

# AN ACOUSTIC ANALYSIS OF OBSTRUENTS AND VOWEL DURATIONS IN THE INTERLANGUAGE ENGLISH OF NATIVE SPEAKERS OF MODERN GREEK

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## Abstract

Το παρόν άρθρο παρουσιάζει ερευνητική εργασία σχετικά με (α) τη διάρκεια των φωνηέντων που προηγούνται φρακτικών τεμαχίων τα οποία εμφανίζονται στο τέλος Αγγλικών λέξεων ή/ και φράσεων που προφέρονται από φυσικούς ομιλητές της Νέας Ελληνικής και (β) της πραγμάτωση της αξίας της ηχηρότητας των φρακτικών αυτών ήχων. Η ομιλία η οποία έχει ερευνηθεί ακουστικά δείχνει ότι (α) οι πραγματώσεις των φρακτικών από Έλληνες που μαθαίνουν Αγγλικά τείνουν να είναι μη ηχηρές (ασχέτως της αξίας ηχηρότητας που έχουν οι λέξεις στα Αγγλικά) και (β) τα Αγγλικά φωνήεντα πραγματώνονται ως βραχεία από άποψη διάρκειας όταν προφέρονται από Έλληνες ομιλητές. Οι πραγματώσεις αυτές στην interlanguage των Ελλήνων ομιλητών συζητώνται βάσει των επιρροών της L<sub>1</sub>, L<sub>2</sub>, και της Universal Grammar. Η θέση μου είναι ότι στην πρώιμη Αγγλική interlanguage των φυσικών ομιλητών της Νέας Ελληνικής η διάρκεια των φωνηέντων καθορίζει την ύπαρξη ή μη της ηχηρότητας και ως εκ τούτου καθιστά δυνατή την πρόβλεψη της αξίας ηχηρότητας των φρακτικών (και όχι το αντίθετο!). Το παρόν άρθρο συζητά την πιθανότητα ύπαρξης στα Νέα Ελληνικά διαφοράς στη διάρκεια του φωνηέντος που προηγείται ενός ηχηρού ή μη φρακτικού και των ομοιοτήτων/ διαφορών των δύο γλωσσών στο θέμα αυτό. Παρατίθενται τεκμήρια από φασματογραφήματα λέξεων που αποτελούν ελάχιστα ζεύγη, όπως *σώσει* – *σώσει*.

## Keywords

duration, interlanguage, obstruent, voicing

The purpose of this paper is to account for realisations of word-final obstruents and durations of preceding vowels in the interlanguage (IL) English of adult Greek learners of English. Earlier research (May 2000) at language schools in Athens and Thessaloniki, using 34 young adult (mostly teenage) native Greek learners of English as subjects, has shown that there is a statistically significant tendency among Greek learners of English to realise the obstruents as physiologically and phonologically voiceless irrespective of their voice value in English, and to realise the vowels as durationally short irrespective of their duration in English. New research (2002-3) carried out at the British Council in Athens and at University College London used as subjects:

- i) 16 native Greek learners of English speaking phrases randomly distributed within a text containing minimal pairs distinguished by a word-final [ $\pm$ voice] contrast (e.g. 'proof' – 'prove'); and Greek phrases, likewise randomly distributed, containing minimal pairs distinguished by an inter-vocalic [ $\pm$ voice] contrast (e.g. ['iθi] 'manners, customs' – ['iði] 'already'; and
- ii) 8 native English speakers who were required to speak the same English phrases as those spoken by the Greek subjects, but not the Greek phrases.

The Greek subjects, 8 male and 8 female, were aged between 19 and 30, speakers of Standard Modern Greek, and of middle class/ professional background. All had learnt English at school, the pronunciation model to which they had been exposed prior to attending the British Council being that of the native Greek teacher. They were now at levels of advancement between the Cambridge First Certificate in English and the Cambridge Certificate of Proficiency. The English subjects, 4 male and 4 female, speakers of Received Pronunciation, were students and staff at University College London within the same age range as the Greek subjects.

The tendency shown in the 2002 recordings in Athens were almost identical to those in Athens and Thessaloniki in 2000. For example, the sixteen native Greek speakers were each recorded saying the English word 'smooth' ['smu:ð] four times, once in each of four different phonetic environments. Out of the total of 64 utterances of the token 'smooth', 49 (76.5%) were pronounced [smʊθ], that is the vowel was raised and shortened to [ʊ] and the final obstruent was realised physiologically and phonologically voiceless. Waveform measurements gave a median duration for [ʊ] of 133.2ms, and spectrographic evidence showed the obstruent as a voiceless fricative. The eight English speakers, on the other hand, recorded a median duration for [u:] of 199.2ms, and only four (12.5%) occurrences of the obstruent as a voiceless fricative. That is to say, the median vowel duration among the English speakers was 66ms (49.6%) longer than among the Greek speakers.

A similar pattern was found throughout the recording experiment, leading to [±voice] contrasts in minimal pairs being lost by the Greek speakers. The phrases 'a long rope again' and 'a long robe again' were spoken by the sixteen Greek speakers, usually without any contrast being made either in the voice value of the obstruent or in the duration of the vowel. The result in such cases was that the two utterances were auditorily identical, spectrograms showing few or no measurable differences. Native English hearers used as subjects maintained that the phrases were indistinguishable, perceiving both as 'a long rope again'. That is, they heard the voiceless member of the pair.

The English speakers, on the other hand, speaking the same two phrases, recorded a mean duration of the vowel in 'rope' 9.8% longer than the Greek speakers, and a median duration of the vowel in 'robe' 23.2% longer than that of the Greek speakers. Whereas the difference in duration between the two vowels among the Greek speakers was 8.4%, that among the English speakers was 25.5%. That is, the English speakers lengthened the vowel in 'robe' 17.1% more than the Greek speakers. In all cases their realisations of the obstruent in 'robe' was physiologically [+voice].

These phenomena were observed in all of the phrases containing [±voice] minimal pair contrasts spoken by the Greek subjects. For example, IL realisations of 'there is a leak' and 'there is a league' were also judged indistinguishable by native English hearers, who perceived both as 'there is a leak', again hearing the voiceless member of the pair.

**To summarise:**

- i) The vowels

The sixteen Greek subjects each spoke nineteen minimal pairs distinguished by a word-final [ $\pm$ voice] obstruent contrast. Invalid utterances excluded, the combined total of pairs spoken by the sixteen was 289. Out of these, 161 (56%) of the vowels preceding the obstruent in the [+voice] member of the pair showed durational differences insufficient to effect a phonological contrast with the [-voice] member of the pair, irrespective of whether subjects gave physiological voicing to the [+voice] obstruent.

ii) The obstruents

In environments where native English speakers produced a physiologically [+voice] obstruent, the Greek speakers, in 174 utterances of eleven tokens realised 84 (48.5%) as physiologically voiceless.

### Accounting for the phenomena

The aim, as stated, is to account for the phenomena. In doing so, we have first to look at certain crucial differences between English and Greek phonology.

- i) With very few exceptions, the only closed syllables that are allowed in Greek word-finally are those ending in [s] or [n]. There is a prohibition on word-final obstruents other than [s], except for those occurring in a small class of foreign words of recent borrowing, for example [klab], 'club'. English, on the other hand, allows closed syllables. Apart from [h], [j], [w] (and [r] in Received Pronunciation), any consonant can close a word-final syllable.
- ii) English has both 'long' and 'short' vowels' for example [u:], [ʊ], whereas in Greek vowel duration is relatively short and relatively stable. Length is never a distinctive feature. In English length alone can be a sufficient contrastive feature, irrespective of physiological voicing in a following consonant, and can be a cue to the phonological voice status of the consonant.
- iii) Vowel duration in English is audibly shorter before voiceless obstruents than before voiced obstruents, a phenomenon known as 'pre-fortis clipping', for example [bVˈt], [bVˈd] while, in Greek, vowels normally vary less in duration than they do in English. Since word-final obstruents, with the exception of [s], are disallowed in Greek, and since Greek vowel duration is relatively constant, it follows that pre-fortis clipping could not occur word-finally even in the hypothetical case of a word-final obstruent occurring.

Additionally we have to take note of the generally accepted view that, cross-linguistically, it is the voice value of the consonant that is the physical marker of the duration of the preceding vowel. While not in any way disputing this, I interpreted the evidence from the experiments to indicate that in the IL English of the Greek learners, the opposite was the case, that is to say the duration of the vowel was the physical marker of the following 'voice' contrast and hence that vowel duration enabled one to predict the voice value.

My reasons for taking this view were derived from looking at the types of input available to the native Greek learner. These could be from the first language (L<sub>1</sub>); the second language (L<sub>2</sub>); and Universal Grammar (UG). These are discussed in the following two paragraphs.

### **Accounting for the vowels**

The point to consider then is the question why, in 56% of cases the vowels preceding a [+voice] obstruent were realised durationally short, irrespective of duration in English. First there is no physical reason for it. If there were, all vowels would be short cross-linguistically. Second, it cannot be input from the L<sub>2</sub> because not all the vowels in the L<sub>2</sub> were short. Third, it is unlikely to be input from UG, because there is no UG prohibition on long vowels. The only reasonable hypothesis is that it is input from the L<sub>1</sub>, in which all the vowels are relatively short, and *not a feature triggered by the voice value of the following obstruent*, since it occurred whatever the voice value of the obstruent.

### **Accounting for the obstruents**

However the [-voice] value in the IL of the obstruents could *not* have been input from the L<sub>1</sub> because word-final obstruents, with the exception of [s], do not occur in the L<sub>1</sub>. Nor could it have come from the L<sub>2</sub>, since it occurred whatever the voice value of the obstruent in the L<sub>2</sub>. Given, then, that in UG word-final voiceless obstruents are less highly marked than are word-final voiced obstruents, it seems likely that the voiceless realisations may be attributed to input from UG.

### **Testing the claims**

To test the claims I am making it is necessary to recall that not all of the English words in the data containing voiced word-final obstruents were mispronounced with a short vowel and with a voiceless obstruent. In fact only 56% were mispronounced in this way. All of these should properly have had long vowels. By itself, this evidence is not conclusive, but it is crucial to the argument, since we have to look at the realisations of the remaining 44%. The point is that some of these did have long vowels.

Now if the claim I have made is correct, one would expect that in cases where subjects actually produced a long vowel matching the duration of the target vowel, then de-voicing of the following obstruent would not occur. That is precisely what happened. Those subjects who realised the [i:] in 'lead' as [i:] said [li:d], not [li:t]; and those who realised the [i:] in 'please' as [i:] said [pli:z], never [plis]. And so on. This part of the data shows crucially that once they had lengthened the vowel, they did not de-voice the obstruent, that is it demonstrates that it is the vowel duration that predicts the voice value of the following consonant in the IL.

It could be objected that the statement could be formulated the other way round, that is,

that once subjects had produced a [+voice] obstruent they then lengthened the preceding vowel – the opposite of my hypothesis. But that would not capture the process because, as we have seen, the short vowels in the IL were input from the L<sub>1</sub> whereas word-final obstruents cannot be input from the L<sub>1</sub> since, with the exception of [s], word-final obstruents, voiced or voiceless, do not occur in the L<sub>1</sub>. In other words, the very fact of non-occurrence of word-final obstruents in Greek, whether voiced or voiceless, means that *as non-occurring segments in the L<sub>1</sub> they cannot provide input*, whereas the occurrence of the Greek short vowels can, and it is these vowels which predict the [-voice] obstruents in the early L<sub>1</sub>. Only when learners acquire the English long vowels do they, as we have seen, produce a [+voice] consonant.

Finally, the research included recordings of native Greek speakers speaking phrases in Greek. These consisted of minimal pair inter-vocalic [±voice] contrasts such as [iθi] – [iði], randomly jumbled within a text so as not to be recognisable as minimal pairs. The purpose was to test the degree to which there is in Greek a measurable variation in the duration of a vowel preceding a voice-voiceless obstruent contrast corresponding, even slightly, to the variation that occurs in English. In the earlier experiments it seemed auditorily that some variations occurred, and the new data analysed spectrographically confirms the auditory evidence.

Obviously the inquiry could not include word-final positions, but word-medial positions across syllable boundaries could be taken. Results to date show that some quite considerable variations do in fact occur. I give here two examples:

**Example 1**

|                         |                      |
|-------------------------|----------------------|
| [θa 'sosi ti zo'i mu]   | 'it'll save my life' |
| [na 'sozi po'les zo'es] | 'to save many lives' |

The contrasting segments are [s] in ['sosi] and [z] in ['sozi]. Spectrographic measurements showed wide inter-speaker variations in vowel duration among the sixteen subjects, with a mean durational difference of 21%. However, several subjects recorded little or no durational difference between the vowels in the two words. For example, 0.1%, 1.6%, 3.1%, 8.3%. Yet in those cases the [±voice] contrast was maintained, the contrastive feature being the voice status of the obstruent, not the vowel duration. In English, on the other hand, such small durational differences would be insufficient to effect a phonological contrast, and the [±voice] contrast would, as we have seen, be lost.

**Example 2**

|                     |                         |
|---------------------|-------------------------|
| [i 'maçi te'liose]  | 'the battle finished'   |
| [i 'maji te'liosan] | 'the magician finished' |

The contrasting segments are [ç] in ['maçi] and [j] in ['maji]. Again there was considerable inter-speaker variation in vowel duration, with a mean durational difference of 23.7%, and again several speakers recorded very low differences (5.5%, 5.8%), yet maintained a [±voice] contrast. The pattern in the examples was repeated, *mutatis mutandis*, in all of the eight [±voice] contrasts recorded, and is in accord with the fact that contrast in Greek is effected by the voice

value of the consonant, not by vowel duration, there being no abstract phonological feature [±long] in Greek.

**To sum up:**

- i) In all of the oppositions examined speakers almost always realised the vowels in the voiced members of pairs as durationally longer than the vowels in the voiceless members.
- ii) However, durational differences in Greek were found to be smaller than durational differences in English. Where mean or median percentage differences in Greek were occasionally greater than in English, this was because Greek vowel durations were normally shorter than English vowel durations, resulting in a higher percentage difference.
- iii) Vowel duration in Greek did not play a part in phonological contrast. This is in line with the known fact that durational variation occurs in Greek, but not contrastively. In English, on the other hand, vowel duration is crucial to contrast.

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