

The Coda Voicing Contrast in Lithuanian Learners' English

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Vowel duration, though not belonging to the three main factors in the description of vowels, plays an important role in the English language. Alongside qualitative differences, it helps to distinguish between the meaning of such words as 'ship' and 'sheep'. Vowel duration has been recognised to be a complex phenomenon, which depends on a combination of factors: internal and external (Delattre 1962). The present pilot study focuses on one of the factors belonging to the latter group, i.e. the influence of the postvocalic voicing on vowel duration in minimal pairs of one syllable CVC (consonant-vowel-consonant) words, a phenomenon referred to as 'pre-fortis clipping' (Wells 1990), 'voicing effect' (Yoneyama and Kitahara 2014), 'consonantal voicing effect' (Beller-Marino 2014), 'vowel-length effect' (Ko 2007), 'shortening' (Cruttenden 2014), 'post-vocalic consonant voicing effect' (Taubeber and Evanini 2009), etc. The scope of this research was limited to four checked unrounded English monophthongs: the front-central, close-mid /ɪ/, the front, mid /e/, the front, open /æ/, and the central, open-mid /ʌ/. The durational differences were analysed from a perceptive and productive perspectives. The obtained results indicated that the Lithuanian learners showed an effect of voicing on vowel-duration, manifested in a number of languages: the mean duration of the examined vowels was shorter before a fortis than before a lenis coda. The analysis of individual students' production data proved the importance of the individual variable.

Keywords: vowel duration, coda voicing, Lithuanian learners' English.

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Introduction

A description of any vowel sound involves three main factors: the front-back dimension, the high-low dimension, and the lip aperture type (Cruttenden 2014, McMahon 2002). An additional criterion of constancy of "tongue and/or lip shape" (Collins and Mees 2013: 62) has to be added in order to differentiate between monophthongs and diphthongs. A large number of

languages, English being one of them, alongside the main factors, distinguish a variable of duration, since words “differing in the vowel sound length, are <...> distinct words having different meanings” (Barman 2009: 28). In a classroom, IPA (International Phonetic Alphabet) charts of the English language phonemes colour code short and long vowels. Textbooks on pronunciation provide lists of minimal pairs (e.g. *cot – cord, ship – sheep, cut – cart*, etc.) with the distinction based on the vowel sound length. In English, however, there exists only one opposition solely of length, namely in the case of /ə/ and /ɜ:/ (Cruttenden 2014). In all the other oppositions, the quantitative differences are accompanied by the qualitative ones (Ciszewski 2012, McMahon 2002), resulting in a non-phonemic quality of duration (Mugitani et al. 2009).

Vowel length is not a straightforward concept. House (1961) distinguishes four factors that could affect vowel duration: postvocalic distinction based on voicing, lax/tense vocalic distinction, vowel height, and consonant class. In more elaborate classifications, they can be found under two groups. The intrinsic (Gonet and Stadnicka 2006) or internal (Delattre 1962) factors are the ones “that are in the vowel itself” (Delattre 1962: 1141). They include the relation between vowel abridging and expanding, monophthong and diphthong, and vowel openness and its duration. The extrinsic (Gonet and Stadnicka 2006) or external (Delattre 1962) factors can be summarised as “to be found in the single consonant that follows the vowel (Delattre 1962: 1141). In Gonet and Stadnicka’s (2006) classification, this group encompasses the suprasegmental conditioning, which, though acknowledged in Delattre’s work (1962), was excluded from the list of external factors on the basis of belonging to prosody.

The studies on the reasons for the observed durational differences report controversial results. There is no agreement whether they occur because they are learned, or whether the differences are conditioned by the speech organs; whether they are universal or language specific. Effects of the voicing on vowel duration have been reported in a plethora of languages (Chen 1970, Mitleb 1982, Tauberer and Evanini, 2009, Yun, 2018;), which “points to the fact that they are universal” (Embarki 2016: 1). Ko (2007) claims that the process is “automatic” providing a different reason, namely, the fact that no learning curve was observed in the study on children speaking American English. Ciszewski (2012: 220) provides a dual position stating that it is “both an articulatorily motivated and speaker controllable process”. Duality is present in the discussion of Yoneyama and Kitahara’s (2014: 38) study results: on the one hand, they report “a clear universal and phonetic basis” of the postvocalic voicing effect on vowel duration. On the other hand, the authors, alongside House (1961), state that “the effect can also be suppressed or enhanced by language-specific grammars”. The treatment of voicing patterns as being language-specific rather than universal is equally manifold. It varies from claims that language specific features are mere exceptions from the universal model (Ko 2007) to affirmations of their not absolute universal quality (Mitleb 1982, Tauberer and Evanini 2009).

“[P]erhaps no subject has been studied more thoroughly than vowel length before single consonants” (Delattre 1962: 1141). The length relationships between English vowels and the following consonant are of a complicated nature (Cruttenden, 2014). In linguistic literature, consequently, the phenomenon has been addressed under different terms: ‘pre-fortis clipping’ (Wells 1990), ‘voicing effect’ (Yoneyama and Kitahara 2014), ‘consonantal voicing effect’ (Beller-Marino 2014), ‘vowel-length effect’ (Ko 2007), ‘shortening’ (Cruttenden 2014), ‘post-vocalic consonant voicing effect’ (Taubeber and Evanini 2009), etc. The terminological variation, to some extent, indicates opposing standpoints on the phenomenon. According to one, in English, vowels undergo clipping (the term used instead of shortening in order to avoid ambiguity due to traditionally adopted short/long vowel distinction) when they are followed by a voiceless coda (Wells 1990). Taubeber and Evanini (2009) and Scheer (2017), on the contrary, claim that vowel duration is lengthened by a post-vocalic lenis, or voiced, consonant. Notwithstanding these differences, there is a consensus that “in the temporal dimension, vowel duration is longer before a voiced than before a voiceless coda” (Chio et al. 2016: 2). This phenomenon is not English-specific (Chen 1970, Dawson 2003, Delattre 1962, Yun 2018), but the English language reveals a much more noticeable variation of vowel length as a result of the following consonant (Tauberer and Evanini, 2009, Yun 2018).

The adoption of the view that postvocalic voicing effect is not universal, or automatic, but rather has to be learned by second language learners to sound more native-like (Mitleb, 1982), induced the analyses of the phenomenon in non-native English (Beller-Marino 2014, Cho 2015, Choi et al. 2016, Dawson 2003, Kareem 2015, Skarnitzl and Šturm 2016, Zajac, 2013). Greek learners of English, for example, though producing vowels of different length depending on the coda voicing, were reported to have failed to produce a notable length difference characteristic of English native speakers (Dawson 2003). A similar tendency was observed in Italian English (Beller-Marino, 2014). The influence of learners’ mother-tongue system was expected to play a role in Polish English (Zajac 2013). Korean learners were attested to have significant durational differences in the production

of vowels before fricatives due to their “lack of experience with word-final fricatives” (Cho 2015:137). It can be noted, therefore, that there is a tendency for speakers to apply the knowledge of their native language vowel system on their second language production, which can consequently result in a non-native-like pronunciation.

The present paper is a pilot study aiming at answering the following questions: (1) whether the Lithuanian learners are able to identify coda voicing contrast effect in one syllable CVC (consonant-vowel-consonant) words and (2) whether the Lithuanian learners’ production of checked unrounded English vowel duration depends on the coda’s voicing.

1. Methodology

The pilot study on the duration of four English vowels (ɪ, e, æ, and ʌ) in CVC words in different contexts depending on the postvocalic voicing in the Lithuanian learners’ English consisted of two parts: perceptive and productive. For the current research a list of eight minimal pairs of CVC words (two minimal pairs per vowel) with checked unrounded Standard Southern British (SSB) vowels was chosen (Table 1).

Table 1. Minimal pairs of CVC words used for the identification test.

Vowel in CVC word	With a postvocalic lenis coda		With a postvocalic fortis coda	
ɪ (ɪ1)	kid	/kɪd/	kit	/kɪt/
ɪ (ɪ2)	rib	/rɪb/	rip	/rɪp/
e (e1)	said	/sed/	set	/set/
e (e2)	dead	/ded/	debt	/det/
æ (æ1)	bad	/bæd/	bat	/bæt/
æ (æ2)	sag	/sæg/	sack	/sæk/
ʌ (ʌ1)	pub	/pʌb/	pup	/pʌp/
ʌ (ʌ2)	dug	/dʌg/	duck	/dʌk/

69 first year students of Vilnius University, majoring in English and another (French, Norwegian, Spanish, or Russian) foreign language, completed a test, where they were provided with a list of minimal pairs of CVC words with different postvocalic coda voicing and were asked to decide whether the vowel would be of the same length in both members of each minimal pair. If the answer was negative, the students were asked to indicate which word contained a longer vowel.

For the production part of the research, a set of eight words was chosen, which makes four minimal pairs of CVC words, containing checked unrounded vowels with a postvocalic lenis or fortis consonant (Table 2).

Table 2. Minimal pairs of CVC words used for the production.

Vowel in CVC words	With a postvocalic lenis coda		With a postvocalic fortis coda	
ɪ	rib	/rɪb/	rip	/rɪp/
æ	bad	/bæd/	bat	/bæt/
e	said	/sed/	set	/set/
ʌ	dug	/dʌg/	duck	/dʌk/

The participants were asked to produce the words at their normal speaking pace. The words were recorded with a portable PC using WavePad Sound Editor version 7.05. The recordings were analysed with Praat (Boersma, Weenink, 2018) computer software. Each word was manually segmented and the duration of the vowels produced by the Lithuanian speakers was measured in milliseconds.

Reference recordings of a native English speaker's pronunciation were extracted from Cambridge English Pronouncing Dictionary (2011).

2. Perceptive dimension

The concept of short and long vowels is easily understood by Lithuanian learners. The idea that the duration of the vowel can vary, however, is less self-evident. 65 per cent of the responses indicated the same vowel length in minimal pair CVC words with voiced and voiceless postvocalic consonants. 35 per cent of answers reported temporal differences, 32 per cent of which correctly detected a shorter vowel length before a fortis coda, with only three per cent claiming a vowel to be shorter in one-syllable words with a lenis coda.

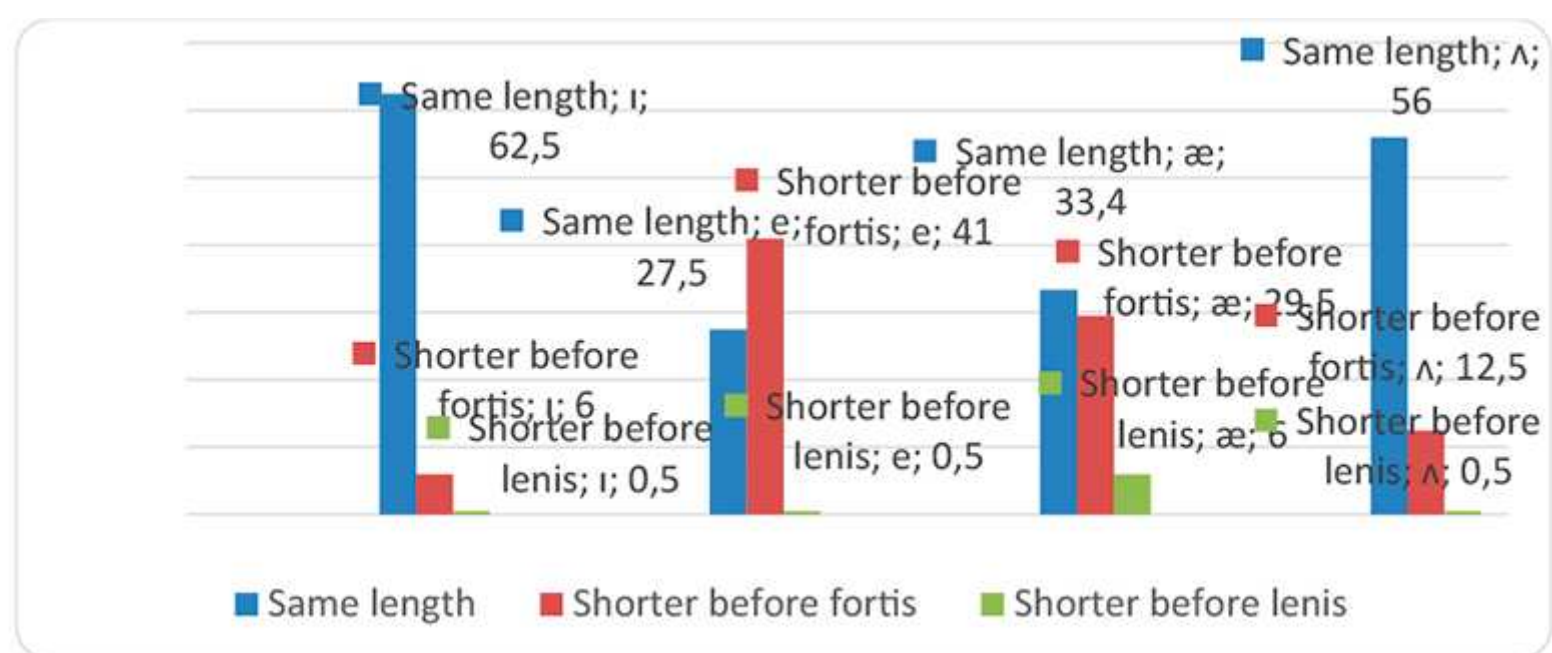


Fig. 1. Perception of vowel duration differences in CVC words with different coda voicing (mean numbers).

From the data in Figure 1, it is apparent that the Lithuanian learners unfamiliar with the phenomenon of coda voicing effect on the preceding vowel are more likely to feel length differences in the case of fully front checked unrounded vowels (/e/ and /æ/)

than in more central ones (front-central /ɪ/ and central /ʌ/). The vowel /e/ stands out as being the only one correctly identified as shorter before a fortis consonant by more than a half of the learners (41 out of 69, i.e. 59 percent), followed by a mean score of 29.5 (43 per cent) for the vowel /æ/ and 12.5 (18 per cent) for /ʌ/. The tendency for the vowels to be seen as having the same length in both words of a minimal pair is converse. The list is preceded by /ɪ/ and then followed by /ʌ/, /æ/, and /e/.

3. Productive dimension

Table 3 reports on the mean vowel duration in milliseconds in the production results. The ratio of a vowel preceding a lenis/fortis consonant shows that the participants of the study produced durationally longer vowels before voiced consonants on all the occasions. The lowest duration ratio can be observed in the production of the minimal pair, which contained the short vowel /ɪ/. Contrastively, the highest ratio was in pronouncing the short vowel /e/. These general tendencies replicate the ones observed in the identification test. Table 3 shows mean duration of the four vowels under investigation depending on the voicing of the coda, and their ratio in the pronunciation of the Lithuanian speakers.

Table 3. Mean duration (ms) and the ratio of individual vowels in the context of lenis and fortis postvocalic consonants produced by the Lithuanian speakers.

	/ɪ/	/e/	/æ/	/ʌ/
Lenis coda	146	219	308	210
Fortis coda	135	165	261	174
Ratio	1.08	1.33	1.18	1.21

The comparison of vowel length in the Lithuanian learners' and native English production indicates the same voicing effect tendency (Table 4). The ratio between the length in the context of postvocalic lenis and fortis consonants, however, is lower in non-native than in native English pronunciation.

Table 4. Mean duration (ms) and the ratio of vowel duration in the context of lenis and fortis postvocalic consonants produced by the Lithuanian and English speakers.

	Lithuanian	English
Lenis coda	220	200
Fortis coda	184	159
Ratio	1.20	1.26

Figure 2 presents mean duration ratio of vowels preceding fortis and lenis consonants produced by the Lithuanian learners (S1-S4) and the English native speakers (NS). The greatest similarity of ratio is in the case of /e/ and the most diverse - in the case of /ɪ/. Notwithstanding the differences, a general tendency can be reported for non-native learners to observe the native speakers' pattern of postvocalic voicing effect.



Fig. 2. Mean duration ratio of vowels in the context of lenis and fortis postvocalic consonants produced by the Lithuanian (S1-S4) and English native speakers (NS).

A closer look at individual data highlights the importance of the individual variable. Though the mean duration of the vowels affirms the widely observed coda voicing effect, the analysis of vowels produced by individual learners sheds some interesting results.

Table 5. Duration (ms) of the vowels in the context of lenis / fortis postvocalic consonants and their ratio in the production of the Lithuanian (S1-S4) and English native speakers (NS).

	S1	S2	S3	S4	NS
ɪb / ɪp	163 / 150 1.09	125 / 112 1.12	132 / 157 0.84	162 / 119 1.36	150 / 106 1.42
sed / set	265 / 200 1.33	162 / 181 0.90	237 / 156 1.52	210 / 124 1.69	203 / 155 1.31
bæd / bæt	356 / 263 1.35	275 / 250 1.10	313 / 275 1.14	288 / 257 1.12	210 / 162 1.30
ɔŋ / ɔk	188 / 162 1.16	206 / 150 1.37	225 / 207 1.09	219 / 178 1.23	235 / 213 1.10

As can be seen in Table 5, the Lithuanian students failed to follow the general native pattern of vowel duration ratio only sporadically. In non-native production, only two cases were observed, where the results showed deviation from the prevalent pattern, namely, S3 produced the KIT vowel and S2 – the DRESS vowel longer in the context of a voiceless postvocalic consonant.

Interestingly, individual vowels under examination, yielded different results in the production of S1-S4 as compared to NS. Three out of four Lithuanian learners produced /e/ and /ʌ/ with a higher length difference than the native speaker. The difference in the the KIT vowel, on the contrary, was lower in S1, S2, and S4 production. The TRAP vowel showed an analogous tendency: the learners produced the vowel with a smaller temporal difference from the observed in the NS

pronunciation. It is worth noting that though the NS ratios for the two front vowels /e/ and /æ/ are almost identical, 1.31 and 1.30 correspondingly, the learners failed to follow the pattern (cf. 1.52 vs. 1.14 in the production by S3 and 1.69 vs. 1.12 in the production by S4).

As it can be seen from Table 5, individual learners' vowels duration deviates from the observed in the native learner's pronunciation. The TRAP vowel in both contexts, with a voiced and voiceless postvocalic consonant, is longer than in NS production. The STRUT vowel, on the contrary, was consistently shorter in S1-S4 pronunciation. The length of the KIT as well as DRESS vowels fluctuates in the Lithuanian learners' pronunciation. It is noteworthy that not a single learner was consistent in either prolonging or shortening the vowels under examination.

Conclusions

The present pilot study focused on one feature of the vowel system – their duration. Though English recognizes the temporal dimension of vowels and provides the classification of its monophthongs into short and long, the differences are usually qualitative, as well as quantitative. The fact that the Lithuanian language distinguishes short and long vowels does not cause problems for Lithuanian learners to perceive English vowels as belonging to one of the classes (short or long). The concept of varying duration of the same vowel produced in different contexts proved to be more problematic. The identification test results indicated that the Lithuanian learners with no prior knowledge of the concept tend to treat the checked unrounded vowels as having the same duration in minimal pair CVC words with different postvocalic voicing. The durational difference was correctly identified in only less than one third of the cases.

The analysis of the vowel production indicated that the Lithuanian learners showed an effect of voicing on vowel-duration, manifested in many languages: the mean duration of the four checked unrounded vowels was shorter before a fortis than before a lenis coda. The observed individual differences, however, proved the need for a wider scope study.

References

- BARMAN, B., 2011. A contrastive analysis of English and Bangla phonemics. *Dhaka University Journal of Linguistics*, 2 (4), 19–42. Available from: https://www.academia.edu/27091767/A_contrastive_analysis_of_English_and_Bangla_phonemics. [Accessed 10 June 2018].
- BELLER-MARINO, Y., 2014. Consonantal voicing effects on vowel duration in Italian-English bilinguals. PhD thesis. *CUNY Academic Works*. New York: The City University of New York. Available from: https://academicworks.cuny.edu/gc_etds/339. [Accessed 16 May 2018].
- CISZEWSKI, T., 2012. Stressed vowel duration and phonemic length contrast. *Research in Language*, 10 (2), 215–223. Available from: <https://content.sciendo.com/view/journals/rela/10/2/article-p215.xml>. [Accessed 15 May 2018].
- CHEN, M., 1970. Vowel length variation as a function of the voicing of the consonant environment. *Phonetica*, 22, 129–159.
- CHO, H., 2015. Production of pre-fortis clipping in English by Korean and English speakers*. *Studies in Phonetics, Phonology, and Morphology*, 21(1), 115–141. Available from: http://www.kci.go.kr/kciportal/landing/article.kci?arti_id=ART001985605#none. [Accessed 15 May 2018].
- CHOI, J., KIM, S., CHO, T., 2016. Phonetic Encoding of coda voicing contrast under different focus conditions in L1 vs. L2 English. *Frontiers in Psychology*, 7 (624), 1-17. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4866536/>. [Accessed 18 June 2018].
- COLLINS, B., MEES, I. M., 2013. *Practical Phonetics and Phonology. A Resource Book for Students*. 3rd ed. London and New York: Routledge.
- CRUTTENDEN, A., 2014. *Gimson's Pronunciation of English*. 8th ed. New York: Routledge.
- DAWSON, J. E., 2003. An acoustic analysis of obstruents and vowel durations in the interlanguage English of native speakers

- of Modern Greek. *Proceedings of the 6th International Conference of Greek Linguistics*, 18-23 September 2003. Available from: <http://www.philology.uoc.gr/conferences/6thICGL/ebook/d/dawson.pdf>. [Accessed 11 April 2018].
- DELATTRE, P., 1962. Some factors of vowel duration and their cross-linguistic validity. *The Journal of the Acoustical Society of America*, 34 (8), 1141–1143.
- EMBARKI, M., 2016. Voicing Effects an Absolute Universal or Language Specific: New Evidence from Modern Arabic. Available from: https://www.academia.edu/4950569/Vowel_Clippling_in_English, 1–4. [Accessed 12 May 2018].
- GONET, W., STADNICKA, L., 2006. Vowel Clipping in English. *Speech and Language Technology*, 8, 77–86. Available from: https://www.academia.edu/4950569/Vowel_Clippling_in_English. [Accessed 11 April 2018].
- HOUSE, A. S., 1961. On vowel duration in English. *The Journal of the Acoustical Society of America*, 33 (9), 1174–1178.
- KAREEM, B. I. G. A.-R. F. A.-R., 2015. Shortening in English as recognized by Iraqi EFL learners at the university level: a perceptual study *. *Journal of Basra Researches for Human Sciences*, 40 (3), 45–74. Available from: https://bhums.iraqjournals.com/article_126444.html. [Accessed 11 April 2018].
- KO, E.-S., 2007. Acquisition of vowel duration in children speaking American English. *Interspeech-2007*, 1881–1884.
- MCMAHON, A. M. S., 2002. *An Introduction to English Phonology*. Edinburgh: Edinburgh University Press.
- MITLEB, F., 1982. Voicing effect on vowel duration is not an absolute universal. *The Journal of the Acoustical Society of America* 71 (S1), 1881–1884. Available from [Accessed 11 April 2018].
- MUGITANI, R., PONS, F., FAIS, L., DIETRICH, C., WERKER, J. F., AMANO, S., 2009. Perception of vowel length by Japanese- and English-learning infants. *Developmental Psychology*, 45 (1), 236–247.
- SCHEER, T., 2017. Voice-induced vowel lengthening. *Papers in Historical Phonology*, 2, 116–151.
- SKARNITZL, R., ŠTURM, P., 2016. Pre-fortis shortening in Czech English: a production and reaction-time s study*. *Research in Language*, 14 (1), 1–14. Available from: <https://content.sciendo.com/view/journals/rela/14/1/article-p1.xml>. [Accessed 11 April 2018].
- TAUBERER, J., EVANINI, K., 2009. Intrinsic vowel duration and the post-vocalic voicing effect: Some evidence from dialects of North American English. *Proceedings of Interspeech 2009*, 2211–2214.
- WELLS, J., 1990. Syllabification and allophony. In: *Studies in the Pronunciation of English, a Commemorative Volume in Honour of A.C. Gimson*. Ed. S. Ramsaran. London: Routledge.
- YONEYAMA, K., KITAHARA, M., 2014. Voicing effect on vowel duration: corpus analyses of Japanese infants and adults, and production data of English learners. *Journal of the Phonetic Society of Japan*, 18 (1), 30–39.
- YUN, I., 2018. A study of the preconsonantal vowel shortening in Chinese. *Phonetics and Speech Sciences*, 10, 39–44.
- ZAJĄC, m., 2013. Phonetic imitation of vowel duration in L2 speech. *Research in Language*, 11 (1), 19–29. Available from: <https://content.sciendo.com/abstract/journals/rela/11/1/article-p19.xml>. [Accessed 11 April 2018].

Sources

Cambridge English Pronouncing Dictionary. 18th ed. Cambridge University Press 2011, v.1.0.

Tools

BOERSMA, P., WEENINK, D., 2018. *Praat: doing phonetics by computer* [Computer program]. Version 6.0.37. Available from: <http://www.praat.org/>.

