A COMPARISON OF ENGLISH AND GREEK ALVEOLAR FRICATIVES

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ABSTRACT

This paper investigates a production problem faced by Greek speakers of English involving the English alveolar fricatives. It seeks acoustic evidence supporting a physiological hypothesis. The hypothesis is confirmed.

1.INTRODUCTION

In Panagopoulos (1985) the problem was examined by reference to physiology and was attributed to a wider 'swing' of the tongue for the Greek alveolars. Greek speakers,like all users of a foreign language, go through training for the acquisition of English by trying to extract the properties of the new phonological system through the knowledge of their own native system. The Greek inventory of consonants includes an alveolar pair, [s,z], but lacks a palato-alveolar opposition. This lack of opposition allows for a wider 'swing' of the tongue in Greek, which presumably includes the articulatory area allotted to the English palato-alveolar fricatives. As a result, the pronunciation of an English [s] by a Greek speaker, often sounds unacceptably retracted, verging on a [ʃ].

The aim here is to provide acoustic evidence for or against the physiological hypothesis made in Panagopoulos 1985.

2. METHOD

Two native speakers of English and Greek produced spectrograms on a Kay Sonagraph. Frequency, amplitude and duration measurements were made on appropriate parameter configurations, often with the help of a calibrated transparent overlay, and the results were normalized and processed statistically. The alveolars were embedded in phrases in intervocalic positions with a stressed vowel preceding them and an unstressed vowel following them.

3.RESULTS AND DISCUSSION

3.1. Spectral peaks and amplitude

The spectral distribution of energy for the alveolars, bands of fricative noise as well as voicing for the voiced segments are as follows:

English:
[s]: 3.8 - 8kHz
[z]: 3.6 - 8kHz
[ʃ]: 2.1 - 7kHz
Greek:
[s]: 3.0 - 8kHz
[z]: 3.0 - 8kHz

The lower bottom range for the Greek [s] became even lower, 2.6kHz, when the alveolar was followed by a voiceless velar plosive. This difference is attributed to less amplitude of noise rather than to the transitions (Harris 1958) which are less prominent features than the centre frequencies. In creating synthetic stimuli the transitions were omitted in May (1976). The same source reported that noise frequencies for (English) [s], varied with vocal tract size,male vs female, so that the lower energy limit was raised for a female speaker, from 3.5kHz and 1.6 for [s] and [ʃ] respectively (Hughes and Halle 1956) to 5.1kHz and 2.6 for the same fricatives. Such sex-specific differences can be safely assumed to be universal though and any amount of shifting applying to English should apply to Greek under the same circumstances. Amplitude, as expected, was higher for the voiceless set than for the voiced set, in both languages by about 8dB. The spectral energy of the Greek voiceless alveolar fricative lies between the English alveolar and palato-alveolar. The English values are close to those by Strevens (1960) and Behren & Blumstein (1988). As far as the Greek alveolar articulation goes it is definetely retracted by comparison to the English [s].

3.2. Durational measurements

The distribution of duration for the alveolars in the two languages was:

English:

	[s]	[z]	[ʃ]
mean:	170 ms	54 ms	172 ms
s.d.	3.5	4	3.6
variance:	12	16	10
range:	7	8	8

Greek:

	[s]	[z]
mean:	73 ms	61 ms
s.d.:	8.5	9.8
variance:	16	17

On the basis of these data,the duration of the English [s] was almost three times as long as that of the Greek [s]. Together with reduced amplitude (see above), the reduced duration of the Greek fortis articulation was much less energetic than the corresponding English articulation and reduced energy supports retraction. In addition, the higher statistic figures for standard deviation, variance and range associated with the Greek alveolars underline their instability, which in our opinion is due to the lack of a palato-alveolar contrast in Greek. An interesting indication is also the fact that the voiced fricatives in the two languages, apart from the higher instability for the Greek [z], are more similar than the voiceless fricatives. This instability of the Greek [z] is reflected in the remarkably higher percentage of devoicing for this sound than for the English [z] (Panagopoulos 1975), a fact that can be attributed to higher intraoral pressure.

4. CONCLUSION

The acoustic data support the physiological hypothesis mentioned in the beginning of this presentation.

Although there are differences in the acoustic analyses of the sets of the alveolar fricatives in English and Greek, the common articulatory parameters they share place them in the same phonological class, which incidentally consists of the same number of oppositions in the two languages (with the addition of the single voiceless glottal fricative in English) because the lack of a palato-alveolar pair in Greek is balanced by the inclusion of a velar pair of fricatives.

The measurements of the spectrograms revealed stable patterns of spectral activity for the English fricatives. This stability is probably due to the restricted freedom of movement of the tongue which is a consequence of language-specific phonological organization.

5. REFERENCES

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