Autistic Teenagers Lexically Align at Similar Rates to Typically Developing Peers

Grace Corrigan[1], Juandiego Carmona[2], Riccardo Fusaroli[3], Ethan Weed[3], Deborah Fein[1], & Letitia Naigles[1]
[1]University of Connecticut, [2]Teachers College, Columbia University, [3]Aarhus University, Denmark

Background

- Lexical alignment (LA): using same term (e.g., *rabbit* not *bunny*) as conversational partner[1]
- LA has been proposed to build rapport & improve social communication (SC)
  - Higher task-relevant LA → better cooperative task performance in TD adult dyads[2]
  - Less frequent but more highly concentrated LA → better cooperative task performance in TD adult dyads[3]
- Autism Spectrum Disorder (ASD) associated with weaker SC[4]
- If LA linked to SC, autistic people would be expected to align less than TD peers
  - However:
    1. British high-verbal autistic children aligned at equal rates to TD peers in a picture-naming game[1,5]
    2. What about lower-verbal autistic children with wider range of ability levels?
    3. How consistent is LA across item type (natural kinds versus artifacts)?

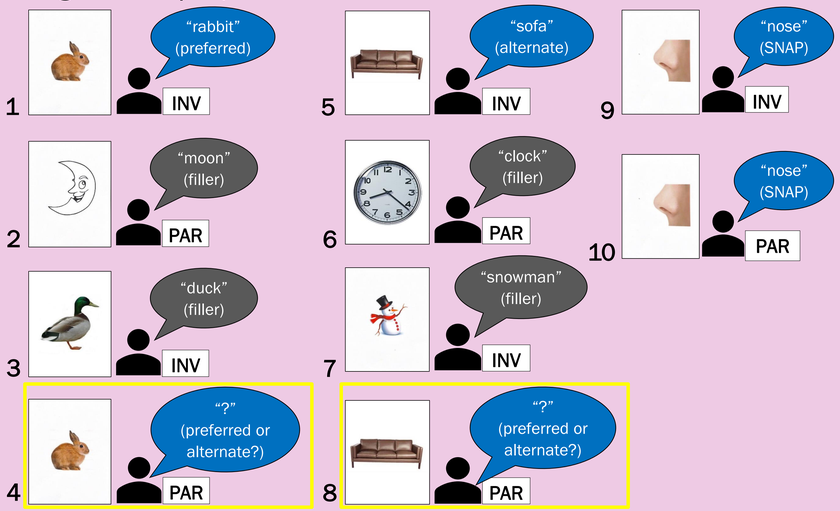
Participants

- Subset of Longitudinal Study of Early Language (LSEL)[6] participants
  - At 1-2 years, TD and ASD groups matched on language ability
- **Present study**: Same participants (teenagers/young adults), now more widely ranging in language ability; see Table 1

Procedure: LA

- Adapted from SNAP paradigm[1]
  - Changed British English items to North American English
- 40 target cards (20 item pairs), 40 filler cards (non-target items), 16 SNAP cards (8 item pairs)
  - Target items (*preferred/alternate*) were:
    - natural kinds (*n*=7), e.g., *mom/mother, stomach/belly, cat/kitten*
    - artifacts (*n*=13), e.g., *toilet/potty, stairs/steps, cup/mug*
- Preferred & alternate terms determined via piloting w/TD undergraduates at University of Connecticut

Figure 1. *Steps of the SNAP Game*



Note. INV = investigator; PAR = participant. Steps 1-4 = preferred-term trial; Steps 5-8 = alternate-term trial; Steps 9-10 = SNAP trial (occurred every 2-3 trials).

Scoring

- PAR's word choice scored for LA according to INV's prime term (Figure 1; Steps 1 & 5) and PAR's term (Figure 1; Steps 4 & 8)
  - Prime with preferred term:
    - INV = *couch*, PAR = *couch* ✓
    - INV = *couch*, PAR = *sofa* ✗
  - Prime with alternate term:
    - INV = *sofa*, PAR = *sofa* ✓
    - INV = *sofa*, PAR = *couch* ✗
- Created **alignment scores** for each participant

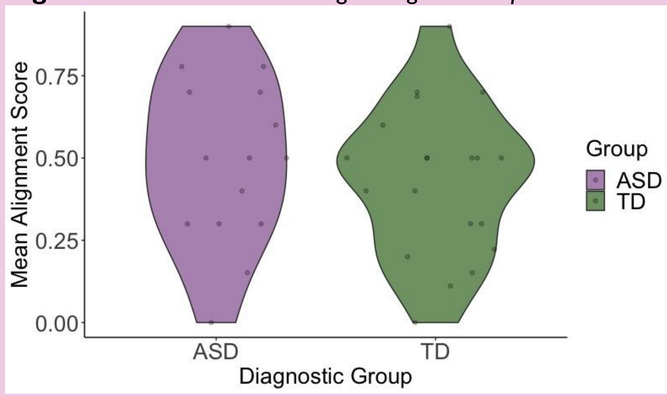
$$\text{ALIGNMENT SCORE} = \frac{\#\text{ of PAR uses of alternate term}}{\#\text{ of INV primes with alternate term}} - \frac{\#\text{ of PAR uses of alternate term}}{\#\text{ of INV primes with preferred term}}$$

Table 1. *Age, Standardized Measure Scores, and Alignment Scores by Diagnostic Group*

	Diagnostic Group: TD		Diagnostic Group: ASD		Comparison
	N	*M (SD)*	*N*	*M (SD)*	*p* (Cohen's *d*)
Demographics					
Age (years)	20	15.30 (3.01)	15	16.20 (3.65)	.430 (0.27)
Measures					
CELF-5[8] combined raw scores (six subscales))	20	**205.45 (24.69)**	15	**153.33 (58.52)**	**.005 (1.23)**
CELF-5[8] Expressive Language Index standard scores	20	**105.80 (18.19)**	15	**82.53 (19.64)**	**< .001 (1.24)**
ADOS-2[7] (Communication + Social Interaction)	19	**2.47 (2.84)**	15	**11.33 (6.07)**	**< .001 (1.95)**

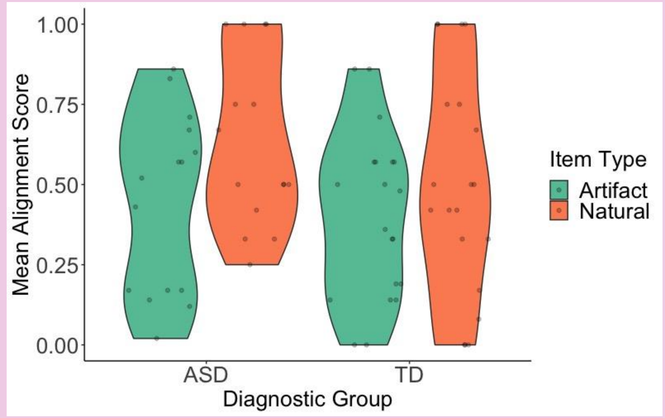
Note. CELF-5 (Clinical Evaluation of Language Fundamentals-Fifth Edition)[8] subscales: Formulated Sentences, Recalling Sentences, Semantic Relationships, Word Classes, Following Directions, Sentence Assembly). Expressive Language Index scores calculated from summed scaled scores (Formulated Sentences, Recalling Sentences, Sentence Assembly). ADOS-2: Autism Diagnostic Observation Schedule-Second Edition[7]

Figure 2. *Autistic and TD Teenagers Aligned at Equal Rates*



Note. $t[33] = -0.74$, $p = .467$.

Figure 3. *LA Scores Were Higher for Nat. Kinds than Artifacts*



Note. Main effect of item type, $F(1,33) = 4.68$, $p = .038$. No main effect of diagnostic group ($p = .245$). No significant interactions.

Results: Analyses

- **Alignment scores did not differ between the TD and autistic groups** (Figure 2).
- **LA scores for natural kinds higher than for artifacts in both groups** (Figure 3).
- TD: LA scores did not correlate significantly with ADOS-SC or CELF scores
- ASD: LA scores significantly **positively** correlated with CELF scores ($r = 0.57$, $p = .027$) and **negatively** correlated with ADOS-SC scores ($r = -0.64$, $p = .010$)
  - When controlling for ADOS-SC scores, correlation between LA scores and CELF scores no longer significant
  - When controlling for CELF scores, correlation between LA scores and ADOS-SC scores no longer significant

Conclusions

- Autistic and TD individuals continue to align at similar rates – **even as teens and young adults.**
- LA scores were higher for natural kinds than artifacts → people may consider names of natural kinds more interchangeable than names of artifacts.
- **LA is related to SC and language in autistic individuals,** but not in TD individuals.
- In this sample, SC and structural language collinearly contribute to LA

References

[1]Branigan, H. P., Tosi, A., & Gillespie-Smith, K. (2016). Spontaneous lexical alignment in children with an autistic spectrum disorder and their typically developing peers. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 42*(11), 1821–1831. https://doi.org/10.1037/xlm0000272
[2]Fusaroli, R., Bahrami, B., Olsen, K., Roepstorff, A., Rees, G., Frith, C., & Tylén, K. (2012). Coming to terms: Quantifying the benefits of linguistic coordination. *Psychological Science, 23*(8), 931–939. https://doi.org/10.1177/0956797612436816
[3]Dideriksen, C., Christiansen, M. H., Tylén, K., Dingemanse, M., & Fusaroli, R. (2022). Quantifying the interplay of conversational devices in building mutual understanding. *Journal of Experimental Psychology: General*. Advance online publication. https://doi.org/10.1037/xge0001301
[4]Rutter, M. (1978). Diagnosis and definition of childhood autism. *Journal of Autism and Childhood Schizophrenia, 8*(2), 139–161. https://doi.org/10.1007/BF01537863
[5]Hopkins, Z., Yuill, N., & Branigan, H. P. (2017). Inhibitory control and lexical alignment in children with an autism spectrum disorder. *Journal of Child Psychology and Psychiatry, 58*(10), 1155-1165. https://doi.org/10.1111/jcpp.12792
[6]Naigles, L. R., & Fein, D. (2017). Looking through their eyes: Tracking early language comprehension in ASD. In L. R. Naigles (Ed.), *Innovative investigations of language in autism spectrum disorder* (pp. 49-64). Walter de Gruyter GmbH; American Psychological Association. https://doi.org/10.1037/15964-004
[7]Lord, C., DiLavore, P. C., Gotham, K., Guthrie, W., Luyster, R. J., Risi, S., & Rutter, M. (2012). *Autism Diagnostic Observation Schedule-Second Edition (ADOS-2)*. Torrance, CA: Western Psychological Services
[8]Wiig, E. H., Semel, E., & Secord, W. A. (2013). *Clinical Evaluation of Language Fundamentals–Fifth Edition (CELF-5)*. Bloomington, MN: NCS Pearson

This work is supported by NIHDCD R01 DC 016665.