SELECTING A METRIC FOR QUANTIFYING PRESCHOOLERS’ TONGUE SHAPE COMPLEXITY USING ULTRASOUND IMAGING

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INTRODUCTION

- Speech sound disorders can have a negative impact on academic, social, or psycho-emotional development.
- Speech sounds differ in tongue shape complexity.
- An objective measure for classifying productions into categories of lingual complexity serve as a predictor of persistence of errors and/or treatment responsiveness.
- Ultrasound imaging may be more versatile and less invasive and costly than alternative visualization methods, such as electropalatography (Gibson, 1999).
- Goal of this study: Find the ultrasound measure that best correlates with lingual complexity categories identified in a previous study of adults (Dawson et al., 2016).

METHODS

- 8 preschool participants (5 females, 3 males) who were evaluated in an ultrasound study at Molloy College. The children ranged in age from 4.0 to 6.3 (mean = 4.10, sd = 10 months).
- Preliminary measurements from one participant are reported here:
  - 6.1 year-old female with normal hearing and no history of speech or language impairment, although /r/ and /l/ sounds were emerging.
- Task: 48-word probe with randomized presentation of 3 elicitions of each word (78 measured phonemes, as some repeated).
- Compared three distinct techniques for transforming raw spatial coordinates:
  - Modified curvature index (MCI) using Matlab.
  - GetContours (Tiede, 2016) allows interaction between tagged intervals in Textgrid and corresponding ultrasound images.
  - 16 tagged data points summarized using a variety of algorithms in Matlab (MathWorks, 2000).

RESULTS

- All /l/ productions were removed from analysis based on 6/7 tokens being greater than 3SDs from the mean of at least one metric. Only 1/18 /l/ productions was removed because it was greater than 3SDs from the mean of two metrics.
- Tagged sound files using Textgrid file in Praat (Obermaier & Weenick, 2014), making separate tier for vowel intervals, approximant intervals, and plosive burst locations. Used Praat scripts to make stop interval.

CONCLUSIONS

- The real component of C1 is the best individual predictor of lingual complexity in this child.
- The best combination of metrics was Procrustes with either the real component of C1.
- Contrast with Dawson et al. finding for adults that real & imaginary components of C1 were best predictors.

The current study extends the experimental paradigm in Dawson et al. to preschool-aged children in order to determine which specific measure is predictive of tongue complexity in children.

MCI (Modified Curvature Index) is the best predictor of /l/ productions.

REFERENCES

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