Conversational turns and child vocalizations as predictors of word learning success in children with autism

Emily Sonsthagen
Department of Speech-Language-Hearing, University of Kansas

Introduction

A hallmark of children who have been diagnosed with autism spectrum disorder (ASD) is the delayed acquisition of spoken language[1].

- Both child vocalizations and conversational turns have been identified as potential predictors of expressive language development in children with and without ASD[2,3].

- Expressive language ability has been shown to predict later social and adaptive outcomes in childhood and adolescence[2,3].

Dr. Nancy Brady and colleagues are currently conducting a randomized controlled trial study to assess a multimodal language intervention for children with ASD who are minimally verbal[4]. The intervention targets receptive and expressive language development through :
- ➢ Speech Sound Practice
- ➢ Joint Book Reading
- ➢ AAC

Study Aims

This study measures the relationship between conversational turn count/vocalization frequency and word learning success. Word learning success is defined by a phonemic scoring system.

1. Do conversational turns or child vocalizations predict word learning success in intervention?

2. Are conversational turn and vocalization rates stable from pre- to post- intervention?

Methods

Data was collected on 23 participants involved in the multimodal intervention. Participants had either a.) completed intervention consisting of 12 weeks or until 40 words were learned, or b.) discontinued the study with only partial data used.

5

Language Environmental Analysis (LENA) software:
- LENA uses a small digital recorder to collect data and segment the audio stream into various categories.
- LENA reports that a conversational turn has occurred when "an adult speaks and a child follows, or vice versa, with no more than 5 seconds in between."
- A child vocalization is defined as "the number of words, babbles, and 'protophones' or pre-speech communicative sounds produced by the child."
- Reports for each participant pre- and post-intervention were generated to determine the average conversational turn count (CTC) and child vocalization count (CVC).

Phonemic feature scoring system (PFSS):

	Word/Klatt	Time	Transcription	C1 V							C2			Points	Pass?	Notes	
				V	P	M	H	A	R	T	V	P	M				
1	bean /bin/	0:33	/b^/	1	1	1	0	0	1	0	0	0	0	4	0		
		1:47	/b^/	1	1	1	0	0	1	0	0	0	0	4	0		
		2:46	/b^/	1	1	1	0	0	1	0	0	0	0	4	0		0.00
2	dot /dat/	0:22	/di/	1	1	1	0	0	1	0	0	0	0	4	0		
		2:02	/di/	1	1	1	0	0	1	0	0	0	0	4	0		
		2:58	/m^/	1	0	0	0	0	1	1	0	0	0	3	0		0.00
3	head /hEd/	0:41	/h^/	1	1	1	1	0	1	1	0	0	0	6	1		
		1:55	/h^/	1	1	1	0	1	1	0	0	0	0	6	1		
		3:06	/^m/	0	0	0	1	0	1	1	1	0	0	4	0		0.67
4	mat /mæt/	0:48	/m^/	1	1	1	0	0	1	0	0	0	0	5	0		
		2:13	/m^/	1	1	1	0	0	1	0	0	0	0	5	0		
		2:53	/m^/	1	1	1	0	0	1	0	0	0	0	5	0		0.00
5	one /w^n/	0:04	/w^/	1	1	1	1	1	1	1	0	0	0	7	1		
		2:09	/w^/	1	1	1	1	1	1	1	0	0	0	7	1		
		3:14	/w^/	1	1	1	1	1	1	1	0	0	0	7	1		1.00
												Totals:			75	5		
												Percentages:			0.50	0.33		

Participant ID: | Date of Probe: | Probe Administrator: | Scored By: — **Probe ID** — EXPRESSIVE PROBE

- Accuracy of productions are evaluated based on three features for consonants and four features for vowels.
- Each correct feature receives 1 point and participants "pass" if they receive 6 or more points on the production.
- Word learning success was determined using multiple components of the PFSS:
  1. Difference score between last and first word sets.
  2. Total number of productions made across all word sets.
  3. Total number of *different* productions made across all word sets.

References

[1] Paul, R., Campbell, D., & Gilbert, K. (2012). Comparing spoken language treatments for minimally verbal preschoolers with autism spectrum disorders. *Journal of Autism and Developmental Disorders, 43*(2), 418-431.
[2] McDaniel, J., D'Ambrose Slaboch, K., & Yoder., P. (2018). A meta-analysis of the association between vocalizations and expressive language in children with autism spectrum disorder. *Research in Developmental Disabilities, 72*, 202-213.
[3] Gilkerson, J., Richards, J., Warren, S., Oller, K.,Russo, R., Vohr, B. (2018). Language experience in the second year of life and language outcomes in late childhood. *Pediatrics, 142*(4), p.e20174276.
[4] Brady, N., Storkel, H. L., Bushnell, P., Barker, R. M., Saunders, K., Daniels, D., & Fleming, K. (2015). Investigating a multi-modal intervention for children with limited expressive vocabularies associated with autism. *American Journal of Speech-Language Pathology, 24*, 438-459. doi:10.1044/2015_AJSLP-14-0093
[5] [LENA recording device] (2017). Retrieved from https://wisconsincentraltimenews.com/2017/10/23/marathon-county-public-library-to-become-first-lena-start-site-in-wisconsin/

Results

Correlation tests were conducted using average rates for CVC and CTC correlated with word learning success indicators.
CVC average correlated with:
- ➢ Difference score (last set – first set), r= 0.251
- ➢ Total # passed words, r= -0.193
- ➢ Total # different words passed, r= -0.162

CTC average correlated with:
- ➢ Difference score, r= 0.114
- ➢ Total # passed words, r= -0.212
- ➢ Total # different words passed, r= -0.228

Correlations were not significant.*

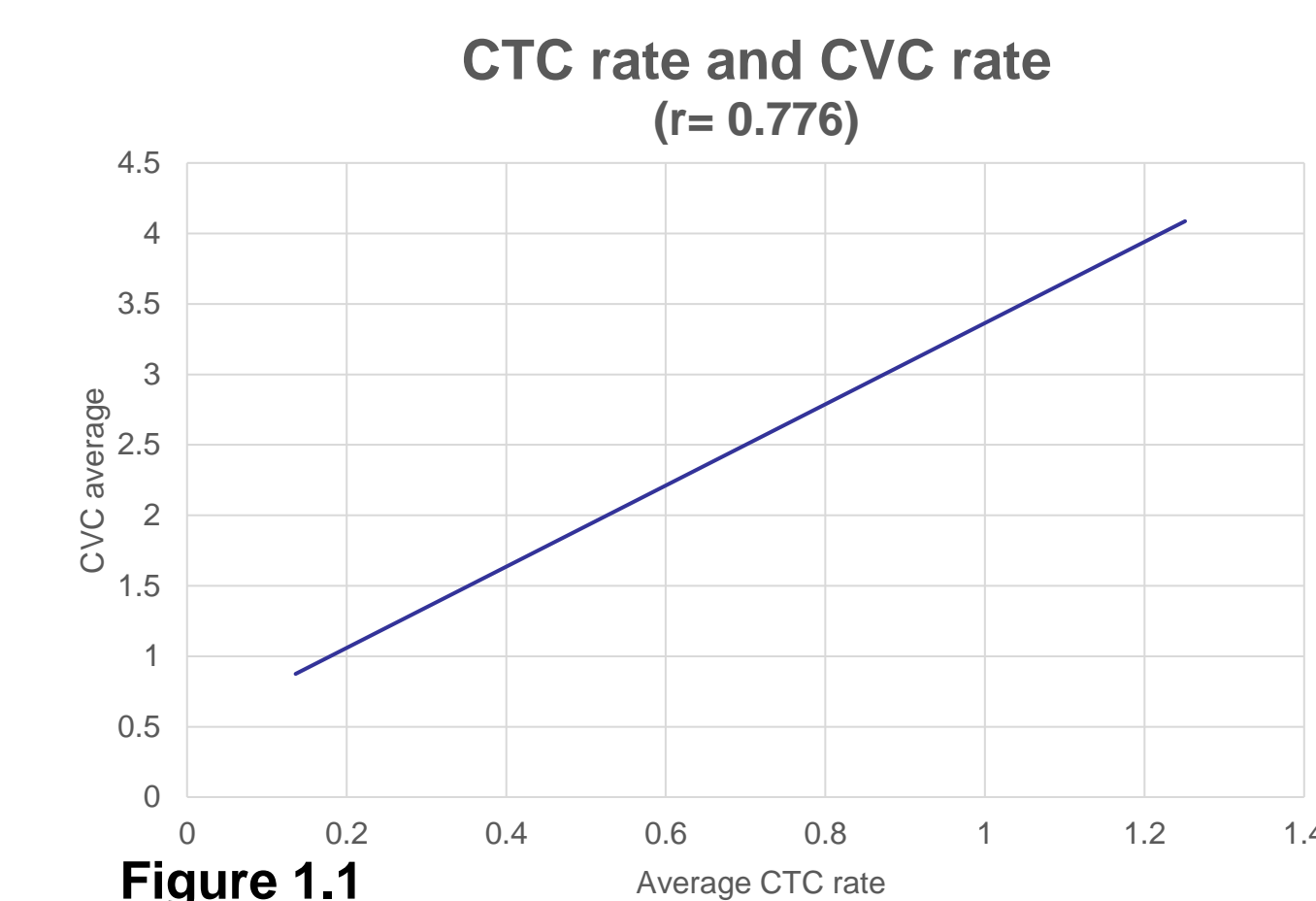Figure 1.1 — CTC rate and CVC rate (r= 0.776)
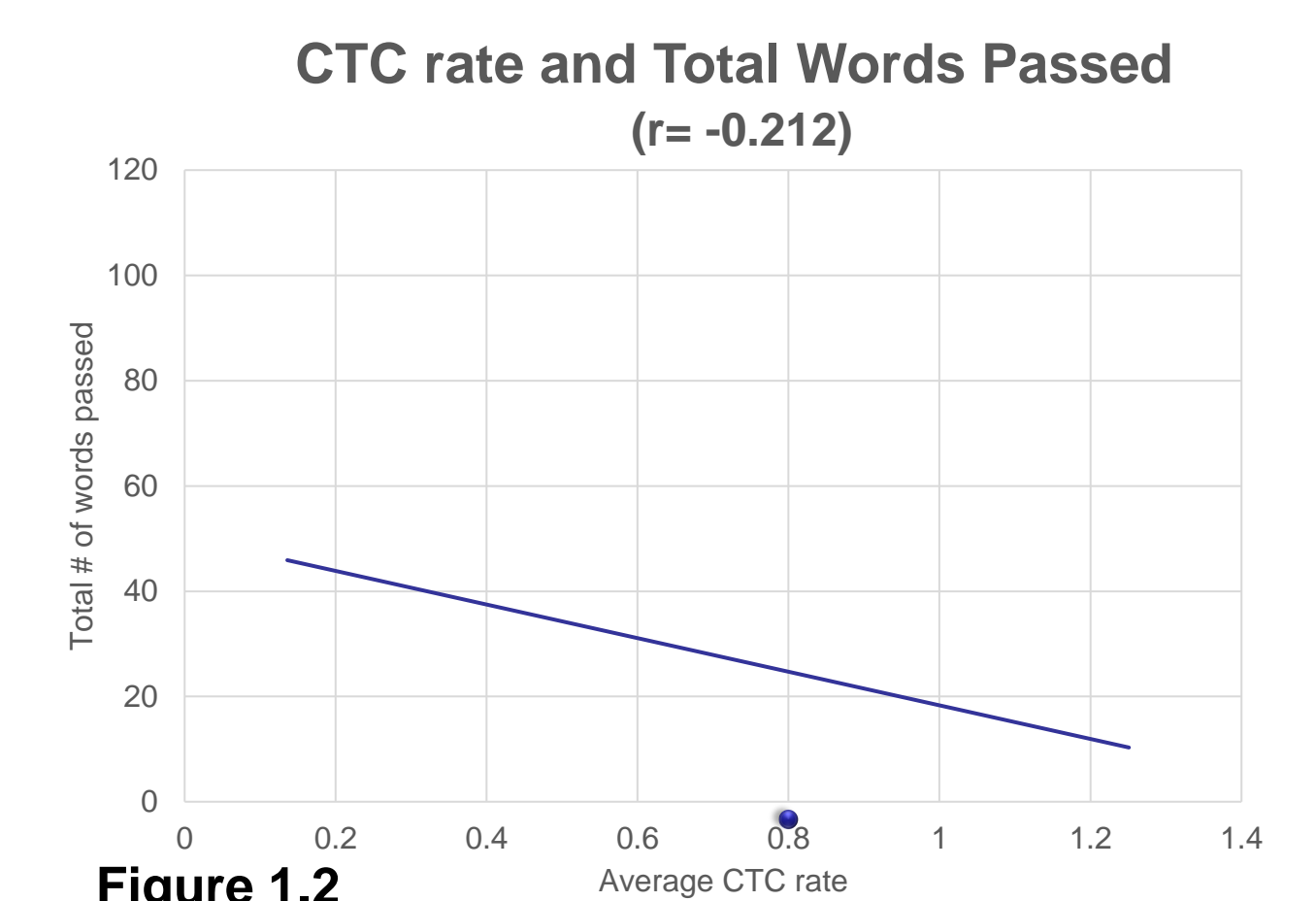
Figure 1.2 — CTC rate and Total Words Passed (r= -0.212)

* Figure 1.1 shows the significant correlation between CTC and CVC rates. However, there was no significant impact for any of the word learning variables (example in Figure 1.2).

Stability of CVC and CTC:

Paired sample t-tests measured the stability of CVC and CTC across pre- and post- intervention means.
- ➢ CVC: $t_{(18)} = -0.256$, p=0.400329733
- ➢ CTC: $t_{(18)} = -0.449$, p=0.329345

CVC and CTC means were not significantly different, indicating stability.

Discussion

Correlational results reveal a significant relationship between CTC and CVC variables; however, no significant relationship was shown between these predictor variables and word learning in intervention.
- These findings may be due to limitations in the LENA segmentation formula for CTC and CVC (doesn't differentiate intentional productions, overlap with other child or adult speakers, etc.)
- Paired-sample testing revealed CVC and CTC were stable across intervention.

Future studies might compare PFSS scores to CTC using an alternate method to contrast with LENA findings.
Joint attention could also be measured as a predictor variable that may contribute to CTC and word learning success.