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Article · January 2019

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Abstract

The present study examines acoustically the manifestation of Vowel Deletion (VD), a phenomenon linked to vowel reduction processes in northern Greek dialects. The dialects under examination are those of Corfu, Epiros, Kozani and Evros. The results show that VD is present in an emphatic manner in the 3 northern dialects of the sample, namely Kozani, Epiros and Evros. Corfu, on the other hand, as a southern dialect, exhibits total immunity to VD. These results suggest that there are intense vowel reduction processes taking place in northern dialects, whereas there is a clear-cut difference between northern and southern dialects. VD is examined in relation to the stress condition of vowels, with the results showing that stress consistently and reliably prohibits VD. Stressed vowels are almost totally unaffected by VD, something that practically associates the phenomenon only with unstressed vowels. Furthermore, the vowel category that is more prone to deletion is [i], followed by [u], while [e], [o] and [a] only delete sporadically and thus insignificantly. Regarding speaker gender, women delete vowels slightly more frequently than men. Finally, the analysis has specific implications regarding the relevant theory of *Adaptive Variability*.

Keywords

Vowel deletion, vowel reduction, Greek dialects, stress, speaker gender, vowel category

1. Introduction

The four dialectal regions under examination are geographically located on the northern part of Greece. The relatively long distances between the regions, on the one hand, and the geographical features of the northern part of Greece, with the sea and harsh mountains alternately dominating the scape, on the other hand, have accounted for the distinct historical and linguistic traditions of Corfu, Epiros, Kozani and Evros. The ethnological dimension should also be taken into account with regard to external influences through the centuries. Despite the fact that the local populations of the 4 regions have resided in those areas since the early antiquity, migration, language contact and other factors have contributed to language change in the course of time, as in every other dialectal area of Greece. However, the dialects of the 4 regions of the study are still alive and widespread among the populations, and with distinctive differences between them.

1.1 Classification of the dialects

Due to the fact that all of the four dialectal regions lie on the northern part of Greece, one could suppose that the four dialects share a number of characteristics that classify them in the same dialectal zone. This is partly true, though. According to contemporary approaches on Greek dialectology, the most influential and successful classification of the dialects of Greece is the one that distinguishes them into *northern* and *southern*, a classification originally proposed by Chadzidakis (a prominent scholar) as early as in the end of the 19th century (Minas, 2004; 37) and adopted by numerous important linguists since then. There is a horizontal line, which roughly coincides with the 38th parallel, splitting Greece into the two dialectal zones. All the four regions of this study fall far above that line, but not all of them belong to the northern dialectal group.

The dialects of Kozani and Evros are unambiguously northern (Topintzi & Baltazani, 2012; Trudgill, 2003; Newton, 1972), while the dialect of Epiros is almost unanimously classified as northern (Christou & Baltazani, 2007; Kontossopoulos, 1981; Newton, 1972). Trudgill (2003) claims that the western part of Epiros belongs to a so-called *central* dialectal zone, however, the study sample from Epiros does not come from this part of the region. Therefore, in this study Epiros is definitely classified as a northern dialect. Finally, Corfu, an island in the northern Ionian Sea, linguistically is not linked to the northern dialects. Kontossopoulos (1981) excludes it from the northern zone, whereas Newton (2003) classifies it as a member of a separate *Peloponnesian-Ionian* zone, which is linked to the southern dialects.

1.2 Vowel phonetics of the dialects

Northern dialects display two major phonetic phenomena, which differentiate them considerably from the rest of the Greek dialects. Both phenomena affect vowels, thus the term *Northern Vowelism*, which has been traditionally used to describe them. The first of the phenomena is *vowel raising* (VR), where the back-mid vowel [e] reaches the height of the back-high [i], and the front-mid [o] reaches the height of the front-high [u] in the F1 axis. The second phenomenon is *vowel deletion* (VD), where the back-high [i] and the front-high [u] delete, i.e., disappear from the surface of the dialects, following a "near-obligatory" process of northern dialects as Topintzi & Baltazani (2012) point out. Of course, VD cannot be considered as a categorical process, but it is the final stage, the most pronounced one, of a vowel reduction process, which takes place in northern dialects. Vowel reduction is gradient in nature, and at its non-final stages it takes the form of vowel devoicing of different levels (Topintzi & Baltazani, 2012). Vowel reduction does not only affect vowel quality, but can also take the form of vowel length reduction. It is also true that VD is conditioned by various phonological and phonetic constraints. Therefore, it does not always show up in every single northern dialect, and when it does, this does not happen always to the same extent. One of the most interesting conditions for the manifestation of VD is the nature of [i] and [u], namely whether these two vowels are *surface* or *underlying* vowels in any given instance. Surface [i] and [u] derive from [e] and [o] respectively, after the manifestation of VR. In order for [i] and [u] to qualify for deletion, they have to be in their underlying form. However, although, in principal, VR does not lead to VD, in some cases this rule can be violated, and surface [i] and [u] can delete as well. A matter of specific importance is the collateral effects of VD. For example, when a deleted vowel creates unacceptable phonetic environments (i.e., consonant clusters) in the dialects or the Greek language in general, then either VD is blocked or other phonetic phenomena surface (see Tzakosta & Karra, 2007).

To date, the vowel phonetics of Corfu and Evros has been understudied in the relevant literature. On the other hand, there have been serious acoustic studies covering the dialects of Epiros and Kozani. Two such studies for Epiros are those of Christou & Baltazani (2007) and Kainada & Baltazani (2015), where the authors examine the vocalic system and the phonetic phenomena that take place in the dialect. Among other results, the authors report that VD in a syllable causes the stressed vowel of an adjacent syllable to increase in duration and be realized in a lower position in vowel space, a finding which is even more important when it comes from spontaneous speech, the type of speech which is used in the present study. Moreover, the stressed vowels of Epiros, examined in comparison to the corresponding vowels of Standard Modern Greek (SMG), are found to be realized (especially the mid vowels) higher than those of SMG.

Two relevant studies for Kozani are those of Topintzi & Baltazani (2012) and Topintzi et al. (2010), which examine VD and rhythm respectively. Topintzi & Baltazani (2012) provide a profound account of VD and Vowel Devoicing, reporting that VD can cause the lengthening and aspiration of adjacent segments, as well as the emergence of various consonantal clusters, some of which are inexistent in SMG. They also examine the mechanisms behind VD, and they find that the surrounding consonants and the prosodic position of the vowel have a significant effect on the manifestation of VD. Finally, they observe that [i] is more resistant to VD than [u], and that VD does not always occur in different tokens of the same word.

Stressed vowels are described as prosodically stronger in a number of studies. Two such studies for SMG (Baltazani, 2007) and the Greek dialects (Kainada & Baltazani, 2015) report that stressed vowels are longer and more peripheral in vowel space. Gordon (1998) reports that cross-linguistically stressed vowels are devoiced to a much lesser extent than unstressed vowels. In various languages, stressed vowels are found to be longer (Keating & Cho, 2005; Nadeu, 2012), resistant to deletion (Mitterer, 2008), and with reduced quality (e.g., Moon & Lindblom, 1994 for English).

Finally, speaker gender poses a factor of significant variation in the realization of vowels, according to various studies on Greek dialects and a number of other languages. Generally, women are more careful with their speech (Samuelson, 2006) and in Greek they have been found to be avoiding the production of non-canonical forms such as reduced vowels (Sfakianaki, 2002; Baltazani, 2006). As a result, VD is expected to be less frequent in the speech of women in the sample of this study.

1.3 Relevant theoretical frameworks

The aim of this study is to explore how its experimental results fit into the relevant phonological theory of *Adaptive Variability* (Lindblom, 1990), which predicts that vowel production is a dynamic process, driven by communicative needs. When speech needs to be clear and more informative, the speaker produces *hyper-articulated* vowels; on the other hand, when communicative demands are low, then the speaker produces *hypo-articulated* vowels. Moreover, vowel production is not categorical, but belongs to a *hyper-hypo* production continuum, governed by the articulatory effort put by the speaker, and associated to the rate of speech. In this context, he manifestation of VD in the vowel sample of this study, which is present indeed, can be seen as the extreme manifestation of hypo-articulation, where the speaker seems to put no effort to produce certain vowels, although Dauer (1980) claims that even at the final stage of vowel reduction, vowels leave their articulatory traces on the adjacent consonants.

2. Method

2.1 Subjects

Sixty-five men and women make up the sample of this study; 6 men and 7 women come from Corfu, 6 men and 6 women from Epiros, 13 men and 7 women from Evros, and 9 men and 11 women from Kozani. They all produce spontaneous, every-day speech, which is clearly dialectal. The sample is controlled for some key sociolinguistic parameters, such as the speaker's age, their ethnic and social background, etc. The average age of the speakers is around 60 years. At the time of the interview they had lived permanently at the place they represent for several years. They are more or less primary education graduates, all of them genuine speakers of their dialects, with limited influence from other varieties (basically SMG). None of them have reported any hearing impairments, use of hearing aids or speaking disorders.

2.2 Data collection

The acoustic data comes from various sources. A substantial part of the recordings comes from field interviews carried out by the author in the dialectal regions under examination from 2009 to 2011. Other recordings come from the audio and video archives of the Greek Public Radio and Television Service (ERT), obtained either from radio/TV stations or online. The remaining recordings come from open online sources or from recordings made by third parties. For example, a couple of interviews come from a local cultural organization of Kozani.

The preparation of the acoustic data includes several steps. First, the recordings were grouped and filed, and then they were orthographically transcribed. The final sample of the acoustic analysis makes up a list of nearly 6000 vowel tokens. The problematic cases have been

excluded, leaving 5518 stressed and unstressed vowel tokens for analysis. Table 1 shows the distribution of the tokens per variable.

Table 1 ***The distribution of the vowel tokens of the study per dialect, speaker gender, vowel category and stress condition***

Vowel category	Stress condition	Dialect and Gender							
		Corfu		Epiros		Evros		Kozani	
		M	F	M	F	M	F	M	F
a	U	168	200	137	263	218	103	162	165
	S	24	20	24	24	38	17	23	23
e	U	102	168	104	216	145	79	120	127
	S	20	19	21	25	35	18	19	23
i	U	81	168	105	154	145	88	99	110
	S	22	16	23	30	38	19	21	19
o	U	107	114	101	161	151	79	116	98
	S	17	19	23	29	34	17	22	22
u	U	53	57	37	51	51	28	34	33
	S	9	10	5	20	7	9	6	10
total		603	791	580	973	862	457	622	630

2.3 Analysis

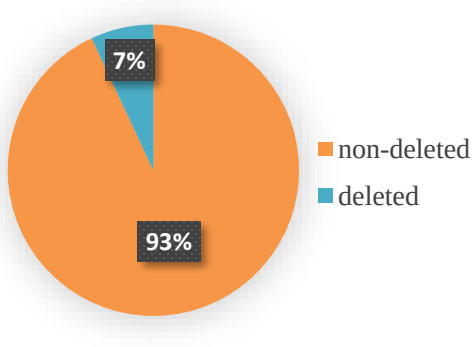
The acoustic data, i.e., the sound files, are analyzed in the *Praat* phonetic analysis suite (Boersma & Weenink, 2017). Each vowel token has been manually tracked by playing the sound and visually checking the spectrogram and waveform of the sound window. Vowels adjacent to other vowels or glides are excluded from the sample (see Wright & Nichols, 2009), so the beginning of the vowels under analysis has been marked either after a pause or after the stricture release of the previous consonant (see Flemming, 2005 and Heinz, 2008). In the same manner, the end of a vowel has been marked either before a pause or at the beginning of the stricture of the following consonant.

3. Results

3.1 Overall results

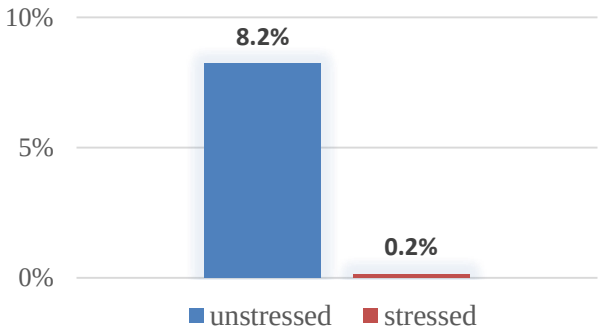
First of all, it should be noted that the results below come from the tokens of the northern dialects of the study, i.e., Epiros, Evros and Kozani. Corfu is excluded, as there are no instances of deleted vowels in this dialect. Moreover, the sample is weighed for the number of the tokens of each dialect. Results reveal that VD in northern dialects reaches a rate as high as 7% for stressed and unstressed vowels combined, as Figure 1 shows. This means that, irrelevant of the dialect, gender, vowel category and stress condition the tokens belong to, more than 1 out of 15 vowel tokens completely fail to reach the surface of oral speech. In other words, they disappear on their way from the underlying to the surface structure of the language.

Figure 1 ***Overall VD rate in northern dialects (stressed and unstressed vowels)***



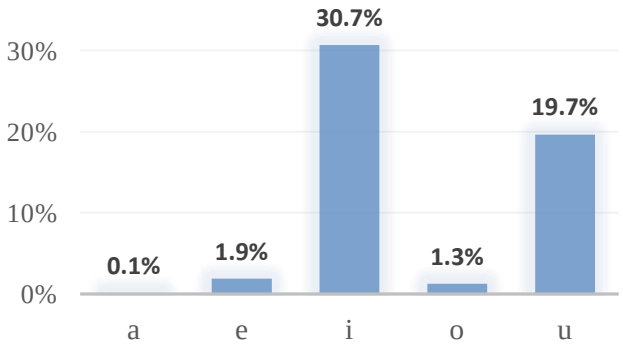
Analyzing the sample per stress condition, a striking difference between stressed and unstressed vowels is revealed. Only 0.2% of stressed vowels delete, a rate coming from a single token in the sample, showing that stressed vowels are actually immune to VD. Unstressed vowels, on the other hand, reach a significant VD rate (8.2%). It seems that the stress condition of vowels is an important factor for the manifestation of VD, a finding which is in agreement with relevant findings in the literature of Greek dialects and other languages.

Figure 2 ***Overall VD rate in northern dialects per stress condition***



Next, VD per vowel category but not stress condition is examined. Therefore, for the unstressed vowels of the three northern dialects of the study, what is found is that the VD rates among the different vowel categories vary extensively, ranging from 0.1% to 30.7%.

Figure 3 ***VD rate in northern dialects per vowel category***

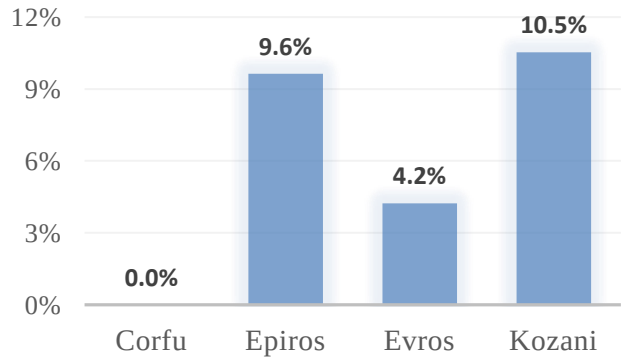


According to the results presented in figure 3, the vowel category undergoing deletion more frequently is the unstressed [i], with VD rate at 30.7%. This result is in contrast with the findings of Topintzi and Baltazani (2012), who found that [i] "resists" deletion compared to [u] in the dialect of Kozani. Later in this study, there will be specific reference to the vowels of Kozani. The overall deletion rate for unstressed [u], which is 19.7%, is considerably lower than that for [i]. The rest of the vowels delete only sporadically, with the deletion rate for [e] being 1.9%, for [o] 1.3%, and for [a] 0.1%. It is more than clear that only the high vowels ([i] and [u]) delete at substantial rates, while the mid vowels ([e] and [o]) delete at very low -yet detectable- rates, and the low vowel [a] essentially resists deletion completely.

3.2 Vowel deletion in the four dialects

The analysis of VD rates for the four dialects is based on the speech of the men and women of the sample and solely on unstressed vowels, since stressed vowels do not delete at significant VD rates. The results show substantial VD rates in the three northern dialects, but not in Corfu.

Figure 4 ***VD rate per dialect (unstressed vowels)***



This means that Corfu, as a typical southern dialect, does not follow the other three dialects in manifesting VD, having no deleted tokens in the entire sample. On the other hand, the dialects of Epiros, Evros and Kozani, which are classified as northern, are in favor of VD. The frequency of VD varies, with Kozani showing the highest deletion rate (10.5%), Epiros following with a similar rate (9.6%), and Evros showing a much lower rate (4.2%). This difference distinguishes the dialect of Evros from the other two, and is indicative of differences among northern dialects. The next figures present the situation in the five unstressed vowel categories in the dialects of Epiros, Evros and Kozani.

Figure 5 ***VD rates in Epiros per vowel category***

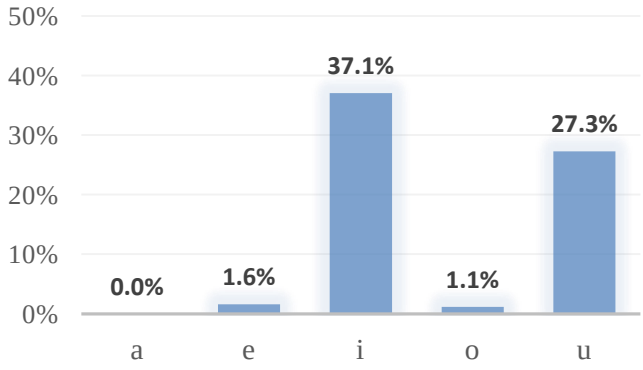


Figure 6 ***VD rates in Evros per vowel category***

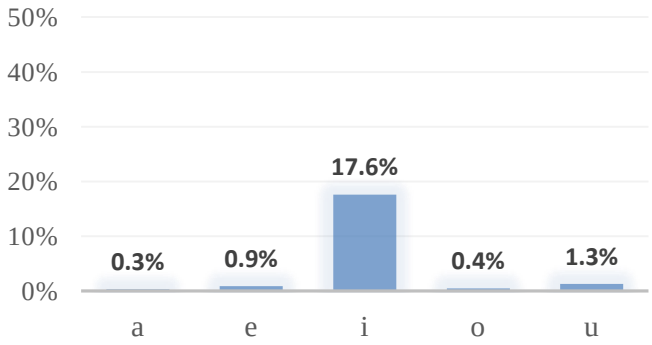
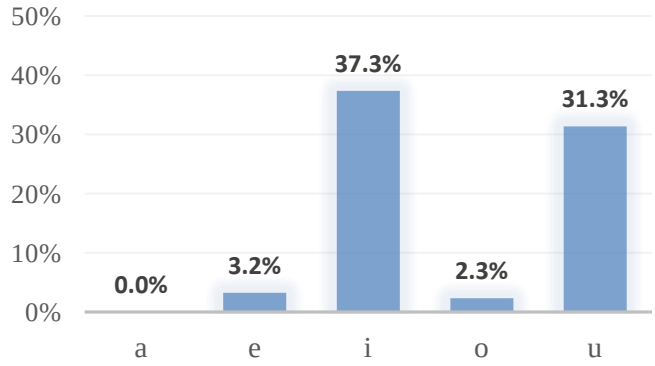


Figure 7 ***VD rates in Kozani per vowel category***

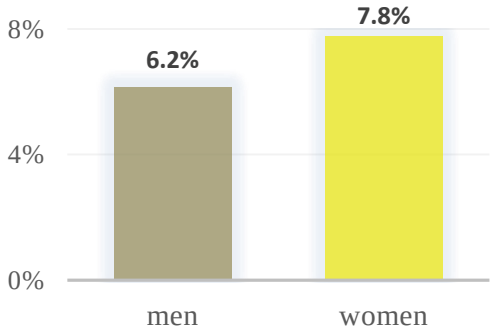


The comparison of the three northern dialects reveals that [i] is the most frequently deleted vowel in every dialect. The deletion rate reaches the highest value in Kozani, with more than one third (37.3%) of the tokens undergoing complete deletion. Epiros comes next, with a similar rate (37.1%), whereas in Evros [i] deletes at a much lower rate (17.6%). The interesting finding, however, is the behavior of [u]. While it deletes at a high rate in Kozani (31.3%), almost one third of the tokens, and at a little lower rate in Epiros (27.3%), it nearly totally resists deletion in Evros, with a rate of only 1.3%. The rest of the findings are not surprising, as for the other three vowels, the highest deletion rate is only 3.2%, and it is for the [e] of Kozani. The mid vowel [o] in Kozani deletes at an even lower rate (2.3%), while the mid vowels [e] and [o] in Epiros delete at very low rates (1.6% and 1.1% correspondingly). In Evros the deletion rates for [e], [o] and [a] are as low as 0.9%, 0.4% and 0.3% correspondingly. An interesting trend in the data is that Kozani has the highest deletion rates in every vowel category. The reverse is true about Evros, with the unimportant exception of [a], whose very low rate (0.3%) comes from only one deleted token out of the 321 unstressed [a] ones in the sample of the dialect. Another trend observed in the data is the asymmetry between the two high vowels, with [i] deleting more frequently than [u] in every dialect. Regarding this, it is also observed that the higher the overall deletion rates in a dialect, the closer the rates between [i] and [u]. Moreover, there is greater variability in the VD rates for [u] than for [i].

3.3 Vowel deletion in the two genders

The last grouping of the data focuses on speaker gender, irrelevant of the dialect the speakers belong to. Again, the analysis is based on unstressed vowels only, and comes from the three northern dialects of the study. Figure 8 shows the results.

Figure 8 ***VD rates for men and women in northern dialects (unstressed vowels)***



Women seem to delete vowels more frequently than men. The deletion rate for women is 7.8%, whereas for men it is 6.2%, with the percentage difference at 22.9%. The following figures show what happens with the vowel categories in each gender.

Figure 9 ***VD rates for men in northern dialects per vowel category***

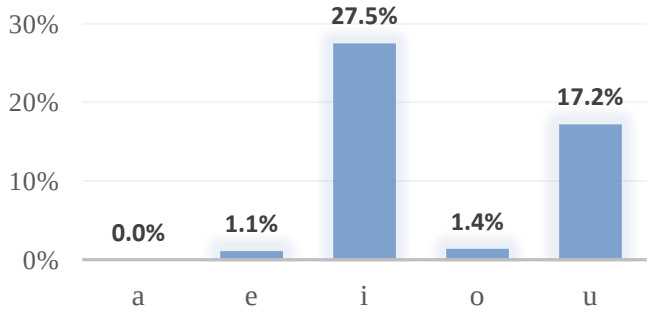
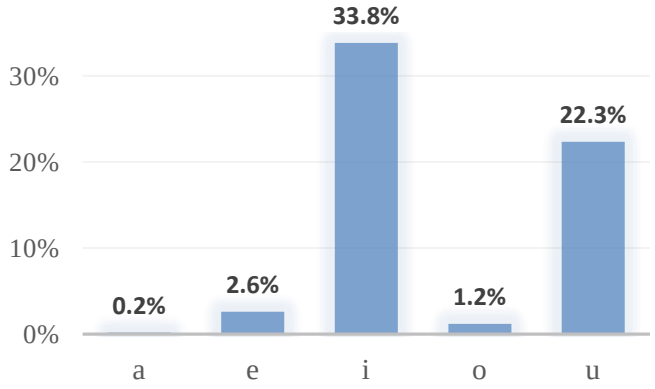


Figure 10 ***VD rates for women in northern dialects per vowel category***



First of all, both genders delete [i] more than [u]. The deletion rate of [i] for men is 27.5%, while for women it is considerably higher (33.8%). The percentage difference between the two rates is 20.6%. The deletion rate of [u] is considerably lower in both genders, but there is a wider difference between men and women. Women delete [u] at a rate of 22.3%, whereas men delete it at a rate of 17.2%, with the percentage difference reaching 25.8%. For the rest of the vowel categories, the deletion rates are quite low for both genders. However, [e] deletes more frequently in the speech of women (2.6%) than men (1.1%). Unstressed [o] deletes at rates slightly above 1%.

3.4 VD in speaker groups defined by dialect and gender

A more profound analysis, examines the interaction of *dialect*gender*. It yields some interesting findings, one of which is the performance of two speaker groups, namely men from Evros and men from Kozani. The first group has the lowest VD rate of all groups of speakers, with a rate of 3% only, while the second group has a VD rate more than 4 times higher (12.4%), the highest of all groups.

When looking at the individual vowel categories, it is striking that men of Kozani delete [i] at a rate as high as 45.5%, which is the highest single rate in the whole sample. Another very high VD rate comes from the women of Epiros, who delete 41.6% of the unstressed [i] tokens. On the contrary, the lowest deletion rate of [i] comes from the men of Evros (13.1%). Regarding the other high vowel ([u]), it is found that again men of Kozani delete unstressed [u] nearly half of the times (44.1%), which is a very high rate, higher than that of the second group, women of Epiros, who delete 37.3% of the [u] tokens. It seems that men of Kozani and women of Epiros are the groups with the most frequent deletions of the high vowels.

Another interesting finding is that men and women of the three northern dialects behave differently regarding the deletion of [i]. Women from Epiros and Evros delete [i] more frequently than men, while women from Kozani delete [i] at a significantly lower rate (30%) than that of men. For the sake of comparison, the rest of the rates are: 30.5% for men of Epiros, and 25% for women of Evros. Regarding [u], only in Epiros women delete it more frequently than men (37.3% vs. 13.5%) whereas in Evros men delete only 2% of the tokens, and women do not delete [u] at all. For the rest of the vowel categories, VD rates are so low (from 0% to 3.9%) that there are not clear patterns regarding genders.

4. Conclusions and discussion

A basic outcome of the acoustic analysis is that the VD found in the sample of the three northern Greek dialects is quite substantial, and sometimes relatively high. Given the provisions of the Adaptive Variability Theory, it is safe to assume that a serious vowel reduction process is in operation in Greek northern dialects. From this perspective, absolute VD percentages are not fully indicative of the situation, since VD is only the final stage of vowel reduction. According to Topintzi & Baltazani (2012), who examine one of these three dialects, complete vowel deletion[1] is only the final stage of a process ranging from full vowel maintenance to full VD, with "intermediate stages of devoicing". This means that the vowel tokens undergoing reduction in the northern dialects of the present study are definitely more frequent than those undergoing VD (i.e., complete vowel deletion). It is not in the scope of the present study to analyze the whole *hyper-hypo* continuum of vowel production, but the results are indicative of hypo-articulation in the northern dialects.

Another finding of this study is that the southern dialect of Corfu does not participate in the VD trend found in the northern dialects. This verifies emphatically the relevant literature reporting that southern dialects are not linked to VD. The picture in the three northern dialects of the study, however, is not uniform. That is, because quite different VD patterns emerge from Kozani, Epiros and Evros. Kozani and Epiros have the highest VD rates, close to each other, while Evros, with a much lower VD rate, shapes a significantly different picture. Given the geographical location of these three dialects, this could be a case of descending gravity of VD from west to east. Whether this pattern actually exists, is up to the future research, which could incorporate the intermediate northern Greek dialects of central Macedonia, eastern Macedonia and western/central Thrace. So far, the results have shown that hypo-articulation, as expressed by completely elided vowels, is dialect-specific. This means two different things; first, that it is categorically separated between the northern and southern dialectal zones, and, second, that it is

[1] *VD* in the present study refers to vowel deletion only, while in the study of Topintzi and Baltazani (2012) it covers both vowel devoicing and vowel deletion, the two being different stages of vowel reduction on the same continuum.

gradually manifested within dialectal zones (Epiros vs. Kozani vs. Evros). In terms of the theory of Adaptive Variability, the sociolinguistic factor of *dialect* seems to be conditioning hypo-articulation. Reflecting on the original theory, it seems that not only discourse, but also sociolinguistic parameters can shape the communicative needs behind speech production on the hyper/hypo continuum. In other words, the communicative needs are not always actively set by the speaker, but they can be part of his sociolinguistic identity.

Regarding another sociolinguistic factor of the analysis, namely speaker gender, women in the three northern dialects are found to delete vowels more frequently than men. The difference, however, is not as pronounced as the differences found among the dialects. This suggests that *dialect* is more important a factor than *gender*. However, the general tendency showing women to delete vowels more frequently than men, goes against the cross-linguistic trend which wants women to produce vowels more "correctly" than men, by avoiding producing reduced vowels (see, for example, Baltazani, 2006). What should also be noted is that the general tendency is non-existent in Kozani, where women delete vowels less frequently than men. This makes the results for women in Epiros and Evros be even more in contrast with the trends found in literature. All in all, it seems that not every sociolinguistic factor can be directly associated with hyper/hypo-articulation phenomena.

All of these differences apply to unstressed vowels only. Stressed vowels show strong resistance to VD, with hardly any deleted tokens present in the sample. This is in line with numerous accounts of the phonetics of stressed vowels. The literature on vowel stress generally attests that stressed vowels are prosodically more salient than unstressed ones; they are longer (Van Summers, 1986; Baltazani, 2007), with enhanced quality (Moon & Lindblom, 1994; Kainada & Baltazani, 2015) and resistant to VD (Mitterer, 2008). As a result, the findings of the present study come to add to the widely attested effects of stress, which connect the lack of stress with significant vowel reduction phenomena. On the other hand, the deletion of only northern unstressed vowels shows that hypo-articulation, while sensitive to phonological constraints, can significantly interact with sociolinguistic factors.

Finally, this study brings up a clear preference of deletion for the high vowel [i] in all of the three northern dialects of the study (Epiros, Evros and Kozani). This is in contrast with what Topintzi & Baltazani (2012) report for Kozani, and maybe a new study will throw more light on this discrepancy. The second vowel that deletes at significantly high rates is [u]. For the two high vowels, it seems that the present study confirms what is known for [i] and [u] deletion in northern dialects. This result is also in line with the cross-linguistic trend of high vowel deletion. On the other hand, the two mid vowels [e] and [o] delete at very low rates, and the low vowel [a] exhibits almost absolute resistance to VD. The vulnerability of high vowels to VD shows again that phonology is important for the manifestation of hypo-articulation.

This study provides experimental evidence regarding the correlates of vowel deletion in four Greek regional dialects. Thus, vowel deletion is strongly associated to northern Greek dialects, but not to southern ones. Moreover, the gravity of VD varies from dialect to dialect in the north; what remains to be investigated is the correlation between the gravity of VD and the geographical location of the dialects. On the other hand, the role of speaker gender does not seem to be a major factor of variation regarding VD, however, the inverse VD rates found for men and women in Epiros and Evros need to be further investigated. Finally, the role of stress as a prosodic inhibitor of VD and the vulnerability of high vowels to VD are findings that provide evidence for the interaction between phonology and vowel reduction phenomena.

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