**Title:** Sex Differences in Language Abilities among Children with Down Syndrome

**Authors:** Manisha D. Udhani\(^1\), Liv S. Clasen\(^2,3\), Elizabeth Adeyemi\(^2,3\), Jay N. Giedd\(^4,2,3\), Alexandra Carolin\(^1\), Nancy Raitano Lee\(^1,2,3\) Drexel University; \(^2\)Child Psychiatry Branch, Intramural Research Program; \(^3\)National Institute of Mental Health; \(^4\)Dept of Psychiatry, University of California San Diego

**Introduction:** While research suggests that sex plays a role in the prevalence and characteristics of language-based learning disorders in the general population (Tomblin et al., 1997), very little research has investigated sex differences in language skills in youth with Down syndrome (DS). This is despite the fact that (a) language impairments are a central feature of the DS cognitive-behavioral phenotype (Silverman, 2007) and (b) the National Institutes of Health now require scientists to consider sex as a biological variable in funded research projects. As such, the current study sought to examine whether parent-report of structural (i.e., non-social) and pragmatic (i.e., social) language abilities as measured by the Children’s Communication Checklist – II (Bishop, 2006), vary as a function of sex and group membership among children with DS and typically developing (TD) peers.

**Method:** The sample consisted of 47 participants (51% female; M\(_{age}\) = 11.2; M\(_{IQ}\) = 53) with DS and 58 TD participants (55% male; M\(_{age}\) = 10.3; M\(_{IQ}\) = 117). Data were collected from two larger studies, one conducted at the National Institutes of Health (Lee et al., 2015) and another that is ongoing at Drexel University. Parents of participants completed the CCC-II. It is comprised of 10 scales – 4 that measure structural language, 4 that measure pragmatic language, and 2 that measure autism spectrum disorder symptomatology. Structural and pragmatic language composites were created by averaging age-adjusted standardized scores on the 4 scales that comprise these two domains.

**Results:** In order to evaluate whether structural and pragmatic language skills vary as a function of sex and diagnostic group, two univariate ANOVAs were completed with structural or pragmatic language composites as the dependent variables and sex and diagnostic group as fixed factors. For pragmatic language, results revealed significant effects of sex (F[1,98]=5.3, p<.03; M<F) and diagnostic group (F[1,98]=150, p<.001; DS<TD), suggesting similar degrees of sex differences in the two groups but poorer performance by those with DS overall (as expected). For structural language, a sex*diagnostic group interaction was found (F[1,98]=6.5, p<.02), such that sex differences were observed within the DS group (M<F; p<.001) but not the TD group (p=0.7). To further investigate sex differences on the structural language scale within the DS group, a 2 x 4 mixed model ANOVA, with one between-subjects factor (sex: male v. female) and one within-subjects factor (structural subscales: speech, syntax, semantics, coherence) was completed. A sex*subscale interaction was observed (F[1,45]=5.6, p<.03), such that females outperformed males on speech and syntax (ps<.002), but did not perform differently on semantics and coherence, although impairment was greatest for speech and lowest for semantics in both boys and girls with DS.

**Discussion:** Results highlight the importance of evaluating the influence of sex on language abilities in DS, as greater sex differences were found in some aspects of language functioning in youth with DS than in TD peers. In particular, parents reported greater impairment for males than females with DS on the CCC-II Speech and Syntax subscales, drawing attention to aspects of language functioning that may represent a particular vulnerability for boys with DS. As a parent report measure was used to examine language abilities in these samples, future research should investigate whether such differences persist when utilizing performance-based measures of language functioning and whether these sex differences are present in other language-based learning domains (e.g., reading).

**References/Citations:**