Comparing Greek, English and Japanese velar and palatal(iz)ed stops

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Question:

- What do superficially similar patterns of allophony across languages look like under closer (finer-grained) analysis?

Traditional description of /k/ allophony

- Chomsky and Halle, 1968
- Setatos, 1974
- Wada et al. 1969

\[
/k/ \rightarrow [k'] \text{ or } [c] \quad / V \text{ clean}
\]

Allophones of word-initial /k/

- Greek: κάρτα, κόπος, κούκλα, κιάλι, κιόσκι, κιούπι, κίνο
- Japanese: kaba, koora, kuma, kyampu, kyookai, kyuuri, kirin, keki
- English: car, coke, cool, cute, cake, key

Cineflourographic midsagittal views of Japanese /k/ before each of the five vowels (Wada, Yasumoto, Ikeoka, Fujiki, & Yoshinaga, 1969)

Japanese /k/ before /i/ is palatal [k’]

/k’/ = [k’/i] /ki/}
An acoustic analysis experiment

- How does Greek /k/ and its allophones compare to English and Japanese?
- What is a good acoustic phonetic cue for place of articulation for plosives?
- Burst spectrum and formants of following vowel.

Method

- 6 adult speakers recorded for each language (data from 3 presented)
- Data part of piloting for a larger NIH project for cross-linguistic language acquisition (PIs Jan Edwards and Mary Beckman).
- Repetition task of aurally presented stimuli (to be used for a different experiment).

Center of gravity overall results
Summary

- /k/ in palatalizing environments is more palatal in Greek and Japanese than in English.
- Greek and Japanese /i/ is more peripheral than English.
- English /u/ is more fronted than Japanese (unrounded) and Greek.

Conclusions

- Burst spectrum is a good cue for determining finer phonetic details of place of articulation.
- Following vowel influences the degree of palatalization of preceding velar.
- Greek /k/ before front vowels is more palatalized than English and Japanese /k/ thus closer to a true palatal plosive [c] than a palatalized velar plosive [kj].

Discussion

- English and Japanese, unlike Greek, contrast /k/ before front vowels with /t̥/ (e.g. kin vs. chin)
- /k/ is more frequent in Greek and Japanese than in English
- Historically [kj] or [c] often can become affricated.
- Children acquire /k/ and its allophones earlier in Greek and Japanese than in English
- Fine-grained phonetic details may be a factor in acquisition and sound change

Other possible phonetic cues

- Intensity (dB) of burst.
- VOT duration.
- Formant transition durations of following vowel.
Some references for Greek


Comparisons

- cube
- kyuuri
- kiupi

(sorry, audio files not available in pdf version)