

Can pronunciation be taught? Teaching English speech rhythm to Greek students

Eleni Tsiartsioni

Aristotle University of Thessaloniki

eltsiart@enl.auth.gr

Abstract: This study investigates the production of features of the English rhythm by Greek learners of 10, 13 and 16 years old before and after 16 pronunciation lessons. Rhythm is approached with the PVI measure which examines vocalic and consonantal variability in a long stretch of speech. The results show a positive effect of pronunciation instruction with the 13-year-old speakers exhibiting a greater improvement than the 10-year-old ones. The comparison of these age groups with the 16-year-old students is not straightforward: the latter seem to have had a different starting point, as their consonantal variability was close to L1 English before the teaching intervention.

Key words: foreign language phonological acquisition, speech rhythm, PVI, pronunciation teaching.

1. Introduction

The present paper presents the preliminary results of a larger study examining the effectiveness of pronunciation teaching among Greek learners of English of three different ages. In particular this study investigates the acquisition of features of the English speech rhythm by Greek children of 10, 13 and 16 years old who learn English in a foreign language - formal setting context. Rhythm is approached with the use of the PVI measure (Grabe and Low 2002), which examines the durational variability of consecutive vocalic and intervocalic intervals in a long stretch of speech. The teaching intervention involved 16 pronunciation mini-lessons embedded in the regular English classes at the public school. This study aims at addressing questions related to the effectiveness of pronunciation teaching in a foreign language context and the role of students' age.

1.1 Review of research on pronunciation teaching

Since the Reform Movement in the late 19th century, which supported that the findings of phonetics should be applied to language teaching, the interest in pronunciation instruction has only been revived in the last few years. Goodwin, Brinton and Celce-Murcia (1994: 5) observe that “the teaching of pronunciation has at times been considered almost a luxury in the ESL/ EFL curriculum, unlike reading, writing, listening and general speaking fluency”. Derwing and Murno (2005: 379) state that “the study of pronunciation has been marginalised... as a result, teachers are often left to rely on their own intuitions with little direction”. This observation is confirmed by Pardo's (2004) review of studies on teachers' attitude to pronunciation teaching, in which he concludes that many teachers are unsure of the effectiveness of pronunciation for intelligibility and communication.

A central question is therefore whether pronunciation can be effectively taught. Pardo (2004) reviews 25 studies on the effect of pronunciation instruction and concludes that there is a positive effect of well-planned, quality pronunciation training (out of the 25 studies reviewed, 23 reported improved pronunciation after instruction)

and that use should be made of specific teaching techniques; pronunciation is not simply 'picked-up'. It is important to stress at this point that the vast majority of the studies reviewed by Pardo examined phonological acquisition that occurs in a second language setting where the target-language is the main means of communication and they also involved immigrant population and students who lived in a target-language community.

Empirical research on pronunciation instruction which occurs in a formal EFL setting also seems to confirm the positive effect of pronunciation teaching (Ekstrand 1982, Olson and Samuels 1982, Thogmartin 1982). Regarding the role of learners' age, contrary to what appears to happen in naturalistic L2 settings, where younger learners have an advantage over older learners in terms of pronunciation ability, research on phonological acquisition that takes place in a foreign language environment tentatively suggests that older students are better at acquiring target-language pronunciation than younger students (Ekstrand 1982, Fullana 2006, Thogmartin 1982). However, it has been shown that the differences between younger and older learners appear to minimise once the younger learners reach the same state of cognitive development as older learners (Muñoz 2003, 2006). This suggests that older learners can have an initial advantage in terms of rate of acquisition over younger ones but in the long run this difference is neutralized.

1.2 Review of theories on speech rhythm

Rhythm has been described as the area of prosody that has to do with the timing or temporal organization of speech (Kehoe and Lléo 2005) and derives from the repetition of elements perceived as similar (White and Mattys 2007: 501). Approaches to rhythm have been classified into three main categories: a) theories in search of 'isochrony', b) theories based on the premise that rhythmic differences between languages are the result of specific phonological phenomena and c) more recent approaches according to which the perception of rhythm classes results from differences in the variability of vocalic and intervocalic intervals.

The theories in search for 'isochrony' argue that all languages are organized into isochronous units. According to Pike (1945: 35), languages are distinguished into stress-timed languages, where stress occurs at regular intervals of time, and syllable-timed languages, where the syllables are the isochronous units. A third type of languages has been also proposed, the 'mora-timed' languages (Bloch 1950, Han 1962), where moras (linguistic units comprising one vowel and any preceding onset consonants) are the isochronous units. Abercombie (1967: 97) proposes a categorical distinction of all languages as being either stress- or syllable-timed. According to Abercombie, English, Russian and Arabic are examples of the former, whereas French is an example of the latter. This dichotomy presupposes that rhythm classes are mutually exclusive, therefore each language can belong to either one or the other category. According to this approach, Modern Greek has been described as a syllable-timed language, due to its 'staccato' effect (Mackridge 1985: 40). A number of studies tried to test the theory of isochrony (Lehiste 1977, Beckman 1982, Roach 1982), however, no reliable acoustic basis for isochrony has been found.

The second approach to speech rhythm maintains that specific phonological phenomena account for the rhythmic differences across languages (Dauer 1983, 1987). As Dauer suggests, such rhythmic differences across languages do not reside in what happens across interstress intervals, but in what happens within them (1983: 55). The phonological and phonetic facts that affect rhythm, according to Dauer, include the duration, the quality and the structure of syllables in a language, the intonation and tonal characteristics of syllables, vowel and consonant quality, as well as the function of

accent (1987: 448-449). Stress-timed languages tend to exhibit greater variety of syllabic structures than syllable-timed languages (1983: 55) and heavier syllables are accented, whereas in syllable-timed languages syllable weight and accent are independent; finally, vowel reduction is more common in the former rather than in the latter type of languages (1983: 57-58). Dauer, however, does not adopt a categorical distinction between stress- and syllable-timed languages but a continuum-based approach instead (Dauer 1983: 60). She reports that different languages can display the aforementioned characteristics to a different extent, so the more characteristics of a typical stress- or syllable-timed language they display, the more stress- or syllable-timed they are.

With regard to the description of Greek speech rhythm, Dauer (1983: 58) observes that even though Greek has been described as a syllable-timed language, it also displays characteristics of stress-timed languages, such as lexical stress and a clearly discernible beat. On the continuum that Dauer proposes (1983: 60) Greek is located somewhere between French (a prototypical syllable-timed language) and English (a prototypical stress-timed language).

According to more recent approaches (Grabe and Low 2002; Low, Grabe and Nolan 2001; Ramus et al 1999; White and Mattys 2007), the perception of rhythmic classes results from differences in the variability of vocalic and consonantal intervals. The present study examines speech rhythm using the *Pairwise Variability Index* (PVI, Grabe and Low 2002), an acoustic measurement which expresses the variability in successive vocalic and intervocalic intervals. Vocalic intervals have been defined by Grabe and Low (2002) as 'the stretch of signal between vowel onset and vowel offset regardless of the number of vowels included in a section' and intervocalic intervals have been defined as 'the stretch of signal between vowel offset and vowel onset, regardless of the number of consonants included'. The PVI is based on the idea that when the duration of successive intervals is relatively similar, low variability indices are anticipated and when the duration of successive measurements is highly variable, then high variability indices are predicted. For this reason, it is expected that:

a) in syllable-timed languages the duration of successive measurements is relatively similar, therefore there should be low variability indices (low vocalic PVI and low intervocalic PVI)

b) in stress-timed languages high variability indices should be computed reflecting complex syllable structure and reduced vowels.

Grabe and Low (2002) computed a PVI analysis of the speech rhythm of eighteen languages based on one speaker per language and the results seem to support the rhythmic classification proposed by Pike (1945) and Abercrombie (1967) and are in agreement with previous descriptions of the speech rhythm of most of the languages they examined (with the exception of Tamil, which the PVI classifies as stress-timed, although, according to previous studies, it appears to be a syllable-timed language). Also Grabe and Low (2002) point out that their findings do not provide evidence for a strict categorical distinction between the classes and that there is a considerable overlap between the stress-timed and the syllable-timed languages, as well as the unclassified ones.

Baltazani (2007) also examined Greek speech rhythm using the PVI measure based on data from two speakers. Both Grabe and Low (2002) and Baltazani (2007) conclude that Greek rhythm is located somewhere between the rhythm of stress- and syllable-timed languages. The scores of these two studies were different from the scores reported in Ross et al (2008) who examined one speaker using a variety of elicitation materials.

Summarising the differences between English and Greek speech rhythm, English is considered to be a prototypical example of ‘stress-timed’ languages, with distinctive vowel length, unstressed syllables reduced both in length and quality, complex syllable structure and ‘heavy’ versus ‘light’ syllables (with the former attracting stress and the latter being unstressed). Greek on the other hand displays characteristics both of ‘syllable-timed’ (no alternation between strong and weak syllables, lack of distinctive vowel length) and of ‘stress-timed’ languages (lexical stress and a clearly discernible ‘beat’).

1.3 FL rhythm acquisition

A number of studies have stressed the importance of suprasegmentals for communication and comprehensibility (for a review see Gong 2002: 26, 29). At the same time, suprasegmentals and in particular FL rhythm may be one of the most challenging pronunciation features to be learnt by speakers of a different language. Chela-Flores (1994: 235-236), for instance, claims that “the failure to make sufficient difference in length between the vowels in stressed and unstressed syllables seems to be the basic cause of difficulty among NNS of English”, and explains that “a syllabic rhythm might be the result of too much emphasis on the pronunciation of each unit in an utterance and not producing adequately lengthened and shortened syllables in chunks”. It follows from this remark that when learning the English rhythm, native speakers of a ‘syllable-timed’ language have to learn (a) how to give sufficient stress to the main words and (b) how to reduce the unstressed syllables effectively. These suggestions have played an important role in setting the targets of the pronunciation teaching course and also in deciding on the content of instruction in the present study.

The effectiveness of pronunciation teaching focusing on rhythm has been tested by Chela-Flores (2001). The author used a technique according to which basic rhythm and intonation are first presented in isolation from words and only after the students have learnt to perceive and discriminate the rhythmic patterns are they asked to orally produce sentences mapping on the rhythm patterns. The results of ten lessons showed an improvement in students’ perception and controlled production of the rhythmic patterns and also self-perceived improvement in detecting their own mistakes.

L2 rhythm production has been investigated in a number of studies (Wenk 1985; Low, Grabe and Nolan 2000; Gut 2003; Carter 2005; Lin and Wang 2005; White and Mattys 2007). These studies showed that speakers tend to produce L2 rhythm with values intermediate between L1 and L2. On the other hand, some other studies have posed a methodological question on the interpretation of rhythm measures (Ferjan et al 2008, Grenon and White 2008, Mok and Dellwo 2008); these studies showed that L2 speakers of ‘syllable-timed’ languages produce L2 English rhythm with values similar to those of native speakers of English. According to the authors, however, this similarity with native values does not necessarily reflect native-like mastery of rhythm but instead may be attributed either to great speaker variability and to features unrelated to rhythm (Ferjan et al 2008), or to speaking rate and selective lengthening (Mok and Dellwo 2008).

2. Questions of the study

The present research aims at exploring the following questions:

1. Is pronunciation teaching effective in a foreign language setting?
2. Does age play a role in the acquisition of pronunciation in a classroom environment? For example, are students of younger age more favourably predisposed to acquiring FL pronunciation, as happens in naturalistic second language settings?

3. Methodology

3.1 Subjects

In the present study two groups of subjects were recorded, an experimental group (n=36), which received pronunciation instruction, and a control group (n=36) which followed the regular English classes at school. Each group was subdivided into three subgroups comprising students of three different ages. In particular, the students who were recorded in each group were: 12 ten-year old students/ age group A (4th grade of the Primary School), 12 thirteen-year old students/ age group B (1st grade of Junior High School), 12 sixteen-year old students/ age group C (1st grade of Senior High School). The particular ages have been selected so as to capture, as far as possible, the ages which have been claimed to represent the end of the critical or sensitive period for native-like mastery of pronunciation in naturalistic second-language settings (age 6 according to Long 1990, age 12 according to Scovel 1988, age 16 according to Patkowski 1990). It would be interesting to see if a similar effect of age is also observed in foreign-language contexts, in settings where students are not exposed to the target language in their everyday life but learn it in a formal environment, such as a school or a language institute as is the context of the present experiment. The youngest age examined in this study does not coincide with the earliest suggested end of the sensitive period, i.e. 6 years of age, because under the Greek educational system the teaching of English begins at the age of 9 (3rd grade of Primary School) and not earlier.

All students began learning English at around the age of 9. None of the 72 children examined reported having been taught English pronunciation systematically before the study. The students of the experimental group received 50 lessons of pronunciation instruction on English stops and speech rhythm. Sixteen of these lessons were devoted to the teaching of aspects of the English rhythm. Each lesson lasted 10-15 minutes and all lessons were embedded in the regular English classes at school. The pronunciation lessons were taught by the researcher, who was also the main English teacher of the experimental classes.

Due to practical limitations it was not possible to record native English children in the U.K., in order to obtain reference L1 measures. Instead of that, recordings were made of fifteen Greek-American bilingual children (five of each age group) who lived in Greece at the time of the recordings and were reported by their teachers to sound like native speakers of English. Thirty L1 Greek speakers (ten for each age group) were recorded on L1 Greek production.

3.2 Speech Materials/ Recording Procedure/Data Analysis

Recordings of students' speech samples were made twice, once before and once after the teaching intervention (Time 1 and Time 2 respectively). During the recordings, which took place in a quiet room in the students' schools, the speakers were asked to read an English text for the calculation of English rhythm and a Greek text for the calculation of Greek rhythm. The 10-year-old speakers read a text adapted from their English schoolbook, whereas the older students read 'The North Wind and the Sun' which is a standard text used for phonetic analyses of rhythm. The Greek text of 'The North Wind and the Sun' was recorded for the calculation of L1 Greek rhythm.

The recordings were analysed acoustically with the use of waveforms and digital spectrograms generated by the speech analysis software *PRAAT* (Boersma and Weenink 2003). For each recording we measured the duration of 125 vocalic and 125 intervocalic intervals, i.e. 250 items for each recording, which gives us a total of 47,250 items measured for the present study (for English L2: 72 speakers * 2 recordings * 250 items=

36,000 items; for Greek L1: 30 speakers * 250 items = 7,500 items; for English L1: 15 speakers * 250 items = 3,750 items, total: 47,250 items). Subsequently, a PVI index was computed for the vocalic and the consonantal intervals for each speaker (vocPVI and consPVI) applying the formula proposed by Grabe and Low (2002). A normalized version of the PVI was employed both for the vocalic and the consonantal intervals. Since this study examines speakers of different age groups and different languages, the normalized PVI was considered optimal since it adjusts for potential speaker rate variability that may occur under the elicitation procedure (Bunta and Ingram 2007) and is frequent in L2 speech.

3.3 Framework for Pronunciation Teaching

The framework of pronunciation teaching which is used in the present study is adopted from Celce-Murcia, Brinton and Goodwin (1996), who propose five teaching stages for pronunciation teaching which move away from controlled to free activities (p. 36). These stages involve the following:

1. Description and analysis of features
2. Listening discrimination activities
3. Controlled practice (i.e. oral reading of minimal pair sentences, short dialogues etc)
4. Guided practice (information-gap activities, cued dialogues)
5. Communicative practice (i.e. less structured activities that require the learner to attend to both form and meaning of utterances).

The lessons focused on the teaching of the following aspects of rhythm: word stress, sentence stress (identification of stressed/unstressed syllables and words, visual representation of stress patterns), content versus function words, reduced speech: reduced vowels and the schwa. The techniques used for pronunciation teaching involved the use of rubber bands (Gilbert 1984), graphic representation (Chela-Flores 1995, Wong 1987), rhymes, poetry, jazz chants (Adams 1979, Graham 1992, Bray 1995), all of which have been reported to be quite useful in the teaching of foreign language rhythm.

4. Results

4.1 L1 Greek and English

This section presents the results on L1 Greek and L1 English speech rhythm for the three age groups. In particular we present the results of the vocPVI, which expresses the degree of vocalic variability and consPVI, which expresses the degree of consonantal variability. The following graphs illustrate the vocPVI and consPVI of Greek and English L1.

Figure 1. PVI profile of L1 Greek and English

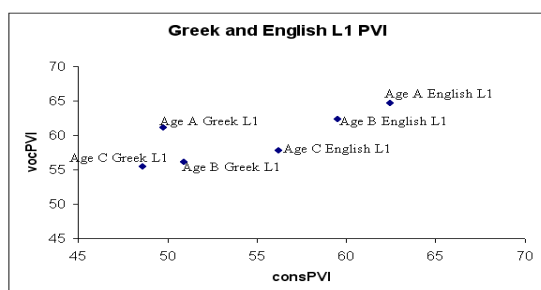
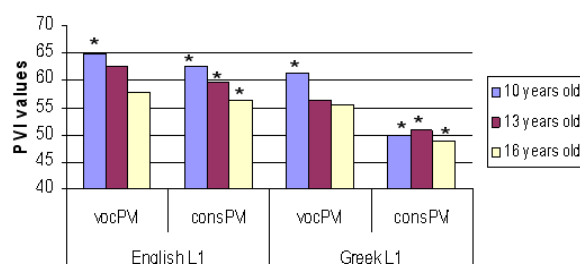


Figure 2. PVI values for L1 Greek and English



Figures 1 and 2 show that English tends to exhibit higher consonantal and vocalic variability than Greek for all age groups, although the difference in the PVI values is not statistically significant for all age groups. In order to determine the statistical significance for this difference, we conducted independent samples t-tests for the vocPVI and the consPVI for the speakers of the two languages in each age group. In figure 2 the asterisks above the bars show the cases where there is a statistically significant difference between the two languages. In particular, there is a statistically significant difference in the vocPVI and consPVI for the 10-year-old groups and in the cons PVI of the 13- and 16-year-old groups. No statistically significant difference is found for the vocPVI of the 13- and the 16- year old groups. A possible explanation for this could be the large inter-speaker variability in these groups of speakers. The overall PVI profile of the two languages is in accordance with previous descriptions of English being more ‘stress-timed’ than Greek, even though the lack of statistical significance in some cases may suggest that language classes are not so neatly separated as previously believed [in agreement with Ross et al (2008) who argued that languages traditionally belonging to different rhythm classes are not always differentiated by rhythm metrics].

4.2 L2 English

This section presents the results on the production of English rhythm by the Greek speakers before and after the teaching intervention. The results of each age group will be presented separately; also the results of the experimental groups, which received pronunciation instruction, will be juxtaposed to the results of the control groups, which followed the regular classes at school, as well as to the L1 Greek and English data from the equivalent ages.

Figure 3. Age A: PVI values for English L2

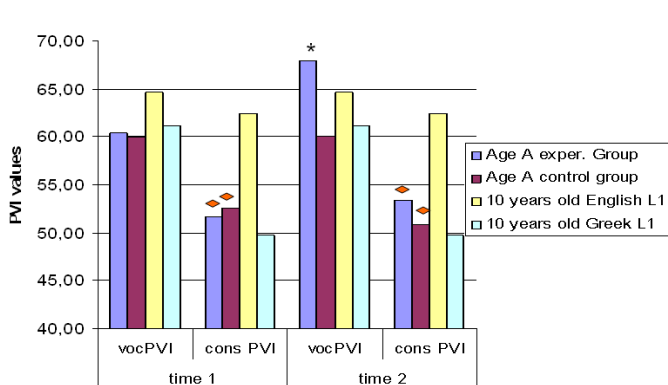
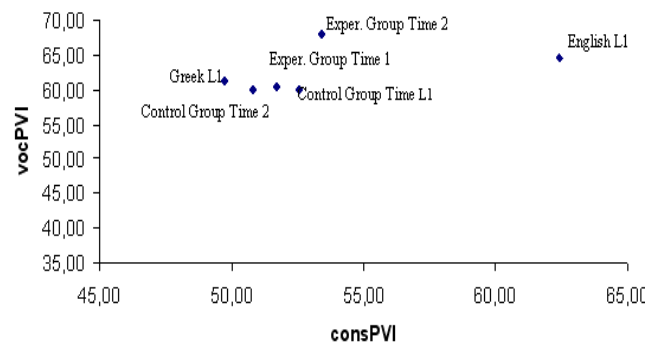


Figure 4. Age A: PVI profile of English L2



Figures 3 and 4 present the results of the Age group A, i.e. of the 10-year-old students. The figures show that at Time 1, that is before the teaching intervention, no difference is observed between the control and the experimental group. This is confirmed by the independent-samples t-tests which showed no statistically significant difference between these two groups ($p > 0.05$). However at Time 2 a statistically significant increase is observed for the vocPVI of the experimental group (paired-samples t-tests between Time 1 and 2, $p < 0.05$) and a smaller increase in consPVI, though not statistically significant. Actually all speakers except one increased their vocPVI values at Time 2, as a result of the teaching intervention. On the other hand, the PVI values of the control group at Time 2 are not statistically different from Time 1, which suggests

that the group which did not receive pronunciation instruction showed no improvement in their speech rhythm over that time.

Regarding the relationship with L1 Greek and English values, at Time 1 the vocPVI values of both groups were not statistically significant either from L1 Greek or from L1 English. This may be due to the fact that the difference between the vocPVI of the two languages, though statistically significant, is very small (64 vs 61). The consPVI is statistically different from L1 English and no different from L1 Greek both at Time 1 and 2. The asterisks above the bars in Figure 3 show the cases where there is a statistically significant difference with L1 Greek, whereas the diamond-shape mark shows the cases where there is a statistically significant difference with L1 English. At Time 2, the vocPVI of the experimental group is statistically different from L1 Greek and no different from L1 English. This means that students could have started implementing vowel reduction and elision as a result of the teaching intervention, which must have influenced the vocPVI of this group. The graphic representation of the results in Figure 4 illustrates that the improvement is bigger for the vocPVI of the experimental group than for the consPVI which is still far from L1 English.

Figure 5. Age B: PVI values for English L2

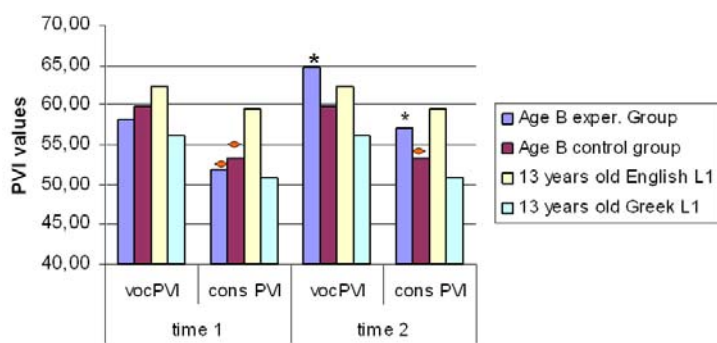
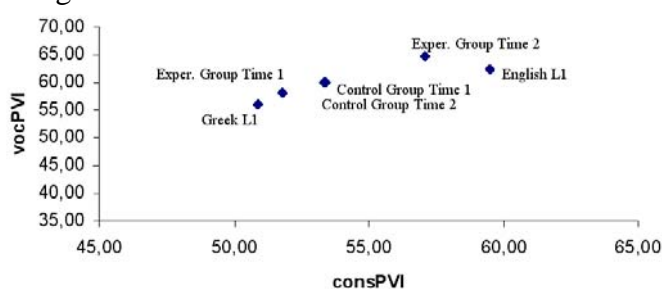


Figure 6. Age B: PVI profile of English L2



Figures 5 and 6 present the results for Age B, that is for the 13-year-old students. It appears from Figure 6 that at Time 1 the experimental group is very close to L1 Greek, however at Time 2 it is closer to L1 English. No difference is observed for the control group, since it occupies exactly the same position in the PVI chart in the two recordings. In Figure 5 we observe an increase both in the vocalic and consonantal PVI for the experimental group at Time 2. This difference is statistically significant both for the vocPVI and the consPVI (paired-samples t-tests, $p < 0.05$). In particular the vocPVI and the consPVI increased for 10 speakers of the experimental group and decreased for 2 speakers at Time 2. We can therefore assume that the speakers of this group have started mastering both the vocalic and the consonantal duration variability.

Regarding the comparison with L1 Greek and English, the asterisks above the bars in Figure 5 show the cases where there is a statistically significant difference with L1 Greek, whereas the diamond-shape mark shows the cases where there is a statistically significant difference with L1 English. At Time 1 no statistically significant difference is observed either with L1 Greek or with L1 English for the vocPVI of the two groups of speakers. This lack of statistical significance may be partly explained by the fact that the L2 values are somewhere between the two languages, and also by the fact that the t-tests showed no statistically significant difference between L1 Greek and English vocPVI for this age group. At Time 2 with regard to the vocPVI of the experimental group, there is a statistically significant difference from Greek L1 and no difference from English L1. As for the consPVI, at Time 1 it is statistically different from English L1 and no different from Greek both for the control and the experimental group; however,

at Time 2 the consPVI of the experimental group is no different from English but statistically different from Greek. These results support the claim that after the teaching intervention the experimental group's production of rhythm moves closer to the English norms both on the vocalic and the consonantal PVI level.

Figure 7. Age C: PVI values for English L2

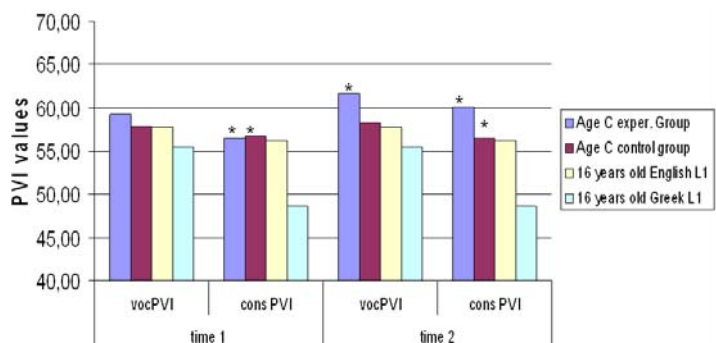
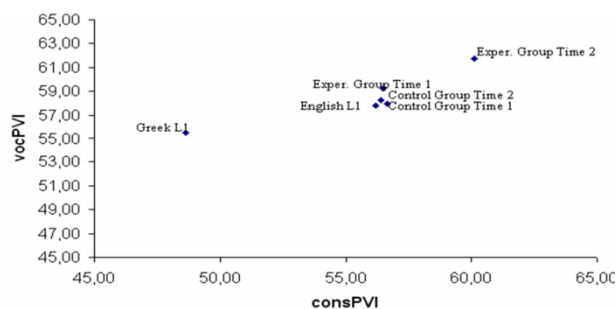


Figure 8. Age C: PVI profile of L2 English



Figures 7 and 8 present the results of the age group C, that is of the 16-year-old speakers. In Figure 7 the asterisks above the bars show the cases where there is a statistically significant difference with L1 Greek. It appears from Figure 7 that at Time 1 the vocPVI of the experimental and the control group is not statistically different from English L1 or from Greek L1. However, at Time 2, after the teaching intervention, there is a slight increase in the vocalic PVI for the experimental group, though not statistically significant (paired-samples t-tests, $p > 0.05$); however this small increase has made the vocPVI of this group become statistically different from Greek L1 and no statistically different from English L1. This can be interpreted as an improvement in the vocalic variability of the group.

As far as the consonantal variability is concerned, at Time 1 the consonantal variability both for the experimental and the control group was statistically different from Greek L1, and no different from English L1. It appears that at Time 1 the 16-year-old speakers were already mastering the English consonantal duration variability before the pronunciation teaching intervention. This could perhaps be attributed to the students' greater experience with the language compared to the younger age groups. The speakers of this group started learning English at the age of 9, so due to their experience with the language they may have approached the foreign language consonantal variability even though they had never been taught it explicitly. Alternatively, this finding could perhaps be related to the fact that the consonantal variability for the L1 English 16-year-old group was lower than the consPVI of the 10 and 13-year-old speakers respectively. At Time 2 the consonantal variability increased for the experimental but not for the control group, though not to a statistically significant extent, and it was again statistically different from Greek L1, but not from English L1.

Summarising the results of all three age groups, we can observe that there is an increase in the vocPVI and consPVI for the experimental groups of all ages, although this increase in values is not always statistically significant. For the age group A there is a statistically significant improvement in the vocPVI; for the age group B we observe a statistically significant improvement both in the vocPVI and consPVI, whereas in the age group C there is English-like consPVI from Time 1 and a statistically significant improvement in vocPVI. No difference is observed for the control groups between the two recordings.

5. Discussion

The present study examined the production of L2 English rhythm by Greek learners of different ages before and after pronunciation instruction. The first research question asks if pronunciation teaching is effective in a foreign language context. The analysis of the results shows that well-organized and planned pronunciation teaching can improve students production, even if it occurs in a foreign language environment with all the limitations that characterize it, for example lack of native English teacher, limited exposure and practice outside classroom, limited interaction in the target language in everyday life and limited amount of time devoted to English lessons at schools (three hours per week for the classes involved in the present experiment). Despite these limitations, we observed an increase both in the vocPVI and consPVI of the experimental groups, even though this was not always statistically significant. This can be interpreted as an attempt of students to apply the rules they have been taught during the pronunciation lessons, for example the rules regarding the reduction of unstressed vowels, the reduction of unstressed syllables in lexical words and the appropriate stress placement in content versus function words. On the other hand, no statistically significant difference is observed in the production of the control groups, which received no pronunciation instruction.

The second research question asks if age plays a role in pronunciation learning that occurs in a formal foreign language setting. The results of the present study show that the 13-year-old group exhibited greater improvement than the younger 10-year-old group both in relation to the vocalic and the consonantal PVI. In particular, the 13-year-old group showed a statistically significant increase both in vocPVI and consPVI at Time 2, whereas the 10-year-old group showed a statistically significant increase in the vocPVI only. Also after pronunciation instruction the vocPVI and consPVI values of age group B were statistically different from L1 Greek and no different from L1 English, whereas for age group A the consPVI was statistically different from L1 English and no different from Greek. The greater improvement in the 13-year-old speakers compared to that in the 10-year-old ones could be attributed to their greater maturity and cognitive development, which may be facilitative factors when learning a language in a formal foreign language context.

The comparison of the results of age groups A and B with age group C appears to be more difficult, since the 16-year-old speakers seem to have had a different starting point at Time 1 than the 10- and 13- year-old groups. In particular, the age group C appeared to be close to English at Time 1 as far as the consPVI is concerned, since the consPVI values before the teaching intervention were statistically different from L1 Greek and no different from L1 English. It appears that the 16-year-old speakers were already mastering the English consonantal duration variability before the pronunciation teaching intervention, perhaps due to the greater experience they already had with the language than the younger age groups. On the other hand, it can be noticed that the consPVI values for L1 English were lower for this age group than for the younger ones. Therefore it could also be argued that the lack of statistical difference in consPVI for the age group C with the L1 English values may be related to the lower consPVI that the L1 English group exhibits compared to the 10- and 13-year-old groups respectively. Still, the consPVI of age group C at Time 1 is statistically different from L1 Greek, therefore in this sense the 16-year-old group at Time 1 had already started mastering consonantal variability to a greater extent than the other groups, but the extent to which the consPVI at Time 1 was native-like may be subject to debate.

Concluding, this research has shown that instruction focusing on the rhythmic patterns of L2 English can have a positive effect on aspects of students' production of the FL rhythm. The study has shown that the 13-year-old group showed a bigger improvement than the younger 10-year-old group, perhaps due to their cognitive development and maturation. However, it is difficult to compare these age groups with the older 16-year-old students, since the latter seem to have started from a different point, as they were close to the L1 English consPVI from Time 1. Further research into the data involving analysis of the degree of vowel reduction and other processes employed by the speakers could give us a clearer picture of how pronunciation instruction has influenced the production of FL rhythm.

References

- Abercrombie D. (1967). *Elements of General Phonetics*. Edinburgh, Edinburgh University Press.
- Adams C. (1979). *English Speech Rhythm and the Foreign Learner*. The Hague: Mouton.
- Baltazani M. (2007). "Prosodic rhythm and the status of vowel reduction in Greek". *Selected Papers on Theoretical and Applied Linguistics from the 17th International Symposium of Theoretical and Applied Linguistics*. Thessaloniki, 31-43.
- Beckman M.E. (1982). "Segment duration and the mora in Japanese". *Phonetica* 39, 113-135.
- Bloch B. (1950). "Studies in colloquial Japanese IV: phonemics". *Language* 26, 86-125.
- Boersma P. & D. Weenink (2003). Praat. Doing phonetics by computer (version 4.0.13). <<http://www.praat.org/>>.
- Bray E. (1995). "Using limericks to help Japanese students improve their pronunciation". ERIC Document reproduction Service (ED404862).
- Carter P. (2005). "Prosodic variation in SLA: rhythm in an urban North Carolina Hispanic community". *Penn Working Papers in Linguistics* 11/2, 59-71.
- Celce-Murcia M., D. Brinton & J. Goodwin (1996). *Teaching Pronunciation: A Reference for Teachers of English to Speakers of other Languages*. Cambridge: Cambridge University Press.
- Chela-Flores B. (1994). "On the acquisition of English rhythm: theoretical and practical issues". *International Review of Applied Linguistics* 32, 232-242.
- Chela-Flores B. (2001). "Optimising the teaching of English suprasegmentals". *Lengues Modernas* 28-29, 255-273.
- Dauer R.M. (1983). "Stress-timing and syllable-timing reanalyzed". *Journal of Phonetics* 11, 51-62.
- Dauer R.M. (1987). "Phonetic and Phonological components of language rhythm". *Proceedings of the 11th International Congress of Phonetic Sciences* 5, Tallinn, 447-450.
- Derwing T.M. & M.J. Murno (2005). "Second language accent and pronunciation teaching: A research based approach". *Tesol Quarterly* 30, 379-397.
- Ekstrand L.H. (1982). "English without a book revisited: The effect of age on second language acquisition in a formal setting". In S. Krashen, R. Scarcella and M.H. Long (eds), *Child Adult Differences in Second Language Acquisition*. Rowley, M.A.: Newbury House, 136-158.
- Ferjan N., T. Ross & A. Arvaniti (2008). "L2 speech and rhythm metrics". Paper presented at ASA 2008, Paris.
- Fullana N. (2006). "The development of English (FL) perception and production skills: Starting age and exposure effects". In C. Muñoz (ed) *Age and the Rate of Foreign Language Learning*. Clevedon: Multilingual Matters, 41-64.
- Gilbert J.B. (1984). *Clear Speech: Pronunciation and Listening Comprehension in American English*. New York: Cambridge University Press.
- Gong J. (2002). "Introducing English rhythm in Chinese EFL classrooms: a literature review". *Post-Script* 3/1, 26-42.
- Goodwin, J., D. Brinton & M. Celce-Murcia (1994). "Pronunciation assessment in the ESL/EFL curriculum". In J. Morley (ed). *Pronunciation, Pedagogy and theory: New Views, New Directions*. TESOL, 3-16.
- Grabe E. & Low E. (2002). "Duration variability in speech and the rhythm class hypothesis". *Papers in Laboratory Phonology* 7, Mouton.
- Graham C. (1992). *Singing, Chanting, Telling Tales*. New Jersey: Prentice Hall Regents.
- Grenon I & L. White (2008). "Acquiring rhythm: a comparison of L1 and L2 speakers of Canadian English and Japanese". *Proceedings of the 32nd Boston University Conference on Language Development (BUCLD)*, 155-166.

- Gut U. (2003). "Prosody in second language speech production: the role of the native language". *Fremdsprachen Lehren und Lernen*, 32, 133-152.
- Han M.C. (1962). "The feature of duration in Japanese". *Onsei no kenkyuu* 10, 65-80.
- Kehoe M. & C. Lléo (2005). "The emergence of language-specific rhythm in German-Spanish bilingual children". *Working Papers in Multilingualism* 58, Hamburg. SFB 538.
- Lehiste I. (1977). "Isochrony reconsidered". *Journal of Phonetics* 5, 253-263.
- Lin H. & Q. Wang (2005). "Vowel quantity and consonant variance: a comparison between Chinese and English". Paper presented at the *Conference Between Stress and Tone* June 2005, Leiden.
- Long M. (1990). "Maturational constraints on language development". *Studies in Second Language Acquisition* 12, 251-285
- Low E. L., E. Grabe & F. Nolan (2000). "Quantitative characterizations of speech rhythm: syllable-timing in Singapore English". *Language and Speech* 43, 377-401.
- Mackridge P. (1985). *The Modern Greek Language*. Oxford, Oxford University Press.
- Mok P & V. Dellwo (2008). "Comparing native and non-native speech rhythm using acoustic rhythmic measures: Cantonese, Beijing Mandarin and English". *Proceedings of the 4th Speech Prosody 2008 Campinas Brazil*, 423-426.
- Muñoz C. (2003). "Variation in oral skills development and age of onset". In M.P. Garcia-Mayo and M.L. Garcia-Leccumberri (eds) *Age and the Acquisition of English as a Foreign Language*. Clevedon: Multilingual Matters.
- Muñoz C. (2006). "The effects of age on foreign language learning: the BAF project". In C. Muñoz (ed) *Age and the Rate of Foreign Language Learning*. Clevedon: Multilingual Matters, 1-39.
- Olson L.L. & S.J. Samuels (1982). "The relationship between age and accuracy of foreign language pronunciation". In S. Krashen, R. Scarcella and M.H. Long (eds), *Child Adult Differences in Second Language Acquisition*. Rowley, M.A.: Newbury House, 84-92.
- Pardo D.B. (2004). "Can pronunciation be taught? A review of research and implications for teaching". *Revisita Alicantina de Estudios Ingleses* 17, 6-38.
- Patkowski M. (1990). "Age and accent in a second language: A reply to James Emil Flege". *Applied Linguistics* 11, 73-89.
- Pike K. (1945). *The Intonation of American English*. Ann Arbor Press, University of Michigan
- Ramus F., M. Nespors & J. Mehler (1999). "Correlates of linguistic rhythm in the speech signal". *Cognition* 73, 625-292.
- Roach P. (1982). "On the distinction between stress- and syllable-timed languages". In D. Chrystal (ed) *Linguistic Controversies: Essays in Linguistic Theory and Practice in Honour of F.R. Palmer*. London, Edward Arnold, 73-79.
- Ross T., N. Ferjan & A. Arvaniti (2008). "On quantifying speech rhythm". Poster presented at the *Workshop on Empirical Approaches to Rhythm*. March 2008, UCL, London.
- Scovel T. (1988). *A Time to Speak: A Psycholinguistic Inquiry into the Critical Period for Human Speech*. Rowley, M.A.: Newbury House.
- Thogmartin C. (1982). "Age, individual differences in musical and verbal aptitude, and pronunciation achievement by elementary school children learning a foreign language". *International Review of Applied Linguistics* 20, 66-72.
- Wenk B.J. (1985). "Speech rhythms in second language acquisition". *Language and Speech* 28/2, 157-175.
- White, L. & S. Mattys (2007). "Calibrating rhythm: first and second language studies". *Journal of Phonetics* 35 (4), 501-522.
- Wong R. (1987). *Teaching Pronunciation: Focus on English Rhythm and Intonation*. Englewood Cliffs, New Jersey: Prentice Hall.