VELAR SOFTENING: AN ACOUSTIC STUDY IN MODERN GREEK

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Velar palatalization in Greek

- In Greek, velar stops become palatalized before front vowels (/i/ and /e/) following an allophonic rule.
- *For example*:

  /kapa/→ ['kapa] “letter k”

  /kita/ → ['kjita] “look”

  /kefi/ → ['kjefi] “fun”

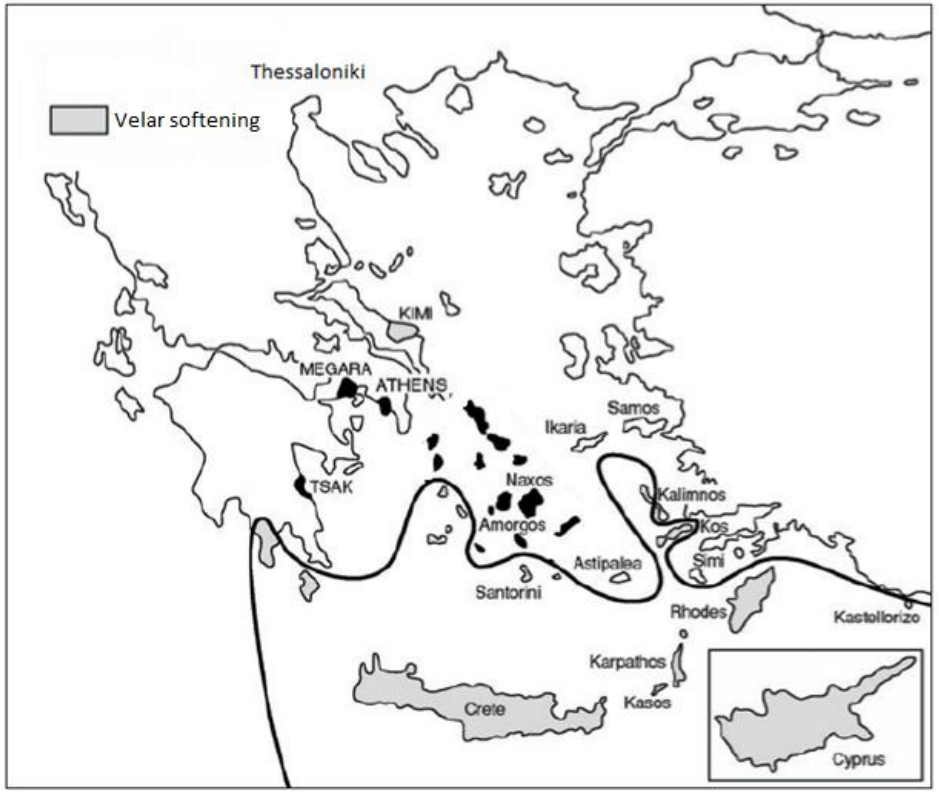
- Velar palatalization is a common feature of all Greek dialects, including standard Greek.

Velar palatalization in south-eastern dialects

- In many South-eastern Greek varieties velar stops before front vowels undergo *softening*, in addition to palatalization
  - **Velar softening**: a change in manner of articulation from stop to an affricate
- *Cretan-Greek*:

  /kita/→ ['tɕita] “look
- *Standard-Greek*:

  /kita/→ [‘kjita] “look”
- However, accounts on the exact nature of the phenomenon in Greek are scarce and mainly impressionistic.



Adapted from Trudgill (2003)

Velar softening and the Greek affricate /ts/

- Greek has a voiceless affricate /ts/ that is found in all dialects
- *Example*:

  /tsita/ → [ˈtsita] “fish bone;cheetah”

- In dialects, such as Cretan-Greek, which are characterized by velar softening, the affricate /ts/ exists alongside the affricate realizations of front /k/.
- *Example*:

  /kita/→ ['tɕita] “look”

- Velar softening before front vowels in Cretan is overt and depicted in popular culture as [ts] for [kj] substitutions when imitating ‘Cretan-speech’.
- This suggests there might be a narrower categorization of [ts] and [kj] in different Greek dialects.

Study Aims

- Velar softening *proposed* as important classification feature of Modern Greek dialects*
- However, it has been little studied instrumentally.
- **Aims**:
  - Examine acoustic characteristics of velar palatalization/softening in two Greek dialects:
    - A southern dialect spoken in Crete
    - A northern dialect spoken in Thessaloniki
  - Examine gender effects, prosodic position and stress placement on velar palatalization/softening.
  - Examine acoustic characteristics of /ts/ in the context of dialectal variation.

Participants

- 12 Greek-speaking adults
  - 6M & 6F, age 21-61 yrs.
- Thessaloniki (N. Greece)
  - 6 participants
- Ierapetra, Crete (S. Greece)
  - 6 participants
- Age and level of education were balanced across dialects.

Stimuli and Procedure

- Two- or three-syllable real words containing /k/ or /ts/ word-initially or word-medially before the vowels /i/, /e/, /a/

  Examples:

  /kima/ [ˈkjima] “wave” /fakes/ [faˈkjes] “lentils” /fatsa/ [ˈfatsa] “face”

- The syllable containing the target sound was either stressed or unstressed.
- Participants read sentences of the form:

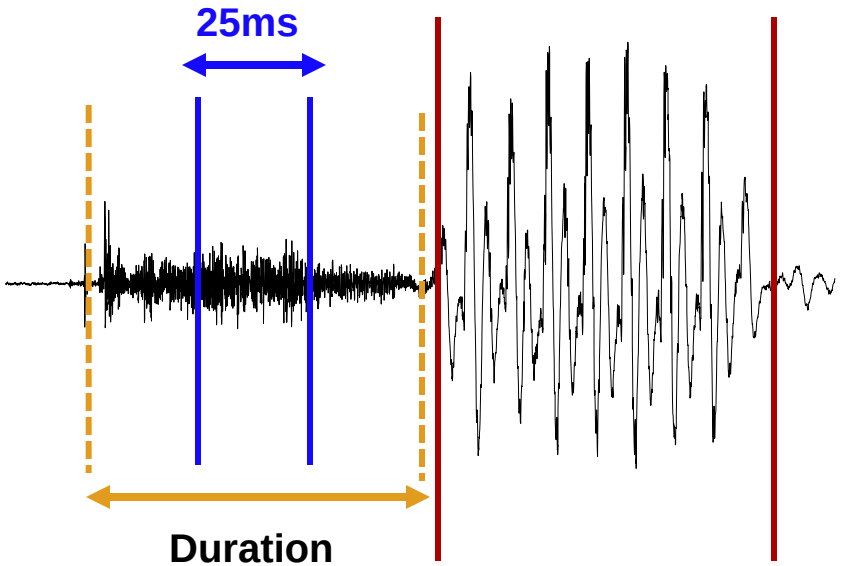
  _____ *τώρα είπα* [ˈtoɾa ˈipa] “I’ve just said” _____
- For Cretan speakers, we replaced the standard form [ˈtoɾa] “now, just” with the dialectal form [eˈða] to facilitate elicitation of the dialectal features.
- Only the words elicited utterance-initially are presented in the current study.

Acoustic analysis

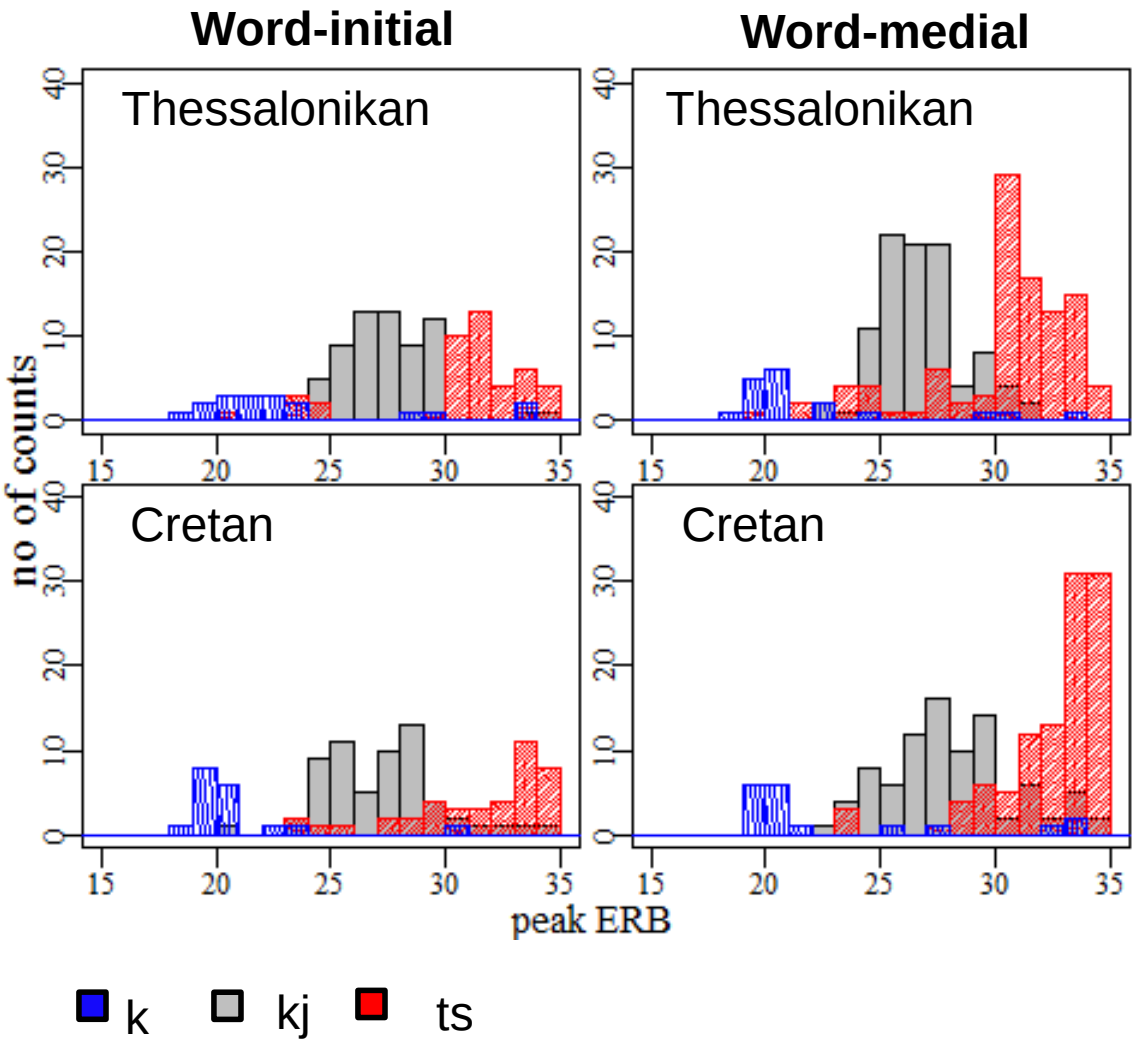
- **Burst spectrum analysis:**
  - Power spectrum of 10 ms Hamming window centered at the burst.
  - Linear values (Hz) transformed into Equal Rectangular Bandwidth (ERB) to better capture the cues crucial to the auditory system.
  - The frequency in ERB of the most prominent peak (Peak ERB) was identified.
    - Higher peak ERB values indicate a shorter front cavity (or a more anterior place of articulation).

Acoustic analysis (cont.)

- **Intensity analysis:**
  - Relative intensity of 25 ms centered at midpoint of plosive release with reference to the maximum intensity of following vowel.
- **Duration analysis:**
  - Temporal interval between burst and voice onset.

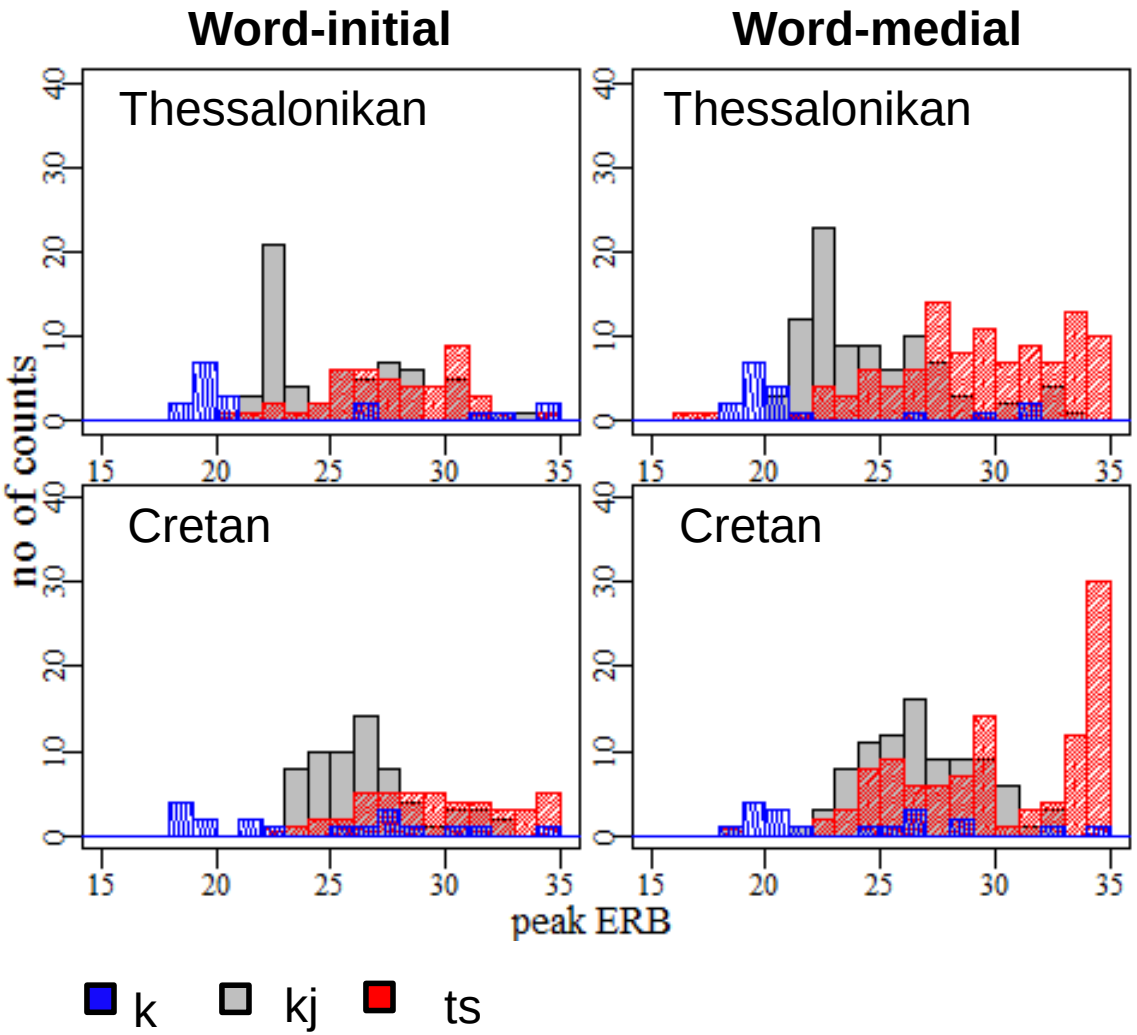


Burst analysis: Females



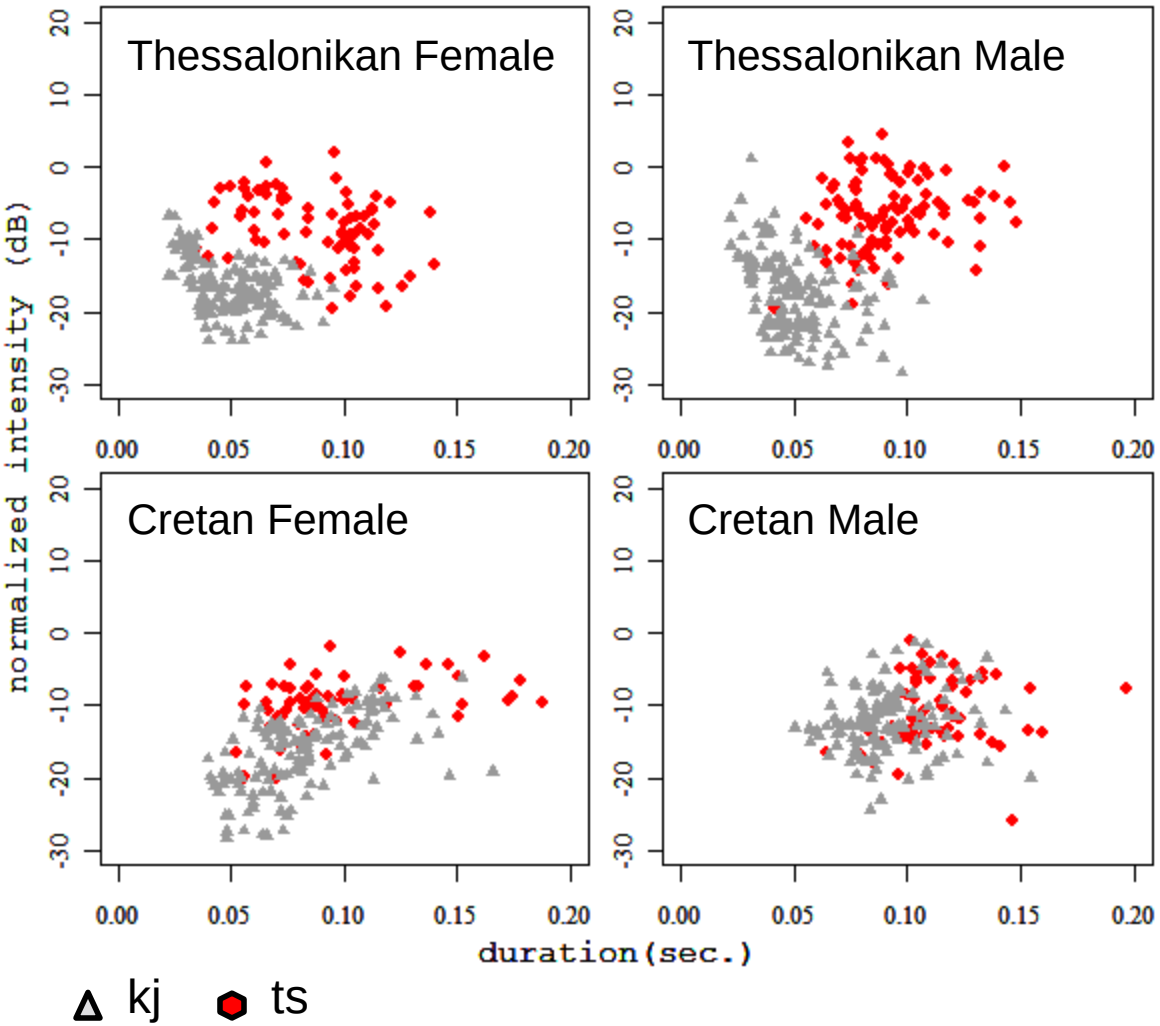
- Peak ERB values of [k] (allophone of /k/ before non-front vowels) lower than those of [kj] (allophone of /k/ before front vowels).
- No clear dialectal differences in peak ERB values of [kj] and [ts].
- Clear separation of the three categories in terms of peak ERB.

Burst analysis: Males



- Peak ERB values of [k] (allophone of /k/ before non-front vowels) lower than those of [kj] (allophone of /k/ before front vowels) similar to females.
- The difference between peak ERB values of [k] and [kj] is greater in Cretan than in Thessalonikan speakers.
- Overlap in peak ERB of [kj] and [ts] for Cretan speakers in word-medial context.
  - More posterior realization of [ts] and wider range of values relative to females.

Intensity by Duration: All speakers



- The affricate [ts] is both longer and higher in intensity than [kj] in Thessalonikan speakers.
- There is overlap in intensity and duration of [kj] and [ts] in Cretan speakers.

Summary of findings

Acoustic evidence of velar palatalization in both dialects

Acoustic evidence of velar softening in Cretan-Greek

- Burst analysis:
  - More anterior realizations of [kj] in Cretan speakers compared to Thessalonikan speakers, especially for male speakers.
  - The peak ERB values of [kj] and [ts] overlapped more in male than female speakers, as well.
    - Male speakers produced [ts] with a wider range of peak ERB values and often had more posterior realizations of [ts] compared to females.
- Intensity by Duration analysis:
  - More overlap in relative intensity and duration between [kj] and [ts] in Cretan than in Thessalonikan speakers.
  - Similar patterns for males and females across all prosodic environments and stress conditions.

Discussion

- Observed dialectal variation in degree of velar fronting in Greek suggests velar palatalization/softening can be used as a classification feature of Greek dialects.
- Acoustic similarity of [kj] and [ts] in Cretan could explain anecdotal [ts] for [kj] substitutions in Cretan-Greek as perceived by non-Cretan speakers.
- The more posterior realization of [ts] in male speakers and the less separation between [kj] and [ts] may also contribute to perceptual confusion between the two categories.
- Finally, the study adds to the literature on the acoustic factors that play a role in the implementation of velar softening.

Future directions

- Supplement acoustic data with articulatory data (EPG) to examine differences in place of articulation.
- Conduct a perception experiment to examine whether the acoustic similarity of [kj] and [ts] in Cretan leads to perceptual confusions among Cretan and non-Cretan dialect speakers of Greek.

Acknowledgments

- Research supported by NSF grant BCS-0729140 to Jan Edwards and by a Callier Postdoctoral Fellowship to Asimina Syrika.
- Thanks to Katerina Derdemezis for assistance with data segmentation and analysis.
- Thanks also to Mary E. Beckman (Ohio State University) and Marios Fourakis (University of Wisconsin-Madison) for helpful comments.
- Special thanks to the people who took part in the study!

Thank you!