A Production Study of Korean Consonants

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Introduction

- **Three-way contrast** in Korean obstruents
  - lenis vs. tense vs. aspirated (stops & affricates)

Type	Labial	Coronal	Dorsal
Stops	p p’ pʰ	t t’ tʰ	k k’ kʰ
Affricates		tʃ tʃ’ tʃʰ	
Fricatives		s’ s	

- **Cue shift**
  - **VOT → f0** in lenis vs. aspirated distinction
  - **Tense** series : still **shorter VOT** than lenis & aspirated
- **Laryngeal setting** in three-way contrast
  - Tense : **low H1*-H2*** (creaky)
  - Lenis : **high H1*-H2*** (breathy)
- **Psychoacoustic Roughness?**
  - A sensory attribute related to **rapid changes on the amplitude** envelope of a sound (15-300 Hz)
  - Roughness **correlated positively with creaky tones** in Burmese (Villegas et al., 2020)

Research Objective

1. To use **psychoacoustic roughness** to **identify phonation types** associated with the laryngeal contrast
   a) tense series b) fricatives & affricates
2. To assess **which cues** could be **involved in the laryngeal contrast**

Methods

- Participants : 24 Seoul Korean speakers in their 20s
- Stimuli :
  - 66 CVCV bisyllables (most nonce)
  - All obstruents represented in C1
  - Each word embedded into a Korean carrier sentence
- **Spectral tilt, psychoacoustic roughness, f0, VOT** and **duration** measured & analyzed

Results & Discussion

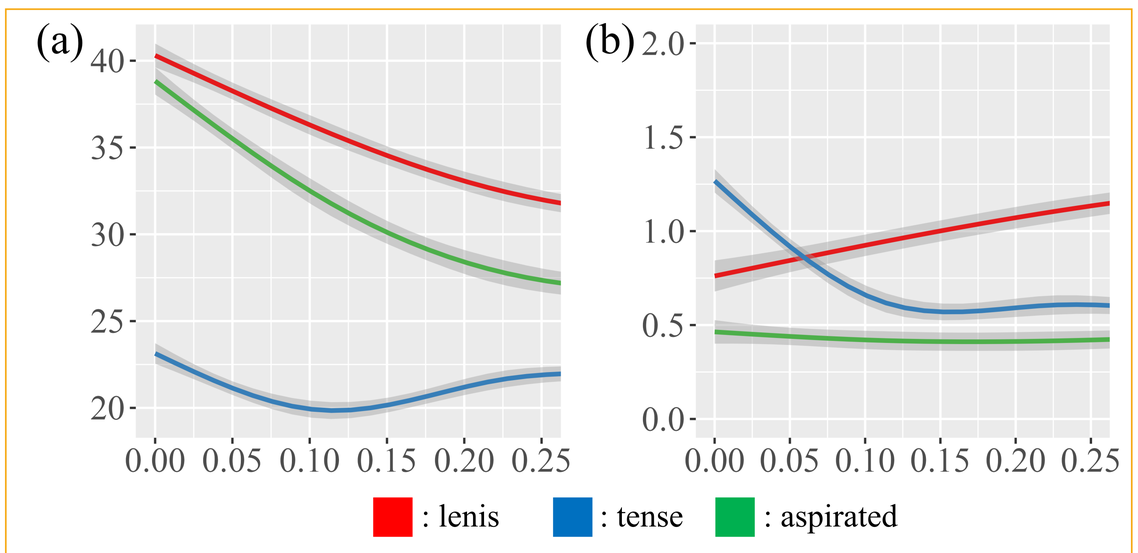

Fig 1. (a) Spectral tilt (H1–A1*) and (b) roughness of stops (by laryngeal setting, 25% of the vowel)*

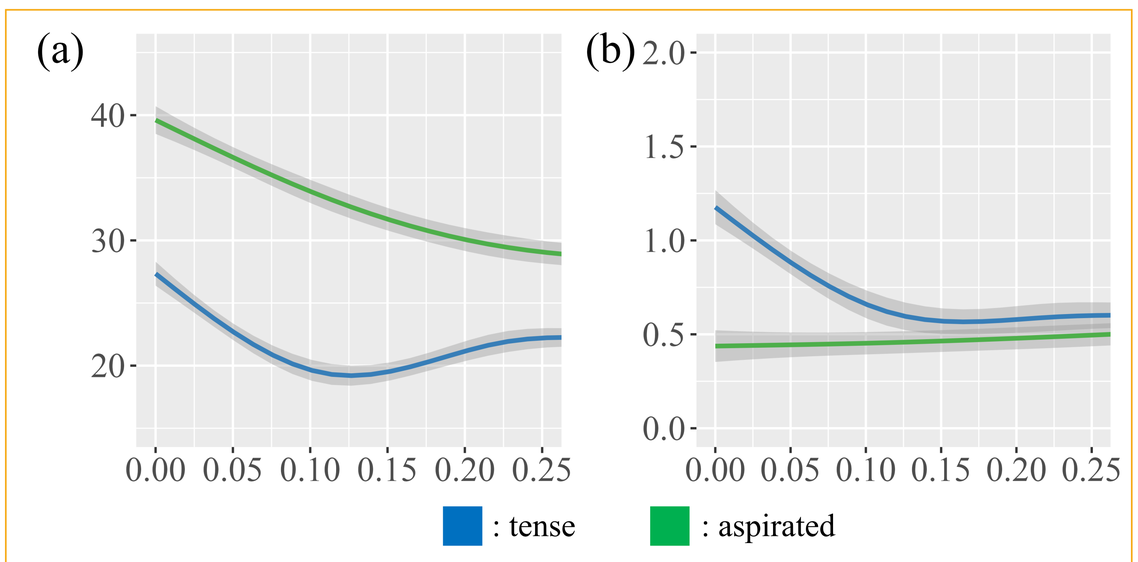

Fig 2. (a) Spectral tilt (H1–A1*) and (b) roughness of fricatives (by laryngeal setting, 25% of the vowel)*

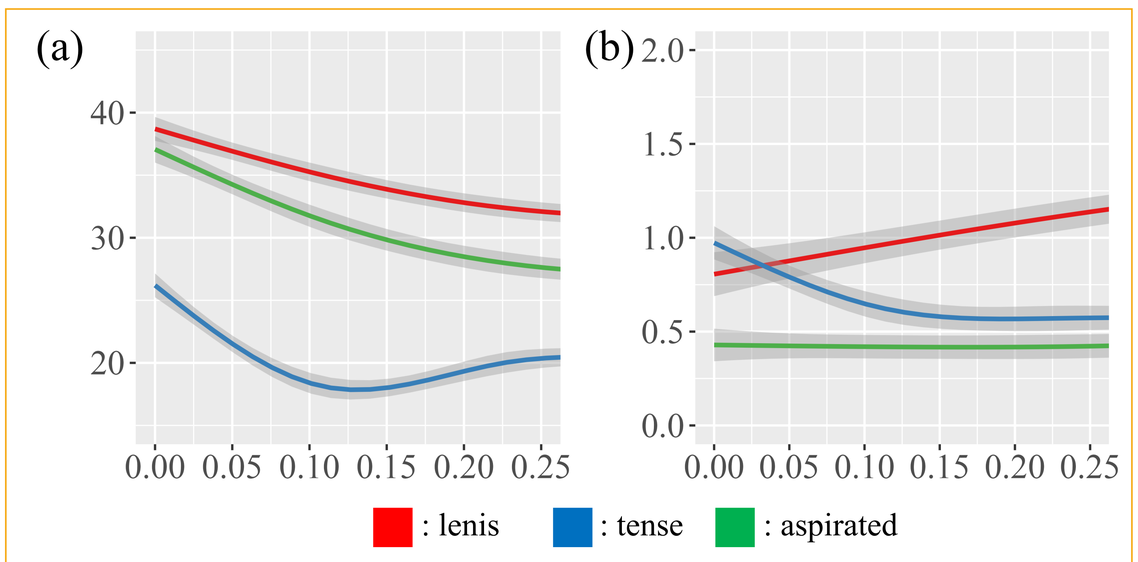

Fig 3. (a) Spectral tilt (H1–A1*) and (b) roughness of affricates (by laryngeal setting, 25% of the vowel)*

Laryngeal constriction & f0 (Fig. 1, 2, 3, 4)

- **Tense obstruents** : **low spectral tilt** & **high roughness** (creaky)
- Lenis stops : roughness **increased** due to **lowered f0** of lenis stops (roughness **correlates inversely** with f0)
- f0: affricates pattern with stops (lowest in lenis)

Duration measures (Fig. 5)

- **Tense obstruents** :

Stops	Affricates	Fricatives
longer CD	longer CD / shorter FD / shorter RD	longer FD

- **Frication Duration** :
  - **Tense fricatives > aspirated fricatives**
  - Aspirated affricates > lenis affricates > tense affricates
  - Fricatives > Affricates
- **Release Duration** (frication + aspiration) :
  - Tense series : significantly short (**absence of aspiration**)
    - May play a role in **distinguishing tense series**
- **Closure Duration** :
  - Stops > affricates // tense > aspirated > lenis
  - Coronal lenis stops & affricates : shorter closure duration

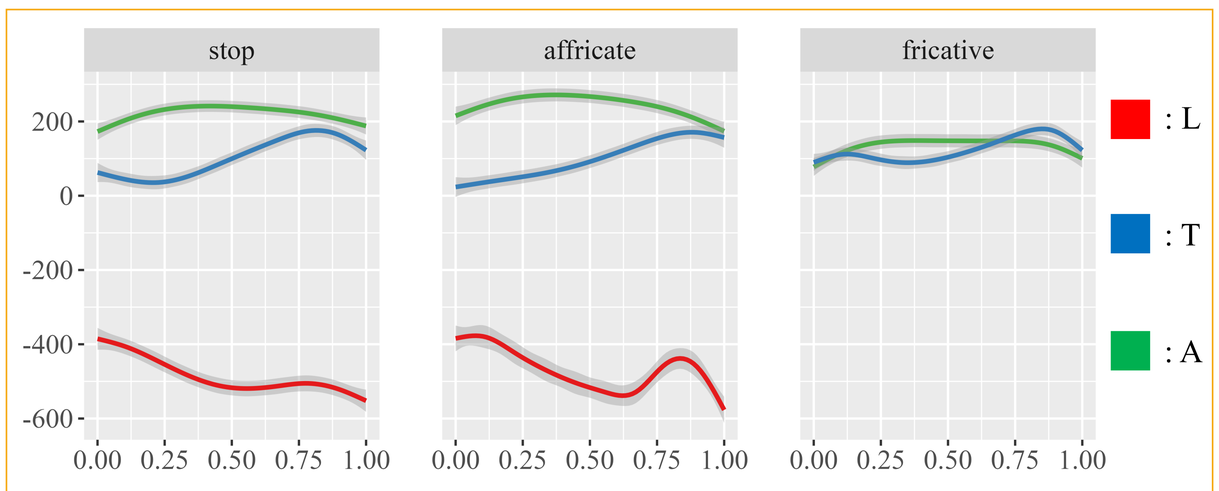

Fig 4. f0 of coronals (by laryngeal setting and manner, entire vowel)

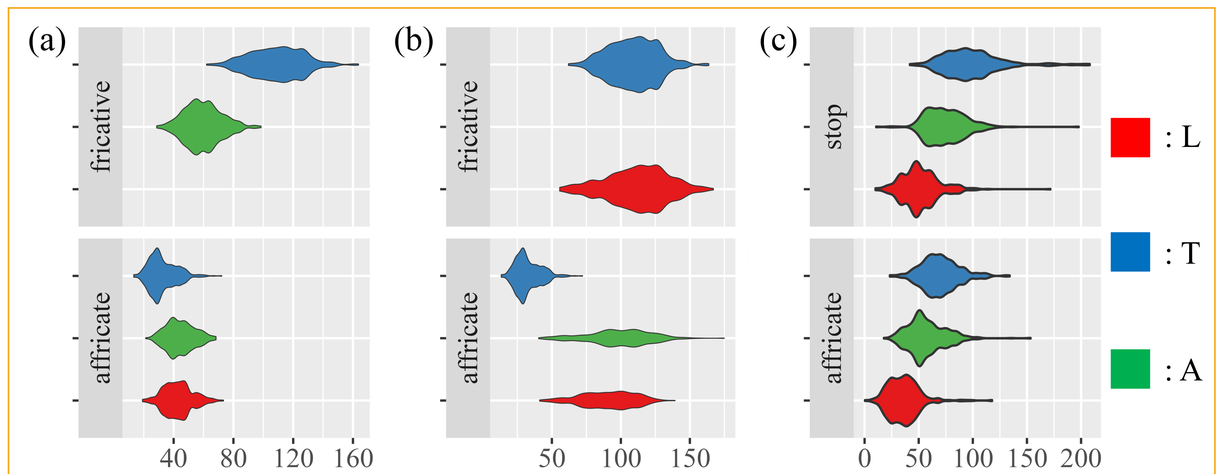

Fig 5. (a) frication duration (FD), (b) release duration (RD), (c) closure duration (CD) (raw duration in ms)

Selected References

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