

Sex Differences in Early Language Milestones and Later Language Functioning in Youth with ASD: The ACE GENDAAR Network

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Background

- Autism Spectrum Disorder (ASD) is characterized by disruptions in social, behavioral, and communication behaviors.
- Meeting early language milestones has been identified as a strong predictor of positive language outcomes in individuals with ASD.
- Females compared to males show better early cognitive and language functioning, including high risk infants with and without ASD outcomes.
- Less is known about language trajectories in females with ASD, as they often make up a minority of research participants.
- The purpose of this study is to evaluate the relationship between early language milestones and later language and communication ability in a sex balanced sample with ASD.
- We predict that females with ASD will present stronger relationships between early language milestones and later language development.
- Additionally we will explore the sibling effect on language and communication abilities on participants with ASD. We hypothesize that children with a sibling will have better language and communication skills than those without siblings.

Methods

This study used data from the ACE GENDAAR network, a four site NIH funded project designed to examine sex-based genetic and neural differences in children with ASD.

Participants

- The project included 137 youth (female=60, male=77) ages 8-18 years with ASD.
- All children met ASD criteria on ADOS-2 and via the ADI-R and completed the DAS-II to measure cognitive abilities, with a score of ≥ 70 on the Verbal Domain.

Gender	N	Verbal IQ	Age (months)
Female	60	102.5 SD: 18.51	150.98 SD: 33.75
Male	77	101.29 SD: 18.37	150.08 SD: 35.16

Measures

Language Ability:

- Differential Ability Scales, 2nd Edition** (DAS-II; Elliott, 2007): A standardized instrument administered by a clinician assessing cognitive abilities and verbal IQ.
- ACE Medical History** (NIH): A parent interview to record subject medical history.
- Autism Diagnostic Interview, Revised** (ADI-R; Rutter, 2003): A parent interview conducted by a clinician, including assessment of skills in areas of language.
- Clinical Evaluation of Language Fundamentals** (CELF-4; Semel et al., 2003): An instrument administered by a clinician assessing language skills in children.
- Vineland Adaptive Behavior Scales, 2nd Edition** (Vineland-2; Sparrow, 2006) Structured parent interview on adaptive behavior to support diagnosis of intellectual and developmental disabilities.

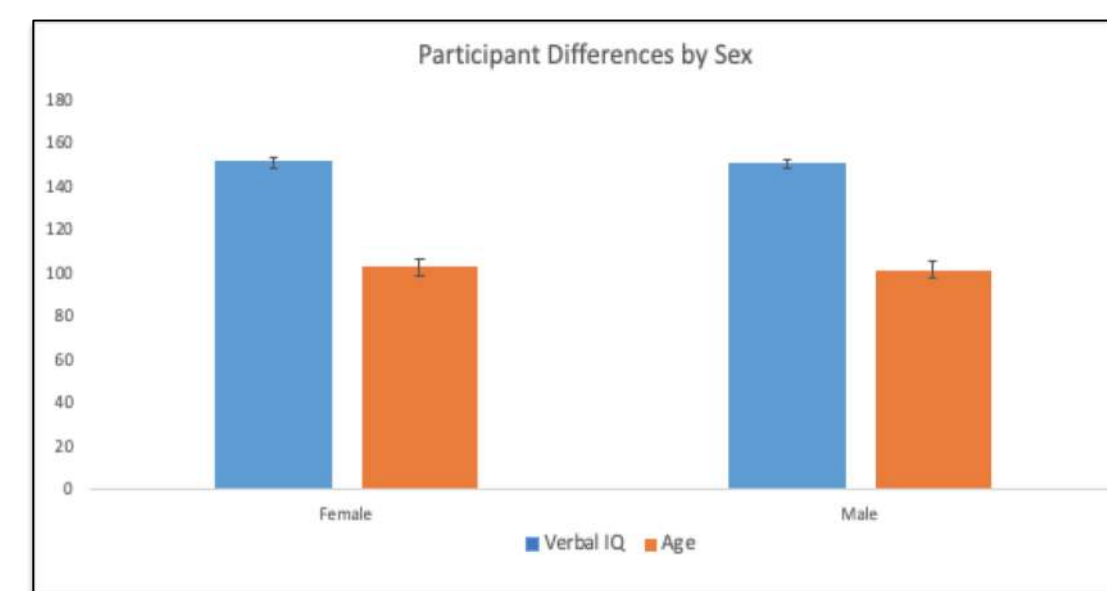
Autism Severity:

- Autism Diagnostic Observation Schedule** (ADOS-2 ; Lord et al., 2012): A series of tasks administered by a clinician assessing autism severity and repetitive behaviors.
- Autism Diagnostic Interview** (ADI-R; Rutter, 2003): A parent interview conducted by a clinician, including assessment of social-communication skills and repetitive behaviors.

Language Assessment

- ACE Medical History:** Age at first words and age at 3 word phrases (confirmed with the ADI-R).
- CELF-4:** Subdomains Recalling Sentences (RS) and Formulating Sentences (FS).
- Vineland Adaptive Behavior:** Communication Domain.

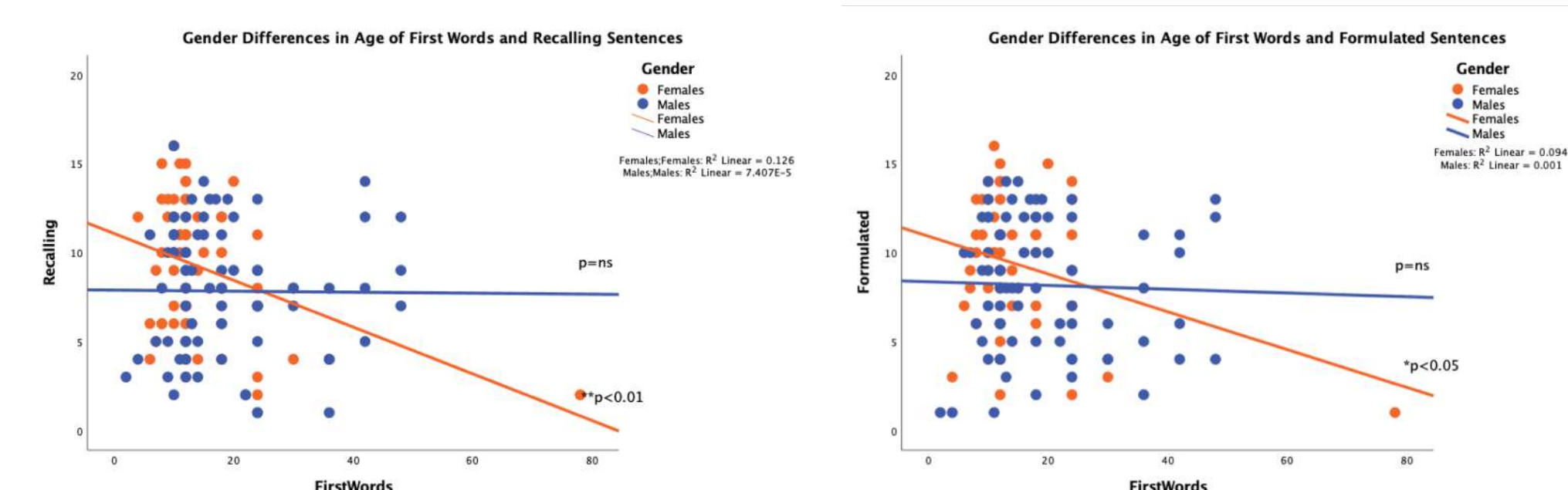
Results



Independent t-tests showed no sex difference in age ($t[135]=0.15$, $p=ns$) or verbal IQ ($t[135]=0.38$, $p=ns$).

Aim 1: Measuring Initial Language (age at first words) Development with Later Language Ability

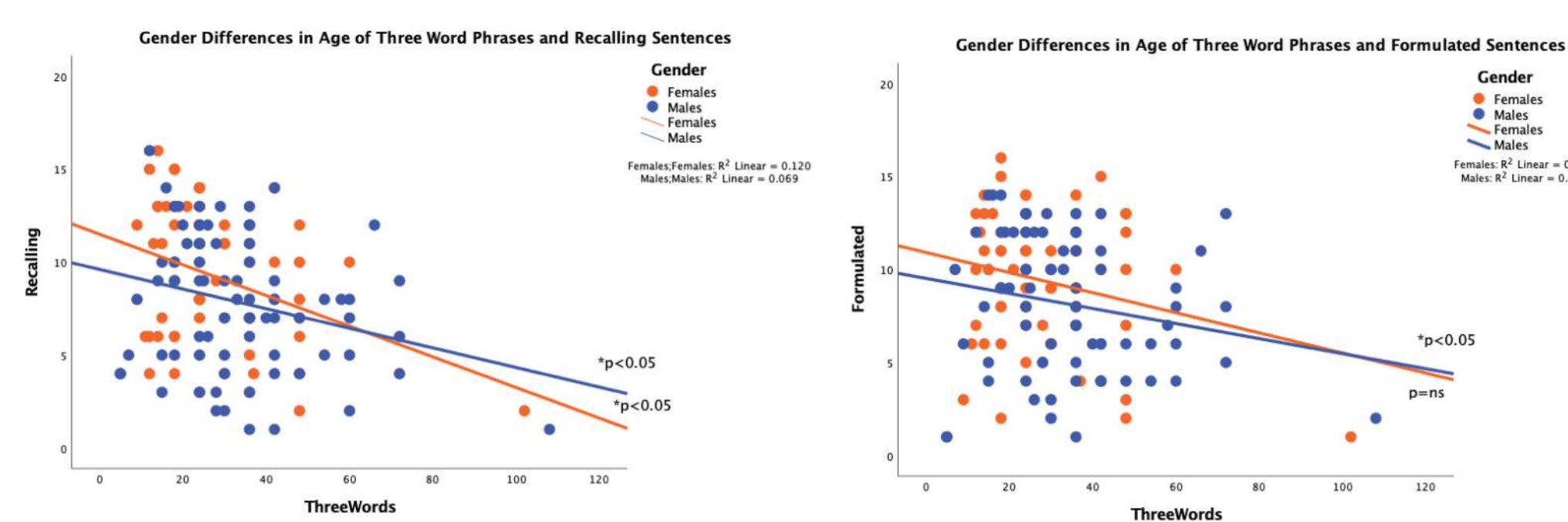
Correlations were run between age at first words and current language level



- Age at first words was negatively correlated to later language ability for females in that females who achieved first words by an **earlier age** showed **better later language ability** in both recalling sentences ($r=-.36$, $p<0.01$) and formulated sentences category ($r=-.31$, $p<0.05$) while for males no significant relations in either category were observed (RS: $r=-.02$, $p=ns$; FS: ($r=-0.4$, $p=ns$).

Aim 2: Measuring Initial Communication Development (age at 3 word phrases) with Later Language Ability

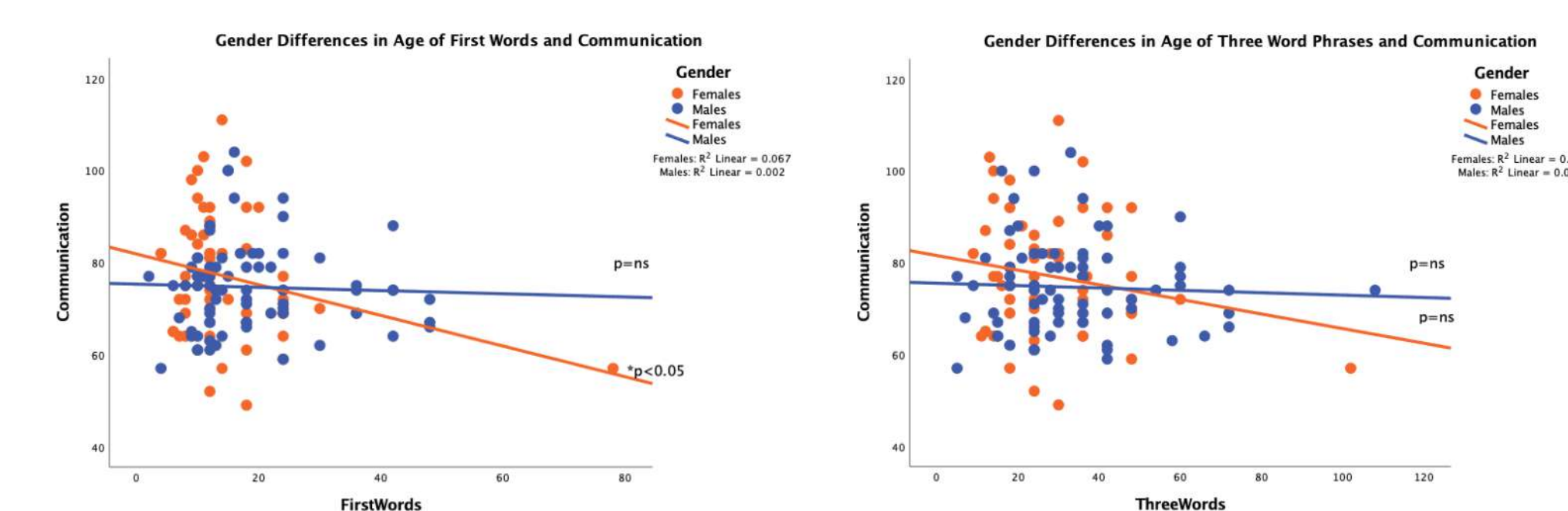
Correlations were run between age at first three word phrases and current language level



- Age at 3 words was related to recalling sentences for females ($r=-.28$, $p<0.05$) and for males ($r=-.25$, $p<0.05$). Age at 3 words and formulated sentences showed significant correlations for males only ($r=-.23$, $p<0.05$).

Aim 3: Measuring Early Language Milestones with Later Communication Ability

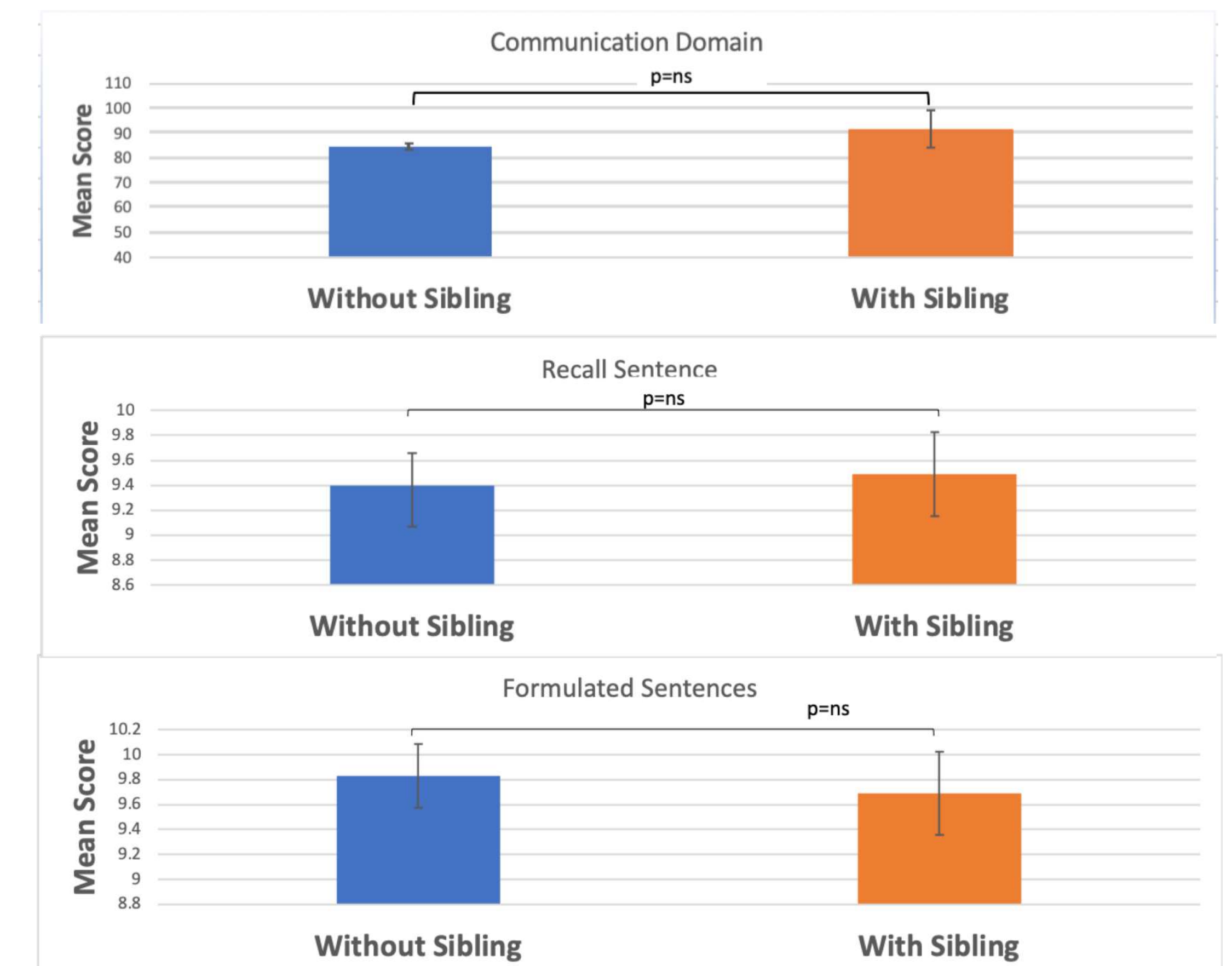
Correlations were run between age at early language milestones and current communication level



- The Communication Domain on the Vineland Adaptive Behavior Scale showed significant correlations with age at first words for females only ($r=-.26$, $p<0.05$) suggesting females who **achieve first words at an earlier age show better current language ability**. Age at 3 words and Vineland Communication scores showed no significant relation for females ($r=-.13$, $p=ns$) nor males ($r=-.01$, $p=ns$).

Aim 4: Measuring Sibling Effect on Language and Communication Abilities

A series of ANOVAs were implemented between language milestones and Vineland-2 Communication Domain, CELF-4 subdomains: Recalling Sentences and Formulated Sentences.



- We found no significant differences across any communication categories between ASD participants with siblings and ASD participants without siblings.

Discussion

- Our overall results indicate that achieving language at an earlier age can have a positive impact on later language development.
- Overall, females showed stronger positive language development (on multiple domains) at a later stage when achieving language milestones earlier than males. However, our male sample did show stronger correlations in formulating sentences category.
- The CELF is a clinician administered language measure while the Vineland is a parent interview; therefore an extension of this research would look at the reporter concordance across both measures to address any discrepancies in scoring of language abilities.
- Further research should also look at other factors that could impact language development such as family demographics (parental education, household income), and the type of interventions received by children with ASD (such as speech therapy).
- Our analysis of sibling involvement on communication showed no significant results in any categories for either groups. Our analysis only focused on the presence or absence of a sibling and did not take into account sibling age or other factors such as if the sibling lives in the same household as the participant to think about how communication opportunities are facilitated.
- Future research in this area would benefit from looking at more sibling characteristics to understand more about sibling involvement in language development.

Acknowledgements and References:

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Thank you to all of the families who participated in this study and to the GENDAAR Network for data collection & analysis!