DOES "CLOSE" COUNT IN TRANSCRIPTION AS WELL AS IN HORSESHOES?

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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.

- Non-categorical nature of development:
  - Covert contrast (subphonemic differences that are not perceptible to adults)
  - Intermediate productions (productions that are in between two phoneme categories)
  - These productions may have lower transcription reliability (Pye et al., 1988).

- Do we need an "intermediate" transcription category?
  - Stoel-Gammon (2001) suggested using "intermediate" to improve the reliability of transcription.

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?

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

FIGURE 1. MEAN RATINGS FOR THE DISORDER-RATING TASK PLOTTED AGAINST THE MEAN RATINGS FOR THE AGE-RATING TASK
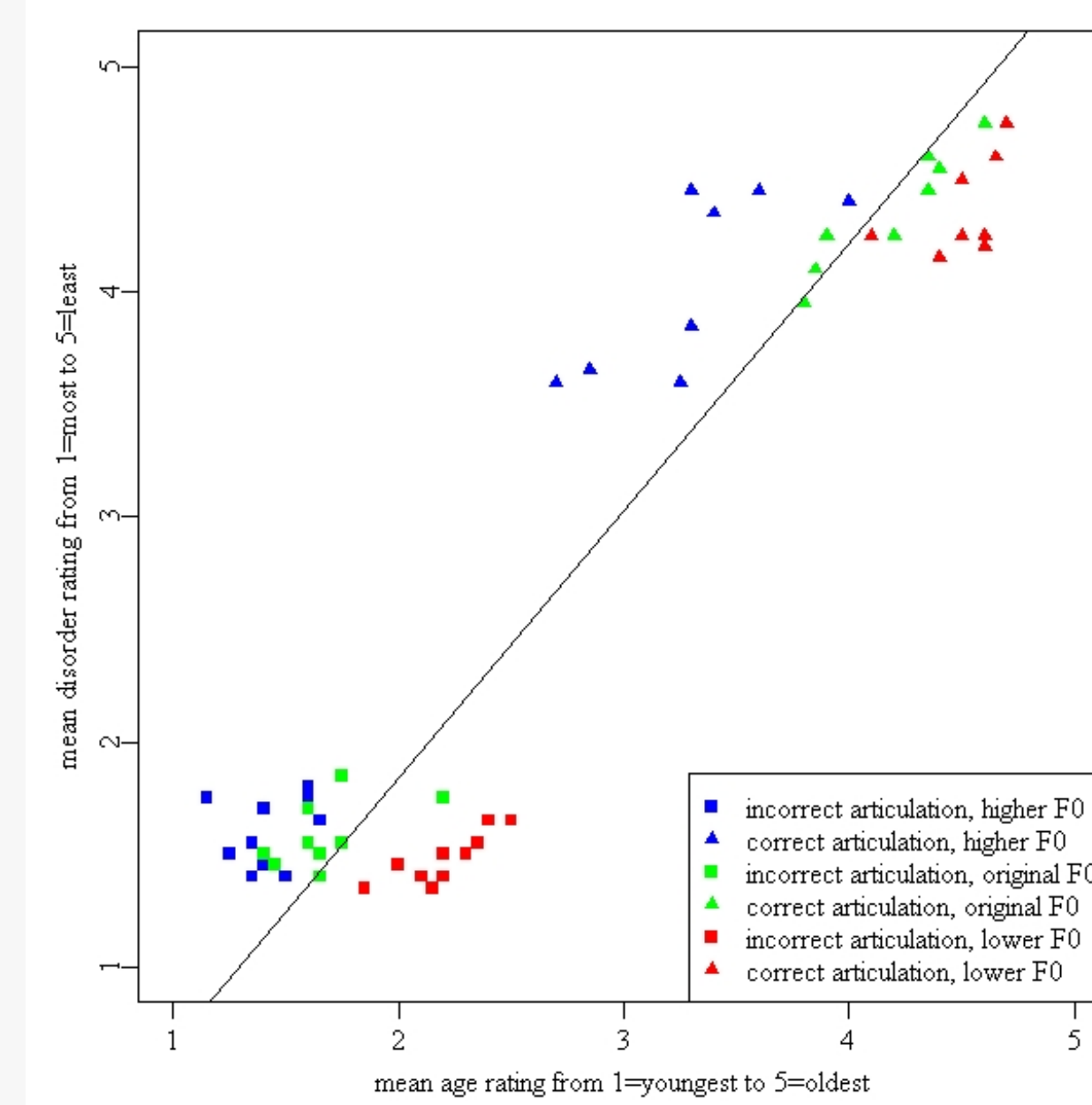
- There was no significant difference between the mean ratings for the two different orders, so data from both orders was combined.
- When judging the age of the child, listeners were influenced both by the F_0 and formant values of the carrier phrase and by the presence or absence of phonological errors 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"
  - "older-typical"

EXPERIMENT 2

PARTICIPANTS

- 30 young-adult, female listeners
  - All were students in the Communicative Disorders Department at the University of Wisconsin-Madison.
  - All were native English speakers.

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.

TRANSCRIPTION CATEGORY
1) correct /s/
2) [s] for /θ/ substitution
3) intermediate between /s/ and /θ/
• [s]:[θ] (slightly closer to [s])
• [θ]:[s] (slightly closer to [θ])
4) [θ] for /s/ substitution
5) correct /θ/

- Each CV sequence was paired with two different carrier phrases: one "younger-disordered" carrier phrase and one "older-typical" carrier phrase.

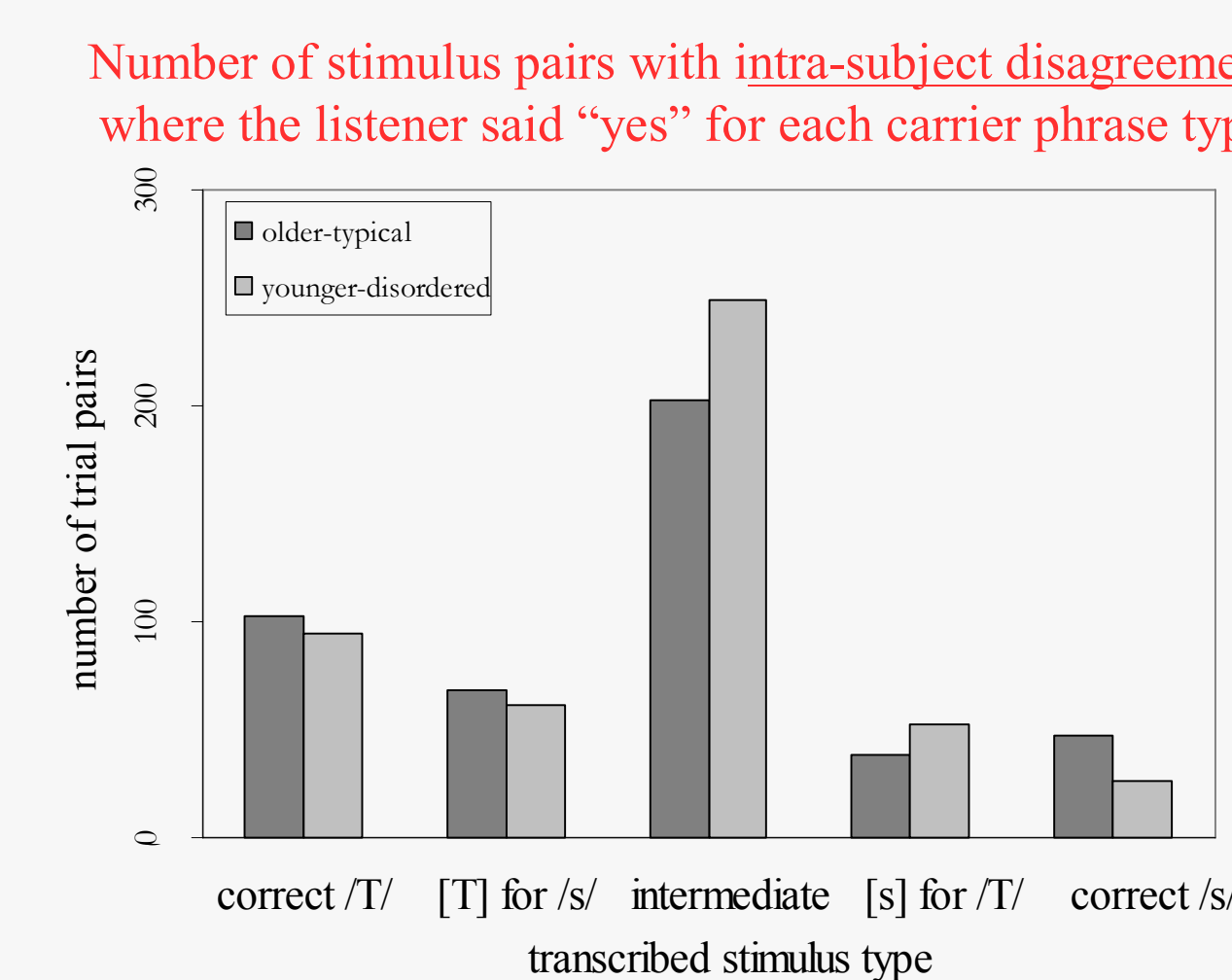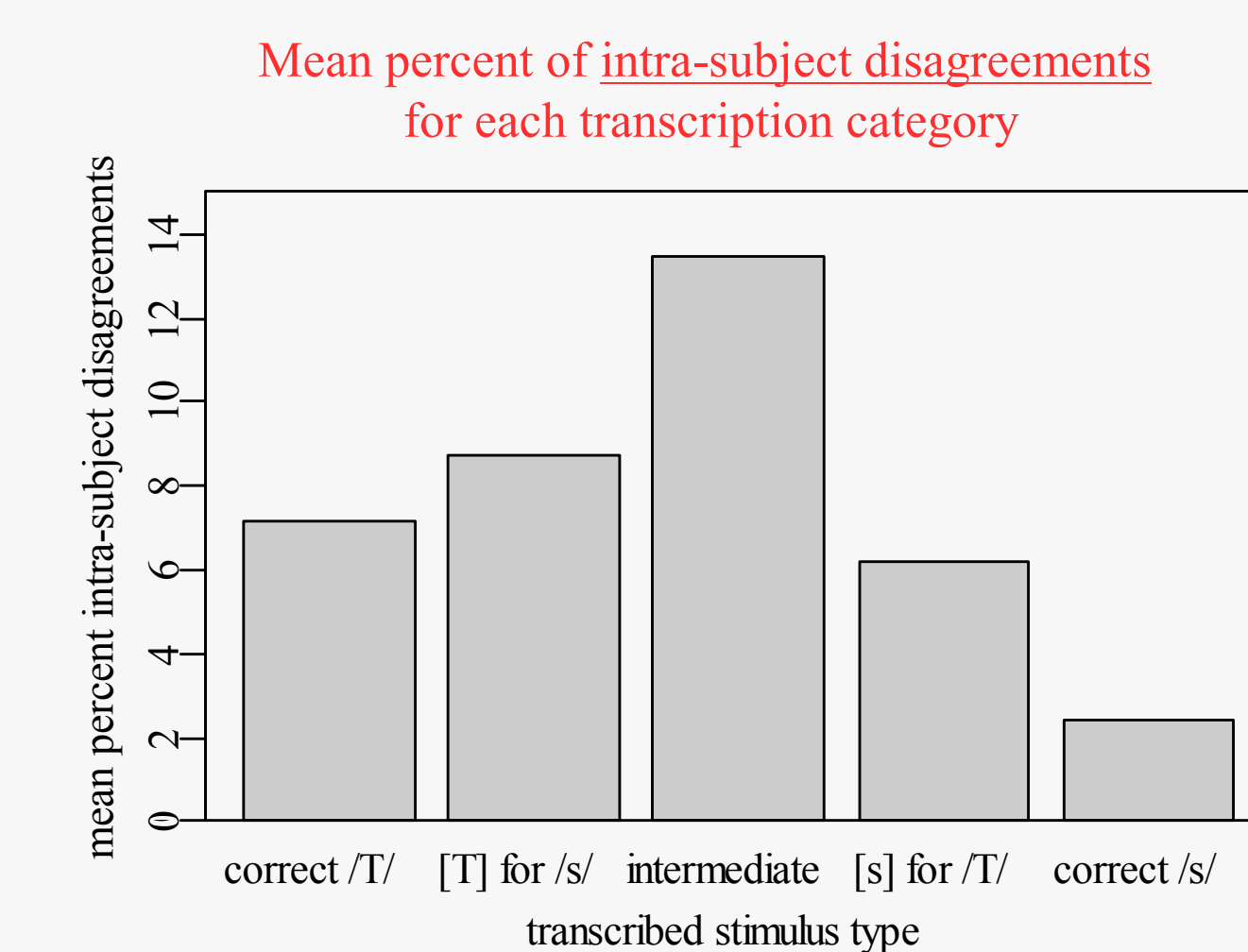|	"Younger-Disordered"	"Older-Typical"
Pronunciation	"I weawwy yike"	"I really like"
F0 and formant conditions	• Raised F_0 and formants • Unchanged F_0 and formants	• Lowered F_0 and formants • Unchanged F_0 and formants

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, which also recorded reaction times.

RESULTS: LISTENERS' ACCURACY RESPONSES

Mean percent correct [s] responses by transcription category and carrier phrase
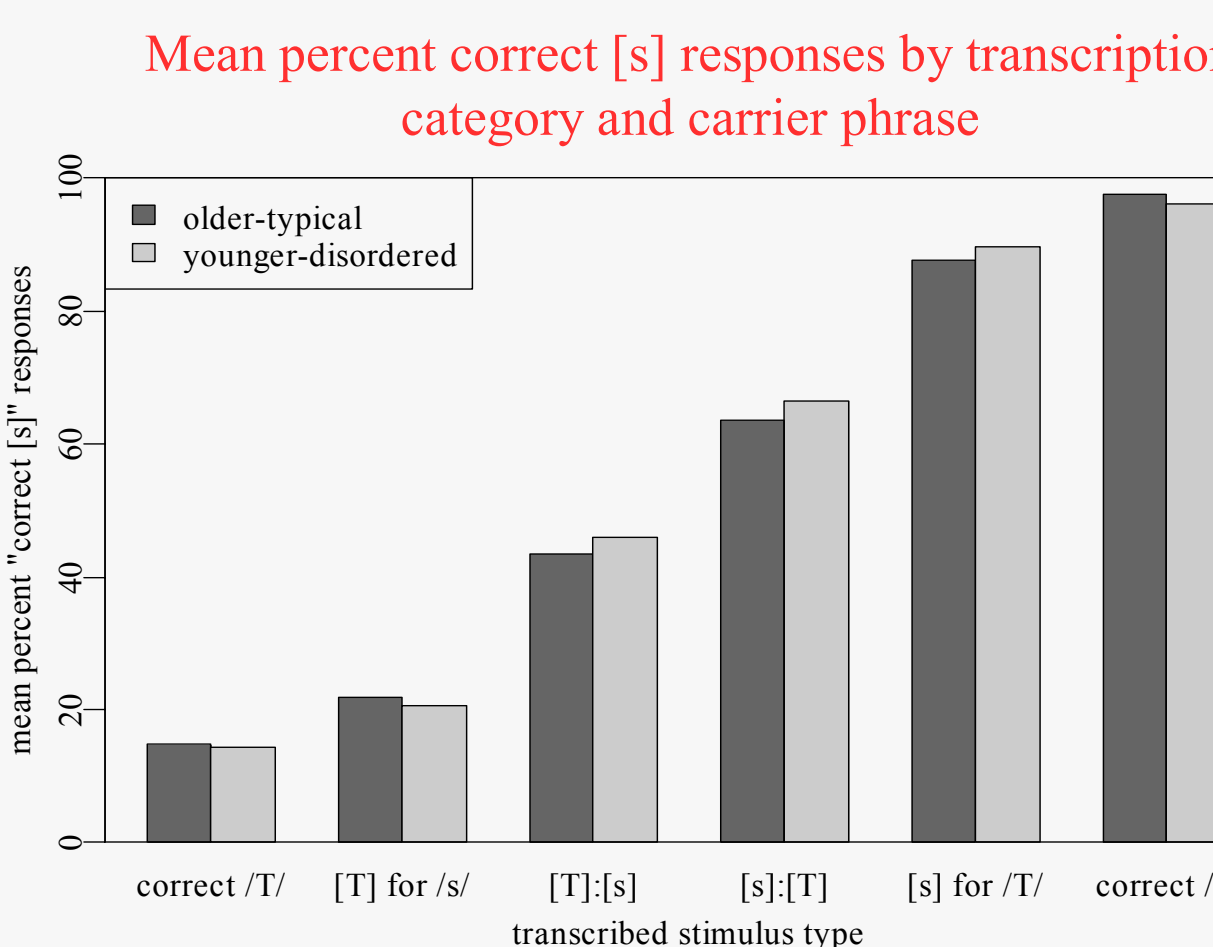
- The mean % correct [s] responses was significantly different for each of the 6 transcription categories.

- There was no significant main effect of carrier phrase type.

Mean percent of intra-subject disagreements for each transcription category

Number of stimulus pairs with intra-subject disagreement where the listener said "yes" for each carrier phrase type

- 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.

RESULTS: LISTENERS' REACTION TIMES
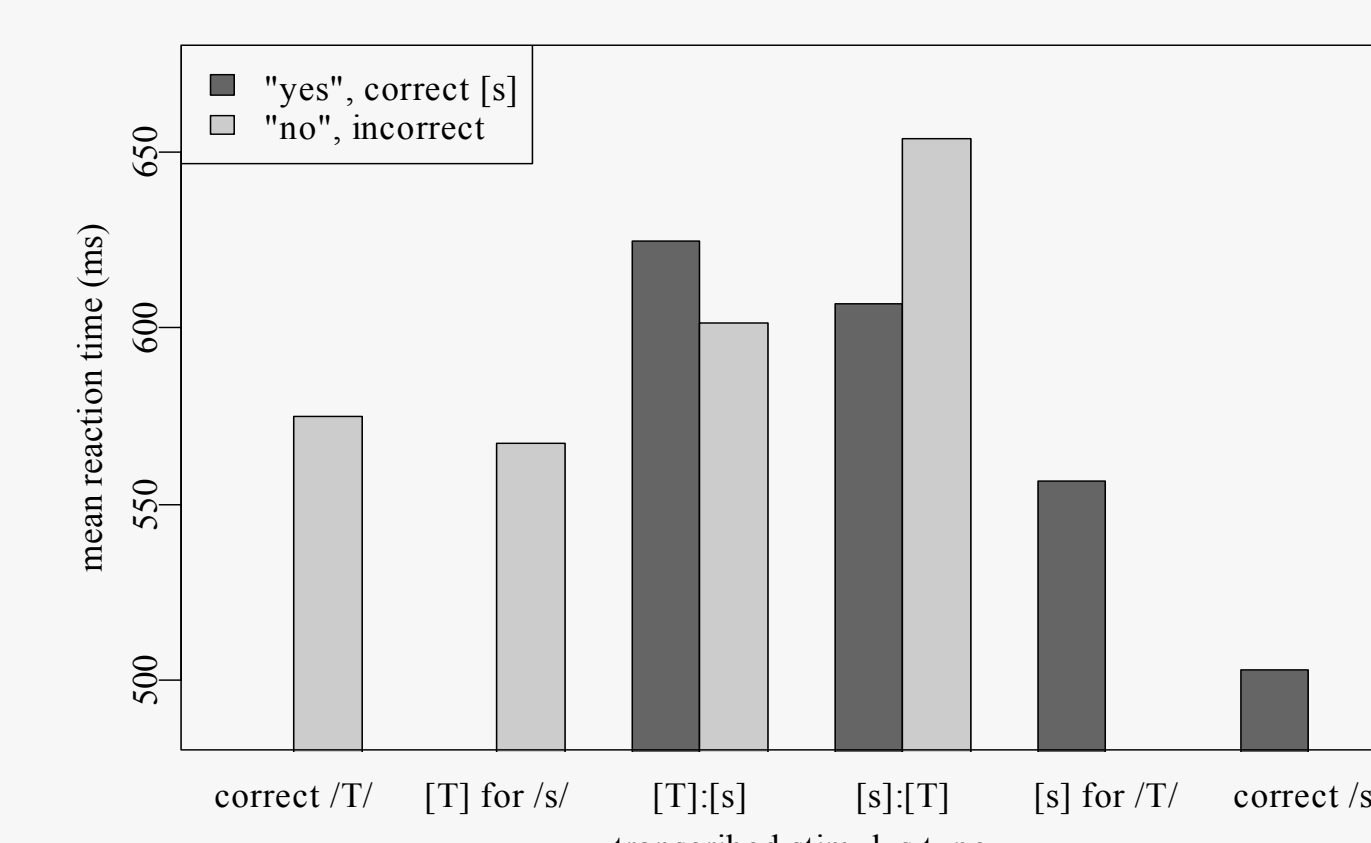
- Reaction times for "yes" responses (dark bars)
  - Plotted for correct productions of /s/, clear substitutions, and intermediate productions.
  - Significant effect of transcription category.
  - Intermediate productions ([s]:[θ] and [θ]:[s]) were not significantly different from each other, but were different from both correct productions of /s/ and clear substitutions.

- Reaction times for "no" responses (light bars)
  - Plotted for correct productions of /θ/, clear substitutions, and intermediate productions.
  - Significant effect of transcription category.
  - Intermediate productions ([s]:[θ] and [θ]:[s]) are significantly different from clear substitutions and marginally different from correct productions (p=.052).

DISCUSSION AND CONCLUSIONS

1) Naïve listeners' accuracy responses for each of these six 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 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?

3) Intermediate productions were more likely to be rated inconsistently.

4) 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) There was a significant effect of transcription category on naïve listeners' reaction times.
   - For both "yes" and "no" responses, listeners took longer to respond to intermediate productions than to either correct productions or clear substitutions.

FUTURE DIRECTIONS

1) Elicit gradient judgments from individual listeners.
   - Use rating systems, including Direct Magnitude Estimation and Visual Analog Scales.

2) Perform acoustic analysis of consonants in different transcription categories.
   - Analysis of spectral moments and relative amplitude of the fricative noise.
     - Compare /s/ and [s] for /θ/.
     - Compare /θ/ and [θ] for /s/.
   - Describe intermediate productions.

3) Run a similar experiment 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.

ACKNOWLEDGMENTS

http://www.ling.ohio-state.edu/~edwards/