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BACKGROUND

- Autism spectrum disorder (ASD) → neurodevelopmental disorder characterized by social communication challenges and restricted & repetitive behaviors [1]
- Atypical vocalizations appear to be an early indicator of ASD:
 - Toddlers with ASD produce fewer speech sounds than typically developing (TD) toddlers [2]
- Fine-grained analyses of children with ASD's vocalizations have used phonetic transcription via the International Phonetic Alphabet (IPA) [2, 3]
 - IPA utilizes symbols that capture all speech sounds in an audio recording:

Original orthography: fish
 IPA transcription: fɪʃ

- However, previous studies have only focused on a single developmental timepoint [2, 3, 4]
 - It is unclear whether differences between children with ASD and TD children persist across later developmental stages
- Further, heterogenous language abilities have been identified, where some children with ASD are: [5]
 - Low-verbal (i.e., below age-appropriate language use)
 - Middle-verbal (i.e., language use is delayed as compared to their TD peers)
 - High-verbal (i.e., language use is comparable to their TD peers)
- Previous studies have characterized vocalizations in autism based on group averages, without considering these heterogenous language profiles

OBJECTIVES

- To compare vocalizations produced by children with ASD and TD children across developmental stages
- To compare within the ASD sample by analyzing the vocalizations of low- versus middle-verbal children with ASD

METHODS

- 24 participants from a longitudinal study tracking the language abilities of children with ASD and TD children (see Table 1) [6]
- Participants were grouped based on their Mullen Expressive Language raw scores at visit 1
- Language samples from 30-minute parent-child play sessions during three home visits (V1, V2, & V3), each four months apart, were transcribed via IPA

Table 1. Demographic information and standardized test scores

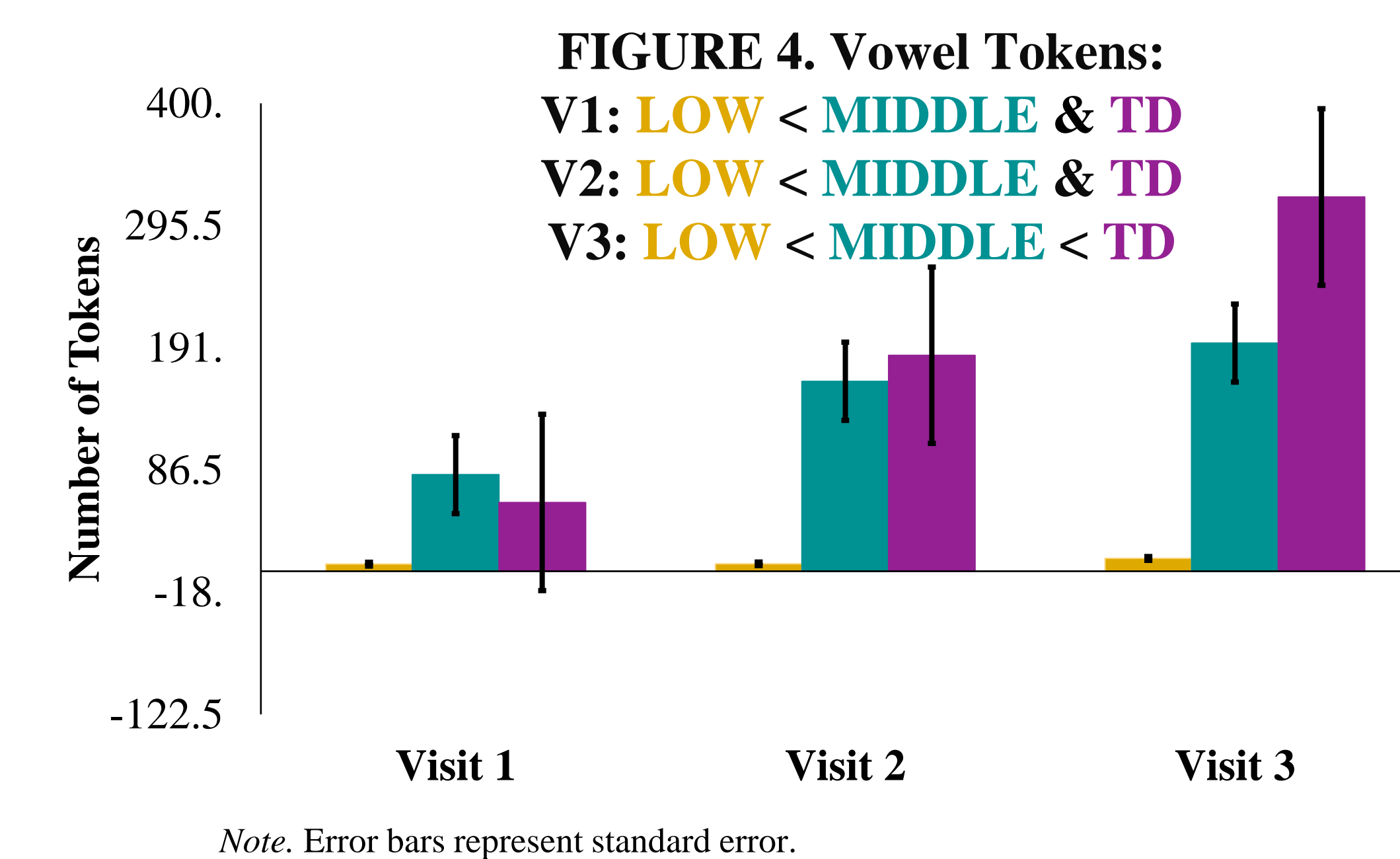
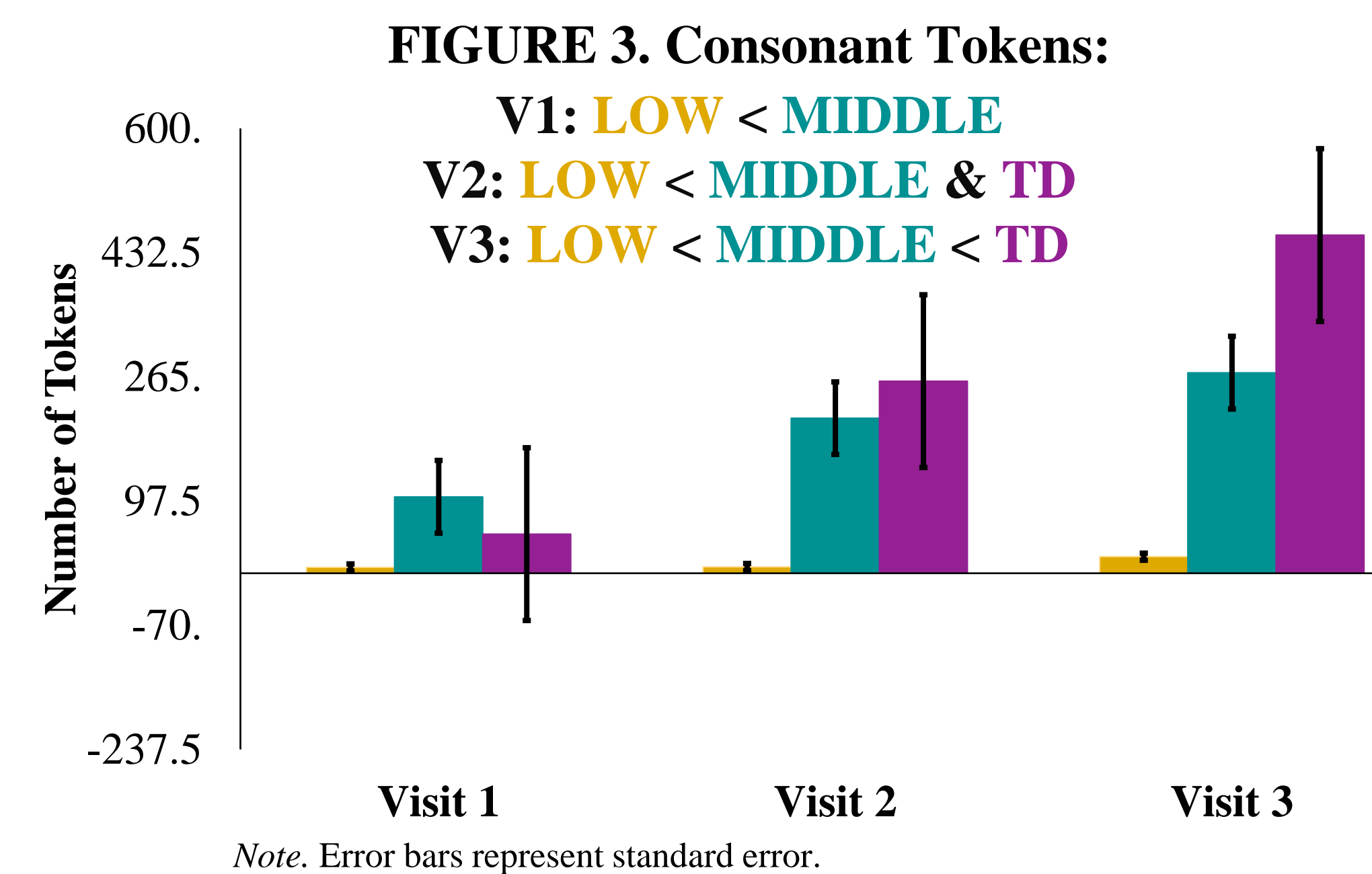
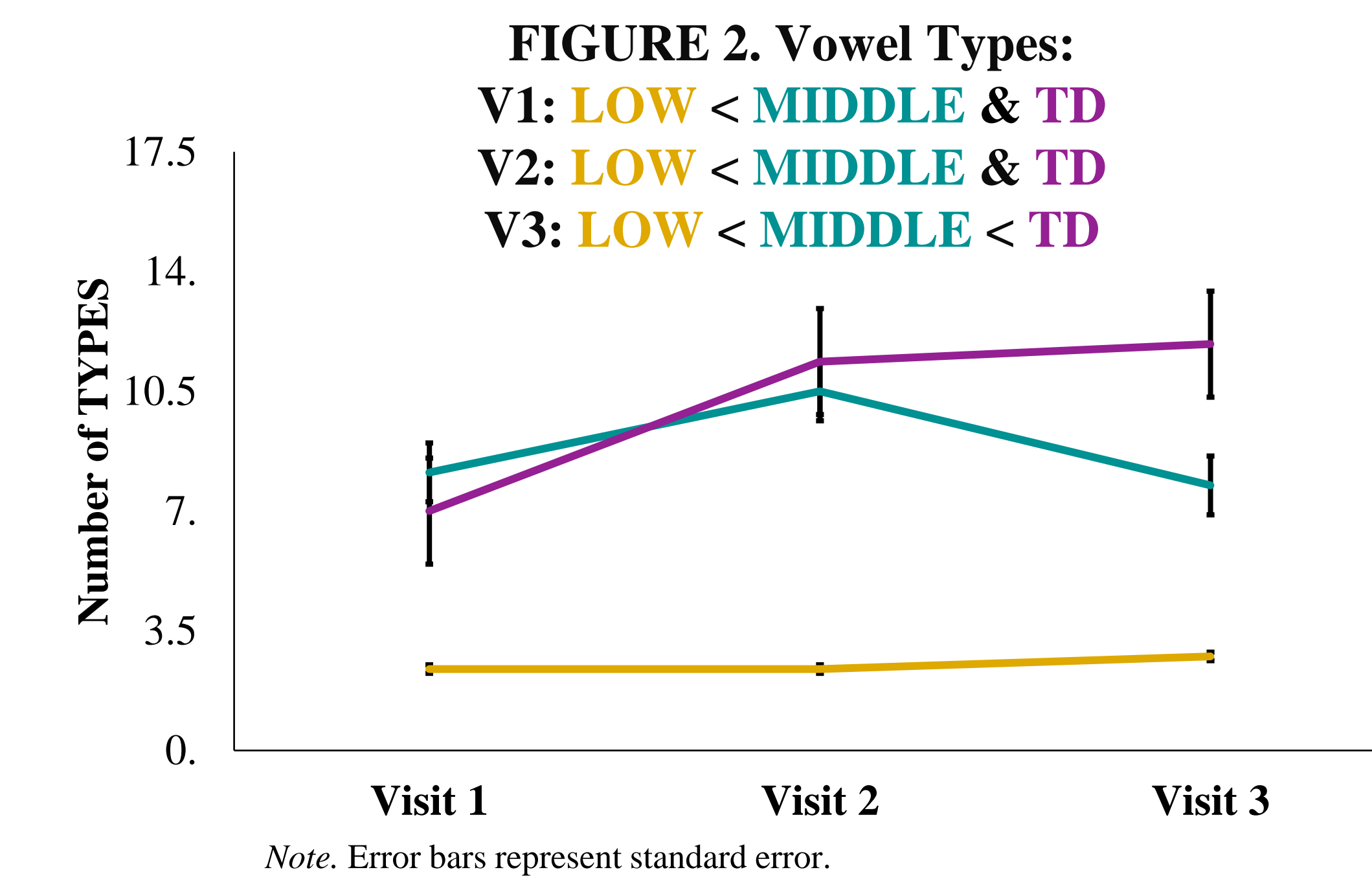
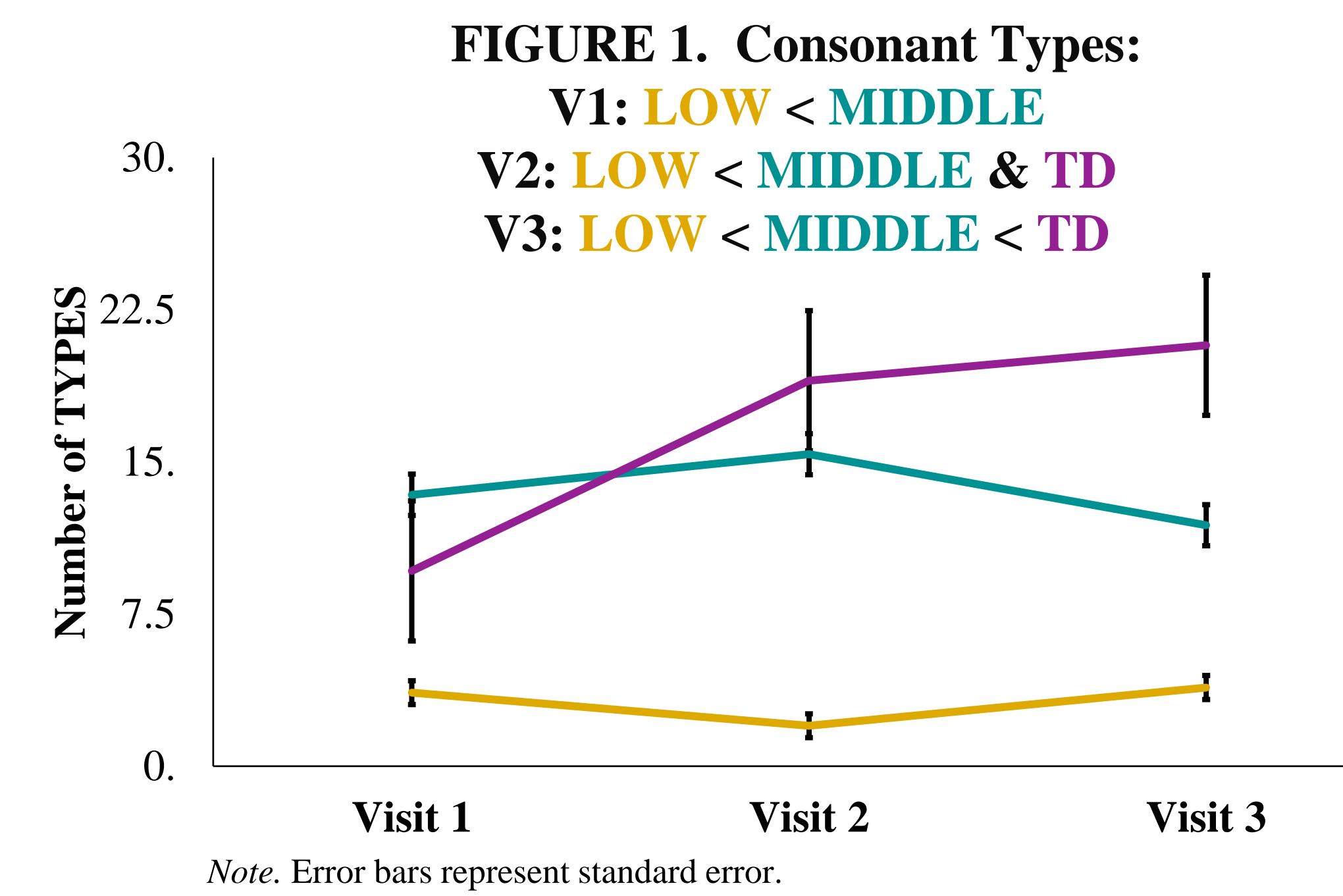
	Age in months at V1 M (SD)	Mullen Expressive Language Raw Score (M, SD)	ADOS Total (M, SD)
Low-Verbal ASD (n = 8)	34.48 (5.4)	9.88 (1.13)	18 (3.12)
Middle-Verbal ASD (n = 8)	33.0 (5.49)	15.88 (2.64)	14.25 (2.55)
TD (n = 8)	19.3 (0.37)	15.25 (1.49)	0.5 (1.07)

TRANSCRIBING & CODING

- When transcribing vocalizations into IPA, we are listening for distinct phonemes
- We coded for **consonant and vowel types** (i.e., unique consonants & vowels) and **tokens** (i.e., total # of consonants & vowels)

IPA Symbols & Examples of Their Phonetic Sounds					
æ	bæt	bat	k	kat	cat
ʊ	bʊk	book	ŋ	sɪŋ	sing
i	bi:t	bit	ʃ	ʃəʊ	show
ɛ	bɛt	bet	p	pleɪ	play

RESULTS



DISCUSSION

- In conjunction with previous studies, children with ASD produced fewer consonant and vowel types and tokens than their TD peers at three major developmental stages.
- Moreover, low-verbal children produced even fewer consonant and vowel types and tokens than middle-verbal children with ASD.
- These patterns suggest that transcribing via IPA has the ability to capture the heterogenous language profiles within ASD at an early age.
- Future work should:
 - continue to investigate the development of vocalization patterns longitudinally to determine whether children with ASD continue to fall behind their TD peers, and
 - assess other phonetic patterns in vocalizations, such as phoneme elongation

References & Acknowledgements

[1] American Psychiatric Association. (2013). *DSM of mental disorders* (Vol. 5)
 [2] Moffitt et al. (2022) *Autism Research* :1-10
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 [4] McDaniel et al. (2021) *Am. Jnl. On Int. & Dev. Dis.* (126): 142-157
 [5] Tager-Flusberg (2005) *Sci China Life Sci.* 2015, 58: 1044–1052
 [6] Naigles & Fein (2017), *Innovative investigations of language in ASD* (pp. 49-64)

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