The Preliminary Study of Influence on Tone Perception from Segments

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Outline

☐ Background
☐ Method
☐ Results
☐ Discussion and Conclusion
Background

- Standard Chinese
  - Tones

- Syllable Structure
  - (Consonant) (Medial) [Nucleus Vowel] (Coda)
  - Initial: [i], [u], [y]
  - Final: [n], [ŋ]

Fig1: Distinctive F0 Patterns of Chinese Four Tones.
Background

- **Tradition source-filter model**
  - In speech production, source and filter are largely independent. (Fant, 1970).

![Diagram showing f0, time, /a/, /i/, pitch, and /a,i/ over time](image)
Background

- Possible correlation btw. Source & filter (Titze, 1989; Fitch & Giedd, 1999).
Background

- Traditional definition of tone ignored the relationship between tone and segments.

Segments influence tone perception
Background

- **Consonant**
  - Plosive +
    - aspiration → lower tones
    - unaspiration → higher tones (Yang, 1989).

- **Vowel**
  - vowel +
    - lower intrinsic f0 → higher tones
    - higher intrinsic f0 → lower tones (Yang, 1989; Fox & Qi, 1990; Zheng, 2014; etc.).
Background

- About segments’ influence on tone perception, previous research:
  - Simple syllable structure
    - V (/a/, /i/)
    - CV (/pa/, C mainly for plosive)
  - Investigated the effect of vowels and consonants on tone perception separately rather than integrally

- Research Problem

  1. Whether other articulatory manner of consonants and complicated syllable structure influence tone perception?
  2. Whether consonant and vowel interact to influence tone perception?
Method

- Tone continua perception experiment
  synthesizing a tone continuum imposed on various syllable structures to conduct tone perception experiment.
  - Tone continua: Tone 2_Tone 3

  ![Tone Continua Pattern](image)

  - Turning point: 40% of F0 contour
  - S, T and E point were changed equally and simultaneously
Syllable Structure

- **Initial**
  - Plosive
  - Affricate
  - Fricative

- **Medial**

- **Final**
  - Nucleus
  - Coda

- **Final Nucleus**

- **Final Coda**

Examples:
- **tuan**
- **tan**
- **chuan**
- **chan**
- **huan**
- **han**
Method

- Procedure
  - Identification task;
  - Random order;
  - Two alternative forced choice: Tone 2 or Tone 3.

- Participant
  - 18 females and 7 males;
  - Age range from 22 to 30;
  - No speech, language and hearing impairments.
Results

- The accuracy of Tone 2

![Bar chart showing accuracy percentages for different syllable structures.](image)

Fig 3: The Average Response Percentage of Tone 2
Results-Initial

Fig 4 (a): Identification Curves of Syllables with Medial

Fig 4 (b): Identification Curves of Syllables without Medial
Results-Final

Fig 5 (a): Identification Curves of syllables with plosive.

Fig 5 (b): Identification Curves of syllables with fricative.

Fig 5 (c): Identification Curves of syllables with affricate.
The present preliminary study examines how consonants and vowels influence tone perception with Tone 2-Tone 3 continua based on six syllable structures by controlling the turning point at 40% of f0 curves.

- Apart from plosive, affricate and fricative also influence tone perception as well as complicated syllable structure;
- Consonant and vowel interact to influence tone perception.

Our results support the hypothesis that tone perception is influenced by segments, f0 and segmental information jointly contribute to tone perception.
Discussion and Conclusion

Impact

we offer a preliminary investigation of the role of consonant types and vowel conditions on tone perception in Standard Mandarin. The results have significance in the second language teaching and computer-aided pronunciation training.

Future work

the accurate location of turning point; more tonal types and segmental types.
Thank you for your attention