

## **L1 influence in vowel production: the case of Greek [ε].**

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### **Περίληψη.**

Στη σχετική βιβλιογραφία έχει υποστηριχθεί ότι φωνητικά λανθασμένες πραγματώσεις από φυσικούς ομιλητές της Ολλανδικής μπορούν να αποδοθούν στην επίδραση της μητρικής τους γλώσσας (Γ1). Σε αυτή την προκαταρκτική μελέτη θα παρουσιαστεί ένα χαρακτηριστικό παράδειγμα: η πραγμάτωση του φωνήεντος [ε] στα ελληνικά από Ολλανδούς ομιλητές. Η συγκεκριμένη περίπτωση είναι ιδιαιτέρου ενδιαφέροντος επειδή το φωνήεν [ε] αποτελεί επίσης ένα από τους ήχους της Ολλανδικής. Παρά ταύτα, η πραγμάτωσή του στην Ελληνική αποδεικνύεται προβληματική.

Σε αυτή την μελέτη θα παρουσιαστούν ακουστικά δεδομένα δύο φυσικών ομιλητών της Ολλανδικής: ενός αρχαρίου και ενός προχωρημένου φοιτητή της Ελληνικής. Στην ανάλυση των δεδομένων θα ισχυριστώ ότι α) υπάρχει μια πρωτοφανής επίδραση της Γ1 εξαιτίας του φωνολογικού συστήματος της Ολλανδικής, και β) ένα υψηλότερο επίπεδο ελληνομάθειας μειώνει την εν λόγω επίδραση.

Από άποψη διδακτικής, τα αποτελέσματα δείχνουν τη σημασία της συστηματικής διδασκαλίας της προφοράς. Κλείνω την μελέτη με ορισμένες διδακτικές συμβουλές.

**Keywords:** acoustic phonetics, vowels, language education, L1 influence.

### **1. Introduction.**

In previous literature it has been argued that many phonetic mispronunciations in Greek by native speakers of Dutch can be ascribed to the influence of their native language (L1) (see Mennen 2004 for intonational phenomena). In this preliminary study I will give another typical example of L1 transfer: the production of Greek [ε] by Dutch speakers. This case is of particular interest because [ε] is also one of the sounds of Dutch, but despite this, its production in Greek is problematic for Dutch speakers.

In this article I will present acoustic data of two native speakers of Dutch: one beginner and one advanced learner of Greek. In the analysis of these data I will argue 1) that there is a clear influence of the phonological system of Dutch and 2) that a higher level of language proficiency decreases this influence.

From a didactic point of view, these conclusions illustrate the importance of the teaching of pronunciation and show that considerable improvement is possible.

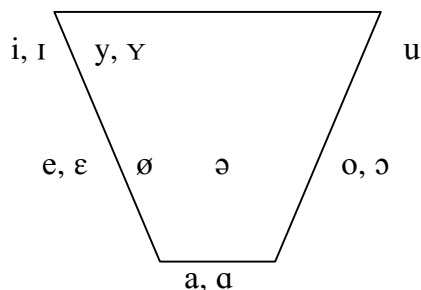
The organization of this paper is as follows. In the next section a brief overview of the vowels of standard Dutch will be presented. Special attention will be given to the 'e'-coloured vowels [e], [ε] and [ə]. The main hypotheses of section three will be based on this overview. In section four the outline of a phonetic experiment will be presented followed by the results shown in section 5. This article closes with the conclusions in section 6 and discussions and suggestions for future research in section 7.

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\* Ο Jeroen Vis διδάσκει γλωσσολογία στο προπτυχιακό και μεταπτυχιακό επίπεδο στο πανεπιστήμιο του Άμστερνταμ. Έχει κάνει σπουδές στο τμήμα κλασικών σπουδών του Radboud University Nijmegen (MA), στο τμήμα Νεοελληνικών σπουδών του πανεπιστημίου του Άμστερνταμ και έχει εξειδικευτεί στη γλωσσολογία στο τμήμα φιλολογίας στο πανεπιστήμιο Κρήτης (PhD, υπό προετ.). Τα κύρια ερευνητικά και διδακτικά του ενδιαφέροντα εστιάζονται στο χώρο της θεωρητικής γλωσσολογίας (φωνολογία, φωνητική), της ιστορικής γλωσσολογίας και της διδακτικής των γλωσσών (Ελληνικής, Ολλανδικής, κλασικών γλωσσών). Έχει συμμετάσχει με ανακοινώσεις του σε συνέδρια γλωσσολογίας στην Ελλάδα και στο εξωτερικό.

## 2. The vowels of standard Dutch.

The vowel system of standard (Northern) Dutch consists of 12 full vowels (Booij 1995). Most of them occur in pairs of a lax and a tense vowel, traditionally called ‘short’ and ‘long’. Besides the full vowels there is also the neutral vowel schwa (see figure 1):



Lax vowels:			Tense vowels:		
pit	[pɪt]	‘kernel’	piet	[pit]	‘Pete’
mes	[mɛs]	‘knife’	mees	[mes]	‘tit’
had	[hɑt]	‘have’ (past)	haat	[hat]	‘hate’
kop	[kɔp]	‘head’	koop	[kop]	‘buy’ (sing.)
put	[pʏt]	‘well’	vuur	[vyr]	‘fire’
Neutral vowel:			leuk	[løk]	‘nice’
koper	[kopər]	‘buyer’	hoed	[hut]	‘hat’

Figure 1. The vowels of standard Dutch.

For the purpose of this study a concise description of the phonetic and phonological features of the lax vowel [ɛ], its tense counterpart [e] and the neutral vowel [ə] will be given in this section.

In human speech complex sound waves are produced. Waves of specific frequencies show a higher intensity. These frequency rates, known as formants, are distinct for every vowel and they can be seen as the main phonetic characteristics of the vowel in question, especially the first two formants (F1 and F2). For standard Greek, it has been claimed that the formant frequencies for the vowel [ɛ] are  $F1 \pm 470$  Hz. and  $F2 \pm 1730$  Hz. (Fourakis et al. 1999, see also Arvaniti 1999). This is approximately the same vowel space for the lax vowel [ɛ] in standard Dutch as in the word ‘help’, [hɛlp], ‘id.’, (Adank 2003). Its tense counterpart [e] like in the word ‘mees’, [mes], ‘tit’, has a lower F1 and a higher F2, i.e. the vowel is produced higher and more fronted. This is due to the advanced tongue root (ATR) position during its production. The typical neutral vowel [ə] has F1 and F2 values of approximately 500 Hz. and 1500 Hz.

Phonologically, the tense and lax vowels differ in their number of time slots. A time slot is an abstract phonological unit and doesn’t refer necessarily to its phonetic duration. The tense vowel [e] has two phonological time slots whereas its lax counterpart [ɛ] has only one (Booij 1995). This can be represented as in 1. below:



This difference has major consequences for the distribution of both vowels within the syllable. In Dutch, the rhyme of the syllable, i.e. the core vowel and all following tautosyllabic consonants, is determined by two timing constraints:

Minimal rhyme constraint.

The minimal rhyme of the syllable consists of two time slots.

Maximal rhyme constraint.

The maximal rhyme of the syllable consists of three time slots.

As has been mentioned above, the lax vowel [ɛ] counts as one time slot, the tense vowel [e] as two. Also the consonants (except the coronals [t] and [s]) count as one time slot each. This leads to the following distribution of the vowels [ɛ] and [e]:

a) The lax vowel [ɛ] must be followed by at least one tautosyllabic consonant in order to count two time slots. As a result, it can be found only in closed syllables, e.g.:

Distribution of lax [ɛ]:

1 time slot:	*ke	*[kɛ]	‘ill-formed’
2 time slots:	bel	[bɛl]	bell
3 time slots:	welk	[vɛlk]	which

b) The tense vowel [e] may occur in an open syllable (2 time slots) or may be followed by at most one tautosyllabic consonant (3 time slots), e.g.:

Distribution of tense [e]:

2 time slots:	mee	[me]	together with
3 time slots:	meer	[mer]	lake
4 time slots	*meerk	*[merk]	‘ill-formed’

The second factor that determines the distribution of the vowels in Dutch is stress. When a vowel is unstressed, it may reduce to the neutral vowel schwa [ə]. This reduction is obligatory for the vowel /e/, both in open and closed syllables:

(2a)	gebied	[xə.'bit]	‘area’
(2b)	koper	['ko.pər]	‘buyer’

The full vowels [e] and [ɛ] on the contrary must be stressed.

In the next figure, the possible distribution of the three vowels is illustrated:

	[e]	[ɛ]	[ə]
stressed, open	[ <sup>1</sup> ve.to], veto, ‘id.’	*	*
stressed, closed	[mer], meer, ‘lake’	[vɛlk], welk, ‘which’	*
unstressed, open	*	*	[xə.'bit], gebied, ‘area’
unstressed, closed	*	*	['ko.pər], koper, ‘buyer’

Figure 2. The distribution of the ‘e’-coloured vowels in standard Dutch.

As can be noticed, there are certain gaps in the distribution of the ‘e’-coloured vowels:

- i. The full vowels [ɛ] and [e] can not occur in unstressed syllables.
- ii. The neutral vowel [ə] cannot occur in stressed syllables.
- iii. The lax vowel [ɛ] cannot occur in open syllables.

This specific distribution of the ‘e’-coloured vowels will be the basis of the hypotheses of section 3.

### 3. Hypotheses.

Assuming that the grammar of L1 influences the speaker’s competence of L2, a transfer of L1 is also expected in the case of the ‘e’-coloured vowels. As has been argued above, these vowels have a specific distribution in Dutch. When the target in Greek is the vowel [ɛ], native speakers of Dutch are expected to produce this vowel in harmony with its distribution in Dutch. Depending on the phonological context the vowel will tend to be produced as tense [e], lax [ɛ] or neutral [ə] as illustrated in figure 3 below:

Context:	Example:	Expected realisation:
stressed, open	<sup>1</sup> vlɛ.po	higher and more fronted: [e]
stressed, closed	<sup>1</sup> cɛr.ɔs	like Greek: [ɛ]
unstressed, open	<sup>1</sup> an.θro.pɛ	reduced to schwa: [ə]
unstressed, closed	ɛx. <sup>1</sup> θros	reduced to schwa: [ə]

Figure 3. The expected realisation of Greek [ɛ] by native speakers of Dutch.

The second hypothesis is related to the level of language proficiency. When a Dutch speaker is more proficient in Greek, a decreased influence of the phonological system of his native language is to be expected. As a result, his productions will tend to be more faithful to the Greek target. Beginners on the contrary are expected to show more influence of L1 which will result in more variation and aberrant realisations.

### 4. The experiment.

In order to acquire the relevant data I conducted a phonetic experiment. For this experiment I used a corpus of 14 familiar Greek words. These words contained the vowel [ɛ] in all four relevant phonological contexts. Its distribution was as follows:

Context	Number of tokens	Words
stressed, open	5	<sup>1</sup> vlɛ.po, <sup>1</sup> ɛ.çis, <sup>1</sup> ɛ.xun, <sup>1</sup> ɛ.xo, <sup>1</sup> ɔu. <sup>1</sup> lɛ.vo
stressed, closed	2	<sup>1</sup> cɛr.ɔs, <sup>1</sup> pɛn.θi
unstressed, open	3	<sup>1</sup> an.θro.pɛ, mɛ. <sup>1</sup> nu, <sup>1</sup> a.sɛ
unstressed, closed	4	ɛx. <sup>1</sup> θros, <sup>1</sup> su.pɛr, <sup>1</sup> mar.cɛt, <sup>1</sup> ɔɛl. <sup>1</sup> fus

Figure 4. Overview of the data.

These words were embedded in the carrier phrase “ipa ti leksi ... kala.” (I said the word .... properly). Two male subjects read the phrases in random order. Filler sentences were used in order that the subjects were not biased. This has been repeated three times, which resulted in 42 tokens for each subject, including some misreadings that haven’t been examined any further.

The subjects were native speakers of Dutch and they were learning Greek at the time of the recordings. Both were living in Rethymno, Greece, and they were using Greek on a

daily basis. The beginner was aged 63 and learning Greek for about one year. The advanced learner was a third grade university student in Greek philology, aged 21.

The recordings have been done directly on the computer and the data have been analysed with the speech analysis program 'pitchworks'. For the purpose of this study, F1 and F2 frequencies have been measured in the middle of the vowel [ε] where the formant structure was stable.

##### 5. The results.

Figure 5 shows the frequencies of F1 and F2 of the vowel [ε] produced by the advanced learner P. As one can see, most of his realisations are in the vowel space between 420-520 Hz for F1 and 1500-1850 Hz for F2. There is a notable diversity in the F1 frequencies, fluctuating between a fronted vowel [e] and the neutral vowel [ə]. The diversity in the frequencies of F1 is substantially smaller.

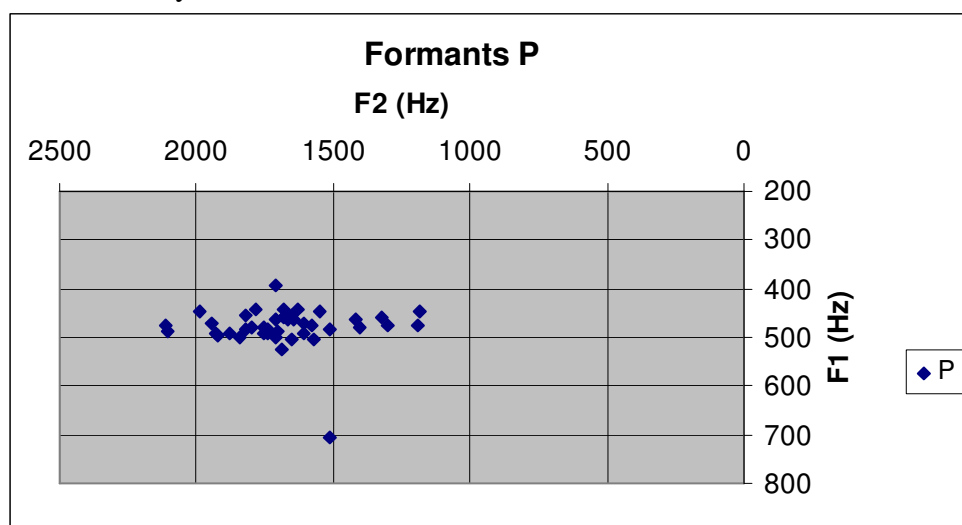


Figure 5. The formants F1 and F2 of P. in Hz.

Figure 6 shows the same measurement of P, split up by phonological context: stressed, open syllables (rhomb), stressed, closed syllables (square), unstressed, open syllables (triangle) and unstressed, closed syllables (cross). This figure clearly shows that the vowel [ε] in stressed, closed and unstressed, open syllables has a stable realisation, approximately like Greek [ε]. More variation can be found in the realisation of [ε] in unstressed, closed syllables. Sometimes the vowel is realised as the typical neutral vowel schwa [ə], sometimes as a more fronted vowel [ε̞]. The realisation of [ε] in stressed, open syllables shows a relatively large dispersion as well. In this context, the vowel is realised between mid fronted [ε̞] and more fronted [ε̟]. This is summarized in figure 7.

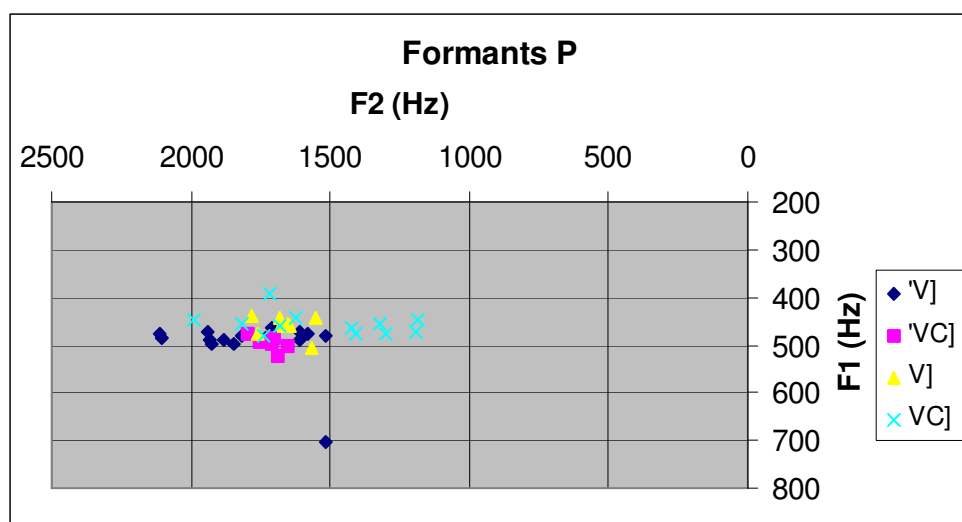


Figure 6. The formants F1 and F2 of P. in Hz. by phonological context.

Context:	Example:	Realisation:
stressed, open	<sup>1</sup> vɫɛ.po	[ɛ] – [ɛ̝]
stressed, closed	<sup>1</sup> cɛr.ðos	[ɛ]
unstressed, open	<sup>1</sup> an.θro.pɛ	[ɛ]
unstressed, closed	ɛx. <sup>1</sup> θros	[ə] – [ɛ] – [ɛ̝]

Figure 7. Overview of the realisations of [ɛ] by P.

Figure 8 shows the formants F1 and F2 of the vowel [ɛ] as produced by the beginner J. As can be noticed, the variation of both formants is considerable. Most realisations are between 420-520 Hz. for F1 and 1500-1850 Hz. for F2, however, a fair number of realisations lies outside this area.

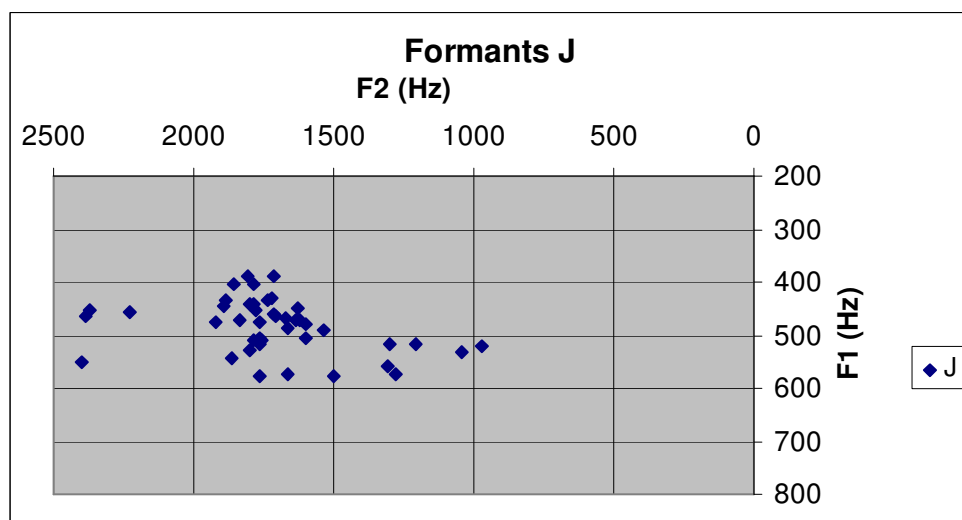


Figure 8. The formants F1 and F2 of J. in Hz.

In detail (see Figure 9) it can be seen that [ɛ] in stressed, closed syllables is realised like in Greek. A fair part of the productions of [ɛ] in unstressed, closed syllables show different realisations as the neutral vowel [ə]. When the vowel [ɛ] occurs in a stressed, open syllable, it tends to be realised lower as [æ] (like in English ‘can’). A general tendency

towards a higher realisation [ɛ] can be seen in /e/ in unstressed, open syllables. These results are summarized in figure 10.

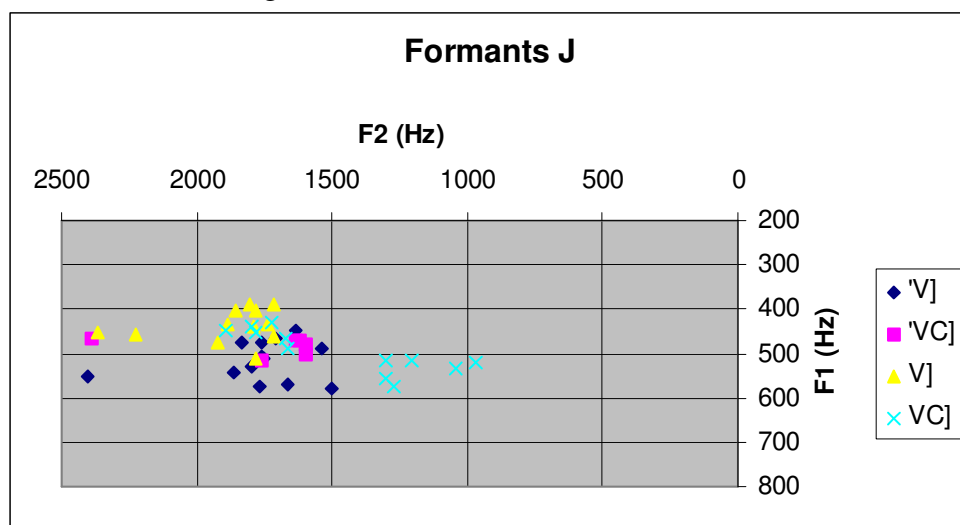


Figure 9. The formants F1 and F2 of J. in Hz. by phonological context.

Context:	Example:	Realisation:
stressed, open	<sup>1</sup> vlɛ.po	[æ]
stressed, closed	<sup>1</sup> cɛr.ðos	[ɛ]
unstressed, open	<sup>1</sup> an.θro.pɛ	[ɛ̃]
unstressed, closed	ɛx. <sup>1</sup> θros	[ə] – [ɛ]

Figure 10. Overview of the realisations of [ɛ] by J.

In Figure 11 the realisations of the vowel [ɛ] of both Dutch speakers P and J are compared with each other as well with the mean realisation of native speakers of Greek (G) (Fourakis et al. 1999). It can be observed that the realisations of both Dutch learners of Greek are more or less clustered around the Greek average realisation. A comparison between both Dutch speakers reveals a conspicuous difference. The proficient learner of Greek groups his realisations more or less within the same vowel space, especially with respect to the value of his F1. The beginner however produces considerably more variation, both in his F1 as well as in his F2. Moreover, he shows some instances of extreme fronting of [ɛ] as well as a stronger tendency towards reduction.

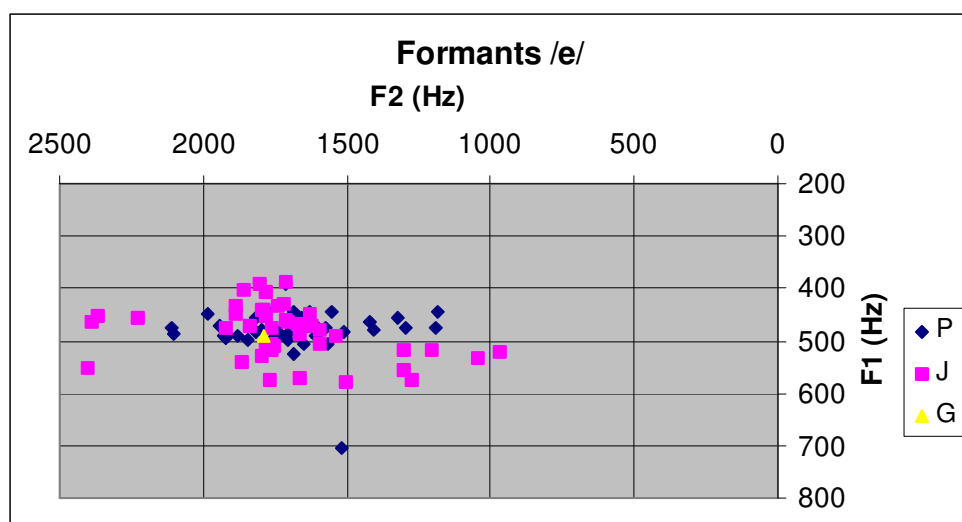


Figure 11. The formants F1 and F2 of P., J. and the Greek average in Hz.

## 6. Conclusions.

Two parameters in the production of Greek by native speakers of Dutch have been examined in this paper: a) the influence of L1 and b) the influence of the level of language proficiency. The production of the vowel [ε] has been chosen as a specific case study. The relevant data have been provided by a phonetic experiment and the results of it have been presented in section 5 above. In this section I will continue with the general conclusions. Discussions and suggestions for future research will follow in the last section.

The production of the vowel [ε] in Greek by native speakers of Dutch was expected to be realised in harmony with the Dutch phonological system. Specifically, the structure of the syllable and stress would determine its realisation. As can be seen in the figures 6 and 9 the actual realisations can be divided into different groups based on the quality of the vowel [ε]. In the case of J. three clear groups can be distinguished: [æ], [ε] and [ɛ̃]. In the case of P. there are two different categories: [ɛ̃] and [ε]. If these different groups of realisations are to be described by their phonological features, the description would be in terms of the structure of the syllable and stress, exactly those criteria that determine the realisation of the ‘e’-coloured vowels in Dutch. As a result it can be concluded that there is an obvious influence of the Dutch phonological system. It is worth noticing that similar conclusions have been drawn in the case of Serbian learners of English (Markovic, in prep.) The overall results are summarized in figure 12 below:

Context:	Example:	Expected realisation:	J.	P.
stressed, open	<sup>1</sup> vɫε.po	higher and more fronted: [e]	[æ]	[ε] – [ɛ̃]
stressed, closed	<sup>1</sup> cεr.δos	like Greek: [ε]	[ε]	[ε]
unstressed, open	<sup>1</sup> an.θro.pε	reduced to schwa: [ə]	[ɛ̃]	[ε]
unstressed, closed	εx. <sup>1</sup> θros	reduced to schwa: [ə]	[ə] – [ε]	[ə] – [ε] – [ɛ̃]

Figure 12. Overview of the results.

A few exceptions to these general conclusions should be noted. When the vowel [ε] occurs in unstressed, closed syllables its realisation appears to be very unstable. Vowel reduction in unstressed syllables is very common in Greek but it was thought to be limited to the vowels [i] and [u] only (Dauer 1980). Recently however, it has been shown that all vowels can be reduced (Baltazani 2007). A comparison with the same set of words produced by native speakers of Greek should be made in order to find out whether this vowel reduction



causes the unstable realisation of [ɛ] in this context. I leave this question open for future research.

The unexpected lowering of [ɛ] in stressed, open syllables by J. could be ascribed to his dialectal background (Limburgian). However, more data are not at hand to verify this conclusion.

With respect to the level of language proficiency it has been shown that the advanced learner showed less variation and grouped his realisations of [ɛ] much more within the same vowel space as the native speakers of Greek do. The beginner on the other hand showed more inconsistency. Moreover, the aberrant realisations of the advanced learner seemed to be more symptomatic whereas those of the beginner had a systematic character. However, it should be noted that even in a very advanced stage of learning, unfaithful realisations still persist.

## 7. Discussions and further research.

In this paper I have examined the production of the vowel [ɛ] in Greek by native speakers of Dutch. Special attention has been given to the influence of the phonological context and of the level of language proficiency. However, there are more parameters that could influence the pronunciation. Some of these will be discussed shortly in this section.

Only familiar Greek words have been used in the experiment. As a result, there were no minimal pairs and the neighbouring consonants were random. However, these could influence the phonetic realisation as well and additional data are required. Preliminary results of a second experiment indicate that the influence of the neighbouring consonants can be neglected.

In this experiment I used two speakers with a different level of proficiency in Greek assuming that they are indicative for the learning process as a whole. As a result, individual characteristics like gift of languages and background haven't been taken into account. A longitudinal study will make clear whether this assumption is correct.

Including other vowels as well could extend this study. Some preliminary results of the realisation of the vowel [o] suggest that the parameters of phonological context and language proficiency influence its realisations in a similar way. I leave the details open for future research.

Finally, what can this study contribute to the teaching of Greek as a foreign language? As has been shown, the grammar of L1 influences the speaker's competence in L2. In particular, the proper realisation of the Greek vowel [ɛ] is problematic for native speakers of Dutch. This should be systematically taught in order to avoid mispronunciations. In a broader didactic context, other phonological peculiarities of Greek in comparison with Dutch like voicing distinction, rhotics, intonation and syllabic structure should get enough attention in the class-room as well.

It has been demonstrated above that mispronunciations are not restricted to the initial learning stage but continue to occur even in a very advanced stage. Due to the fact that they are not always easily audible I suggest the use of phonetic analyses. Only by means of a detailed recording and analysis, students and teachers alike can get aware of the exact pronunciation of the foreign language.

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