

# Phonetic factors influencing /l/-rhoticisation in Greek

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## Abstract

This study investigates phonetic factors – vocalic/consonantal context, duration, stress - favouring rhotic perception of the lateral approximant in Greek. Nonsense words containing the lateral in different lengths in both intervocalic and internal coda position, alongside similar words containing a rhotic, were presented to Greek listeners for categorisation as /l/ or /r/. Results showed that laterals were perceived as rhotics if they matched the rhotic in duration. Rhotics, on the other hand, were only perceived as laterals if they were articulated as an approximant rather than as a tap.

Key words: laterals, rhotics, perception, sound change

## Rhoticisation of laterals in Greek

The alternation of rhotics and laterals is a widespread cross-linguistic phenomenon (Maddieson 1980, Proctor 2009), and the confusion of the two sounds may be enhanced in environments where reduction is expected, such as in unstressed syllables. In all Greek dialects, a lateral in internal coda position rhoticised into an alveolar tap, regardless of place of articulation of the following obstruent, even though the standard language has since reintroduced forms with /l/ (Newton 1972). Dialectological evidence from other languages, e.g., Italian dialects, shows that following velar or labial sounds may favour /l/-rhoticisation in coda position (Rohlf's 1966).

Lambdacisation, i.e., /r/ > /l/, such as occurs e.g. in Andalusian Spanish (Quilis-Sanz 1998), on the other hand, is a much rarer phenomenon than rhoticisation. It has been reported for Greek only in cases of liquid dissimilation.

In order to assess which phonetic factors (duration, stress, vocalic and consonantal context) favour /l/-rhoticisation in Greek, a perception experiment has been conducted.

## Experiment

### Stimuli

The stimuli consisted of disyllabic nonsense words containing either /l/ or /r/ in intervocalic position or in word-internal coda, as well as either one of the vowels /a, i, u/, either one of the consonants /p, t, k/ (where applicable), and stress either on the first or the last syllable. A male speaker of Standard Thessaloniki Greek read the stimuli three times from a list at a self-chosen speaking rate. All tokens obtained were used for the acoustic analysis. For the perception test, the best one among the three repetitions was selected (or the two best ones in the case of rhotics, provided that both taps and approximants were available (see below)). In the stimuli containing /l/, the duration of the lateral was manipulated to obtain two further stimuli of the same word: one with a 75-ms-long lateral (matching the average length of the approximant in the speaker's speech) and another in which the lateral had a duration of 30 ms (corresponding to the length of the tap closure).

### Laterals and rhotics in the Greek speaker

The laterals of the Thessaloniki Greek speaker were greatly influenced by the (symmetrical) vocalic context. They were somewhat dark in the environment of /a, u/ ( $\Delta F2-F1$  1041 Hz and 1146 Hz, respectively), and extremely clear in the /i/-context ( $\Delta F2-F1$  2147 Hz).

The rhotics of the speaker could take either one of two realisations: a tap (with possible undershoot) accompanied by a short svarabhakti vowel when in coda position, or an approximant. Taps tended to occur mainly with back and low vowels, while approximant articulation was more readily found in /i/-contexts. Intervocalic rhotics were always taps.<sup>1</sup>

### Subjects

All the stimuli (three repetitions of each) were presented in random order over headphones to 21 native listeners of Greek (age range 18 – 37) from diverse regions of Greece and Cyprus. The listeners were asked to identify the nonsense words as containing either a rhotic or a lateral by clicking on the orthographic transcription of the word on a computer screen.

## Results

### Rhotic perception of laterals

The rhoticisation rate of the 30 ms-long laterals in intervocalic position was 20% in the /a/-context, 28% with /i/, and 60% when the context vowel was

/u/. Laterals of greater durations were not perceived as rhotics. The significant effect of duration ( $F=126,35$ ,  $p<0,0001$ ) was confirmed by statistical analysis (ANOVA). A post-hoc Tukey test of multiple comparisons of means revealed that any significant effect other than that of duration (30 ms vs. 75 ms and original duration) hinged on the fact that the token /úlu/ yielded an extremely high number of rhotic responses (83%).

In internal coda position, laterals, again those with 30 ms-duration, were perceived as rhotics 15% of the time in /a/-context, 33% with /i/, and 53% in /u/-context. Statistical analysis (ANOVA) yielded a highly significant effect for vowel quality ( $F=56,372$ ,  $p<0,0001$ ) (/u/ leading to rhoticisation more than half of the time with 30 ms-tokens) and lateral duration ( $F=239,6598$ ,  $p<0,0001$ ). Lateral duration thus has about the same effect as with the intervocalic tokens. Contrary to expectations and predictions from the dialectological literature, place of articulation of the following stop consonant didn't yield any significant effect ( $F=0,7354$ ,  $p=0,4796$ ). Stress was also not significant in either intervocalic or internal coda tokens.

### **Lateral perception of rhotics**

Due to the presence of two types of rhotic in the speech of the Thessaloniki Greek speaker, both were presented to listeners for categorisation wherever possible. Both rhotic types were not, however, available in each case, which leads to the results being somewhat unbalanced. Notwithstanding these drawbacks, it is useful to separate the two rhotic types, for they proved to be prone to lambdacisation to different degrees. On average, only 2% of the taps were perceived as /l/, whereas 28% of the approximant rhotics led to misidentification as a lateral. This difference was highly significant (Student's t-test:  $p=0,003$ ). Within the approximant rhotics, lateral perception occurred 35% of the time in /a/-context, 10% with /i/, and 54% with /u/. Due to the unbalanced occurrences of approximant rhotics across vowel contexts, these results were not further analysed statistically, but the high rate of confusion in the context of the back rounded vowel /u/ is striking. Among the taps, the tokens /artá/, /urtú/, and /urkú/ also yielded high rates of lambdacisation (16%, 11%, and 6%, respectively).

### **Discussion**

It has been shown that rhotic perception of laterals is due primarily to variability in duration. The original length of the laterals used in this study, around 120 ms, has been obtained under laboratory conditions; in spontaneous speech, however, much shorter durations are likely to occur for lateral sounds, in which case rhoticisation would be an expected sound change. This is in line with the fact that laterals rhoticise more readily in

unstressed environments where segmental shortening can usually be encountered.

The reverse case of lambdacisation, on the other hand, seems to hinge on more than simple duration issues. A tap, even a reduced one, being a fast ballistic movement of the tongue tip (Barry 1997) designed to create a short interruption in the acoustic carrier signal, cannot readily be lengthened. If an approximant rhotic is considered as the reinterpretation of undershot taps and thus becomes a target articulation for the rhotic in free allophonic variation with the tap in contemporary Thessaloniki Greek, it may be hypothesised that a gestural reorganisation is a necessary first step in the perception of the rhotic as a lateral. Given these more complex prerequisites, lambdacisation is expected to be a far less common phenomenon than rhoticisation, which cross-linguistic dialectological facts seem to confirm.

## Notes

1. Baltazani 2005 finds a somewhat different distribution of taps and approximants in her study of Greek rhotics. Specifically, her speakers present more approximants intervocalically than in internal coda position.

## Acknowledgements

I'd like to thank Andrew Isaak for technical assistance, as well as Vangelis Karatsiolis and Nontas Apostolopoulos for help with finding the subjects of this study. Special thanks to Giorgos Frangos without whom the study would not have been possible.

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