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### **Stress and Rhythm in Modern Greek dialects**

Η παρούσα ανακοίνωση εξετάζει πειραματικά ορισμένα ακουστικά χαρακτηριστικά του λεξικού τόνου στη κυπριακή, αθηναϊκή και θεσσαλική ελληνική. Η μελέτη βασίζεται σε δεδομένα από 21 ομιλητές από τις σχετικές περιοχές τα οποία αναλύθηκαν φωνητικά. Τα αποτελέσματα δείχνουν ότι στην αθηναϊκή και θεσσαλική ελληνική τα τονισμένα φωνήεντα διακρίνονται από τα άτονα στη μεγαλύτερη διάρκεια και ένταση και η διαφορά στην ένταση μεταξύ των τονισμένων και άτονων φωνηέντων είναι μεγαλύτερη στην θεσσαλική ελληνική. Αντίθετα στην κυπριακή η διάρκεια των φωνηέντων κυρίως εξαρτάται από τη θέση του φωνήεντος στη λέξη όπου το δεύτερο φωνήεν φαίνεται να έχει μεγαλύτερη διάρκεια, αλλά τονισμένα φωνήεντα στη πρώτη συλλαβή μπορεί να έχουν μεγαλύτερη ένταση.

#### **INTRODUCTION**

Various classifications of MG dialects, such as the one suggested by Newton (1972) are based on the co-occurrence of certain features in some dialects and their absence in other dialects. For example, the presence or absence of the so-called vowel raising and loss distinguishes between Northern and Southern dialects, while geminates, final /n/ in all phonological environments and manner dissimilation in consonant+j clusters characterizes the Southeastern dialects.

I am using the term ‘dialect’ in a very broad sense as one of the varieties of the Greek language spoken in the area. As it has been shown in various studies in sociolinguistics none of the features mentioned above is absolute and occurs in the speech of all speakers in all social contexts. However, whether we are talking about the situation of di- or triglossia or a continuum from the local variety to Standard Modern Greek, it appears that there exist certain features associated with the given region and absent from Modern Greek, that tend to be more frequent in informal settings, in speech of older or less educated people living in the given area (cf. Sciriha 1996).

The question that has been asked already by several linguists such as Malikouti-Drachman (2001) or Drettas (2000) is whether the segmental differences between the different dialects point to a more a general difference in syllable structure or prosodic structure between them. In order to find out whether there is indeed a difference in rhythmic structure between various dialects, in this paper I will first compare the acoustic properties of lexical stress in three dialects of Modern Greek.

Based on the existing classifications of Modern Greek dialects, such as the ones suggested by Kontossopoulos (1981) or Newton (1972), I have chosen two varieties that may be expected to be furthest apart in a dialectal continuum: Thessalian Greek which belongs to Northern dialects and Cypriot Greek which belongs to SE dialects. I have also included the data from Athenian Greek as a benchmark.

Studies in language use in Cyprus (Sciriha 1996, Karyolemou 2000, Arvaniti 2001 and others) show that almost all Cypriots can be expected to show in their speech both Cypriot and Standard (Athenian) Greek features and currently it is hardly

possible to find speakers who would not be influenced by Standard Modern Greek. All speakers are also likely to vary the ratio of Cypriot and Standard features depending on the circumstances. Although no such study to my knowledge has been done for language use in Thessaly, it might be expected that the influence of Standard Modern Greek in this area would be even greater than in Cyprus due to the difference in political status of this region.

#### ***DATA AND METHODOLOGY***

Since in this study I am more interested in phonetics of the respective varieties of Greek than in the analysis of sociolinguistic patterns of variation, the speakers as well as the topics for the interview were chosen with the view of obtaining samples of speech with the highest percentage of regional features. Speakers of Athenian Greek were chosen so that they matched in their sociolinguistic characteristics the speakers of Thessalian and Cypriot Greek.

*Age and gender:* the age of speakers ranged between 75 and 93 years. Out of 21 speakers (7 for each variety) chosen for further analysis, 5 were women and 16 men.

*Place of origin:* both in Thessaly and in Cyprus, Greek is not homogeneous, but distinguishes local varieties. Therefore speakers were chosen from the same region. All speakers of Cypriot Greek come from Mesaoria, all subjects were born in Cyprus in different villages in the vicinity of Nicosia; however, the majority of them did not stay in the same village, but moved several times within the same region. All speakers of Thessalian Greek come from a village of Moschato (Blazdo) in 10 km from the town of Karditsa. This village already appears in the travelogues of 19<sup>th</sup>-20<sup>th</sup> century and during the time of the Ottoman Empire belonged to the Greek speaking area. All subjects were born in Moschato and lived there at the time of the recordings. All speakers of Athenian Greek have lived in Athens since at least 1955, one of them was born in Athens, and others originated from Peloponnesos and other areas of Greece. All of them lived in Athens at the time of the recordings.

*Education and occupation:* All speakers in this study come from families mainly involved in agriculture. Most speakers finished primary school, while several went to primary school for 2-3 years, but could not finish it because of financial situation of their families. Few speakers, mainly women, did not go to school. All male subjects used to work as manual workers: carpenters, cabinet builders, plumbers, miners bricklayers or builders. Among the female subjects one worked as cook, another one as a tailor, others stayed at home and did household jobs and needlework. At the time of the recordings all speakers were retired, but some of them continued working part-time.

All recordings were made in the respective regions. In Cyprus the interviews were conducted in a quiet room in the Club for Aged People (Λέσχη Ηλικιωμένων) in the Strovolos district of Nicosia and in the house of one of the subjects in the village Sia, south of Nicosia. In Thessaly the speakers were recorded in subjects' houses or in a quiet room in village coffee-shop. In Athens like in Cyprus the interviews were recorded in the Club for aged people (ΚΑΠΗ) of the Agii Anargiri district of Athens. The average duration of an interview was 25 minutes.

The speakers were invited to participate in research about the respective region and were not given any instructions concerning the choice of language. Originally 43 speakers were recorded; however, only 21 (7 for each variety) were selected for further analysis, since some speakers spoke to the interviewer in Standard Modern Greek (i.e.

they mainly used Standard morphology, syntax and vocabulary), while in other cases the quality or the duration of the interview was not sufficient.

The goal of the interviews was to elicit as much free conversation as possible in less formal style, where speakers can be expected to use the respective regional variety. Therefore the speakers were asked about the subjects, in which they were intimately involved. The topics all speakers were most inclined to talk about were their childhood, school, and family.

The interviews were conducted by the researcher, who spoke to the subjects in Standard Modern Greek. As far as possible the interviewer tried not to intervene into the conversation, so that most of recordings are a monologue. During some recordings in Cyprus, speakers were interviewed by a native speaker of the Cypriot dialect.

The interviews were recorded using a DAT recorder and high quality lapel microphones. All subjects were aware of being recorded and gave their consent to the use of the recordings for this research. The total duration of all recordings is about 10 hours. They were subsequently copied to CDs in the Phonetic Laboratory of Oxford University and converted to .wav files with sampling rate 22 kHz.

An impressionistic phonetic transcription of little detail was made of all recordings to identify main phonological features as well as orthographic transcription in standard Greek spelling and Latin transliteration. The latter was used to compile a word index for all recordings with use of WordSmith software for text analysis.

#### *USE OF STANDARD MODERN GREEK IN THE DATA*

All phonological features listed in previous studies as typical for Cypriot and Thessalian Greek were attested in the recorded data. However in all cases regional forms co-occurred with Standard forms.

The presence of both local and standard forms in the speech of all the speakers can be attributed to a number of factors. It might reflect the actual variety of language spoken by speaker in their everyday communication or it could result from the artificial setting of the interview.

Although a recorded interview can hardly ever be as natural as normal conversation, there is certain evidence that after initial adjustment speakers were not paying much attention to the tape-recorder. Only in two cases speakers asked during the monologue, whether the tape-recorder was still on. There also was no noticeable difference in the way the speakers spoke to the interviewer during the interview and under other circumstances.

The fact that the interviewer was foreigner and spoke to speakers in Standard Modern Greek unavoidably had an impact on their speech. Many speakers gave answers in more standardized language initially, that is they avoided use of such Cypriot feature as affricates or post-position of weak object pronoun or such prominent Thessalian feature as loss of unstressed high vowels. However as the participation of the interviewer in the conversation was reduced to a minimum, there is evidence that the speakers tended to pay less attention to the presence and the identity of the interviewer as the interview went on. Another piece of evidence comes from the fact that in course of the conversation all speakers chosen for further analysis would mainly use regional forms and regional vocabulary.

To further evaluate the influence of the identity of the interviewer over the choice of language, the recordings of Cypriot Greek made in Nicosia can be compared with those made in Sia. The speakers recorded in Sia were interviewed by a native

speaker of Cypriot dialect, whose family comes from this village. The percentage of some of the identified Cypriot feature (use of Cypriot clusters, use of affricates in /tʃe/ and /etʃinos/ 'that', use of /ʃ/ in /eʃi/ 'there') in the speech of speakers recorded in Nicosia was compared to the corresponding data for speakers recorded in Sia. Nonparametric Mann-Whitney U test showed no significant difference between the percentages of any of these features according to the place of the recording. Therefore it may be concluded that the identity of the interviewer or settings did not have crucial impact over the speakers' language usage and the obtained samples of spontaneous speech represent the variety of Cypriot Greek not very distinct from the one used for informal everyday communication.

### **RESULTS**

This study focuses on analysis of vowel duration and amplitude in disyllabic words with stress on first or second vowel, in order to determine whether the three varieties in question use different means to distinguish between the stressed and unstressed words. The data sample consisted of around 1000 tokens of 10 different words (5 for each stress pattern) that were used most frequently by all speakers of the three varieties. Words that were pronounced with emphasis were discarded. The data sample for this study also didn't include tokens where the second unstressed vowel was completely absent (10% of all words with the stress on the second vowel in Thessalian Greek and 2% of words in Athenian and Cypriot Greek).

The duration and amplitude were measured in WaveSurfer. The vowel duration was measured on the spectrogram following the standard conventions was measured and double-checked on the waveform.

### *DURATION*

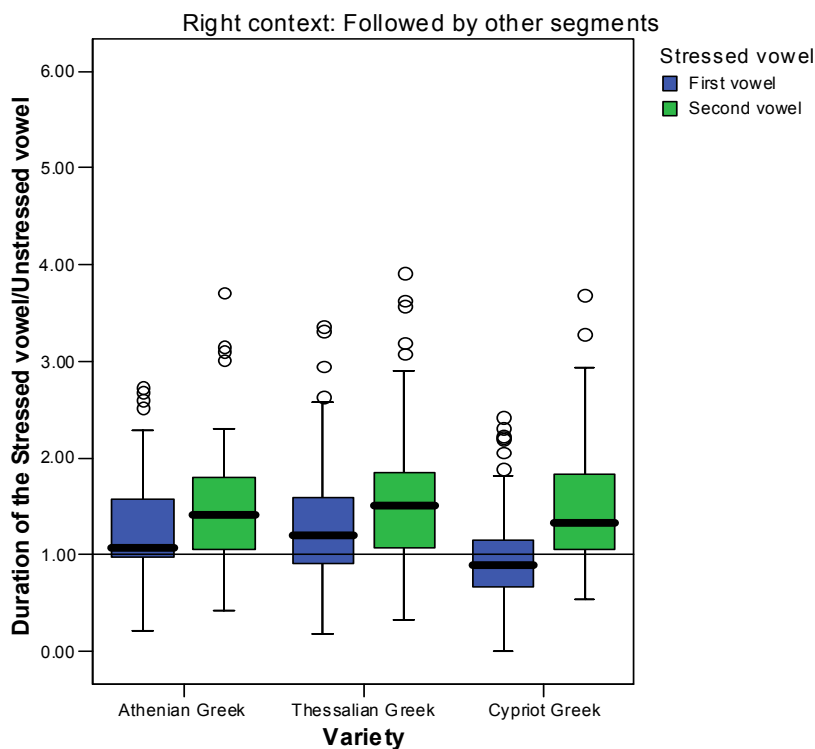
Segment duration can be affected by a number of factors such as intrinsic duration, phonological context, position, speech tempo, stress etc. The use of the same words for all speakers of all three varieties allowed eliminating such factors as phonological context (cf. Port 1979 etc.) or possible effect of the intrinsic duration of the vowel. The individual variation in speech tempo is difficult to control in this kind of data; however it has been suggested that in spontaneous speech speakers do not normally vary their tempo as much as subjects in controlled environment and differences in tempo are mainly attributed to pauses rather than segmental duration (Port 1979: 94). Several studies on duration in connected speech were performed by Crystal and House (1990 and others). They found that while pauses are important, slow talkers also show slower segmental duration than fast talkers. In general according to their results the effect of stress was greater than that of tempo. These observations however may be language specific; therefore to minimize the effect of speech tempo factor I will only look at the difference between the durations of two vowels within the same token.

It is well known that the segment duration is affected by the position (cf. Campbell and Isard 1991 and other); therefore I will look separately at tokens that were followed by a pause and tokens immediately followed by other segments. For the sake of brevity I will refer to the latter as "occurring in the middle of phrase"; however, it has to be remembered that intonational boundaries in spontaneous speech do not always coincide with syntactic boundaries.

In tokens that were followed by other segments the ratio ( $R_d$ ) between the absolute durations of stressed ( $D_{str}$ ) and unstressed vowel ( $D_{unstr.}$ ) ( $R_d = D_{str.}/D_{unstr.}$ )

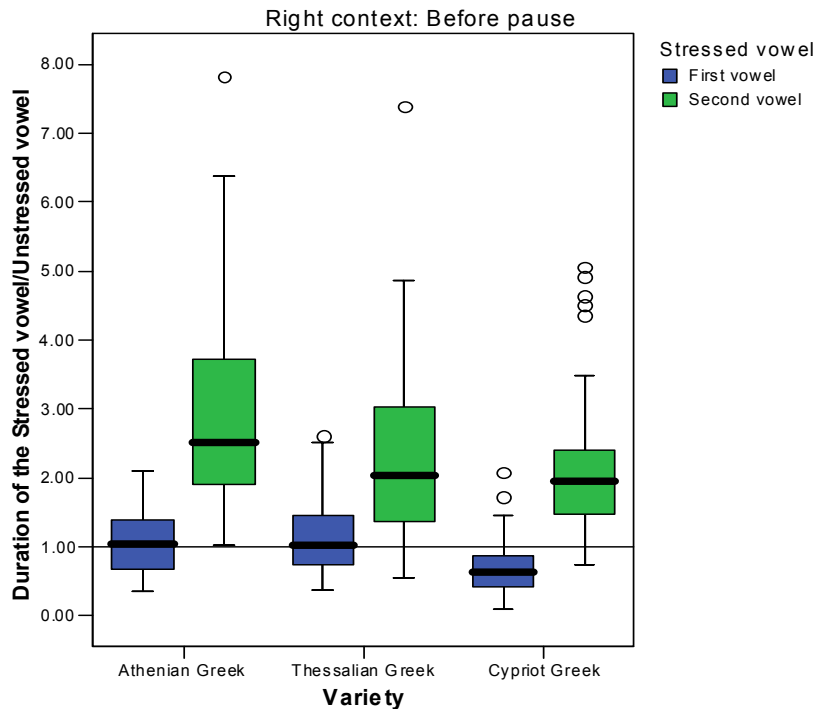
significantly depended on the stress pattern, that is whether the stress fell on the first or the second vowel of the word) (Mann-Whitney U nonparametric test  $p < 0.001$  in Thessalian and Cypriot Greek,  $p = 0.02$  in Athenian Greek). However, there was an important difference between these two varieties: in Athenian and Thessalian Greek the stressed vowel was usually longer than the unstressed vowel (the average ratio  $R_d = 1.2$  if the first vowel was stressed,  $R_d = 1.5$  if the second vowel was stressed in Athenian Greek,  $R_d = 1.3$  if the first vowel was stressed,  $R_d = 1.6$  if the second vowel was stressed in Thessalian Greek), while in Cypriot Greek the second vowel was normally longer regardless of the position of stress ( $R_d = 0.93$  if the first vowel was stressed and  $R_d = 1.6$  if the second vowel was stressed). These results are represented on Figure 1.

**Figure 1:** The ratio between the durations of the stressed and unstressed vowel within the same token in Athenian, Thessalian and Cypriot Greek depending on the position of the stress. The horizontal line indicates the value of  $R_d = 1$  where both vowels have same duration.



The same pattern was preserved if tokens occurred before pause: the ratio between the durations of the stressed and unstressed vowels significantly depended on the position of stress (Mann-Whitney U nonparametric test  $p < 0.001$  for all three varieties). In Thessalian and Athenian Greek it was usually the stressed vowel that was longer (the average ratio  $R_d = 1.1$  if the first vowel was stressed,  $R_d = 1.3$  if the second vowel was stressed in Athenian Greek,  $R_d = 1.2$  if the first vowel was stressed,  $R_d = 2.3$  if the second vowel was stressed in Thessalian Greek), in Cypriot Greek regardless of the position of stress the second vowel was often longer than the first one, with the difference being greater if the second vowel was also stressed ( $R_d = 0.7$  if the first vowel was stressed and  $R_d = 2.2$  if the second vowel was stressed). These results are represented in Figure 2.

**Figure 2:** The ratio between the durations of the stressed and unstressed vowel within the same token in Athenian, Thessalian and Cypriot Greek depending on the position of the stress. The horizontal line indicates the value of  $R_d=1$  where both vowels have same duration.

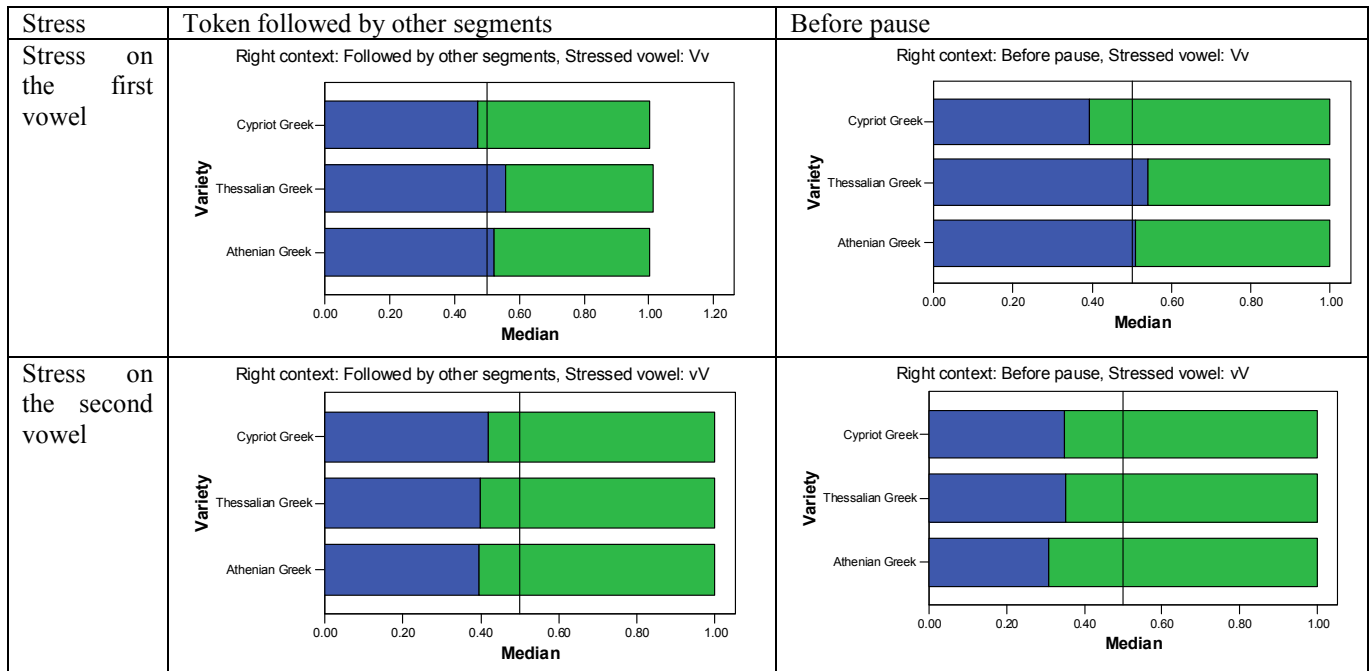


The relations between the durations of the first and second vowel depending on the stress pattern and the position of the token in the phrase is shown on Figure 3.

Figure 3 shows that in all three varieties the second vowel tended to be longer than or similar in duration to the first vowel. In all three varieties it was longer than the first vowel if it was stressed. In Cypriot Greek the second vowel was longer than the first vowel even if it was unstressed. In Athenian and Thessalian Greek the duration of the first vowel was generally greater if this vowel was stressed. Thus the difference between stressed and unstressed vowel in these two varieties is marked by greater duration of the stressed vowel. In Cypriot Greek this only applies to the second vowel which was longer when stressed, while the duration of the first vowel in this data sample appeared to be not influenced by whether it was stressed or not.

These results for spontaneous speech in Athenian and Thessalian Greek correspond to the similar results previously stated for controlled speech (Dauer 1980, Botinis 1989, Arvaniti 1991), which also found that duration is one of the main acoustic correlates of stress in (Standard) Modern Greek.

**Figure 3.** Relative vowel durations depending on the stress patten and position of the token. The bars represent the median relative duration of each vowel calculated as median value of the duration of the corresponding vowel divided by the sum of durations of both vowels. The median value was preferred over the mean value to restrict the effect of the outliers.



### AMPLITUDE

Like duration the vowel amplitude can be affected by a number of factors including individual differences, sentence stress, word stress, intrinsic intensity of the vowel and others. Since it was not possible to control all these factors due to the nature of the data, I will only look at the difference in maximum amplitude of stressed and unstressed vowels in the same position and within the same word.

In all three varieties vowels had different amplitudes depending on their quality, thus [o] had higher amplitude than [u], while [a] had higher amplitude than [e] or [i]. Since the effect of the difference in intrinsic amplitudes of vowels can sometimes be greater, than the effect of the stress, only words with the same vowel in both syllables were chosen for the analysis of the amplitude.

In all three varieties the stressed vowel generally had higher amplitude than the unstressed vowel in the same word. In Athenian and Thessalian Greek there was no significant dependency between the ratio of the amplitudes and the position of stress in the word ( $R_i=1.05$  in Athenian Greek and  $R_i=1.07$  in Thessalian Greek). In Cypriot Greek the ratio between the stressed and unstressed vowel was greater if the first vowel was stressed ( $R_i=1.07$  if the stress fall on the first vowel,  $R_i=1.03$  if the stress falls on the second vowel, Mann-Whitney U nonparametric test  $p=0.025$ ). It is also noteworthy that in Cypriot Greek in words with stress on the second vowel the amplitude of the stressed vowel was sometimes smaller than the amplitude of the unstressed vowel.

Across varieties there was a significant difference (Mann-Whitney U nonparametric test  $p=0.021$ ) between the ratio of vowel amplitudes in Athenian and Thessalian Greek: in Thessalian Greek the difference in amplitude between the stress and unstressed vowels within the same word is greater than in Athenian Greek. It was also greater than in Cypriot Greek in words with the stress on the second vowel (Mann-Whitney U nonparametric test  $p=0.014$ ). These results are summarized in Figure 4.

**Figure 4:** The ratio between the amplitudes of the stressed and unstressed vowel within the same token in Athenian, Thessalian and Cypriot Greek depending on the position of the stress. The horizontal line indicates the value of  $R_i=1$  where both vowels have same amplitude.

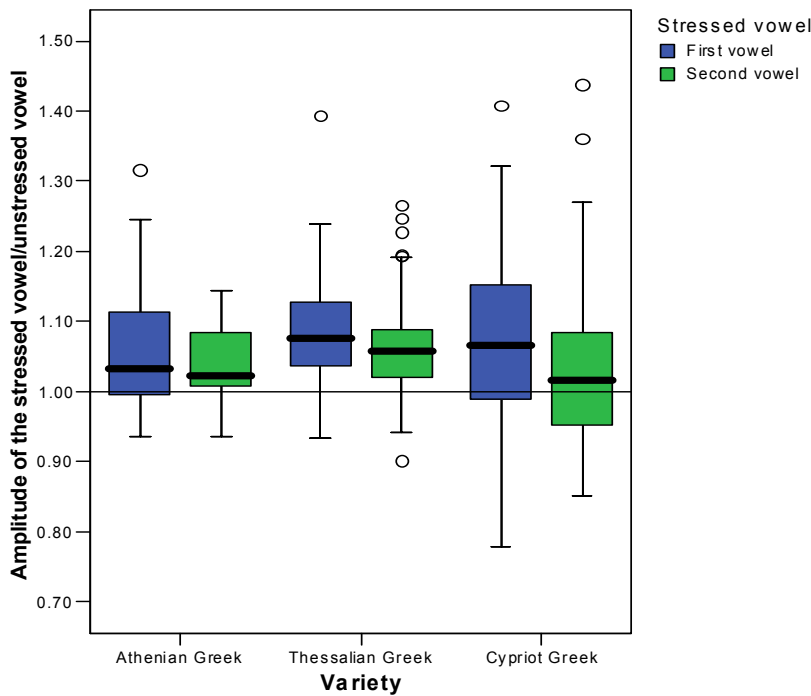
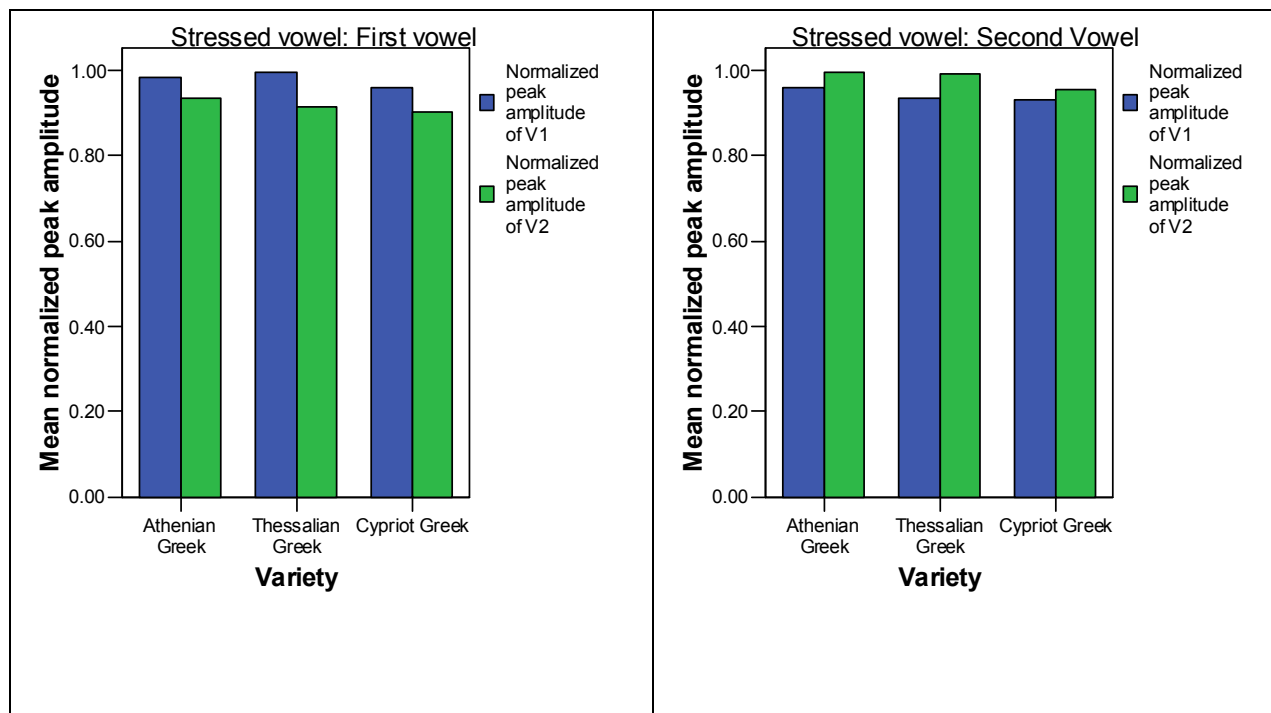


Figure 5 shows the normalized peak amplitudes of both vowels in words with different stress pattern. The figure once again shows that in all varieties the stressed vowels had higher amplitude than the unstressed vowels in the same word regardless of the stress pattern. The only exception was words with the stress on the second vowel in Cypriot Greek, where the difference between the amplitudes of the two vowels was not significant (in all other case Wilcoxon nonparametric test  $p<0.001$ ).

Thus in all three varieties stressed vowel usually had higher amplitude than the unstressed vowel of the same quality within the same word. The difference in amplitudes between the vowels was greater in Thessalian Greek than in Athenian Greek. At the same time in Cypriot Greek the ratio of amplitudes for words with both stress patterns varied more than in the other varieties and the difference between the stress and unstressed vowels was found insignificant in words with the stress on the second syllable.



**Figure 5.** Normalized peak amplitudes of the first and second vowel in Athenian, Thessalian and Cypriot Greek in words with stress on the first (left) and the second (right) vowel.



### CONCLUSION

The acoustic features of lexical stress in the three varieties in question appear to be different. Athenian and Thessalian Greek use both duration and amplitude to distinguish between the stressed and unstressed vowels; however, in Thessalian Greek the difference in amplitude between the stressed and unstressed vowel is greater than in Athenian Greek. It appears that in Cypriot Greek vowel duration mainly depends on the position of the vowel in the word, with the second vowel being longer than the first one. At the same time if the first vowel is stressed in Cypriot Greek, it has higher amplitude than the second vowel. Noteworthy, the difference in amplitude is not significant if stress falls on the second vowel.

This difference may be linked to the previously observed differences in segmental structure – thus the fact that stressed vowels in Thessalian are longer and have higher amplitude than unstressed more consistently than in the other 2 varieties is most probably related to the well known Northern Greek vowel reduction. The analysis of formant structure of stressed and unstressed vowels in these varieties, which is left beyond the scope of this paper, also confirmed the qualitative difference between stressed and unstressed vowels in Thessalian Greek. Another issue that may be discussed in this context is the historical development of these regions and other languages that might have been in contact with Greek in these areas and contributed to the development of local varieties.

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