Syllable phonology and constituency temporal production in Greek

Antonis Botinis[1], Evgenia Magoula[2], Olga Nikolaenkova[3], Athina Tsiori[2]

[1]Lab of Phonetics & Computational Linguistics, University of Athens, Greece
[2]Department of Primary Education, University of Athens, Greece
[3]Department of General Linguistics, Saint Petersburg State University, Russia

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Abstract

This is an experimental study of temporal organisation of the Greek syllable. In accordance with a production experiment, the results indicate the following: (1) open and closed syllable units have a significant difference. (2) open and closed syllables do not have significant differences of vowel nucleus durations. (3) onset syllable consonants are significantly longer than coda syllable consonants. (4) lexical stress application has a significant lengthening effect on syllable unit, onset consonant as well as nucleus vowel but not on coda consonant constituents. (5) focus application does not have any significant effect on any syllable constituent.

Key words: consonant, vowel, duration, syllable, temporal production, stress, Greek

Introduction

The present study is an experimental investigation of segment durations as a function of syllable structure, lexical stress and focus. Thus, the main questions concern (1) the effects of each of the above prosodic factors on segment durations and (2) the interactions among the above factors. Syllable structure involves reverse phonotactis, i.e. CV and VC, and thus open vs. closed syllable structures in variable syllable unit contexts.

In accordance with research in different languages, including Greek, a variety of hypotheses with reference to segment duration variability has been suggested. Among them, more consonants in syllable onset are correlated with shorter respective durations (Botinis, Erkenborn, Isacsson, Westin, 1999), open syllable structure is correlated with longer vowel nucleus than closed syllable structure (Maddieson 1985) and stressed syllables are correlated with longer consonant onset as well as vowel nucleus (Botinis 1989, Fourakis, Botinis, Katsaiti 1999).

However, despite significant research, segment temporality as a function of syllable constituency variability has hardly been investigated. E.g., although it is widely known that lexical stress has a lengthening effect at syllable level, the effects of lexical stress on different syllable constituents are hardly known. Thus, in this paper, we attempt to enlarge our knowledge on temporal correlations as a function of syllable constituency variability.

Experimental methodology

The speech material consists of four test words: two in nominative singular and two in accusative plural with lexical stress at the antepenultimate and penultimate, respectively (Table 1). The test words were produced at the beginning of the carrier phrase [___ˈfonakse ðinaˈta] ‘s/he shouted ___ loudly’. Five female students at their mid-twenties, with standard Athenian Greek pronunciation, produced the speech material at a normal tempo in focus and out of focus context in a sound-treated studio at Athens University Phonetics laboratory. The speech material was analysed with Praat programme and segment duration results were subjected to statistical processing with SPSS statistical package.

Table 1. Test words in nominative and accusative with lexical stress assignment in antepenultimate and penultimate syllable, respectively.

Nominative singular	Accusative plural	Gloss
ˈenɵetos	enˈɵetus	Inserted
ˈnefelos	neˈfelus	Nefelos (name)

Results

The results are shown in figures 1-3. In accordance with a three-way ANOVA (syllable type x lexical stress x focus), syllable type and lexical stress have significant effects on both onset consonant and vowel nucleus durations whereas focus has no significant effect on any syllable constituent.

Figure 1 shows mean durations of syllable type units as well as syllable constituents as a function of open vs. closed syllables. The open syllable unit is 187 ms (SD 52) and the closed syllable unit is 170 ms (SD 45) and this difference of 17 ms is significant ($F=7.1$, $p<0.008$). The onset consonant in open syllable is 87 ms (SD 26) whereas the coda consonant in closed syllable is 58 ms (SD 11), a significant difference of 29 ms ($p<0.0001$). The nucleus vowel in open syllable is 100 ms (SD 32) and in closed syllable 111 ms (SD 42), a non-significant difference of 11 ms.

Figure 2 shows mean durations of syllable type units as well as syllable constituents as a function of lexical stress application. The stressed syllable is 211 ms (SD 41) and the unstressed syllable 145 ms (SD 31), a significant difference of 66 ms ($F=94$, $p<0.0001$). The onset consonant in stressed syllable is 101 ms (SD 23) and in unstressed syllable 71 ms (SD 20), a significant difference of 30 ms ($F=27$, $p<0.0001$). The vowel nucleus in stressed syllable is 131 ms (SD 28) and in unstressed syllable 79 ms (SD 27), a significant difference of 52 ms ($F=100$, $p<0.0001$. The coda consonant in

stressed syllable is 57 ms (SD 14) and in unstressed syllable 59 ms (SD 7.5), which is a non-significant difference of 2 ms.

Figure 3 shows mean durations of syllable constituents as a function of focus application. The effects of focus application are in general negligible and do not reach a significant level on either syllable unit or any onset, nucleus or coda syllable constituent.

The results indicate significant interactions of syllable type x lexical stress with reference to syllable unit ($F=14.2$, $p<0.0003$) but not any other syllable constituent.

In accordance with the above results, lexical stress application has a bigger temporal effect on syllable unit and/or syllable constituents than syllable type whereas focus application hardly has any effect. The temporal effect of lexical stress application, on the other hand, has a hierarchical effect on different syllable constituents, i.e. nucleus vowel>onset consonant>coda consonant.

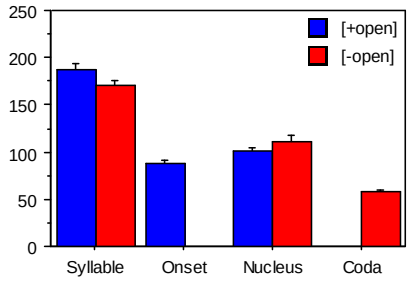

Figure 1. Syllable unit as well as onset, nucleus and coda constituent durations (in ms) as a function of open ON (+open) vs. closed NC (-open) syllable structure.

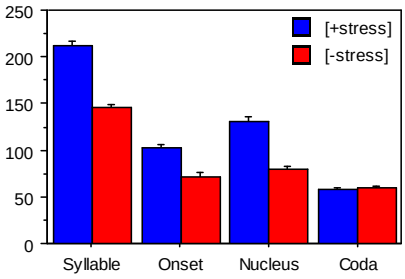

Figure 2. Syllable unit as well as onset, nucleus and coda constituent durations (in ms) as a function of stressed (+stress) vs. unstressed (-stress) syllables.

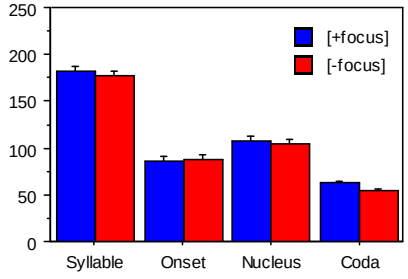

Figure 3. Syllable unit as well as onset, nucleus and coda constituent durations (in ms) as a function of focus (+focus) vs. out of focus (-focus) context.

Discussion and conclusions

This study is an investigation of temporal organization of syllable structure, i.e. VC vs. CV, as a function of lexical stress and focus applications. The main results indicate the following: (1) CV syllable is longer than VC syllable and this is due to the onset consonant of open syllable rather than its nucleus vowel. (2) onset consonant of CV syllable is longer than coda consonant of VC syllable. (3) lexical stress application has a lengthening effect on onset consonant and nucleus vowel but not on coda consonant. (4) focus application has no temporal effect on any syllable constituent.

The results of the present study are hardly in accordance with most studies in syllable structure and duration correlates. Most importantly, there is no evidence of the open syllabicity lengthening effect of nucleus vowel, as suggested by Maddieson (1985) and others (see e.g. Farnetani, Kori 1986, McCrary 2004). On the other hand, similar to the open syllabicity lengthening effect is evident in another study (Chaida et al. 2017, this volume). However, in the latter study, there was a difference speech material, i.e. CV vs. CVC, and hence different syllable structure. Furthermore, there was a compensatory lenthening effect, according to which longer nucleus vowel entailed shorter onset consonant. Its seems that the temporal organisation of syllable is the result of many factors among which the open syllable lengthenis effect is one among them.

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