Effects of Social Communication and Language Ability in ASD children with Siblings vs. ASD children without Siblings

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Background

- Autism Spectrum Disorder (ASD) is a collection of neurodevelopmental disorders characterized by social-communicative and behavioral impairments and affects approximately 1 in 68 children in the U.S. (CDC, 2014).
- Children with ASD, on average, score lower on language measures than their typically developing peers (Flusberg, Joseph, & McGrath, 2010) and have suffer from social impairments involving speech quality, social-communication, and interpersonal interaction (Keonig, Scahill, & White, 2007).
- In TD families, siblings can have positive influences on social skills (Stormshak, Bellanti, Bierman et al., 1996) and promote language, cognitive development, and understanding of emotions (Brody, 2004).
- The aims of the study will:
  1. Compare the social communication in children with ASD who have siblings to those children with ASD who do not have siblings.
  2. Compare language ability in children with ASD who have siblings to those children with ASD who do not have siblings.
     a) Explore if sibling characteristics (e.g. sex) impact these measures.
  3. Compare the severity level of autism spectrum-related symptoms in children with ASD who have siblings and children with ASD who do not have siblings, factoring age differences between siblings.
- We hypothesize that:
  1. Children with ASD who have siblings will exhibit better social communication and higher language ability than those who do not have siblings, which is similar to what's seen in TD families.
  2. ASD children who are closer in age with their siblings will show more benefit of having a sibling than those that are farther in age.

Methods

Participants:

- Children between the ages of 8 and 17 years old participated in the Gender Exploration of Neurogenetics and Development to Advance Autism Research (GENDAAR) study. To be included in these analyses, children must (1) have a confirmed diagnoses of ASD, (2) have an IQ over 70, and (3) have either one or zero biological siblings under the age of 18.

Table 1: Participants for Aim 1 &2

	ASD with Siblings	ASD without Siblings
N	66	24
Age (Mo.)	M = 142.26, SD = 34.84	M = 150. 79, SD = 34.84
Nonverbal IQ	M = 101.79, SD = 16.96	M = 105.9, SD = 21.62
♀ Sibling	31	N/A

Table 2: Participants for Aim 3

	Proband & Sibling close in age (± 2 years)	Proband Older than Sibling	Proband Younger than Sibling	Proband Only Child
N	19	34	13	24
Age (Mo.)	M = 131.72 SD = 36.653	M = 153.18 SD = 35.964	M = 155.43 SD = 33.979	M = 150.79 SD = 34.841

Measures:

- ***Social Communication***:
  - **Autism Diagnostic Observation Schedule** (ADOS-2; Lord et al., 2012): A series of tasks administered by a clinician assessing social interaction and communication.
  - **Social Responsiveness Scale** (SRS-2; Constantino, 2012): A parent reported questionnaire used to identify ASD behaviors in a child, including a scale for measuring social communication.
  - **Social Communication Questionnaire** (SCQ; Rutter, 2003): A parent reported questionnaire used to provide information on a use of language/communication and style of interaction.
  - **Autism Diagnostic Interview** (ADI; Rutter, 2003): An parent interview conducted by a clinician assessing the behaviors in areas of reciprocal social interaction and communication.
- ***Language Ability***:
  - **Differential Ability Scales, 2nd Edition** (DAS-II; Elliott, 2007): An instrument administered by a clinician assessing cognitive abilities and verbal IQ.
  - **Clinical Evaluation of Language Fundamentals** (CELF-4; Semel et al., 2003): An instrument administered by a clinician assessing language skill in children.
  - **Autism Diagnostic Interview** (ADI; Rutter, 2003): An parent interview conducted by a clinician assessing the behaviors in areas of language.
- ***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 behavior.
  - **Social Responsiveness Scale** (SRS-2; Constantino, 2012): A parent reported questionnaire used to identify ASD behaviors in a child, including a scale for measuring repetitive behavior.
  - **Autism Diagnostic Interview** (ADI; Rutter, 2003): An parent interview conducted by a clinician assessing the behaviors in repetitive behaviors.

Results

AIM 1: Measuring Social Communication in ASD with Siblings and ASD without Siblings

- *A series of ANOVAs were implemented with ADOS-2, SRS-2, SCQ, and ADI as dependent variables. We found that there were **no significant differences**, across all measures, between ASD children with siblings and ASD children without siblings.*
- *However, there were **significant differences** when exploring the presence of female sibling in the ASD children with sibling group. ASD children with siblings were separated into two groups: ASD children with female sibling and ASD children with male sibling.*

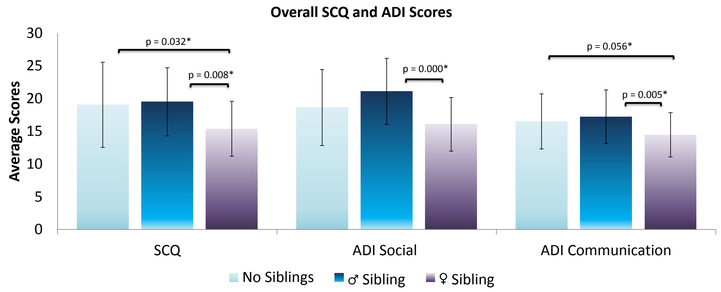


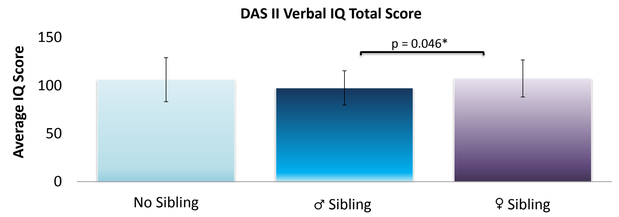
Table 3: Groups separated by Sibling Gender

	ASD with ♀ Sibling	ASD with ♂ Sibling	ASD w/o Siblings
N	31	35	24
Age (Mo.)	M = 142.32 SD = 35.91	M = 142.20 SD = 34.09	M = 150.79 SD = 34.84

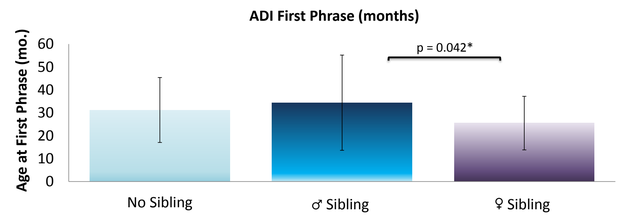
- Compared to ASD children who do not have siblings, ASD children who have female siblings score **significantly lower (better)** on Social Communication Questionnaire (p = 0.032) and **marginally lower (better)** on ADI Communication (p = 0.056)
- Compared to ASD children who have male siblings, ASD children who have female siblings score **significantly lower (better)** on Social Communication Questionnaire (p = 0.008), ADI Social (p = 0.000), and ADI Communication (p = 0.005).

AIM 2: Measuring Language Ability in ASD with Siblings and ASD without Siblings

- *A series of ANOVAs were implemented with DAS-II, CELF-4, and ADI as dependent variables. We found that there were **no significant differences**, across all measures, between ASD children with siblings and ASD children without siblings.*
- *However, there were **significant differences** when exploring the presence of female sibling in the ASD children with sibling group. ASD children with siblings were separated into two groups: ASD children with female sibling and ASD children with male sibling.*



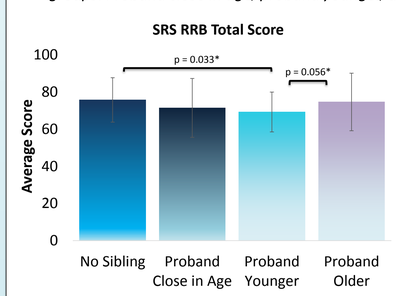
- Compared to ASD children who have male siblings, ASD children who have female siblings score **significantly higher (better)** on Verbal IQ (p = 0.046).
- On one subscale of DAS II, ASD children who have female siblings score **significantly higher (better)** on Word Definition (p = 0.016) than ASD children who have male siblings.
- ASD children who have female siblings **do not differ** from ASD children who do not have a sibling.

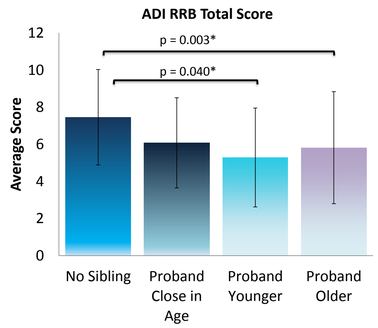


- On the ADI First Phrase, ASD children who have female siblings **said their first phrase earlier** than ASD children who have male siblings (p = 0.042).
- ASD children who have a female sibling was **not significantly different** from ASD children without siblings.

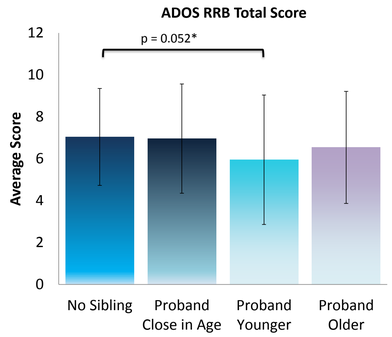
AIM 3: Measuring Autism Severity in ASD with Siblings and ASD without Siblings between Age Groups

- *A series of analyses were implemented with ADOS-2, SRS-2, and ADI as dependent variables. We factored in age differences in the ASD children with sibling group, separating children into three groups: Proband close in age, proband younger, and proband older.*





- There were **no significant differences** on overall autism severity or on the social affect scores of the ADOS and SRS between the groups.
- However, there were **significant differences** when exploring restricted, repetitive behavior measures of ADOS, SRS, and ADI.
- Overall, ASD children who are younger than their sibling **score significantly lower (better)** on the restrictive and repetitive behavior domain of all measures: SRS RRB (p = 0.033), ADOS RRB (p = 0.052), and ADI (p = 0.040) than ASD children who do not have siblings. In addition, we found that ASD children who are younger **score significantly lower (better)** on SRS RRB (p = 0.056) than ASD children who are older than their sibling. ASD children who are older than their sibling **score significantly lower (better)** on ADI RRB (p = 0.003) than ASD children who do not have siblings.



Discussion

Summary:

- Overall, there were **no significant differences** on social communication and language ability, across all measures, when comparing ASD children who have siblings and ASD children who do not have siblings, which contradicts our first hypothesis.
  - However, when taking into account the gender of the sibling, ASD children who have a female sibling **showed overall benefit and scored better** on measures of social communication when compared to ASD children who have a male sibling and ASD children who do not have a sibling. ASD children who have a female sibling also **showed overall benefit and scored better** on language ability when compared to ASD children who have a male sibling. ASD children who have female siblings **do not differ** from ASD children who do not have a sibling on language ability. These results align with previous research in which females are better at verbal tasks due to having better verbal and nonverbal episodic memory, verbal recall, object recognition memory, and communication skills (McGivern & Pineda, n.d.; Lewin, C., Wolgers, G., & Herlitz, A. 2001). Furthermore, females may have more sibling contact and closer sibling relationships with siblings with disabilities (Burke, Hodapp, & Urbano, 2010).
- There were **no significant differences** on overall autism severity or on the social affect scores of the ADOS and SRS between ASD children who have siblings and ASD children who do not have siblings, but **differ** in restricted, repetitive behavior. Furthermore, children with ASD who are younger than their sibling exhibited **less severe restricted and repetitive behaviors**, according to ADOS-2, ADI, and SRS scores, than children with ASD who do not have siblings and ASD children who are older than their sibling, which contradicts my second hypothesis.
  - However, the results align with previous research in which younger sibling gains cognitively by imitating the older since the older sibling act as role models, which can lead ASD children to reduce their restricted and repetitive behavior (Vicirelli, 1985; Hasselt & Michel, 1992). In one study, ASD children who have siblings, especially if they are older, were reported having less severe restricted and repetitive behaviors than ASD children who do not have siblings because typically developing siblings of individuals with ASD spoke of pride in teaching their sibling with ASD (Foden, 2007).

Conclusions & Limitations:

- There could be other factors that may have contributed to these results such as not knowing the dynamic between the ASD child and their family/sibling, considering the number of siblings, excluding step or half siblings in the study, and excluding siblings over 18. Given the complex variety of sibling relationships, replicating the analysis with a larger sample of kids is needed to understand the potential interacting effects of gender, age, number of siblings, etc…
  - These findings emphasize the role that siblings play in language and social development in autism and it can help improve intervention programs for ASD.