Hiding in Plain Sight: An Analysis of Gesture Use and the 'Female Camouflage Effect' in Autistic Females

Jessica E. Goldblum[1], Clare Harrop[1,], & Connie Kasari[2]

[1]University of North Carolina at Chapel Hill, [2]University of California, Los Angeles

Background

Autism spectrum disorder (ASD) affects boys and girls ~3:1. However, ASD girls are understudied, underdiagnosed, and may be ***camouflaging*** their symptoms – via compensatory behaviors – to appear more social. Camouflaging is mentally exhausting, can prevent a correct ASD diagnosis, and **can delay necessary early intervention**.

Gesture use is an early form of social communication (Table 2) and allows for initiating (**I**) and responding (**R**) to joint attention (**JA**) and behavioral requests (**BR**). Gestures are a core deficit in ASD (Kasari et al., 2006). ASD girls camouflage with learned behaviors – including gestures (Rynkiewicz et al., 2016) – more than ASD boys and typically developing children. However, camouflage using gestures has yet to be studied in young girls with ASD. We hypothesize that, for autistic children aged 2-5, ***girls' early-life gesture use will be markedly different than those of boys', indicating camouflage***.

Aims

We aim to further delineate ways in which **young girls** camouflage their ASD symptomatology by exploring possible sex differences in:

(1) Rate of gesture use

(2) Gesture typology

Method

Subjects

77 autistic children (39 girls and 38 boys) 2-5yrs were recruited from 4 UCLA studies. Girls and boys were matched by chronological and diagnostic age from scores on the ADOS-2 (Lord et al., 2012.) and the Mullen Scales of Early Learning (MSEL; Mullen, 1995).

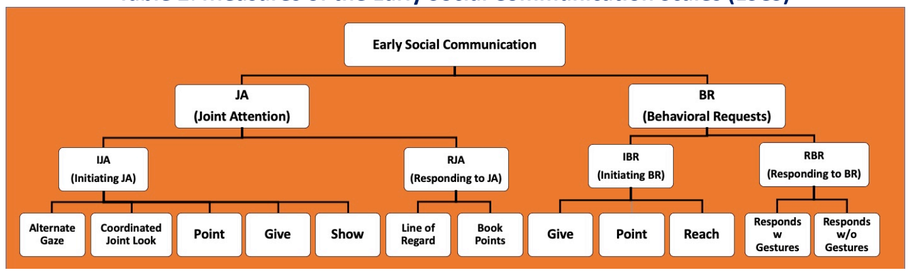
Measures and Outcome Variables

Rate and quality of **IJA**, **RJA**, **IBR**, and **RBR** bids were measured with the Early Social Communication Scales (ESCS; Mundy et al., 2013). Univariate ANOVAs tested for sex differences in ESCS bids, as well as interaction effects of participants' chronological age and MSEL age equivalents on sex.

Table 1: Sample Characteristics

		Females		Males	
		Frequency	*μ*	Frequency	*μ*
Ethnicity	African American	4		2	
	Asian	4		2	
	Caucasian	14		16	
	Hispanic	4		6	
	Other/Multi Racial	6		7	
ADOS Module	1	32		33	
	2	7		7	
	missing	1		0	
ADOS Total Score at Entry			15		16
Age in Months at Entry			41		40
MSEL Developmental Quotient			63.77		64.78
MSEL Expressive Age Equivalent			21.69		22.08
MSEL Receptive Age Equivalent			22.44		23.35

Table 2: Measures of the Early Social Communication Scales (ESCS)



IJA or IBR – Point

IBR – Reach

IJA – Show

Higher-Skilled Gesture Use in ASD Females

Figure 1

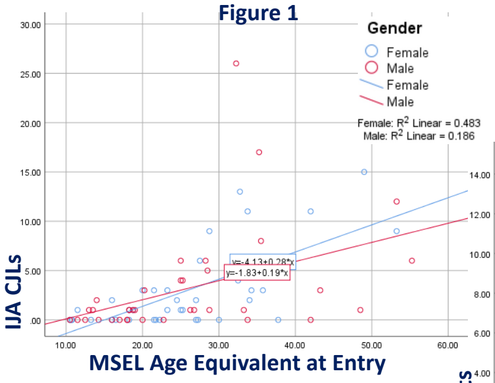
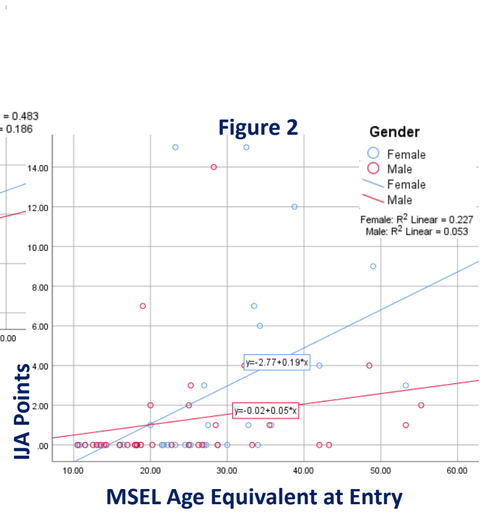


Figure 2



More developmentally advanced females show more IJA coordinated joint looks (Figure 1) and IJA points (Figure 2)

Table 3: Results

Joint Attention						Behavioral Requests					
	ESCS Behavior	Steps	F	p	η^2		ESCS Behavior	Steps	F	p	η^2
IJA	Alternate Gaze	Sex	0.012	0.915	0.000	IBR	Give	Sex	1.509	0.223	0.021
		Sex * CA	1.520	0.225	0.041			Sex * CA	1.415	0.250	0.038
		Sex * AE	2.000	0.143	0.053			Sex * AE	1.690	0.192	0.045
	Coordinated Joint	Sex	0.000	0.980	0.000		Point	Sex	8.340	0.005**	0.100
		Sex * CA	0.676	0.512	0.019			Sex * CA	5.720	0.005**	0.140
		Sex * AE	7.710	0.001**	0.180			Sex * AE	0.640	0.530	0.018
	Give	Sex	0.300	0.580	0.004		Reach	Sex	0.484	0.489	0.007
		Sex * CA	0.746	0.478	0.021			Sex * CA	4.960	0.010*	0.120
		Sex * AE	5.480	0.006**	0.130			Sex * AE	0.128	0.880	0.004
	Point	Sex	2.080	0.150	0.028	RBR	Responding w/ Gestures	Sex	4.640	0.035	0.061
		Sex * CA	0.350	0.706	0.010			Sex * CA	2.545	0.086	0.067
		Sex * AE	3.790	0.027*	0.090			Sex * AE	1.194	0.309	0.033
	Show	Sex	3.160	0.080	0.043		Responding w/o Gestures	Sex	8.120	0.006**	0.100
		Sex * CA	2.540	0.086	0.067			Sex * CA	2.900	0.060	0.070
		Sex * AE	0.059	0.943	0.002			Sex * AE	7.770	0.001**	0.180
RJA	Line of Regard	Sex	0.060	0.807	0.001						
		Sex * CA	0.081	0.922	0.002						
		Sex * AE	16.410	0.000***	0.316						
	Book Points	Sex	1.256	0.266	0.017						
		Sex * CA	4.260	0.020*	0.110						
		Sex * AE	3.570	0.030*	0.090						

*p < .05. **p < .01. ***p < .001.

Results

Between-sex differences (Table 3)

Males had more IBR points (p = .005), while ***females*** had more RBRs to examiner's BRs with and without gestures (p= .03, p=.006).
Sex differences in IJA shows approached significance (p=.08).

Sex * CA (Chronological Age) Interactions (Table 3)

With age, males used more IBR points (p=.005) and reaches (p=.01).
With age, females had more RJAs to examiner's book points (p=.02).
A sex by age interaction on IJA shows approached significance (p=.086).

Sex * MSEL AE (Age Equivalent) Interactions (Table 3)

More ***developmentally advanced females had*** **more IJA coordinated looks (p=.001) and IJA points (p=.027)** and more RJAs to examiner's line of regard (p=.000) and book points (p=.03).
The same pattern was shown for IJA gives (p=.006), but this effect was driven by too few cases.

Discussion

In a large sample of young children with ASD, results show sex differences in early gesture use, with moderation effects of chronological age and age equivalence on JA and BR behaviors.

While boys initiated more points and reaches (with age) to request, **more developmentally advanced girls initiated – and responded to – joint attention at higher rates with higher-level skills and gestures (points and coordinated joint looks).** ***This supports our hypothesis that gesture use plays a part in the 'female camouflage effect'.***

Overall, our data show that 2-5-year-old ASD females camouflage their ASD symptoms by initiating JA gestures *and* by responding to others' JA and BR bids. As the ADOS-2 and other ASD diagnostic assessments evaluate gestures, knowledge of camouflaging by gestures use is critical in capturing more ASD girls within the diagnostic process.

Future research should examine girls' ***responding*** behaviors as a means of behavioral camouflage. Advancing the investigation of the 'Female Camouflage Effect' will allow us to better (and more successfully) diagnose girls who have autism spectrum disorder, ultimately expediting needed early intervention.

References

Kasari, C., Freeman, S., & Paparella, T. (2006). Joint attention and symbolic play in young children with autism: A randomized controlled intervention study. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, *47*(6), 611–620. https://doi.org/10.1111/j.1469-7610.2005.01567.x

Lord, C., Rutter, M. L., DiLavore, P. S., Risi, S., Gotham, K., & Bishop, S. L. (2012). *Autism Diagnostic Observation Schedule - Second Edition (ADOS-*2). WPS.

Mullen, E. M. (1995). Mullen scales of early learning. Circle Pines, MN: American Guidance Service Inc.

Mundy, P., Delgado, C., Block, J., Venezia, M., Hogan, A., & Seibert, J. (2003). A manual for the Abridged Early Social Communication Scales (ESCS). Coral Cables: University of Miami.

Rynkiewicz, A., Schuller, B., Marchi, E., Piana, S., Camurri, A., Lassalle, A., & Baron-Cohen, S. (2016). An investigation of the "female camouflage effect" in autism using a computerized ADOS-2 and a test of sex/gender differences. *Molecular Autism*, *7*(1). https://doi.org/10.1186/s13229-016-0073-0

Funding

UL1TR001111; North Carolina Translational and Clinical Sciences Institute, University of North Carolina at Chapel Hill. KL2 Award = Harrop