

The influence of breathy voice on tone perception by young speakers in Suzhou Wu Chinese



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Introduction

Tone perception can be influenced by phonation type:

- creaky voice in Mandarin T3 and Cantonese T4
- breathy voice in White Hmong, Shanghai Wu, and Jiashan Wu

Consonant voicing, phonation type and tone in Wu Chinese:

- Voiceless consonants: high register tones, modal voice
- Voiced consonants: low register tones, breathy voice
- The breathy voice is disappearing in Shanghai Wu [1, 8] and in Suzhou Wu [3]
- The breathy voice can still influence the perception of young speakers in Shanghai Wu [2]

Aim: To investigate whether breathy voice can still influence the identification of low register tones in Suzhou Wu of young speakers

Register	Onset	Phonation	Ping	Shang	Qu	Ru
High	Voiceless	Modal	T1 44	T3 52	T5 31	T7 55
Low	Voiced	Breathy	T2 23	T6 412	T8 23	

Table 1. The tone system of Suzhou Wu

Method

Participants:

- Twenty young native speakers: Ten male and ten female
- Age range: 21-32 ($\mu = 24.5$, $\sigma = 2.68$)

Stimuli:

1. Natural tokens of an old (age = 67) voice and a middle-aged (age = 49) voice
2. Syllables of unchecked (T1 vs. T2) and checked (T7 vs. T8) tone pairs
3. Syllables of both stop (/p/ vs. /b/) and fricative (/s/ vs. /z/) onsets
4. Superimposition of pitch contours (as shown in Figure 1) on base syllables of high (modal) and low (breathy) register tones
5. Duration and intensity were scaled

Procedure:

- **Task:** Two-alternative forced choice identification
- **Platform:** Online using PsyToolkit [6, 7]
- The experiment was loaded beforehand in the browser
- The participants were asked to wear earphones during experiment
- Time-out: 5000 ms (5 s); Inter-stimuli interval: 300 ms

Data analysis:

- Logistic mixed-effects models on the unchecked and checked tone pairs separately

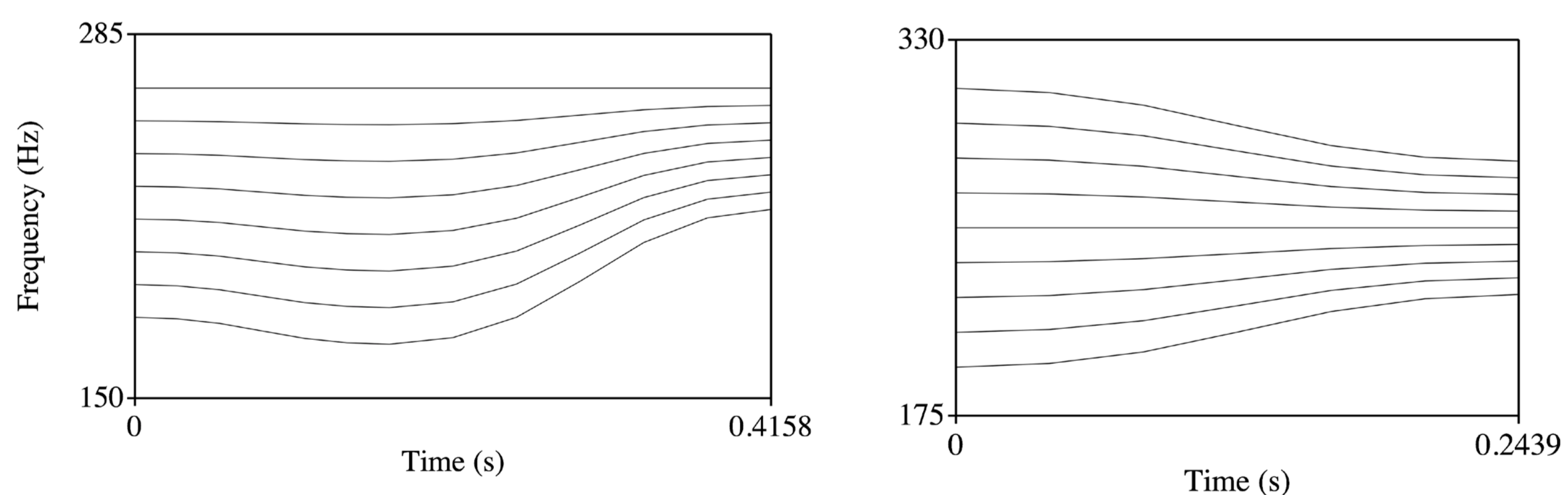


Figure 1. Pitch contour continua for unchecked (left) and checked (right) tone pairs

Results

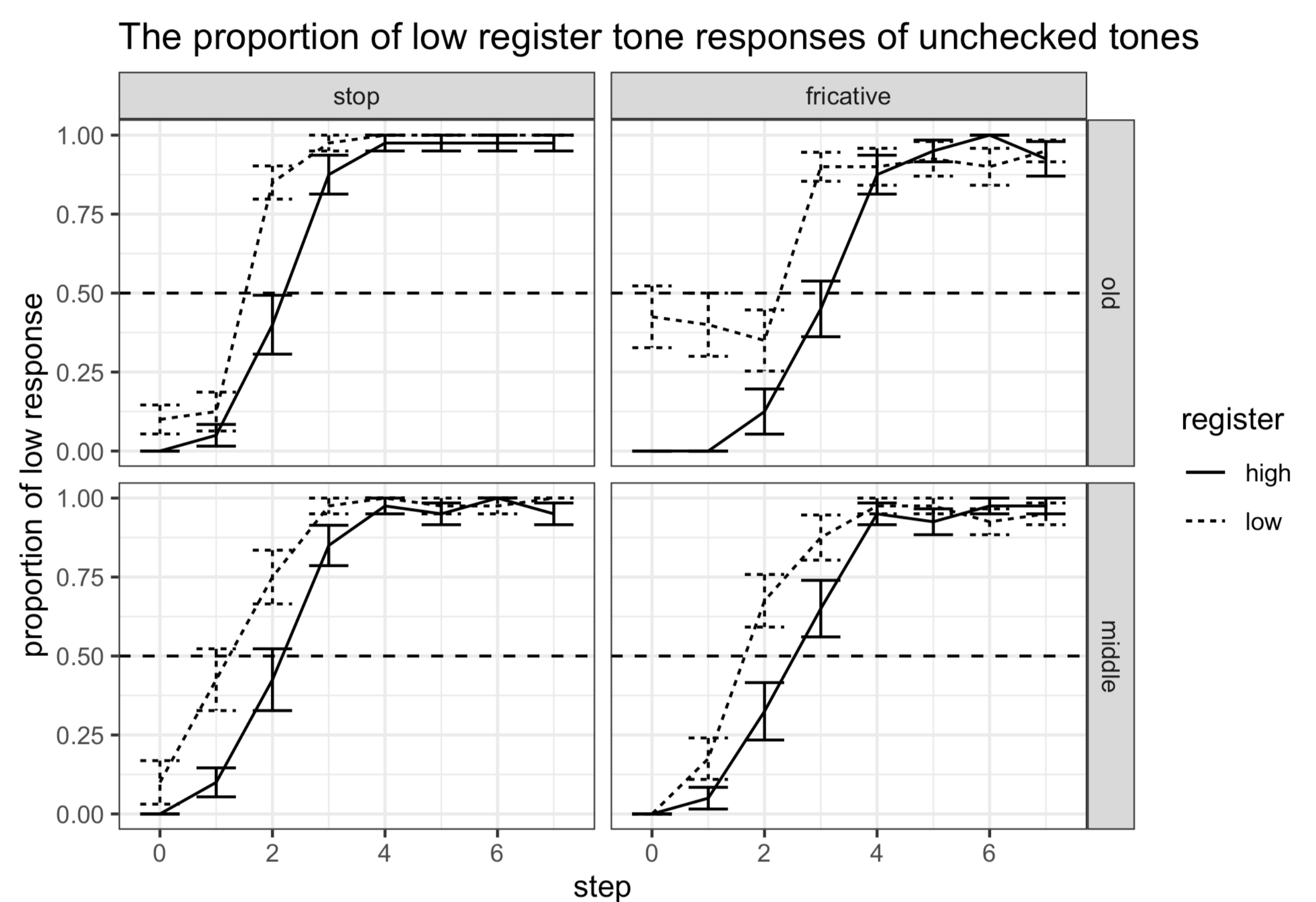


Figure 2. Proportions of low register tone response for unchecked tone pairs with stop (left) and fricative (right) onsets and the voice of old (top) middle-aged (bottom) speakers

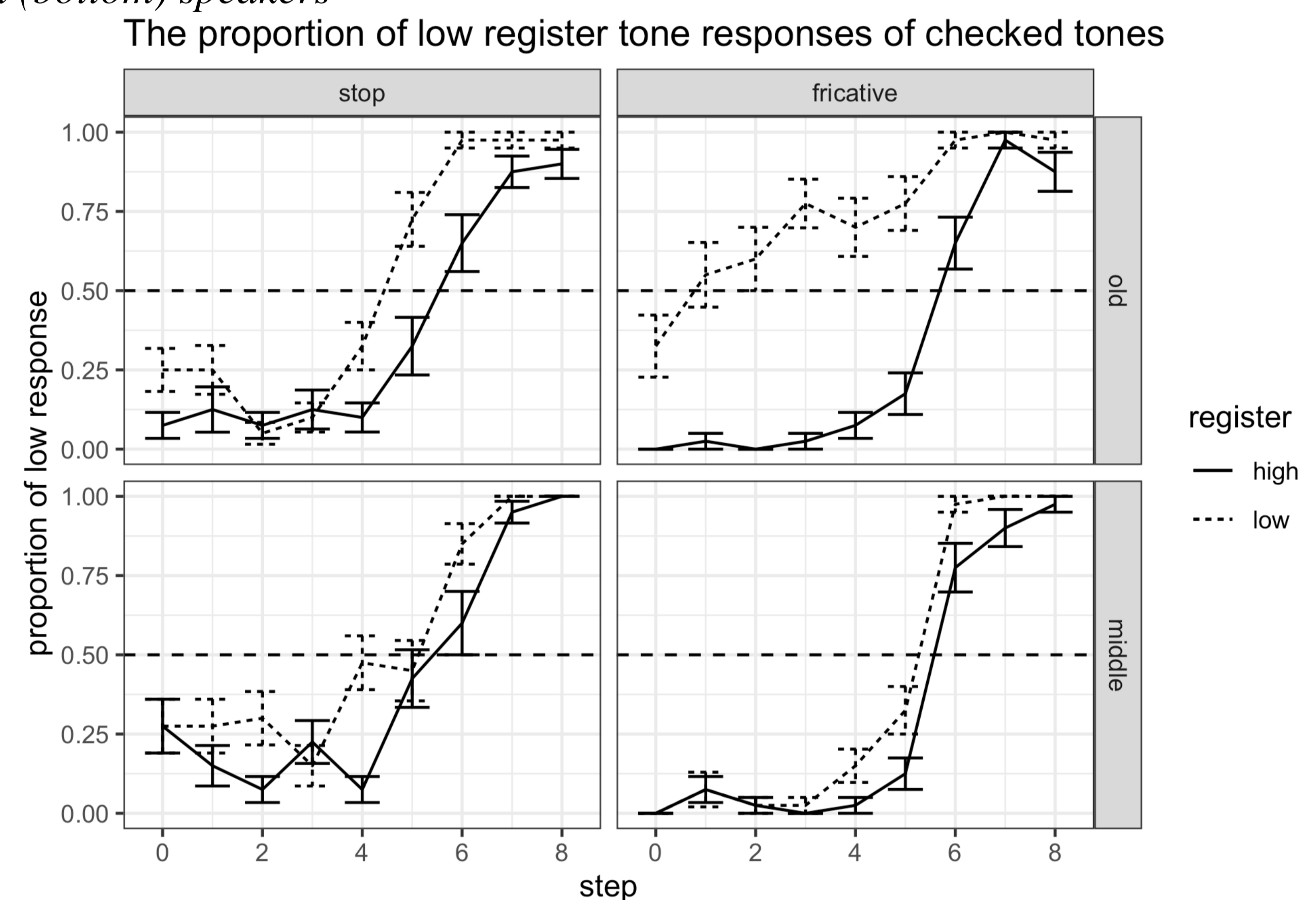


Figure 3. Proportions of low register tone response for checked tone pairs with stop (left) and fricative (right) onsets and the voice of old (top) middle-aged (bottom) speakers

- The identification curves were clearly **categorical** in that low pitch (higher step) induced more low register tone response and less for high pitch (lower step)
- The category boundary was shifted towards the high pitch end by breathy voice, for both unchecked and checked tone pairs
- The effects of breathy voice in stimuli of old and middle-aged voices were similar
- More low register tone response when listening to the stimuli of old voice with fricative onset, even in the high pitch end (top right panel, Figure 3)

Conclusions

1. Breathly voice in low register tones **does** have an influence on young speakers' perception
2. A trading relation between breathy voice and low pitch in both unchecked and checked tone pairs
3. Fricative onset and old voice combined with breathy voice can facilitate the identification of low register tones even further