INTRODUCTION
Rates of socially directing vocalizations (e.g., cries, laughter, and babbling) could indicate risk for autism spectrum disorder before age 2.3
Only a small number of studies have quantified social directedness of vocalizations in high risk infants
Systematic study of the relationship between types of early vocalizations and social directedness could enhance early prediction efforts

METHOD
Sample
Audio-visual recordings of Communication and Symbolic Behavior Scales (CSBS) or Autism Observation Schedule for Infants from the Infant Brain Imaging Study (IBIS)
Groups matched on 24 month Mullen Visual Reception, maternal education, and sex ratio

<table>
<thead>
<tr>
<th>Group</th>
<th>12-month N (female N)</th>
<th>24-month N (female N)</th>
<th>24-month Mullen VR Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Risk (LR)</td>
<td>12 (2)</td>
<td>15 (2)</td>
<td>49.8 (8.6)</td>
</tr>
<tr>
<td>High Risk No ASD (HR-)</td>
<td>14 (2)</td>
<td>15 (3)</td>
<td>48.9 (7.5)</td>
</tr>
<tr>
<td>High Risk ASD (ASD)</td>
<td>14 (2)</td>
<td>13 (2)</td>
<td>47.7 (9.5)</td>
</tr>
</tbody>
</table>

Segmentation and Annotation
Infant vocalizations segmented using ELAN R
Rated as speech, non-speech, or vegetative (not analyzed) (2 raters 88% agreement, kappa=.68, resolved through consensus)
Rated as socially directed based on: orienting, use of gesture, making a request, or responding to a question (2 raters, 83% agreement, kappa=.66, 3rd rater adjudication)

Analysis
Number of directed total, speech-like, and non-speech vocalizations were DVs in generalized linear models with diagnosis as a predictor and ASD as the reference group
Proportions (directed versus undirected) fit with a binomial distribution, and counts (number directed) fit with a Poisson distribution with the log of recording time as an offset

RESULTS
Longitudinal
A significant diagnosis-by-age interaction was observed for proportion of total and speech-like vocalizations directed
LR infants showed a steeper increase in this proportion than ASD infants between 12 and 24 months

12 months
Total Vocalizations ASD < HR, Speech-like ASD < HR, Non-speech ASD < HR, LR
Number Directed
Total Vocalizations ASD < HR, LR, Speech-like ASD < HR, LR, Non-speech ASD < HR, LR

24 months
Total Vocalizations ASD < HR, LR, Speech-like ASD < HR, LR, Non-speech ASD < HR, LR
Number Directed
Total Vocalizations ASD < HR, LR, Speech-like ASD < HR, LR, Non-speech ASD < HR, LR

DISCUSSION
By age 1, infants who go on to receive an ASD diagnosis direct fewer vocalizations to others than ASD infants between 12 and 24 months

Both speech-like and non-speech vocalizations are less directed

Further study of the clinical utility of directed vocalizations for early detection is warranted

REFERENCES:
2. Center for Autism Research, Children’s Hospital of Philadelphia, Philadelphia, PA
3. Department of Psychology, University of Pennsylvania, Philadelphia, PA
4. Washington University School of Medicine, St. Louis, MO
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