Phonetic variation in regional varieties of Modern Greek: vowel raising

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Abstract

The paper is based on experimental phonetic analysis of stressed and unstressed vowels in spontaneous speech in Cypriot, Thessalian and Athenian Greek. It is shown that unstressed vowels differ in quality from the stressed vowels not only in Thessalian Greek, where this phenomenon is well described as “vowel reduction", but also in Athenian and to lesser degree in Cypriot Greek. The paper discusses possible phonological implications as well as the role of language contacts in phonologization of vowel reduction in Thessalian Greek.

Keywords: vowel reduction, formant undershoot, stress, vowel quality, phonologization.

1. Introduction

Since 19th century the differences in sound pattern between regional varieties of the Greek language have been subject to numerous descriptions which often served as a basis for later phonological interpretations. At the same time until recently little has been done to provide phonetic description of these differences on the basis of instrumental analysis of primary data. Furthermore, due to focus on one area and reference to written Greek, published descriptions sometimes included both regional phenomena as such and processes occurring in colloquial Greek elsewhere (but not reflected in written language). Quantitative studies of use of specific features across different regions are necessary in order to establish whether we are dealing with regional or social and stylistic variation or combination of both.

In this paper I will be looking at quality of stressed and unstressed vowels in three varieties of Greek: Athenian, Cypriot and Thessalian Greek. I will look at the quality of stressed and unstressed /e/, /o/ and /a/ in order to describe the variation in vowel quality both within each of these varieties and between them.

2. Vowel reduction in Greek dialects

It is generally accepted in Modern Greek dialectology that in Athenian and Cypriot Greek distribution of vowels is not dependent on stress (cf. Mackridge, 1985: 18–19, for Athenian Greek; Newton, 1972a: 37, for Cypriot Greek) and all vowels can occur both in stressed and unstressed position without much variation in quality (Arvaniti, 1999a; Fourakis, Botinis, & Katsaiti, 1999). In Thessalian Greek according to published descriptions [o] and [e] in unstressed position are rare and usually alternate

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with [i] and [u]; etymological high vowels /i/ and /u/ are often dropped in unstressed position (cf. Papadopoulos, 1926; Tzartzanos, 1909). Thus χωράφι *'field'* pronounced [xorˈafi] in Standard Modern Greek, in Thessalian Greek appears as [xurˈaf'], παιδί *'child'* SMG [peðˈi] corresponds to [piðˈi]. The process of vowel reduction allows for certain variation and does not affect all unstressed mid and high vowels. Chatzidakis (1892: 350–351) mentions many cases of analogy in application of vowel reduction and also regional differences.

Raising of mid-vowels and loss of high vowels apart from Thessaly is also common in Macedonia, Epirus, Western Thrace and some other regions and serves as a criterion for dividing Greek dialects into "Northern" dialects which show vowel reduction and "Southern" dialects where vowels preserve their quality in unstressed position. Nevertheless, some cases of vowel reduction were also attested in the areas outside the traditional Northern dialects area. Devoicing or loss of unstressed high vowels seems to be one of the features of casual speech in Standard Modern Greek (cf. Arvaniti, 1999b: 169; Dauer, 1980a; Theophanopoulou-Kontou, 1973: 375). Chatzidakis (1892: 347–348) noted that unstressed /i/ between consonants is sometimes lost also in Southern Greek dialects, for example in Crete, but this process is by far not as regular as in Northern dialects. Loss of unstressed vowels has also been attested in Chios (Pernot, 1907: 46–48).

Recent studies also brought some evidence that at least in some dialects, traditionally described as 'southern', stressed and unstressed vowels may have different quality. On the basis of the manuscripts contained in the Historical Archive of the Academy of Athens, Pantelides (2001) concluded that the reduction of the unstressed /o/ was widespread in many dialects throughout Peloponnese, especially in Messenia, Laconia and Arcadia. Similar "unaccomplished" reduction was noticed earlier by Papadopoulos (Papadopoulos, 1926) in Northern Euboea and Chalcis. In an experimental study of Standard Modern Greek, Dauer (1980b: 295–296) found no regular difference between stressed and unstressed vowels, but noticed raising of F2 and lowering of F1 in case of some unstressed vowels. Recently Baltazani (2005) has found that unstressed vowels in Greek are more centralized and far more undistinguishable from one another than the stressed vowels. Barry and Andreeva (Barry & Andreeva, 2001: 61) in a comparative study which included Greek, found cases of centralised ('shwa-ised') vowels in spontaneous speech of Greek speakers. Nicolaidis (2003) in her analysis of spontaneous monologues has found great variability of formant frequencies for all Greek vowels with considerable overlap, especially between the open vowel /a/ and the mid vowels /e/ and /o/. She found that F1 for all vowels decreased with the decrease in duration. Decrease in duration also led to centralization of /i/, /e/ and /o/. These results correspond to Baltazani's findings about the centralization of unstressed vowels in Greek and thus contradict numerous impressionistic observations that Greek vowels retain their quality regardless of stress.

3. Description of data

The study is based on spontaneous monologues recorded from 21 speakers in Athens, Thessaly (Karditsa) and Cyprus (Nicosia). All speakers belonged to the same age group (75–93 years old), had primary education and were involved in traditional occupations. All speakers from Cyprus and Thessaly were natives of the area. Speakers recorded in Athens lived there at least since 1950s and were not perceived as regional speakers by speakers of Standard Modern Greek.

The data sample was chosen with a view to limit the variation caused by factors other than stress or variety. The data sample consisted of multiple occurrences of disyllabic words, which occurred most frequently in all three varieties[1]. The first group of words contained the same vowel (/e/, /o/ or /a/) in both syllables. In these tokens comparison within the same word allowed to reduce impact of such factors as speech tempo, sentence stress and position in the utterance, but ignored possible impact of phonetic context. The second group of words was chosen so that stressed and unstressed vowels of the same quality occurred in identical phonetic context, but in different words.

The data sample included all occurrences of the chosen words in the recordings, when they were part of continuous monologue. The only two criteria for exclusion of certain tokens were if they were pronounced in isolation or the quality of the recording was too low. The final data sample consisted of 1700 vowels.

Measurements of formant frequencies were made using the formant-tracking function of the Wavesurfer software and manually checked for accuracy. The formant frequency closest to the middle of the vowel was used for further analysis. To compare the overall location of vowels in the vowel space, Euclidean Distances to the hypothetical centre of the vowel space ('schwa') were calculated for each vowel. This was done following the formula used for example by Harmegnies (1992): $EDschwa=[(F1-500)^2+(F2-1500)^2]^{1/2}$, where *F1* and *F2* are the absolute formant frequencies for the corresponding vowel. This paper focuses on the analysis of *F1*.

4. Results

All varieties showed variation in vowel quality and overlap of formant frequencies between different vowels. Statistical analysis showed certain tendencies that are presented below separately for each vowel. All vowel frequencies are shown in Figure 1.

For /e/ in Cypriot Greek there was no statistically significant difference in formant frequencies of stressed and unstressed vowels if they occurred in similar phonetic context. In Athenian Greek F1 of unstressed /e/ was lower than F1 of the stressed /e/ if vowels occurred in the same context (478.8 Hz vs. 537 Hz, Mann-Whitney U Test, $p < .05$). There was no significant difference in F1 between vowels which appeared in different phonetic context within the same word. In Thessalian

[1] Most frequent words were identified on the basis of a word index compiled for all recordings with WordSmith software for text analysis. The index consisted only of nouns, adjectives, verbs and numerals and excluded articles, prepositions and pronouns.

Greek as one might expect there was significant difference in F1 between stressed and unstressed /e/ in similar context (497.8 Hz vs. 346.7 Hz, Mann-Whitney U test, $p < .001$). Unstressed vowel had lower F1 and was more peripheral. Unlike Athenian Greek the difference between stressed and unstressed /e/ in Thessalian Greek was preserved if stressed and unstressed vowels occurred within the same word but in different phonetic contexts (497.8 Hz for stressed vowel vs. 390.4 Hz for unstressed vowel, Wilcoxon signed ranks test, $p < .001$). Furthermore there was no difference between the F1 of unstressed /e/ and stressed /i/[2].

In Cypriot Greek there was no difference between stressed and unstressed /o/ if they occurred in the same context. At the same time within the same word unstressed /o/ was closer to the centre of the vowel space than the unstressed counterparts and had greater F1 than the unstressed vowel (F1 in the same word 433.6 Hz for stressed vowel vs. 505 Hz for unstressed vowel, Wilcoxon signed ranks test, $p < .05$). In Athenian Greek there was significant difference between the quality of stressed and unstressed /o/ if they appeared in the same context with unstressed vowel having lower F1 (588.5 Hz for stressed vowel vs. 508.6 Hz for unstressed vowel, Mann-Whitney U Test, $p < .001$). At the same time there was no difference between vowels that appeared in different contexts. In Thessalian Greek unstressed /o/ had lower F1 and was more distant from the centre of the vowel space than the stressed /o/ in the same context (400.9 Hz for unstressed vowel vs. 550.5 Hz for stressed vowel, Mann-Whitney U test $p < .001$). This difference was also preserved within the same word for vowels in different contexts (F1 495.5 Hz for stressed vowel vs. 424.6 Hz for unstressed vowel, F2 1269 Hz for stressed vowel vs. 1095.1 Hz for unstressed vowel, Wilcoxon signed ranks tests, $p < .001$). Comparison of unstressed /o/ with the data for stressed /u/ in the same phonetic context showed no significant difference in F1 between the two vowels in this variety of Greek (Mann-Whitney U test, $p = .879$).

[2] This paper presents some results of a larger study. The original datasample also included /i/ and /u/ and therefore it was possible to compare formant frequencies for mid and high vowels.

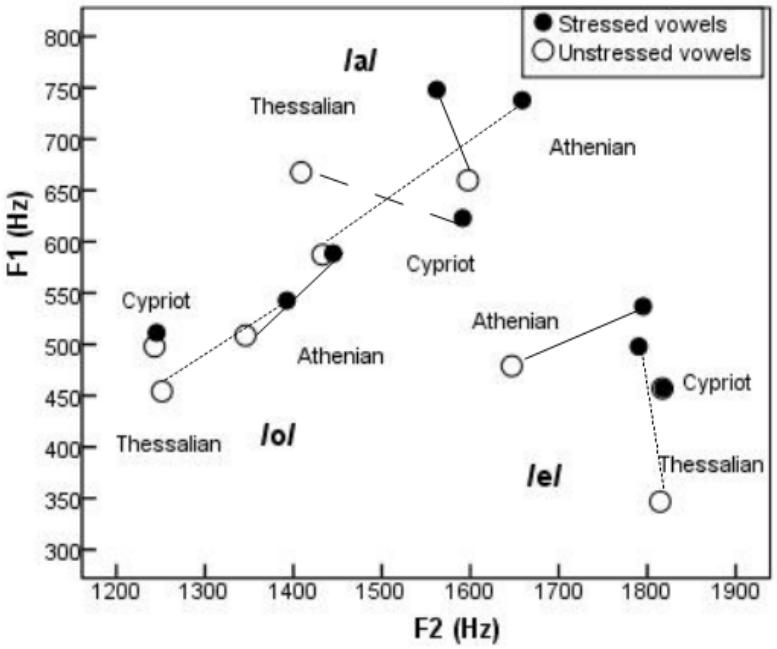

Figure 1. F1 and F2 of stressed and unstressed /e/, /o/ and /a/ in Athenian (solid line), Thessalian (dot line) and Cypriot (dash line) Greek.

Unstressed /a/ in Cypriot Greek was closer to the centre of the vowel space and in similar context had lower F2 than the stressed vowel (1408.7 Hz for unstressed vowel vs. 1591.4 Hz for stressed vowel, Mann-Whitney U test, $p < .05$). In Athenian Greek in similar context unstressed vowel had lower F1, and was more central, than stressed vowel (748.02 Hz for stressed vowel vs. 659.75 for unstressed vowel, Mann-Whitney U test, $p < .05$). There was no significant difference if vowels occurred in different contexts. In Thessalian Greek unstressed /a/ had lower F1 than the stressed /a/ in the same context (F1 737.9 Hz for stressed vowel vs. 587.26 Hz for unstressed vowel, Mann-Whitney U test $p < .001$). This difference was also preserved for vowels that occurred in different contexts within the same word, but the size of the effect was much smaller than in the same context (F1 737 Hz for stressed vowel vs. 712 Hz for unstressed vowel, Wilcoxon signed ranks test $p < .05$; F2 1658.5 Hz for stressed vowel vs. 1555 Hz for unstressed vowel, Wilcoxon signed ranks test, $p < .05$). This confirms the observation by Chatzidakis (1892: 349–352) that the so called "vowel reduction" in Northern dialects affects not only /o/ and /e/, but also /a/.

5. Discussion

The situation when stressed and unstressed vowels differ in quality is often referred to as “vowel reduction” and has been subject to a vast number of studies (to name just a few Crosswhite, 2001, 2004; Delattre, 1981; J. Harris, 2005; Lindblom, 1963a, 1963b; Moon & Lindblom, 1989, 1994; Nord, 1986; Pettersson & Wood, 1991; van Bergem, 1993). Most of these studies distinguish between two types of vowel reduction: phonological (lexical, categorical), when changes in quality of unstressed vowels lead to loss/neutralization of distinction between different segments, and phonetic (acoustic, gradient, vowel undershoot) when such distinction is preserved.

In Modern Greek context vowel reduction in Northern dialects has usually been regarded as an example of phonological vowel reduction (cf. Magoulas, 1977; Trubetzkoy, 1969). Vowel reduction in Athenian Greek was only described at phonetic level (Baltazani, 2005; Dauer, 1980a; Fourakis et al., 1999). There exist no published descriptions of vowel reduction in Cypriot Greek.

In the absence of perceptual studies, it is impossible to make a definitive conclusion on whether vowel reduction in Thessalian Greek resulted in the loss of contrast between mid and high vowels. However, the results of the acoustic analysis presented in this study provide some evidence that vowel raising in these three varieties may represent two different processes.

First, In Thessalian Greek unstressed mid vowels had the same phonetic distribution in terms of frequency of F1 as the high vowels. In Athenian Greek mid-vowels in unstressed position may be subject to raising, but they remain distinct from the high vowels. Raising of /a/ in Thessalian and Athenian Greek did not lead to a complete overlap in formant distribution with any other vowel. In Cypriot Greek the difference between stressed and unstressed vowels was smallest and all vowels maintained distinct distributions of formant values.

Further evidence comes from the effect of duration and phonetic context. Moon and Lindblom (1994) suggest that the phonological vowel reduction involves ‘phonological redefinition of vowel target’, while in case of phonetic reduction the articulatory target remains unchanged, that is the difference between two types is expected to be more pronounced in slow speech. In case of unstressed mid-vowels in Thessalian Greek, there was variation in their formant frequencies and sometimes they preserved their mid-quality, but there is no evidence in this data sample that such pronunciation is favoured in slower speech. At the same time in case of /a/ some of the longer tokens had greater F1 than shorter tokens, although no significant correlation was found between formant frequencies and vowel duration. Similarly in Athenian Greek tokens of unstressed /o/ and /e/ with longest duration also had highest F1. Furthermore, in Thessalian Greek the difference between stressed and unstressed /a/ was more sensitive to phonetic context than the difference between unstressed and stressed mid-vowels and same can be said about unstressed vowels in Athenian and Cypriot Greek.

Van Bergem (1993) suggested that phonological reduction is probably an extension of systematic phonetic reduction and the transition between the two unavoidably involves a period of variation. This idea was further developed by Barnes (2006) who presented an extensive argument that phonological reduction is a

result of phonologization of phonetic misperceptions of vowel quality and ultimate loss of contrast. Thus he argued that different dialects of Bulgarian along the East-West axis represent a number of stages of possible phonologization of phonetic patterns. The results of the present study suggest that this may also be the case for Greek language: both Athenian and Thessalian Greek show raising of mid-vowels in unstressed position, but in Thessalian Greek this process may have led to loss of phonetic difference between mid and high vowels and lexicalisation of new forms with high vowels.

Language contact may have contributed to further advancement of vowel raising in Northern Greek dialects in comparison to other varieties. Vowel reduction similar to the one which was described for Thessalian Greek is also attested in some of the contact languages for this variety and namely in Bulgarian (for more detailed discussion see also Pettersson & Wood, 1985; Sawicka, 1997; Tilkov, 1981: 50–69; Zhobov, 2004), Aromanian (Caragiu-Marioţeanu, 1968; Katsanes & Dinas, 1990: 29–30; Kramer, 1989) and possibly Judeo-Spanish (Gabinsky, 1992: 43–44, 60; T. K. Harris, 1994: 70). It doesn't occur in Albanian or Turkish. At the same time no vowel reduction is attested in contact languages of the other varieties.

Language contact was not the only source of vowel raising in Northern Greek. There is some historical evidence that the tendency to 'raise' vowels existed in Greek outside the area of Northern dialects. Standard Modern Greek (and many regional varieties) shows forms where Ancient Greek 'ο' or 'ω' appear as [u] ('ου') if one of the adjacent consonant is velar or labial: πουλώ [pulˈo] *'sell-1ST.SG'* (Ancient Greek πωλ⏐), κουδούνι [kuðˈuni] *'bell'* (Ancient Greek κώδων) (cf. Kretschmer, 1905: 87; Newton, 1972b: 24; Pantelides, 1929). It has been suggested that vowel reduction in Northern dialects may be a result and extension of a similar ancient trend (cf. also Horrocks, 1997: 212; Magoulas, 1977: 35; Symeonides, 1977; Theophanopoulou-Kontou, 1973: 389). Therefore the role of contact languages was catalytic rather than causal: they enhanced the preference for one of the variants which already existed in the language. Most philological studies of northern vowel reduction agree that it was probably in force by 15–16th centuries (Andriotes, 1933: 341; Chatzidakis, 1892: 348). The terminus post quem appears to be subject to discussion and is placed between 5–6th and 11th century[3] (see Andriotes, 1933: 349; Babiniotis, 1977; Horrocks, 1997: 212–213). This dating fits well with the hypothesis that vowel reduction in Northern varieties was reinforced by language contact with other Balkan languages

Vowel reduction as one of the Balkan features has been discussed in detail by Sawicka (Sawicka, 1997: 18–23), who links diffusion of vowel reduction to multilingualism. The similarities between Northern Greek dialects and neighbouring languages have also been observed in other studies (cf. Beis, 2002; Drettas, 2001: 51; Tzitzilis, 1986; Velceva, 1991). At the same time there also exist other explanations for vowel reduction in these languages that do not involve contacts with Greeks. Thus

[3] Such disagreement is not surprising considering that establishment of phonological reduction was probably preceded by a long period of phonetic alternation, which sometimes probably was reflected in texts.

vowel reduction in Judeo-Spanish is sometimes linked to Portuguese influence before Sephardim Jews left the Iberian Peninsula (cf. Faingold, 1989: 15–16). Aromanian vowel reduction could be continuing the trend that already existed in Balkan Latin (cf. also Beis, 2002: 104). Certainly, no definitive conclusions about the existence of influence between Greek and other languages and the direction of this influence can be made without further investigation into chronology of vowel reduction in contact languages.

6. Conclusion

Analysis of variation in the quality of unstressed vowels provided acoustic evidence for the so-called 'vowel raising' in Thessalian Greek which was previously described only on impressionistic level. It also revealed some other tendencies such as phonetic vowel reduction in Athenian and Cypriot Greek and centralization of unstressed /a/ in Thessalian Greek.

It was found that due to variation existing in spontaneous speech, in all three varieties there exists overlap in vowel qualities and similar tendencies in changes of vowel quality in unstressed position. At the same statistical analysis allowed distinguishing between the varieties where there still existed statistically significant differences in formant frequencies of different vowels and where formant frequencies of two vowels in unstressed position represented single distribution.

It was suggested that phonological reduction of mid-vowels in Thessalian Greek and phonetic reduction in Athenian Greek may represent different stages of the same process and continue the trend that existed in Greek during earlier stages of its development. It was also observed that patterns of reduction similar to the one described for Thessalian Greek exist in languages once spoken in Thessaly, but not in Cyprus and thus language contacts may have contributed to the development of northern vocalism.

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Περίληψη

Η εργασία αυτή παρουσιάζει αποτελέσματα πειραματικής φωνητικής ανάλυσης τονισμένων και άτονων φωνηέντων στην αυθόρμητη ομιλία στην Κυπριακή, Θεσσαλική και Αθηναϊκή Ελληνική. Σύμφωνα με τα αποτελέσματα της έρευνας τα άτονα φωνήεντα έχουν διαφορετική ποιότητα από τα τονισμένα φωνήεντα όχι μόνο στη Θεσσαλική Ελληνική, οπού αυτό το φαινόμενο έχει ήδη περιγραφεί ως "κώφωση", αλλά και στην Αθηναϊκή και σε λιγότερο βαθμό στην Κυπριακή Ελληνική. Το άρθρο τελειώνει με συζήτηση πιθανών φωνολογικών επιπτώσεων και του ρόλου των γλωσσικών επαφών στη φωνημικοποίηση της κώφωσης στη Θεσσαλική Ελληνική.