**Title**: Exploring Early Language in Down Syndrome: Creating a System to Describe Vocalizations and Compare to Standardized Scores at Age 2

**Authors**: Sarah Schillinger1, Meg Lyons1, Amanda Lee1, Lizzy Fulop1, Samantha Valdes1, Marion Schroder1, Allison Pearlman1, Joyce Davis1, Jamie Yuen1, Annette M. Estes2, Stephen R. Dager3, Juhi Pandey1,4, Robert T. Schultz1,5, Jed T. Elison6, Joseph Piven7, Heather C. Hazlett7, Kelly N. Botteron8, Natasha Marrus8, & Julia Parish-Morris1,4

**Introduction**:Infant vocalizations are quantifiable behavioral markers that have been shown to predict later language and diagnostic outcomes. For example, speech-like vocalizing at 12 months is associated with language, social phenotype, and autism diagnosis at age 2 in infants at elevated likelihood for autism (Plate et al., 2022). One study found that children with Down syndrome produce fewer utterances compared to typically developing children between two and five years of age (Parikh & Mastergeorge, 2018) and several studies have identified expressive language delays in Down syndrome (e.g. Martin et al., 2009). However, little is known about the link between early vocalizing and later receptive and expressive language outcomes in Down syndrome. This abstract will (1) present modifications to an established coding system for infants at elevated likelihood for autism (Plate et al., 2022) which has been specialized for infants with Down syndrome, and (2) explore relationships between speech-like vocalizing with Bayley receptive and expressive language scores in 2-year-olds with Down syndrome.

**Method**: Participants included 11 toddlers (3 female, 8 male) with Down syndrome who completed the Communication and Symbolic Behavior Scales (CSBS) and Bayley assessments at 24 months. A team of annotators with experience coding vocalizations from typically developing toddlers and toddlers at elevated likelihood for autism (Plate et al., 2022) listened to recordings of the ADOS and coded child vocalizations. The team met with each other, a research assistant, and a developmental psychologist to determine how best to adapt the language coding pipeline for participants with Down syndrome. The team of coders then segmented and annotated CSBS recordings, labeling toddler vocalizations as speech-like, atypical, and non-speech. Spearman correlations explored associations between rate of speech-like vocalizing (relative to total vocalizing) and Bayley expressive and receptive scaled scores.

**Results**: Participants produced a total of 869 vocalizations. (1) Atypical vocalizations were observed, which were captured in a new coding tier. Atypical vocalizations sounded grunt-like, as if they were produced in the back of the throat (guttural). With the new coding system in place, raters achieved 86% agreement; coding was less reliable before the new tier was added. (2) A Spearman correlation revealed a positive association between rate of speech-like vocalizing relative to total vocalizing and Bayley receptive scaled scores (*rs* = 0.61, *p* = 0.048; Figure). Rate of speech-like vocalizing was not significantly associated with Bayley expressive scaled scores (*rs* = -0.21, *p* = 0.54).

**Discussion:** Adding an “atypical” category to the established language coding pipeline yielded relatively high reliability among coders. Atypical, guttural vocalizations in Down syndrome may be related to upper airway obstructions, for which children with Down syndrome are at greater risk due to their unique craniofacial features (Pfleger & Eber, 2016). In this preliminary study with a small sample, significant concurrent associations between natural speech-like vocalizing and standardized receptive and expressive language scores were found; however, these results were affected by outliers that highlight vast heterogeneity in Down syndrome. Future research should include computational linguistic methods for analyzing much larger samples of vocalizations from infants with Down syndrome to learn more about types and patterns of vocalizing and predict long-term outcomes.

**Figure.**

**References:**

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Center for Autism Research, Children’s Hospital of Philadelphia

2University of Washington Autism Center

3Department of Radiology, University of Washington School of Medicine

4Department of Psychiatry, University of Pennsylvania

5Department of Psychology, University of Pennsylvania

6Institute of Child Development, University of Minnesota

7Department of Psychiatry, University of North Carolina School of Medicine

8Department of Psychiatry, Washington University School of Medicine in St. Louis