Reliability and Validity of a Sentence Intelligibility Measure for Children

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Introduction

Background

- Need for reliable and valid word identification procedures to measure young children’s speech intelligibility:
  - Quantifying severity of speech disorder
  - Measuring speech outcomes

- Word identification intelligibility measures based on a conversational speech sample:
  - Have high ecological validity
  - Are time consuming
  - Are challenging for children with severe intelligibility deficits

- Test of Children’s Speech Plus (TOCS+ software) developed to digitally audio record imitated utterances from young children and play these to listeners for word identification

Methods

Child Subjects

- N = 72 English-speaking children (18 at each of 4 ages: 3, 4, 5 & 6 yrs)
  - All children had receptive language, hearing abilities, and speech mechanism structure within normal limits.
  - In each age group:
    - 9 with typically developing speech
      - Obtained scores ≥ 16th %ile on articulation subtest of the Fluharty Preschool Speech and Language Screening Test (Fluharty-2) and no history of parent concern or speech-language therapy
    - 9 with speech sound disorders (SSD)
      - Identified by referring SLPs and scores < 16th %ile on the Fluharty-2 articulation subtest.

Recording TOCS+ Sentence Tests and Conversational Samples

TOCS+ Sentence Tests

- Two forms administered within two week period
- Recordings made using standard head-mounted mic/pre-amp
  (Share WH20 XLP microphone/AudioBuddy Dual Mic Pre-amplifier)
- Longest utterance in tests:
  - Children with typical speech development:
    - 3 yr. = 4 words; 4 yr. = 5 words; 5 yr. = 6 words; 6 yr. = 7 words
  - Children with SSD
    - Fit with MLU (e.g., for MLU of 4 words, longest utterance = 4 words)

Spontaneous Speech Sample

- 15 minute spontaneous speech sample elicited using interactive play and audio recorded using TOCS+ Recorder/Player software (TOCS+RPT™)

- Starting at 2nd minute of each sample, a 100-word contiguous sample was segmented into utterances following procedures of Shriberg et al.
  - Each utterance saved as a .wav file

Judging Samples

- Adults with normal hearing, English as a first language, post-secondary education, 18 - 35 years of age
- 3 different listeners judged each child’s recordings for each TOCS+ Sentence Test and 100-word spontaneous sample

- Word identification task – maximum 2 presentations per item
- 72 children x 3 conditions x 3 listeners = 648 listening sessions
  - Some listeners participated in more than one session but these were at least a month apart and were never for the same child

- TOCS+ Intelligibility software presented sentence items
- TOCS+ RPT™ software presented spontaneous utterances
  - Listeners instructed to type in the words they heard the child say

Results

Percentage of words identified correctly, based on mean of 3 listeners’ scores = intelligibility score

TOCS+ Sentence Measure: Alternative Forms

- Test Time x Group x Age ANOVA
  - No significant difference between test forms
  - Significant group and age effects

TOCS+ Sentence Measure vs. 100-Word Spontaneous Sample

- Significant Sample by Group Interaction
  - Significant difference between sample conditions
  - Nonsignificant difference between sample conditions

Conclusions

- Strong positive correlation between TOCS+ Sentence forms for both groups of children
- Intelligibility scores did not differ significantly between forms
- Strong positive correlation between TOCS+ Sentence & 100-word spontaneous speech sample scores for children in SSD group
- Intelligibility scores did not differ between sample type for group with SSD but did for group with typical speech development

TOCS+ Sentence Intelligibility measure shows promise as an efficient, stable and representative measure of ability of young children with SSD to make audio recordings of their speech understandable to unfamiliar listeners.
References


