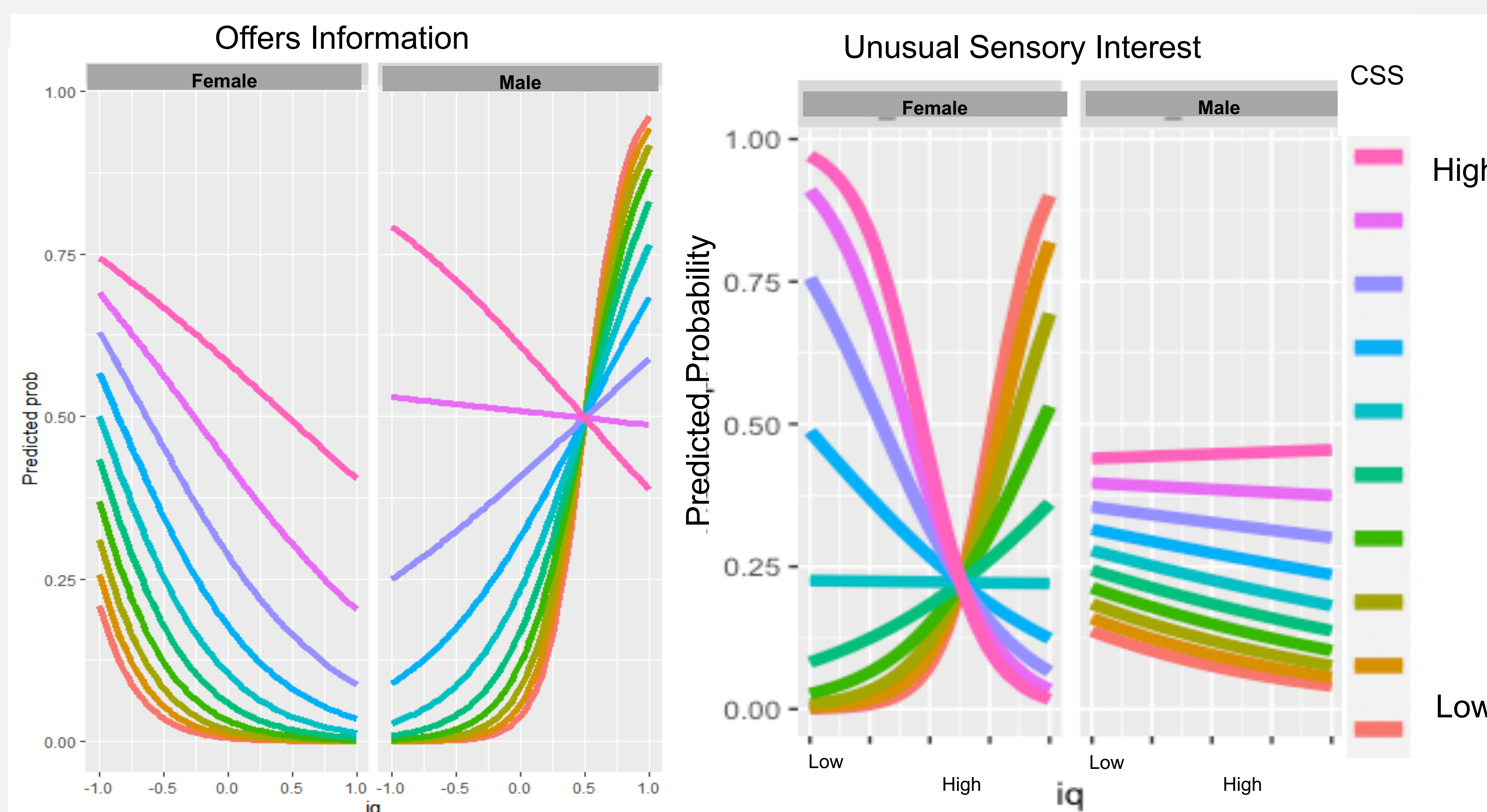
## Results

Variable	Offering of Information	Shared Enjoyment	Gestures	Unusual Sensory Interest
Sex (male as reference group)	0.74*	0.42*	0.61*	-0.03
Total ASD severity	2.27***	2.19***	0.98	0.98
IQ	0.16	0.65	-0.62	-0.07
Sex * Total ASD Severity	-0.76	-0.49	0.12	0.19
Sex * IQ	2.34**	1.02*	0.68	-0.50
Total ASD Severity * IQ	-0.82	-0.01	-1.13	-1.63
Sex * Total ASD Severity * IQ	-2.67*	-1.32	0.48	2.16*

**Table 1.** Logistic regression results indicating the likelihood of scoring high or low on an ADOS items based on sex, CSS, IQ, and interactions

Coefficients are reported. Positive coefficients indicate a higher likelihood of failing the item. \* $p \leq .05$ , \*\* $p \leq .01$  \*\*\* $p \leq .001$

**Figures 1 and 2.** IQ modulation of ASD symptoms in males and females.



## Discussion

- Contrary to earlier research, some **sex differences** were found in the **social communication domains**.<sup>6</sup>
- Symptom severity and IQ modulate the likelihood of specific deficits differently between sexes:
  - Males** had more **difficulty offering information** and there was a similar pattern for **females in unusual sensory interests** if the individual had:
    - Higher severity of ASD symptoms + Low IQ
    - OR
    - Lower severity of ASD symptoms + High IQ
- The probability of deficits in offering information was mostly lawful for females, and the same was true for males in unusual sensory interests.
  - Findings about males with higher IQ having difficulty offering information and sharing enjoyment may support the “Empathizing-Systematizing theory,” that individuals with ASD on average show more “masculine,” systems-oriented” approaches.<sup>7</sup>
    - Clinician perceptions of males’ shared enjoyment may be overly biased on the males’ ability to offer information.
  - Most research on sex differences in RRBs focused on motor mannerisms and intense interests.<sup>7</sup> Our findings suggests a need to further understand sex-specific presentations of sensory sensitivities and interests among females with ASD.
- Some sex differences were consistent with the literature:
  - Males less likely to **pair gestures** with **verbal communication**. Gesture use may help females with ASD camouflage → gesture use may be less useful as a diagnostic criteria of ASD in females.<sup>7</sup>
- Future research:**
  - Sex differences in samples with and without ASD.
  - The impact of clinician characteristics (e.g., sex, ASD diagnosis) on diagnosis for males and females.
  - Focus on gender differences and gender diversity.

## Conclusions

The primary sex differences in ADOS items appears to be in **how IQ modulates the severity of symptoms**, only some of which are included in the diagnostic algorithm. While clinicians may need to be **sensitive to some IQ related differences** that present differently among males and females, overall, there are likely **few sex differences** that should impact ADOS scoring.