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Out of the Mouths of Babes: Prelinguistic Vocalizations in Infants at Risk for Autism Spectrum Disorders

Rhea Paul
Sacred Heart University, paulr4@sacredheart.edu

Katyrzyna Chawarska
Yale Child Study Center
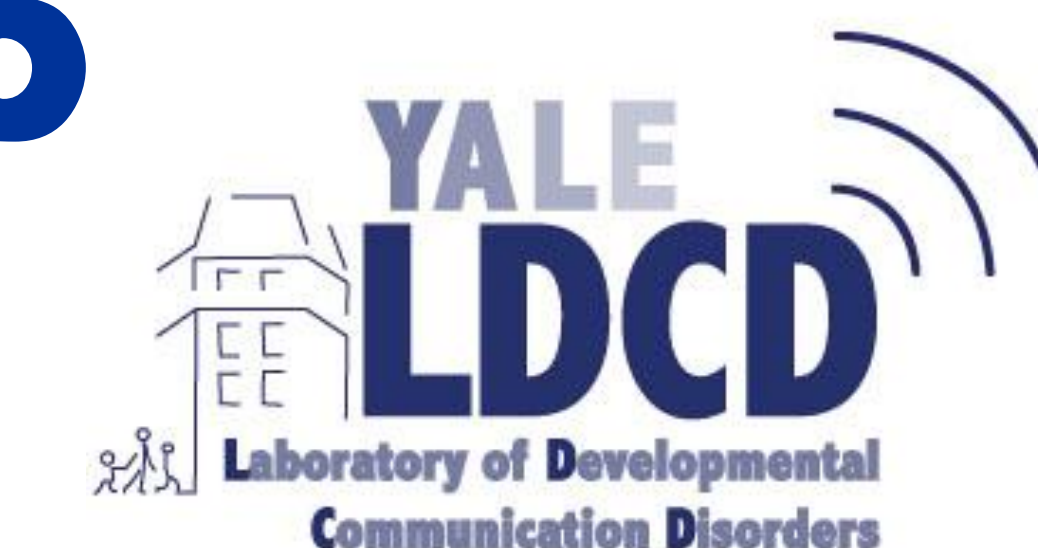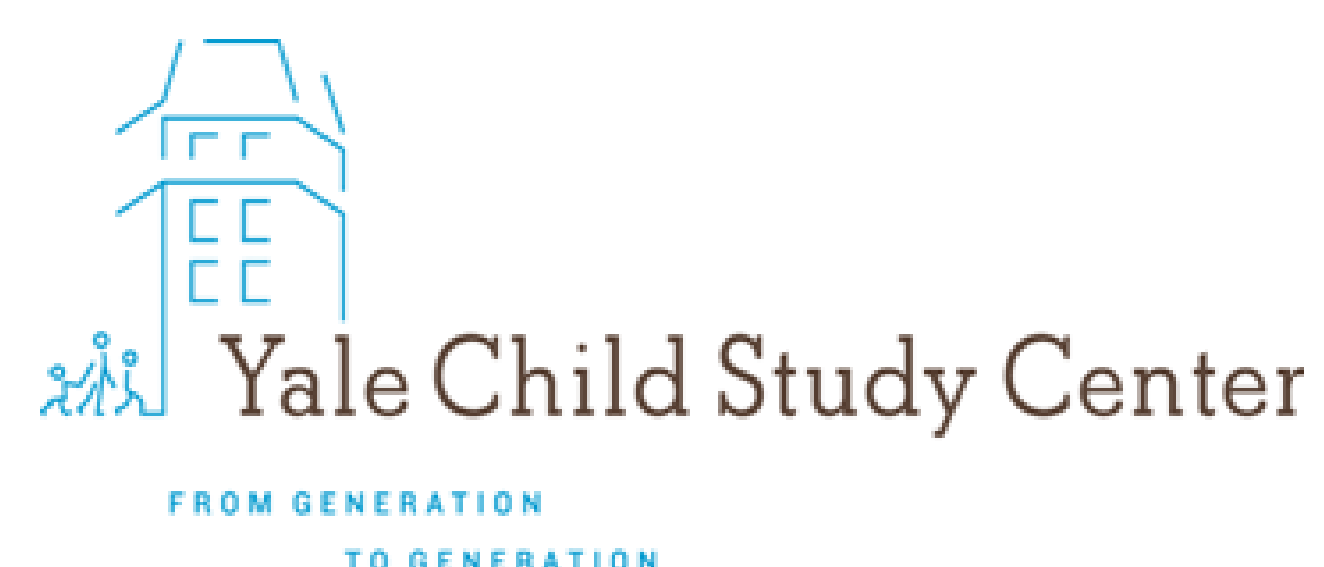
Yael Fuerst

Lauren Berkovits

Ami Klin

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Rhea Paul, Katyrzyna Chawarska, Yale Fuerst, Lauren Berkovits, and Ami Klin

Yale School of Medicine, Child Study Center

Rationale

- **Vocal behavior** in typical infants **predicts speech** development (Oller, 1999; McCune & Vihman, 2001).
- **Language** is almost always **delayed in ASD** (Tager-Flusberg et al, 2005).
- **Prosody** is often **unusual** in ASD (Shriberg et al., 2001).
- Could some of these differences have roots in early vocal behavior?
- Can early vocal behavior
    - Predict language development in ASD?
    - Serve as an early indicator of risk?

Aims

- To **examine vocal production** in infants at high risk for ASD due to the presence of an older sibling with ASD
- To **document changes in vocal behavior** over the first year of life
- To **compare** vocal behavior at 6, 9, and 12 months in **children at high and low risk**
- To examine the **relations between vocal behavior** in the first year **and outcome** at 24 mo.

Participants

- Subject groups:
    - **High Risk**: Infants with sibling diagnosed with ASD
    - **Low Risk**: Infants without diagnosed sibling
- Subject visits:
    - Invited at **6, 9, 12, and 24** mo.
    - Not all subjects made all visits:
        - Six month visit:
            High-risk n= 28; Low-risk n=20
        - Nine month visit
            High-risk n=37; Low-risk n=20
        - Twelve month visit
            High-risk n=38; Low-risk n =23
        - Twenty-four month visit:
            High-risk n=24; Low-risk n=21

Method

- **Participant Characterization**:
    - Mullen Scales of Early Learning administered at 6 and 12 mo. visits.
    - **Vocalization samples** were collected from a timed five-minute parent-child interaction and digitally recorded.
- **Transcription**:
    - **Speech-like**: vocalizations containing consonants and/or vowels that could be represented by phonetic symbols.
    - **Non-speech** vocalizations without recognizable consonants, vowels or speech-like resonance.
- First 50 speech-like vocalizations were transcribed; all non-speech vocalizations occurring within the same time period were tallied and coded.

Procedures

- **Coding**.
    - **Speech**: vocalizations were transcribed with broad phonemic transcription
        - **Consonant inventory** (Shriberg & Kwiatkowski,)
        - **Syllable Structure Level** (Paul & Jennings, 1992)
            - **Level 1**: vowels (V) or continuant single consonants (C)
            - **Level 2**: single C plus V (/paba/)
            - **Level 3**: two or more different Cs plus Vs (/pqti/).
    - **Non-Speech**: vocalizations were identified and counted according to Schienkopf et al. (2000)
    - Each assigned to one of the following categories:
        - **Distress**: Crying, whining or fussing.
        - **Delight**: Laughing or giggling.
        - **Atypical**: Unusual prosodic character but not laughs or cries:
            - **Squeal**: High-pitched vocalization.
            - **Growl**: Low-pitched vocalization.
            - **Yell**: Loud, high-intensity vocalization.
        - **Other**: Not otherwise classified

Outcomes at 24 mo.

Follow-up at 24 months
- *Mullen Scales of Early Learning*
- *Autism Diagnostic Observation Scale-Toddler Module* (C. Lord, Rutter, M., DiLavore, P.C., Risi, S, 2002),
- Consensus clinical diagnosis; presence of autistic symptoms
    - based on observations and assessments with experienced clinicians blind to the participants' risk status.

Results-Vocalization Findings

Vocalization Types at 6, 9, and 12 months

Consonant and Syllable Types at 6, 9, and 12 months
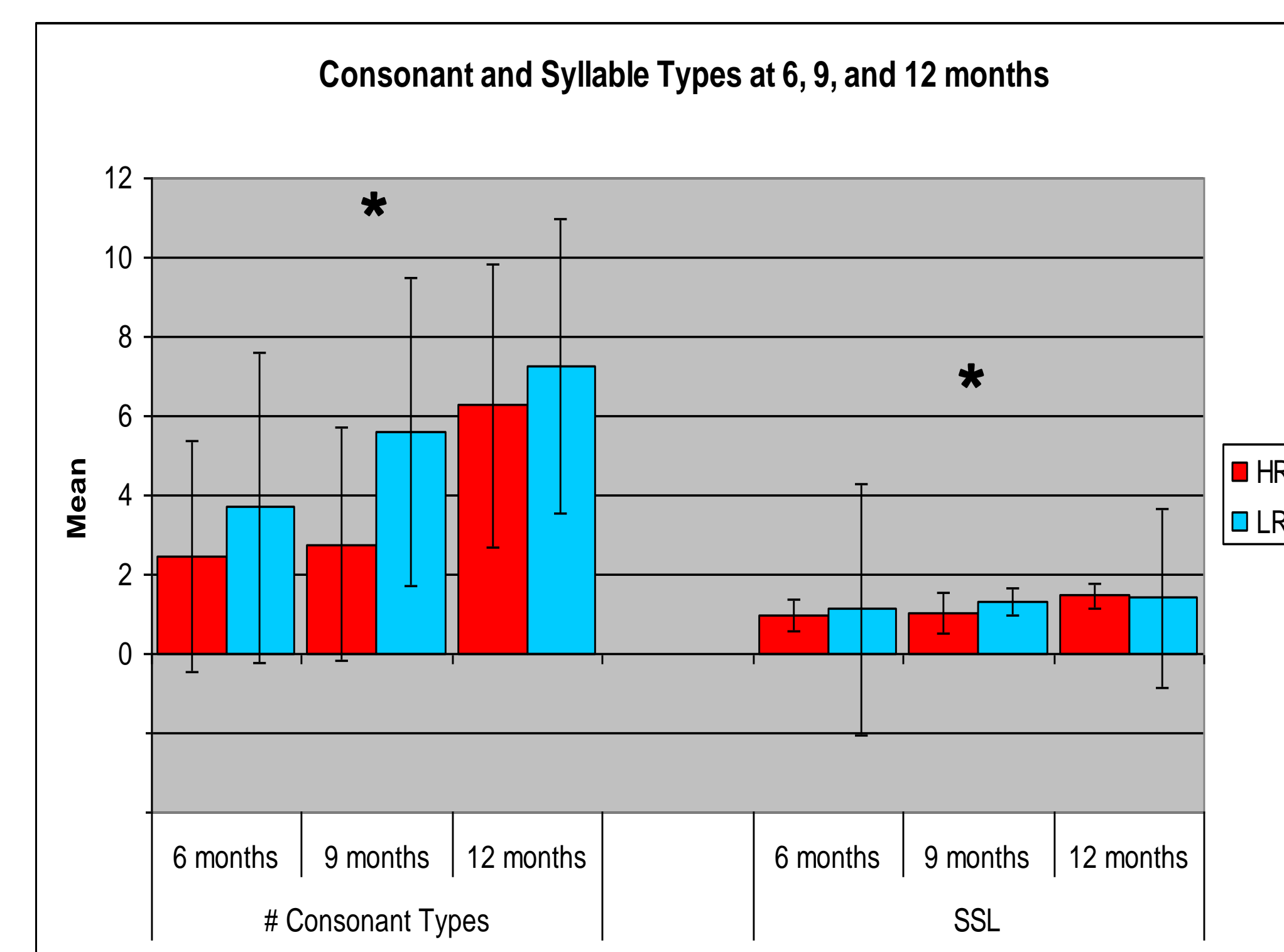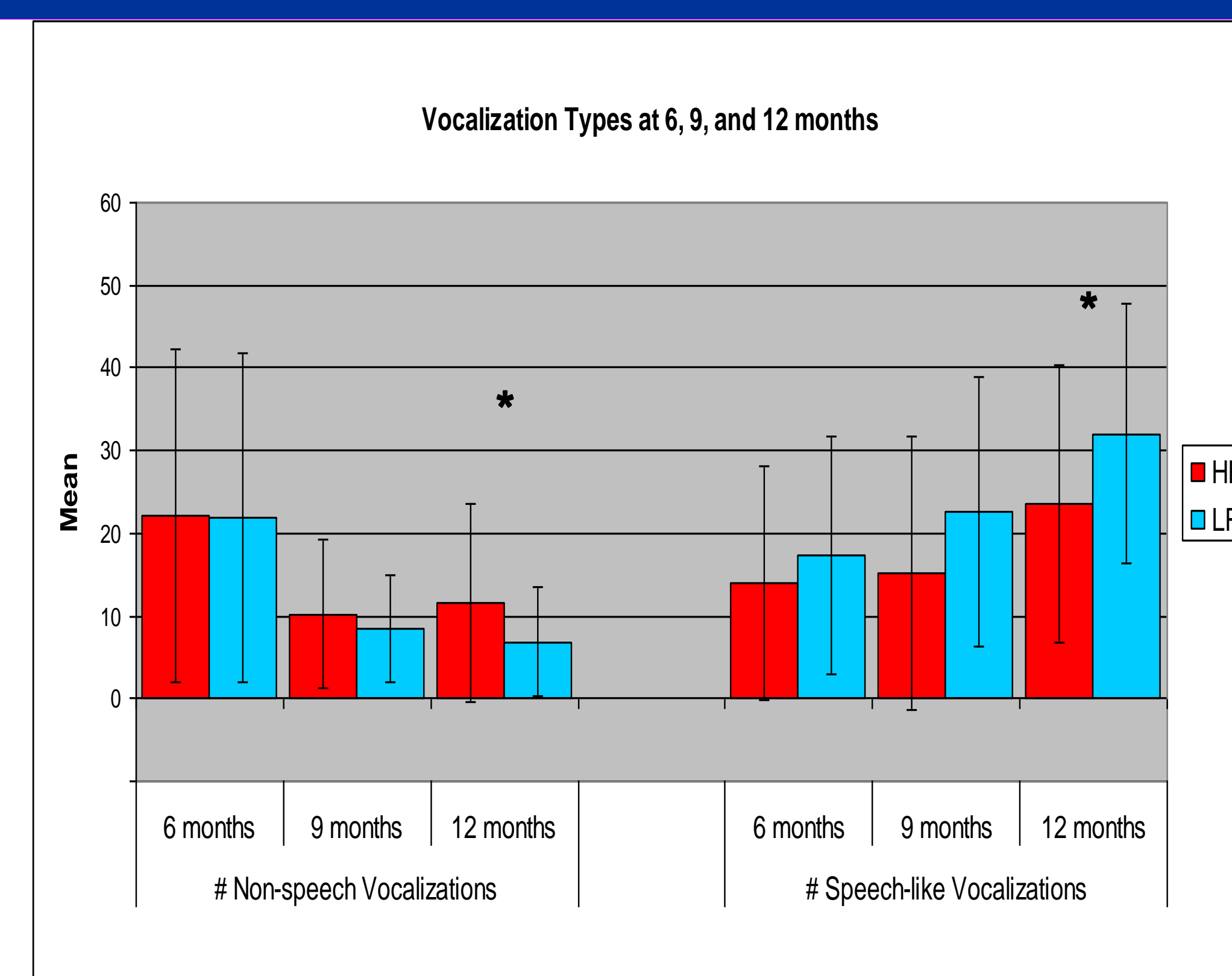
Summary: Vocalization Findings

At **6** months:
 No overall difference on any vocal behavior
At **9** months:
 High Risk infants produce significantly fewer consonants and mature syllables than Low Risk
At **12** months:
 High Risk group produces less speech and more non-speech than Low Risk.

Results- 24 month Outcomes

Clinical Outcomes
HR participants who took part in the 24 month visit (n=25) were subdivided into two groups:
1) Those in whom clinicians observed **some autistic symptoms** (not all met full criteria for ASD), n=14;
2) Those in whom **autistic symptoms were not observed**, n=11.

Discriminant Function Analysis
Number of consonants produced by HR infants at each visit **predicted** whether or not children showed **symptoms of ASD at 24 mo.**:
 At 6 mo. prediction is correct **74%** of the time
 At 9 mo. prediction is correct **77%** of the time
 At 12 mo. prediction is correct **65%** of the time

Acknowledgments and References

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