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Abstract

Language sample analysis is imperative for language assessment in young children. Computer technology, *Language Environmental Analysis System (LENA™)*, collects language samples and employs Automatic Speech Recognition (ASR) to automatically generate language assessment. Data were gathered from 26 families with children aged 24 to 48 months old. A small correlation effect was present, but more research is necessary for validation.

Purpose

The purpose of this study was to determine if a relationship exists between computer-generated language sample analysis, measured by Automatic Vocalization Assessment (*LENA™* AVA), and traditional language sample analysis, measured by manual calculation of Mean Length of Utterance (Manual MLU).

Participants



Child participants

- 24 to 48 months
- No known communicative delays
- 19 females and 7 males

Parent participants

- 25 mothers and 1 father
- 20 to 41 years old

Method:

Materials

- *LENA™* DLP
- *LENA™* clothing
- *FlipCam™* video recorder



Instructions

Families were instructed to use *LENA™* to record at least 5 hours in their home environment during normal daily routines and use a *FlipCam™* to record a 30 minute parent-child interaction video.

Method: Scoring

Manual MLU Score

- Transcribe 15 minutes of interaction
- Calculate each child participant's Mean Length of Utterance (MLU)

$$MLU = \frac{\text{Total \# of child morphemes}}{\text{Total \# of child utterances}}$$
- Convert to **Standard Deviation (SD)** scores then to **Standard Scores (SS)**



LENA™ Automatic Vocalization Assessment (AVA)

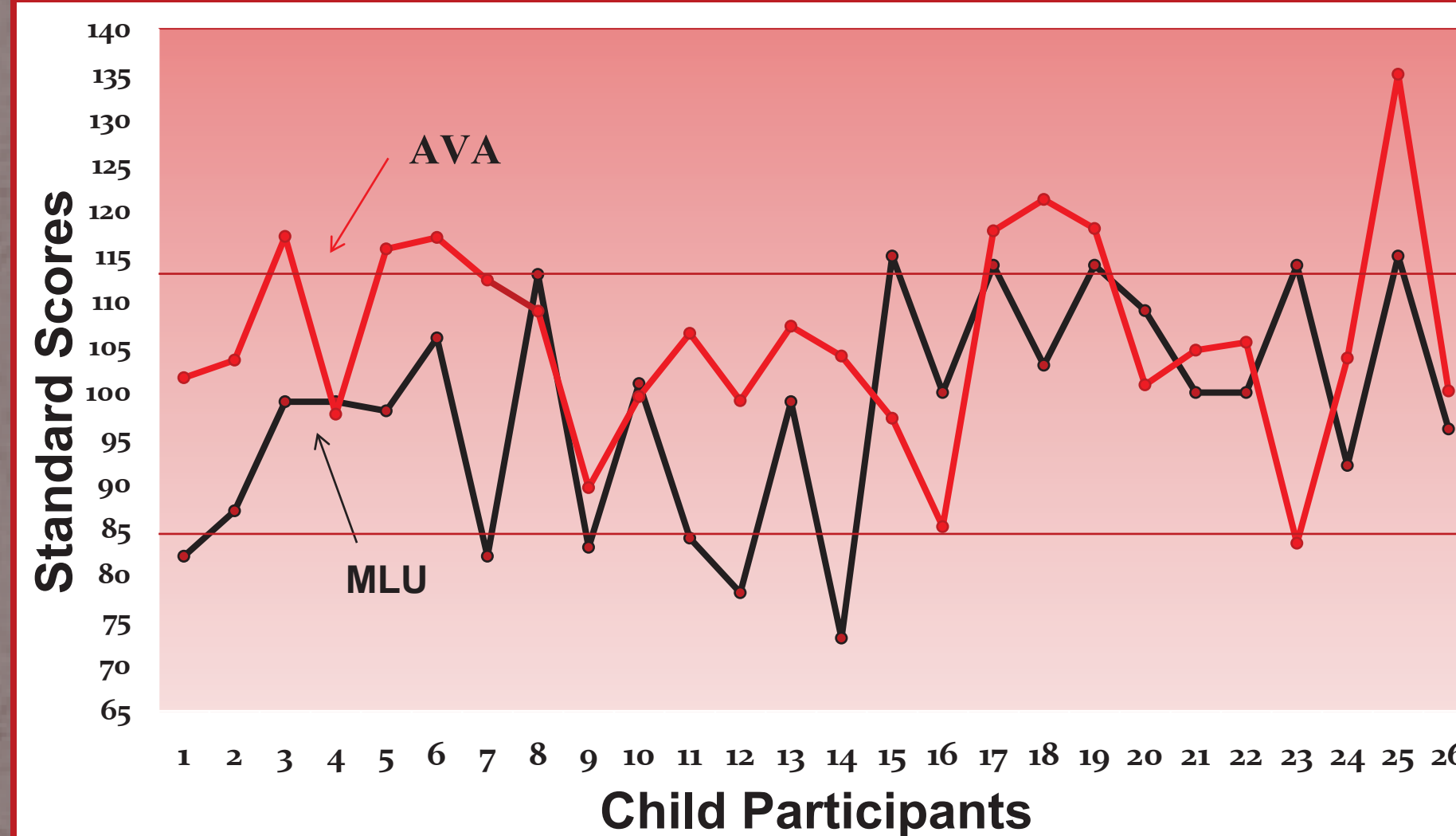


LENA™ employed ASR technology to extract, decode, and categorize acoustic properties of Child

Vocalizations (CV), compare information to age-based normative sample data, and assign each child a *LENA™* AVA Standard Score.

Correlation Study

LENA™ AVA scores and Manual MLU scores were entered into a *Microsoft Excel* spreadsheet. The two sets of data were compared for group effect size utilizing Pearson's *r* correlation statistics.



	Mean	Median	Mode	Range
<i>LENA™</i> AVA	106	99	104	83-135
Manual MLU	98	104	99, 100, 114	73-115

Correlation
LENA™ AVA &
Manual MLU

$r =$
0.25

Small positive
correlation

**p* value = 0.11

Discussion

There was **evidence to suggest a small positive relationship** between *LENA™* AVA and Manual MLU. No strong correlation found between *LENA™* AVA scores and Manual MLU scores because they measure different constructs: *LENA™* AVA=**expressive speech production** & Manual MLU=**expressive language**

This study should be **reduplicated with more subjects to better determine the relationship.

Clinical Implications

• **Higher *LENA™* AVA:** more **Type 2 Errors (false-negatives)** & under referral

**Greater implication as children may be denied needed services

• **Lower Manual MLU:** more **Type 1 Errors (false-positives)** & over referral

Participants referred to EI services:

- *LENA™* AVA: 0/26 = 0% of participants
- Manual MLU: 2/26 = 8% of participants

Case study with a child with cochlear implants:

LENA™ AVA: 99.9 SS; Manual MLU: 69 SS

Recommendations

Study Rx: Enroll more participants (including children with known language delays), standardized language sample starting point and similar routine assignments.

***LENA™* Rx:** Research with greater diversity of cultural, regional, and special needs populations, adjustments to *LENA™*'s sound categorization to better separate speech and nonspeech sounds, application of rules for assigning utterances to exclude meaningless language, inclusion of assimilatory and coarticulatory speech sound properties derived from frequently used words.

Selected References

Miller, J. F. & Chapman, R. S. (1981). *The relation between age and mean length of utterance in morphemes*. 24, 154-161. doi:0022-4685/81/2402-0154\$01.0010

Retherford, K. S. (2000). *Guide to analysis of language transcripts* (3rd ed.) Austin, TX: Pro-Ed.

Richards, J. A., Gilkerson, J., Paul, T., & Xu, D. (2008). *The LENA Automatic Vocalization Assessment (technical report LTR-o8-1)*. Retrieved from <http://www.lenafoundation.org/Research/TechnicalReports.aspx>