

Assessment of Phonetic Skills in Children 1: Transcription Categories & Listener Expectations

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INTRODUCTION

- Transcription is the tool of choice of clinicians and researchers studying phonological development and disorder.
- However, problems with transcription include:
 - Listener judgments are influenced by their expectations.
 - Children do not always progress directly from clear substitutions to correct productions.
- Listener expectations:
 - Listeners' perceptions are influenced by information about a talker, such as gender, dialect, age, and social class.
- Non-categorical nature of development:
 - Covert contrast (measurable subphonemic differences that are not perceptible to adults)
 - Intermediate productions (productions that are in between two phoneme categories)

RESEARCH QUESTIONS

1. How do adults perceive children's correct productions of /s/ and /θ/, clear substitutions ([s] for /θ/ and [θ] for /s/), and intermediate productions (between /s/ and /θ/)?
2. Do expectations about a child's age and the presence (or absence) of a phonological disorder, as cued by a carrier phrase, influence listeners' accuracy judgments?
3. Do listeners with clinical experience perceive these productions any differently than listeners without clinical experience?

EXPERIMENT 1

PURPOSE

- To select the carrier phrases for Experiment 2

PARTICIPANTS

- 20 young adult listeners (English-speaking females)

STIMULI

- Productions of the carrier phrase "I really like" were elicited from a 5-year-old boy who was a native speaker of American English.

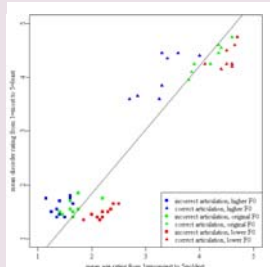
	Raised F ₀ and formants	Unchanged F ₀ and formants	Lowered F ₀ and formants
Error-free	"I really like" Total Number: 4	"I really like" Total Number: 4	"I really like" Total Number: 4
Speech sound errors	"I weawwy yike" Total Number: 5	"I weawwy yike" Total Number: 5	"I weawwy yike" Total Number: 5

PROCEDURE

- Carrier phrases were presented to listeners in two separate tasks.
 - Task 1:** Listeners judged how old the child sounded using a 5 point scale.
 - Task 2:** Listeners judged how adult-like the child sounded using a 5 point scale.
- The order of the two tasks was counter-balanced across listeners.

RESULTS

MEAN RATINGS FOR THE DISORDER-RATING TASK PLOTTED AGAINST THE MEAN RATINGS FOR THE AGE-RATING TASK



- There was no significant difference between the mean ratings for the two different orders, so data from both orders was combined.
- When judging the age of the child, listeners were influenced both by the F₀ and formant values of the carrier phrase and by the presence or absence of phonological errors within the phrase.
- When judging how adult-like the child's speech sounded, listeners were influenced only by the presence or absence of phonological errors.
- Listener ratings of age and of the presence/absence of a phonological disorder were highly correlated.

DISCUSSION

- For the purposes of Experiment 2, two carrier phrase conditions were created: "younger-disordered" and "older-typical"

EXPERIMENT 2

PARTICIPANTS

- 30 young-adult, female listeners
 - All were native English speakers and students in the Communicative Disorders Dept. at UW-Madison
 - 15 were undergraduate students with limited or no clinical experience.
 - 15 were graduate students who had completed at least one graduate level clinical experience

STIMULI

- 200 word-initial consonant-vowel (CV) syllables beginning with /s/ and /θ/ were excised from single word productions elicited from 2- to 5-year-old children using a word repetition task as part of a larger study (Edwards & Beckman, 2008).
- All CV sequences were transcribed by the first author.
- Each CV sequence was paired with two different carrier phrases: one "younger-disordered" carrier phrase and one "older-typical" carrier phrase.

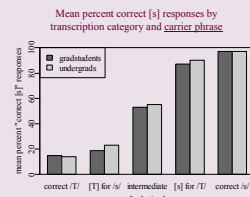
TRANSCRIPTION CATEGORY
1) correct /s/
2) [s] for /θ/ substitution
3) intermediate between /s/ and /θ/ <ul style="list-style-type: none"> • [s]:[θ] (slightly closer to [s]) • [θ]:[s] (slightly closer to [θ])
4) [θ] for /s/ substitution
5) correct /θ/

	"Younger-Disordered"	"Older-Typical"
Pronunciation	"I weawwy yike"	"I really like"
F ₀ and formant conditions	• Raised F ₀ and formants • Unchanged F ₀ and formants	• Lowered F ₀ and formants • Unchanged F ₀ and formants

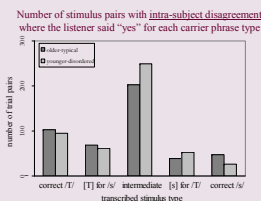
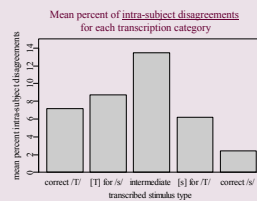
PROCEDURE

- Carrier Phrase-CV pairs were randomly presented on a laptop computer through headphones.
- Listeners were told:
 - Each sentence would begin with the phrase, "I really like," and end with a consonant-vowel sequence beginning with "s."
 - Sometimes the "s" sound would be produced correctly and sometimes it would be produced incorrectly.
- Listeners were asked to judge whether the "s" sound was produced correctly.
- Listeners responded by pressing buttons on a serial response box.

RESULTS: LISTENER RESPONSES



- The mean % correct [s] responses was significantly different for each of the 6 transcription categories.
- There was no significant main effect of carrier phrase type.
- There was no significant main effect of listener group (Undergraduate vs. Graduate students)



- Intermediate productions were more likely to be rated differently across the two carrier phrase conditions than any other transcription category.
- Correct /s/ productions were the least likely to be rated differently across the two carrier phrase conditions.
- When listeners were inconsistent on intermediate productions, they were more likely to hear a correct /s/ when the CV was preceded by a "younger-disordered" carrier phrase.

EXPERIMENT 3

PURPOSE

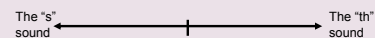
- To elicit gradient decisions from individual listeners (i.e. to determine whether naive listeners reliably categorize productions as intermediate between /s/ and /T/)

PARTICIPANTS

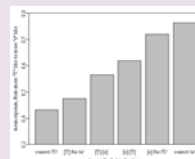
- 20 adult, native English-speaking listeners in Minneapolis, MN

STIMULI AND PROCEDURE

- Listeners heard each of the 200 consonant-vowel syllables presented in Experiment 2.
- Listeners were asked to rate the consonant in each syllable using the visual analog scale shown below.
- Listeners were explicitly instructed to click on the location along the scale that corresponded with the percept of 'proximity' to "s" or "th."



RESULTS: LISTENER RESPONSES



- There was a significant differences between each pair of transcription categories.
- Naïve listeners were able to identify intermediate productions as intermediate.
- Naïve listeners could distinguish between correct productions of /s/ and /θ/ and both [s] for /θ/ and [θ] for /s/ substitutions.

DISCUSSION AND CONCLUSIONS

- 1) Naïve listeners' responses to each of these five transcription categories patterned differently.
 - Validates our original transcription categories.
 - Provides support for the existence of covert contrast.
 - Significant difference between correct productions and clear substitutions.
 - Suggests that "intermediate" is a valid transcription category.
 - Significant difference between "intermediate" and all other transcription categories.
- 2) There was no main effect of listener group.
 - May be related to methodology.
 - Only considered clinical experience.
 - Overlap in amount of clinical experience between groups.
- 3) There was no main effect for carrier phrase condition.
 - Not surprising for correct productions or clear substitutions.
 - Less clear why was there no effect for ambiguous, intermediate productions, which are known to be most affected by listener expectations.
 - Too few carrier phrases?
 - Habituation?
 - Mismatch in voice quality between CV and carrier phrase?
- 4) Intermediate productions were more likely to be rated inconsistently.
- 5) When listeners were inconsistent on these productions, they were more likely to hear a correct /s/ when they expected that the child was younger and had a phonological disorder.
- 6) On a gradient judgment task, listeners' responses were significantly different for each of the transcription categories, suggesting that individual listeners are able to perceive intermediate productions.

FUTURE DIRECTIONS

- 1) Perform acoustic analysis of consonants in different transcription categories.
 - Analysis of spectral moments and relative amplitude of the fricative noise.
 - Compare correct /s/ with [s] for /θ/ substitutions
 - Compare correct /θ/ with [θ] for /s/ substitutions
 - Describe intermediate productions
- 2) Run a similar experiment again with alternate methods of providing expectations.
 - Tell listeners whether the child is suspected of having a phonological disorder.
 - Use vocalic segments of CVs to synthesize carrier phrases that match the CVs in terms of vocal source qualities.
 - Provide listeners with a case history for the child.
- 3) Run a similar experiment with more systematic focus on examining listener experience factors.

ACKNOWLEDGMENTS

- This research was supported by NIDCD grant #02932 and NSF grant #BCS-0729140 to Jan Edwards.
 - Thanks to Tim Arbisi-Kelm, Hyunju Chung, Anne Hoffmann, Eden Kaiser, EunJong Kong, Fangfang Li, Laura Slocum, Asimina Syrika, Emilie Sweet, and Kari Urberg Carlson
 - Thanks especially to:
 - the children who took part in the study
 - the parents who gave their consent
 - The listeners at the UW and UM
- <http://www.ling.ohio-state.edu/~edwards/>