

Listening in:

Comparing Parent Language in LENA Recordings to Parent-Child Play-Based Interactions Across Populations



early intervention
RESEARCH GROUP

Northwestern

Authors & Disclosures

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Why measure parent input?



Measures of parent input

Behavioral Microcoding

- Standard in research for many years
- Requires a human watching and coding adult behaviors
- Captures a snapshot of parent child-interaction

LENA

- Small digital language processor worn by a child
- Software analyzes and segments the recording in order to produce several primary variables
 - Adult Word Count (AWC)
 - Conversational Turn Count (CTC)
- Captures full-day natural language environments



LENA Across Populations

- LENA's utility has been examined with various disability populations (e.g. ASD, hearing loss)
 - Variable correlations have been reported between standardized measures of *child language* and LENA metrics (Wang et al., 2017)
 - No known work has been done examining the relationship between measures of *parent language* and LENA metrics (Wang et al., 2017)



Research Questions

1. How does LENA CTC compare to the behaviorally coded measurement of matched turns from a 10 minute parent-child interaction?
2. How does LENA AWC compare to behaviorally coded measures of parent language quantity from a 10 minute parent-child interaction?
3. Do the densest 10 minutes of a LENA recording compare better than hourly rates of AWC and CTC to behaviorally coded measures from a 10 minute parent-child interaction?
4. Are these relationships consistent across children who are typically developing and different populations of children with developmental delays?



Participants

- 150 parent-child dyads matched for parent gender, child gender, child age, and parent education level across diagnoses
 - Autism spectrum disorder (ASD) ($n = 60$)
 - Developmental language disorder (DLD) ($n = 45$)
 - Deaf and hard of hearing (DHH) ($n = 15$)
 - Typical development (TD) ($n = 30$)



Participants

- Parent gender: 92% female
- Child gender: 14% female
- Child age in months: 32.2 (22-48)
- Parent education: 37% college educated
- Race/ethnicity: 43% identified as a minority



Measures: PCX

- Parent-child dyads filmed playing together for 10 minutes in a Parent-Child Interaction (PCX) using a standard set of toys (shape sorter, stacking cups, Legos, puzzle, dolls, ball, and dollhouse)
- Parents instructed to play with their child as they normally would
- PCXs transcribed and coded by independent raters trained to a minimum 80% reliability across all variables
 - Reliability was calculated for at least 15% of records and was greater than 80%



Measures: PCX

- Parent language standard SALT variables
 - Number of Total Words (NTW)
 - Number of Different Words (NDW)
 - Total Utterances (TU)
- Parent language microcoded variable
 - Matched turns (MT): parent lines of the transcript that were coded for temporal contingency (responding within 3 seconds to a child utterance) and topic contingency (related to the child's focus of interest)



Measures: PCX



Measures: PCX



Measures: LENA

- LENA recordings for each participant were between 10-16 hours
- Hourly rates were obtained for each of the primary LENA variables
 - AWC
 - CTC



Measures: LENA Density

- Day-long recordings have periods with reduced language input that were factored into our hourly rate, such as nap time
- Denser segments of communication may be more comparable to the PCX
- We defined density as the 10 minutes in the day-long LENA recording with the greatest CTC
 - CTC captures both parent and child information
 - CTC has been proposed as the best variable to represent the quality of language input
 - Each LENA variable (AWC, CTC, CVC) was taken from the densest ten minutes of the day-long recording, resulting in AWC-D, CTC-D, and CVC-D



Measures: LENA

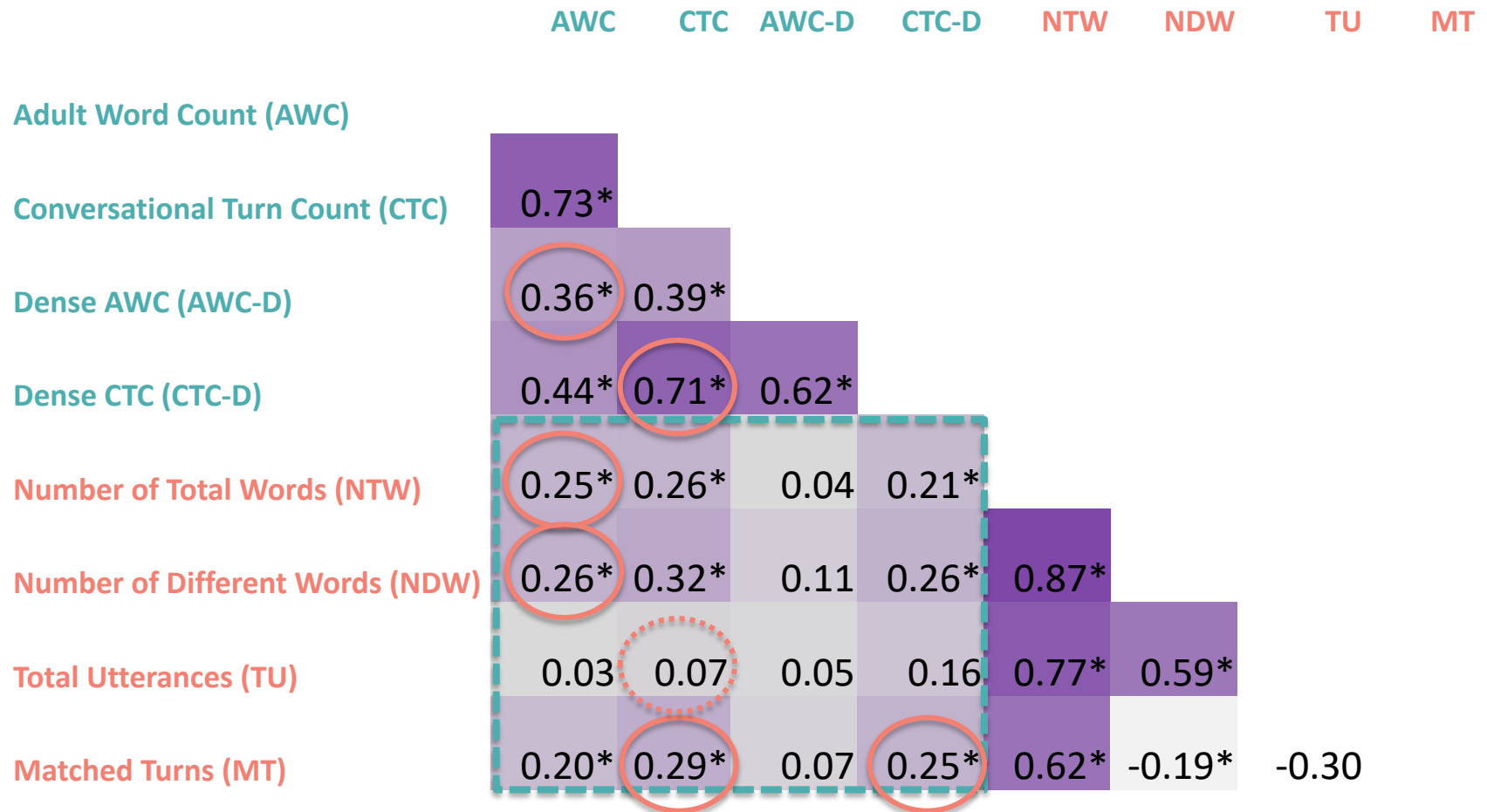


CTC = 5



Results:

Correlations Across Populations



* $p < 0.05$



Disability vs. Typical Development

Disability Group

	Adult Word Count (AWC)	Conversational Turn Count (CTC)
Number of Total Words (NTW)	0.13	0.25
Number of Different Words (NDW)	0.14	0.21
Total Utterances (TU)	0.01	0.05
Matched Turns (MT)	0.25	0.32*

Typical Development

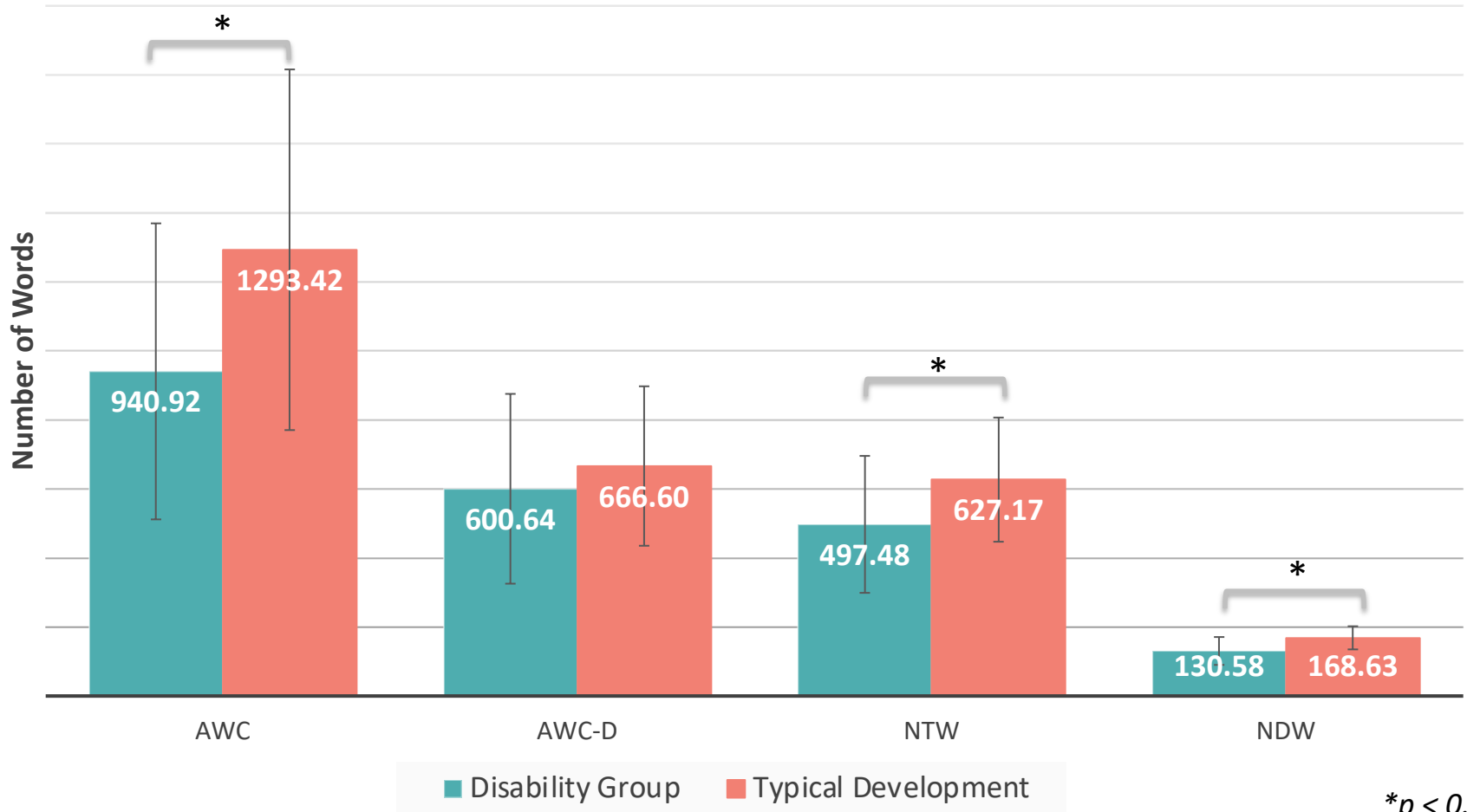
	Adult Word Count (AWC)	Conversational Turn Count (CTC)
Number of Total Words (NTW)	0.35	0.25
Number of Different Words (NDW)	0.34	0.19
Total Utterances (TU)	0.09	0.12
Matched Turns (MT)	-0.23	-0.08

* $p < 0.05$



Disability vs. Typical Development

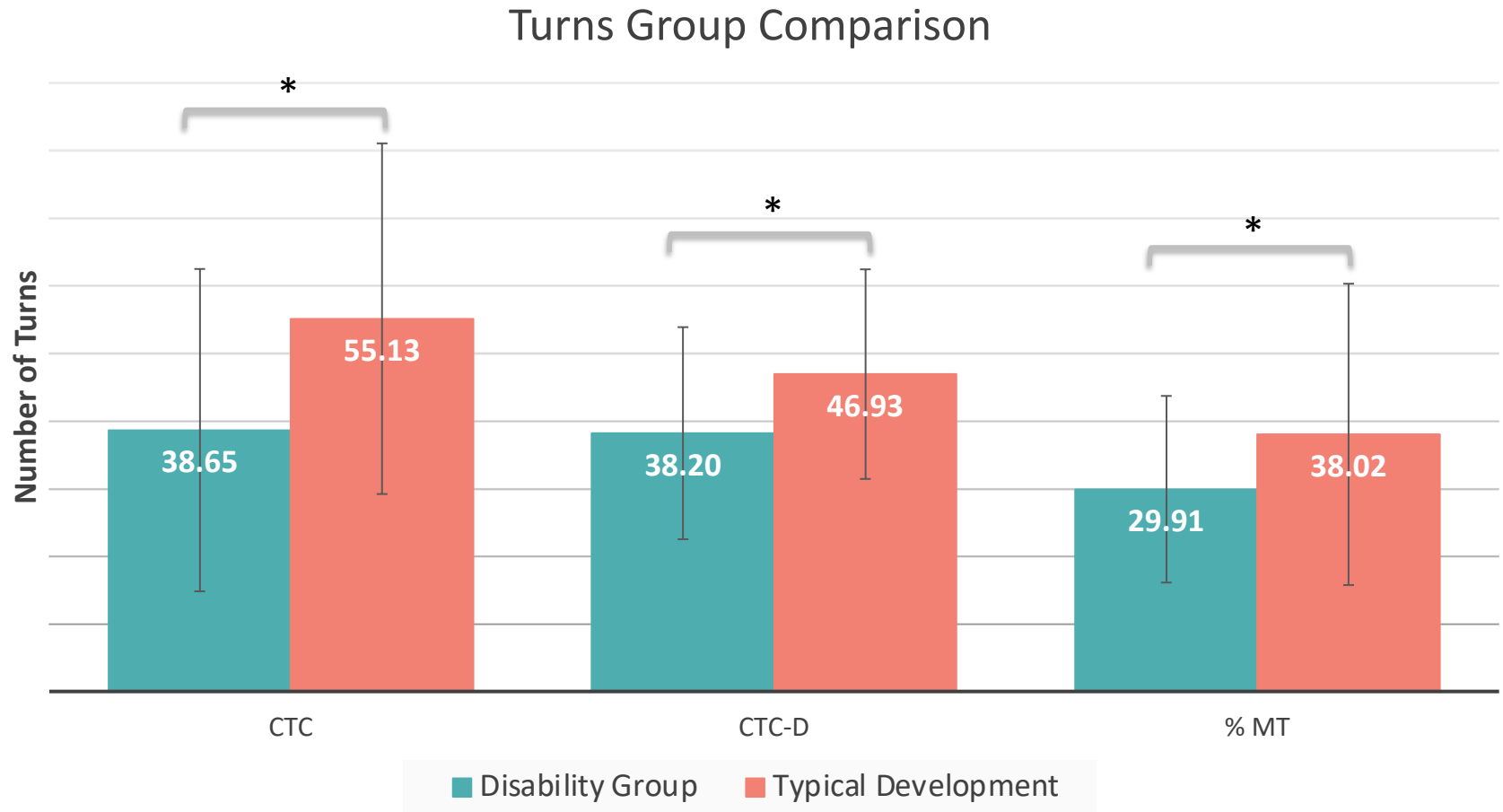
Quantity of Input Group Comparison



* $p < 0.05$



Disability vs. Typical Development



**p < 0.05*





Discussion

- Correlation between CTC and matched turns was moderate in the full group comparison
 - This relationship was not consistent in the typically developing subgroup
- The relationship between AWC and PCX word count measure (NDW, NTW) was weak
 - Correlations were not significant in any of the six subgroups
- These differences may be present is due to our limitations



Limitations

- The adult who is communicating with the child may be different at home vs. in the laboratory setting (e.g. multiple caregivers)
 - This may vary across populations (e.g. therapists)
- Quantity vs. quality (e.g. child-directed speech)
- For example: 
- The LENA foundation recommends at least 10 hours of recording to get a stable estimate, so density measurements are likely not as stable
 - For example: 



Future Directions

- Listen in and transcribe LENA recordings to compare to PCX variables
- Continue to examine the relationship between research measures of both parent and child language and LENA metrics
- D-study to better understand the number of dense samples needed to provide a stable measurement of LENA variables



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Questions?

Thank you!



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