

---

## GEMINATION STRATEGIES IN L1 AND ENGLISH PRONUNCIATION OF POLISH LEARNERS

**ANDRZEJ PORZUCZEK**

University of Silesia, Katowice  
andrzej.porzuczek@us.edu.pl

**ARKADIUSZ ROJCZYK**

University of Silesia, Katowice  
arkadiusz.rojczyk@us.edu.pl

### Abstract

Polish is a language where true geminates appear and the occurrence of a double consonant letter in spelling corresponds with double or at least prolonged consonant articulation regardless of the morphological structure of the word. The above principle also concerns most borrowings, such as the English word ‘hobby’, for instance. In English, true geminates do not occur and a morpheme-internal double consonant letter is only a fairly reliable indication of the way the preceding vowel should be pronounced. This discrepancy may lead to negative transfer in Polish learners of English. Our recent research of native Polish speech (Rojczyk and Porzuczek, in press) generally confirmed the results reported by Ladefoged and Maddieson (1996), among others, who found geminates to be 1.5-3 times longer than singletons. In our study we investigate the influence of double consonant letters on L1 and English pronunciation of Polish learners. They read trochaic family names containing intervocalic <nn>. Each name is preceded by a first name suggesting the nationality (Polish, English, German or Italian) of the person mentioned. By placing each tested item in a Polish and an English semantically and rhythmically equivalent sentences (This is .../To jest...), we measure the level of consonant length variation with respect to the language in which the potential geminates appear, the language context and the learning experience of the students. In this way we collect evidence and formulate observations concerning the learners’ awareness of the status of geminates in various languages and the probability of transfer in EFL learning.

### 1. Introduction

Double consonant letters in written Polish regularly refer to geminates, which are realised phonetically by relatively longer duration or, less frequently, rearticulation. Italian is another example of a ‘geminating’ language, while English and German only allow fake, non-contrastive geminates. Double consonant letters usually indicate a consonant preceded by a short/lax vowel. Such examples as ‘lenis’ vs. ‘leanness’, where a within-word geminate can create lexical contrast are extremely rare. Therefore, transferring the L1 habit of lengthening or, especially, rearticulating double-letter consonants into a ‘non-geminating FL’ leads to pronunciation problems.

The Polish speakers' pronunciation of potential geminates in family names seems to depend on the perceived origin of the name. *Villas* or *Callas* are more often pronounced with a double (prolonged) /l/, while /l/ in *Miller* is rarely geminated. Similarly, we expect a short /n/ in *Kenner* and a long /n/ in *Senna*.

## 2. The phonetic features of (Polish) geminates

Polish has attested geminate consonants both within a word and across the word boundary. Geminate sequences within a word may be contrastive with singletons, e.g., *leki* 'medicines' - *lekki* 'light', *pana* 'gentleman's' - *panna* 'maiden', or *ceny* 'prices' - *cenny* 'precious' (Pająk 2009; Rubach 1986; Rubach and Booij 1990; Sawicka 1995; Thurgood 2002; Zajda 1977). In the corpus of 12650 words Kozyra (2008) found 157 geminates of all types. The most common were sonorants in intervocalic positions, such as *wanna* 'bathtub', *panna* 'maiden', *fontanna* 'fountain', *gamma* 'gamma', *ballada* 'ballad', *mulla* 'mullah', *horror* 'horror'. No sonorant geminates were observed word-initially, and sequences such as /jj/ occurred only across the morpheme boundary. Obstruent geminates were attested both word-initially, e.g., *ssak* 'mammal', *dżdżownica* 'earthworm', as well as in intervocalic positions, e.g., *getto* 'ghetto', *oddać* 'give back'.

The phonetic realization of Polish geminates is conditioned by factors such as tempo, hypo- or hyper-articulation, segmental context, morphological structure, etymology of a word, or the degree of assimilation (Kozyra 2008). Thurgood (2001) reported that another factor influencing the production of geminate sequences may be the voicing of geminate consonants. In this study voiceless geminate affricates /tʃtʃ/ were more often produced as rearticulated than the voiced /dʒdʒ/. Later, Thurgood and Demenko (2003) looked into the production of geminate affricates in pairs such as *Grecy* 'the Greeks' - *greccy* 'Greek' (Pl.), *lecie* 'summer' (Loc.) - *lećcie* 'fly' (Imp.), *uczę* 'I teach' - *uczczę* 'I will celebrate'. They reported a 68% rate of rearticulation in those geminates. Most recently, Rojczyk and Porzuczek (in press) analysed the production of nasal geminates /nn/ both within a word and across the word boundary and found that the vast majority of such sequences had single continuous articulation; in fact only 3.8% of the measured tokens were rearticulated. Those results stand in contrast to Kozyra's (2008) observation that contemporary Polish exhibits a tendency for recurrent rearticulation of geminates.

The durational parameters of Polish geminates together with neighbouring sounds appear to be largely underresearched, especially compared to languages such as Japanese (Kawahara in press), and have been taken up by only a few studies. Thurgood and Demenko (2003) reported the ratio of singletons to singly articulated geminates as 1: 1.7. Malisz (2013) found the singleton-to-geminate ratio to be 1: 2.4 for stops and 1: 2.1 for fricatives. Voicing was reported to contribute to the observed ratios: voiced consonants contributed to higher singleton-to-geminate ratios. Rojczyk and Porzuczek (in press), in the analysis of nasal geminates /nn/, found the singleton-to-geminate ratio to be 1: 2.8 for word-internal geminates and 1: 2.4 for word-boundary geminates. Even fewer studies have investigated durational variability of vowels neighbouring geminate consonants. Malisz (2013) found that vowels preceding geminates were longer by 12 ms for stops and by 17 ms for fricatives relative to those preceding singletons. No post-geminate vowel duration variability was observed in the same study. Thurgood (2002) reported

lengthening of vowels following geminates in *wozi* ‘transports’ and *wwozi* ‘brings in’ by the ratio of 1: 1.4. However, in the 22% of the measured instances the pattern was reversed: vowels following singletons were longer than those following geminates. In the study by Rojczyk and Porzuczek (in press) vowels preceding the singleton /n/ were shorter (73 ms) than those preceding word-internal geminate /nn/ (85 ms). However, when geminates straddled the word boundary /n#n/, the preceding vowels were not significantly longer (76 ms) than those preceding singleton /n/. The durational variability of vowels following singletons and geminates was not attested.

To our knowledge, there is only one study investigating gemination in the English spoken by Poles. Thurgood (2003) had the Polish learners perform two tasks to analyze the production of English affricate geminates across the word boundary: repetition of sentences and responding to multiple choice questions. The results revealed that a gemination strategy was correlated with the proficiency level. Contrary to the predictions, more advanced learners produced more Polish-like singly articulated affricates than intermediate learners. It was taken by Thurgood (2003) to suggest that intermediate speakers had paid more attention to the phonetics of the English cues and thus produced more rearticulated affricates.

### 3. The current study

In the current study, we investigated how advanced Polish learners of English pronounce potential nasal geminates in Polish, English, German and Italian family names embedded in Polish and English sentences. This allowed us to observe the learners’ realisation of double-letter consonants in native and foreign words and how it depends on the language they are speaking. Considering this, we formulated the following research questions:

- How consistent are Polish speakers in signalling Polish geminates?
- How much do the geminates differ in length from singletons?
- Do Polish speakers make a distinction between ‘geminating’ and ‘non-geminating’ languages?
- Does the realisation depend on the origin of the tested word (Polish, English, German, Italian)?
- Does it depend on the language they are speaking (Polish, English)?

#### 3.1 Participants

The participants were thirty-six native speakers of Polish, all of them second-year undergraduate students in the Institute of English, University of Silesia. They ranged in age from 20 to 22 years. None of the subjects reported any speech or hearing impediments. There were twenty-four females and twelve males.

### 3.2 Materials

The tested items were phonologically similar Polish, English, German and Italian family names containing the letter combination <nn>. Each name was preceded by a first name suggesting the nationality (Polish, English, German or Italian) of the person mentioned, and followed by a sentence indicating those people's home towns.

Placing each tested item in a Polish and an English semantically and rhythmically equivalent sentences (This is .../To jest...) made it possible to measure the level of consonant length variation with respect to the language in which the potential geminates appeared and the language context. The actual sentence list used in the study was thus as follows:

Polish:

To jest Paweł Senna. Mieszka w Łodzi.  
 To jest Colin Senner. Mieszka w Luton.  
 To jest Helmut Senner. Mieszka w Dreźnie.  
 To jest Bruno Senna. Mieszka w Rzymie.  
 To jest Paweł Cena. Mieszka w Łodzi.  
 To jest Tomasz Kammel. Mieszka w Łomży.

English:

This is Paweł Senna. He's from Warsaw.  
 This is Colin Senner. He's from London.  
 This is Helmut Senner. He's from Hamburg.  
 This is Bruno Senna. He's from Venice.  
 This is Paweł Cena. He's from Warsaw.  
 This is Tomasz Kammel. He's from Cracow.

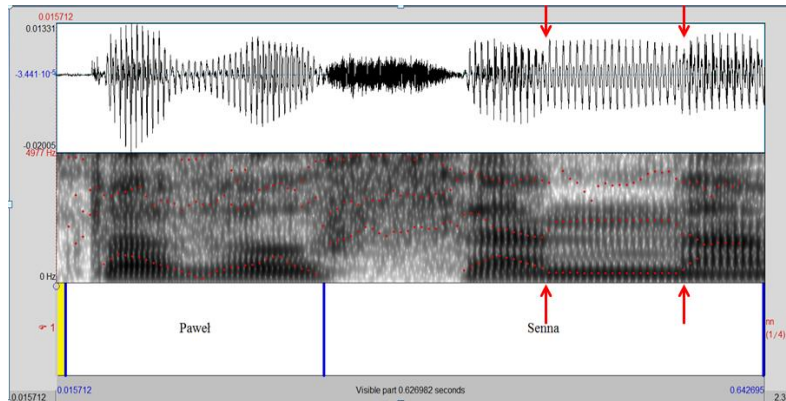
The last example in each set was added to avoid the list effect. The Polish family name *Cena* /'tɛna/ in the penultimate sentence was used to establish the personal baseline singleton duration.

### 3.3 Procedure and recording

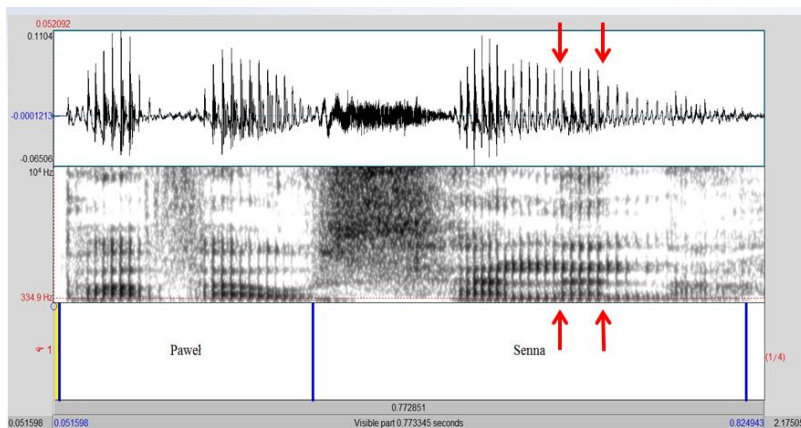
The sentences were presented as a printed list. The participants were given time to get acquainted with the material. They were instructed to read in their normal speaking style and to repeat any disfluent examples. The recording took place in the Acoustic-Phonetic Laboratory at the Institute of English, University of Silesia in a sound-proof booth. The signal was captured with a headset dynamic microphone Sennheiser HMD 26, positioned approximately 20 cm at an angle from the speaker's mouth, preamplified with USBPre2 (Sound Devices) into .wav format with the sampling rate 48 kHz, 24-bit quantisation.

### 3.4 Measurements

The analysed productions were inspected as waveforms and spectrograms in Praat 5.3.10 (Boersma 2001). Boundaries between a vowel and a nasal consonant were identified by a drop or rise in acoustic energy, changes in F1, diminishment or enhancement of F2 and the intensity of higher formants (Fig. 1). The rearticulation of geminates was identified by the presence of higher formants in the spectrogram (Fig. 2).



**Figure 1:** Intervocalic nasal geminate in *Senna*



**Figure 2:** Nasal rearticulation in *Senna*. A vocalic segment (between red arrows) separates nasal consonants

## 4. Results

### 4.1 Rearticulation

As mentioned in the introduction, rearticulation can appear in slow and careful speech. We identified three such cases (cf. Fig. 2), provided by two speakers.

### 4.2 Absolute nasal duration

The mean durations of /n(n)/ in individual words differed with respect to the word origin and the language of carrier phrases. Table 1 shows a slight tendency to prolong /n/ in English and German words, and significant ( $\approx 90\text{ms}/>100\%$ ) lengthening of /n/ in Polish and Italian words in Polish speech. In the English speech of the learners the mean duration of the nasal in English and German words did not differ from the singleton. Polish and Italian words were pronounced with an average nasal 50% longer than the singleton.

word\carrier	Polish	English
Senna (POL)	157	93
Senner (ENG)	80	54
Senner (GER)	83	54
Senna (ITA)	151	86
Cena (POL singleton)	64	57

**Table 1:** Mean durations (ms) of /n(n)/ in tested items

The mean singleton durations were similar in Polish and English contexts.

### 4.3 Individual tendencies

The tendencies shown in 4.2 are also reflected in Table 2, which presents the number and proportion of respondents who lengthened the nasal consonant spelt with <nn> (G) by more than 50ms with respect to the singleton (S) in *Cena*.

word\carrier	Polish	English
Senna (POL)	32 (89%)	13 (36%)
Senner (ENG)	6 (17%)	1
Senner (GER)	7 (19%)	0

word\carrier	Polish	English
Senna (ITA)	30 (83%)	12 (33%)

**Table 2:** The number of responses with G-S>50ms. N=36

The data suggest a clear distinction between ‘geminating’ and ‘non-geminating languages’ made by the participants. An overwhelming majority (83% and 89%) significantly lengthened /n/ in *Senna* in Polish phrases but the duration of /n/ in *Senner* in an English or German phrase only once (by a minimum of 51ms) exceeded the length of the corresponding singleton. With respect to the carrier language, 33-36% of the participants retained a long /n/ in *Senna* in English, while 17-19% applied gemination to *Senner* in Polish sentences.

After the presentation of basic descriptive statistics in sections 4.2-4.3, more detailed statistical analysis follows in section 4.4.

#### 4.4 Statistics

A two-way independent repeated-measures ANOVA was designed to analyze the geminate durations both in absolute and relative measures. The first independent variable was the language of carrier phrases with two levels (Polish, English). The second independent variable was the word origin with four levels (Polish, English, German, Italian). The relative measure was calculated as the ratio of geminate duration to singleton duration. The statistics will be first reported separately for each carrier language and then the interaction between the two carrier languages will be calculated.

The main effect of the word origin on absolute geminate duration in ms in Polish sentences was highly significant [ $F(2, 105)=65.05, p<.001$ ]. The Post Hoc Bonferroni tests revealed that the significant effect was contributed to by a clear pattern of individual differences in which /nn/ sequences in both Polish ( $M=157; SE=6.87$ ) and Italian ( $M=151; SE=7.94$ ) words were significantly longer ( $p<.001$ ) than the same sequences in English ( $M=78; SE=6.98$ ) and German ( $M=83; SE=6.91$ ) words. No significant differences were found between Polish and Italian, and English and German (both  $p=ns$ ).

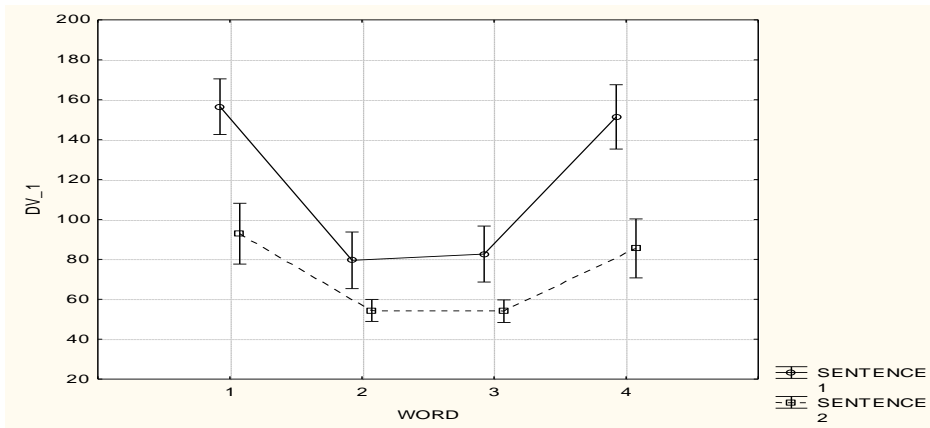
The relative geminate-to-singleton ratio in Polish sentences also produced a highly significant main effect of the word origin [ $F(3, 105)=58.87, p<.001$ ]. The Post Hoc Bonferroni tests showed the same pattern of significant differences as in the case of absolute measures. Namely, Polish ( $M=2.5; SE=0.14$ ) and Italian ( $M=2.4; SE=0.14$ ) words had a larger geminate-to-singleton ratio ( $p<.001$ ) than English ( $M=1.2; SE=0.1$ ) and German ( $M=1.29; SE=.01$ ) words. Again, no significant differences were found between Polish and Italian, and English and German (both  $p=ns$ ).

There was the main effect of the word origin on absolute duration in ms in English sentences [ $F(3, 105)=18.421, p<.001$ ]. As shown below, the pattern of differences was very similar to the one calculated for Polish sentences, however the durations of /nn/ geminates were observably lower for Polish and Italian. The Post Hoc Bonferroni tests indicated that Polish ( $M=93; SE=7.5$ ) and Italian ( $M=86; SE=7.27$ ) words had significantly longer geminates ( $p<.001$ ) than English ( $M=54; SE=2.72$ ) and German

( $M=54$ ;  $SE=2.79$ ) words. No significant differences were found between Polish and Italian, and English and German words.

There was also the main effect of the word origin on the geminate-to-singleton ratio in English sentences [ $F(3, 105)=14.9$ ,  $p<.001$ ]. As in the case of absolute measures in ms, the Post Hoc Bonferroni tests revealed a clear pattern in which the /nn/ geminates in Polish ( $M=1.7$ ;  $SE=0.16$ ) and Italian ( $M=1.6$ ;  $SE=0.15$ ) had a larger ratio ( $p<.001$ ) than the geminates in English ( $M=1$ ;  $SE=0.06$ ) and German ( $M=1$ ;  $SE=0.15$ ). No significant difference was observed between these two groups of languages.

The interaction between Polish and English sentences, and the absolute duration of geminates in ms in the words from the four languages was highly significant [ $F(3, 105)=12.13$ ,  $p<.001$ ].

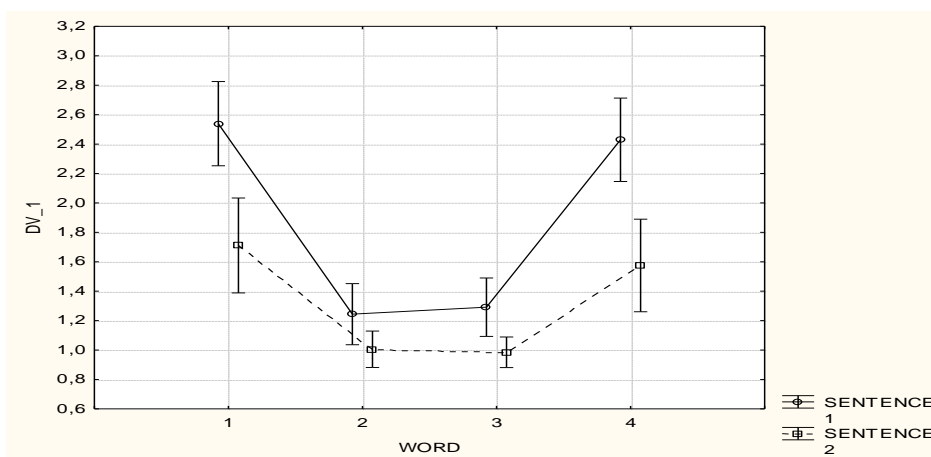


**Figure 3:** The interaction between the sentence language (1 Polish; 2 English) and the word language (1 Polish; 2 English; 3 German; 4 Italian) in ms.

As shown in Fig. 3, the interaction is mainly contributed to by significant decreases in durations of geminates in Polish and Italian in English sentences compared to Polish sentences ( $p<.001$ ). A significant, however less pronounced, decrease is also observed for geminates in English and German words in English sentences compared to Polish sentences ( $p<.001$ ).

The analysis of the geminate-to-singleton ratio showed a similar significant interaction between the language of sentences and the words [ $F(3, 105)=9.2$ ,  $p<.001$ ].





**Figure 4:** The interaction between the sentence language (1 Polish; 2 English) and the word language (1 Polish; 2 English; 3 German; 4 Italian) in the geminate-to-singleton ratio

Similar to the absolute measures, the interaction is contributed to by lower ratios for Polish and English in English sentences compared to Polish sentences ( $p < .001$ ). However, in the case of the relative ratio, the Post Hoc Bonferroni tests did not show significant differences of /nn/ geminates in English and German words between Polish and English sentences ( $p = ns$ ).

## 5. Discussion and conclusions

Polish learners of English significantly (1.5-4 times) prolong intervocalic nasal consonants indicated by a double letter in Polish words. Polish and Italian, contrary to English and German, are perceived as ‘geminating’ languages, which is reflected in the subjects’ production. Polish and Italian names were pronounced by Polish learners with significantly longer /n/ than English and German ones. Gemination was inhibited in English contexts but the distinction between the ‘geminating’ languages (Polish, Italian) and the ‘non-geminating’ ones (English, German) was still noticeable.

Interestingly, an observable proportion of native Polish speakers (4 in 36 in the present study) may tend to degeminate double consonants. In their responses all the nasal consonants were within a 50-ms range, while the other subjects varied the duration of their nasals within ranges exceeding 100ms, except two (81ms and 96ms). This might indicate a general tendency in Polish speakers, which would need to be verified by investigating the production of various age groups. Moreover, a perception study could be carried out in order to attempt to establish a possible durational threshold of nasal geminate recognition.

## References

- Boersma, P. 2001. Praat, a system for doing phonetics by computer. *Glot International* 10: 341-345.
- Kawahara, S. (in press). The phonetics of obstruent geminates, *sokuon*. In S. Shibatani and K. Taro (eds.), *Handbook of Japanese Language and Linguistics*. Berlin: Mouton Gruyter.
- Kozyra, A. 2008. Geminaty w językach słowiańskich. *LingVaria* 1(5): 257-266.
- Ladefoged, P. and Maddieson, I. 1996. *The sounds of the world's languages*. Oxford: Blackwell Publishers.
- Malisz, Z. 2013. Speech rhythm variability in Polish and English: A study of interaction between rhythmic levels. Ph.D. Diss., Poznań: University of Adam Mickiewicz.
- Pająk, B. 2009. Contextual constraints on geminates: The case of Polish. *Proceedings of the 35th Annual Meeting of Berkley Linguistic Society* 35.
- Rojczyk, A. and Porzuczek, A. (in press). *Acoustic features of nasal geminates in Polish*. Paper presented at the APAP conference, Maria Curie-Skłodowska University, Lublin.
- Rubach, J. 1986. Does the obligatory contour principle operate in Polish? *Studies in the Linguistic Sciences* 16: 133-147.
- Rubach, J. and G. E. Booij. 1990. Edge of constituent effects in Polish. *Natural Language and Linguistic Theory* 8(3): 427-463.
- Sawicka, I. 1995. Fonologia. In H. Wróbel (ed.), *Gramatyka Współczesna Języka Polskiego. Fonetyka i Fonologia*. Kraków: Instytut Języka Polskiego PAN: 105-195.
- Thurgood, E. 2001. The phonetic realization of phonologically geminate affricates in Polish: The long and short of it. *Speech and Language Technology* 5: 9-19.
- Thurgood, E. 2002. The recognition of geminates in ambiguous contexts in Polish. *Speech Prosody 2002*: 659-662.
- Thurgood, E. 2003. Affricate gemination in the English of Polish speakers. A study in second language variability. *Journal of the Acoustical Society of America* 113: 2330.
- Thurgood, E. and G. Demenko. 2003. Phonetic realization of Polish geminate affricates. In M. J. Solé, D. Recasens, and J. Romero (eds.), *Papers in Honor of Frederick H. Bengelman on the Occasion of the Twenty-Fifth Anniversary of the Department of Linguistics, CSU Fresno*. Fresno: Department of Linguistic, California State University: 129-139.
- Zajda, A. 1977. Some problems of Polish pronunciation in the Dictionary of Polish Pronunciation. In M. Karaś and M. Madejowa (eds.), *Słownik Wymowy Polskiej / The Dictionary of Polish Pronunciation*, L-LXII, Warszawa: Państwowe Wydawnictwo Naukowe.