

# Heritability of Pragmatic Language in Twins with Autism Spectrum Disorders

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## INTRODUCTION

Autism is characterized by having abnormal or impaired development in social interaction, language and communication, and restricted or repetitive behaviors (APA, 2000).

Evidence that Autism Spectrum Disorder (ASD) has strong genetic contributions has emerged from studies researching heritability of ASD in twins. These studies have found that concordance rates of ASD among monozygotic twins (MZ) are higher than among dizygotic twins (DZ) (Bailey et al., 1995)

Pragmatic language is the component of language most seriously impaired in autism (Baltaxe, 1977; Tager-Flusberg, & Lord, 2005).

The current study asked the following questions:

1. Is pragmatic language ability poorer in individuals with ASD than Typically Developing (TD) individuals?
2. Is verbal IQ (VIQ) related to pragmatic language ability?
3. Is pragmatic language ability correlated within twin pairs?

## METHODS

### Participants

- All TD participants in the study were MZ twins.
- ASD participants were accepted if they were either MZ or DZ twins concordant for ASD due to recruitment challenges.
- All individuals in ASD group had to have a prior diagnosis of Autistic Disorder, Asperger's Disorder, or (PDD-NOS) to participate.
- TD twins with immediate family members with an ASD were excluded.

### Participant Characteristics: Means (SD), Ranges

	N (M)	Age	FSIQ*	VIQ*
Typical	15 (6)	11.6 (5.1) 5.2-21.8	119.9 (5.9) 108-129	122.5 (9.1) 106-136
ASD	13 (10)	13.3 (5.7) 6.6-22.0	99.8 (11.7) 88-134	98.9 (11.9) 87-122

Abbreviations: M: male, FSIQ: Full Scale IQ, VIQ: Verbal IQ, PIQ: Performance IQ  
\* $p < .001$

### Measures

**Verbal and Nonverbal Intelligence.** The Wechsler Abbreviated Scale of Intelligence (WASI) was administered to provide a standard measure of intellectual ability (Wechsler, 1999).

**Autism Diagnostic Assessments.** The Autism Diagnostic Interview-Revised (ADI-R) and the Autism Diagnostic Observation Schedule (ADOS) was administered to ASD participants to confirm prior diagnosis (Rutter et al., 2003; Lord et al., 2002).

**Pragmatic language Ability.** The Pragmatic Rating Scale-Modified, a 15 item scaled behavioral coding system measuring both verbal and nonverbal pragmatic language, was administered to participants as a standard measure of pragmatic language ability. Example items include: (1) empathy/comments on others emotions, (2) unusual eye contact, (3) reformulation, and (4) descriptive gestures (Ruser et al., 2007).

### Procedure

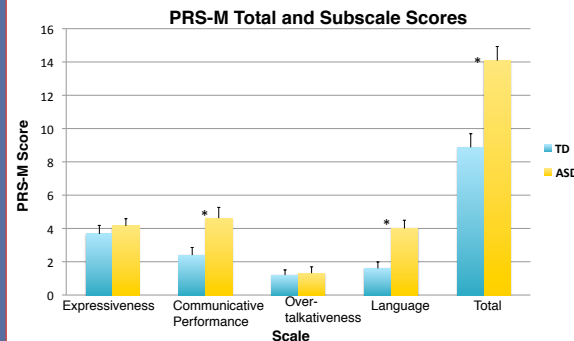
- Participants were videotaped while they were interviewed by a clinical psychologist.
- Interview questions were targeted at learning about the participants social difficulties, relationships, and emotions.
- These videos were then edited to conceal diagnostic group. Videos varied from 13-18 minutes in length.
- A coding group met every other week for two months to become reliable with coding the PRS-M and developed consensus scores for training videos.
- A team of two coders were trained on the PRS-M and became reliable, defined as  $\geq 80\%$ , on coding training videos.
- The coding team, naïve to diagnostic group, then coded the PRS-M for participants involved in the study.
- 25% of videos were double coded to check for reliability.



## RESULTS

### Group Differences

Statistical analysis showed that group differences in overall PRS-M scores were based on diagnostic status,  $t(26) = -4.39, p < .001$ . Group differences were also found for the Communicative Performance,  $t(26) = -2.86, p < .01$  and Language,  $t(26) = -3.87, p = .001$  subscales. Groups did not differ for the Emotional expressiveness and Over-talkativeness subscales.



Given that groups also significantly differed on Verbal IQ, ANCOVA was conducted with VIQ entered as a covariate. Group differences remained for Overall PRS-M scores,  $F(1,25) = 5.92, p < .05$ , as well as the Language subscale,  $F(1,25) = 6.32, p < .05$ . The effect of group on Communicative Performance was no longer significant when controlling for VIQ.

### Verbal IQ and Pragmatic Language Ability

With groups combined, Total PRS-M scores correlated with VIQ,  $r(28) = -.55, p < .01$ . Higher Verbal IQ related to better performance on the PRS-M. Communicative Performance,  $r(28) = -.54, p < .01$ , and Language,  $r(28) = -.45, p < .05$ , subscales were also significantly correlated with VIQ. Expressiveness and Over-talkativeness subscales were not significantly correlated.

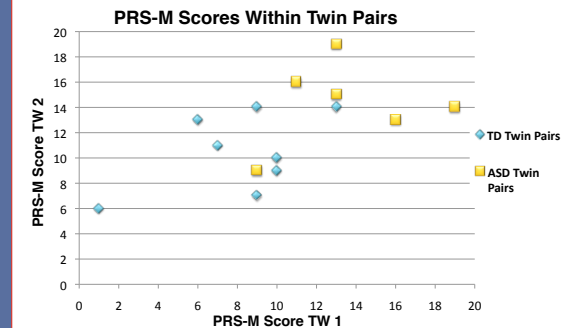
Because groups differed on PRS-M and VIQ, the relation between these variables was also examined within groups.

- For the TD group, there were no significant correlations between VIQ and PRS-M or its subscales. This suggests that among typically developing individuals the PRS-M is measuring an independent aspect of communication functioning from VIQ.
- For the ASD group, Communicative Performance ability significantly related to VIQ. Higher VIQ scores related to better performance on PRS-M. Total PRS-M and its other subscales did not relate to VIQ  $r(13) = -.57, p < .05$ .

Together, these results suggest that the relations found with groups combined may have been due to overall group differences on these scales.

### Pragmatic Language Ability within Twin Pairs

Total PRS-M scores within twin pairs were significantly related  $r(14) = .59, p < .05$ . In addition, a significant relationship also existed for Communicative Performance,  $r(14) = .69, p < .01$ , and Language  $r(14) = .61, p < .05$ . Correlations within TD twin pairs were not significant. In addition, there was only a significant correlation for Communicative Performance within ASD twin pairs  $r(6) = .91, p < .05$ . The non-significant correlations between groups could be due to small sample size.



## DISCUSSION

- This study replicated previous findings that pragmatic language ability is poorer in individuals with autism than typically developing individuals.
- The study also determined that significant differences remained between TD and ASD individuals when controlling for VIQ, this finding supports the idea that the PRS-M and VIQ measure different aspects of language.
- Correlations between VIQ and the PRS-M did exist. It should be of note that in order for an ASD candidate to be scored on pragmatic language ability they needed to have verbal fluency.
- We are in the process of collecting a larger sample to validate these findings.

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