Predictors of the Czech learners' acquisition of selected English phonemes

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Abstract

The study investigates predictors of the acquisition of selected English phonemes in a foreign language context. University students' pronunciation was diagnosed by two tests; their ability to produce seven selected phonemes was assessed. Furthermore, data regarding the students' learning histories was obtained through a questionnaire. Then a multiple regression analysis was conducted in order to identify predictors of the acquisition of the selected phonemes. The analysis uncovered several factors, the most significant being pre-school exposure to English and positive attitudes to English in adolescence, which appeared to influence the subjects' pronunciation positively. Interestingly, several factors which relate to learning English at school appeared to exert a negative influence on the acquisition of the selected phonemes. Furthermore, the study underscored the importance of metacognition in relation to autonomous learning.

Key words: English as a foreign language, pronunciation, segmental features, acquisition predictors, age factor, attitudes, gender, learning contexts

1. Introduction

The majority of Czech learners acquire English as a foreign language (FL) in a monolingual environment which makes it highly demanding or nearly impossible to acquire English at the level of an educated native English speaker. Though aiming at one's pronunciation being intelligible has recently been a preferred target (Brinton, 2012), there are many FL learners who "*do* aspire to native speaker models" (Brinton, 2012, p. 251; in the Czech context e.g. Černá et al., 2011; Pištora, 2015). A monolingual learning setting requires even more strenuous efforts on the part of learners of English who strive for perfection in English pronunciation as they have always been affected by their peers' non-native production of English pronunciation, non-native English teachers' pronunciation, and by the choice and use of teaching/learning materials unless: (a) they happen to be among the lucky ones who have had teachers of English, be they non-native or native speaker teachers of English, who created favourable conditions for the acquisition of pronunciation; (b) they invest their energies into fighting back against the linguistic influence of monolingualism and into searching for other ways to acquire standard English pronunciation.

Culturally and politically, in the Czech Republic the conditions for attaining good English pronunciation are more than favourable. English has secured its position within the curriculum, being the prioritised first foreign language, which pupils start to learn in grade 3 at the latest (MŠMT, 2016, p. 144). A command of English in general and of its pronunciation is highly valued within Czech society, very often there is parental pressure on learners to acquire English as early as possible (Černá, 2015). There are plentiful opportunities to learn or brush up one's English pronunciation with minimum resources or extra financial resources thanks to the internet making its resources more accessible to the public, and learners might be intrinsically motivated to improve their English in order to succeed in their professional lives. The way English sounds appeals to Czech teenagers; they listen to English songs on a daily basis and are motivated to follow and understand their lyrics (Černá, 2016, pp. 81-83).

2. Theoretical background

The literature suggests that a wide variety of factors influence pronunciation acquisition. These factors either concern individual learners or are socially bound. The classification of influential factors below is inspired chiefly by Szalkowska-Kim (2014, pp. 14-15) and Kenworthy (1987, pp. 4-8) but also by some other authors:

- native language;
- intro- and extraversion of a personality; motivation (instrumental, integrative (Szalkowska-Kim, 2014), "achievement motivation", i.e. "concern for good pronunciation" (Kenworthy, 1987, p. 8); risk-taking; age; gender; brain hemisphere specialisation (Szalkowska-Kim, 2014);
- auditory and articulatory skills, i.e. musicality (Szalkowska-Kim, 2014), phonetic ability (Kenworthy, 1987); individual learning strategies: training; individual styles and cognitive skills: (a) cognitive abilities such as the ability to concentrate, long- and short-term memory, speech processing efficiency; (b) cognitive processes employing skills such as, for example, working phonological memory efficiency (Szalkowska-Kim, 2014), etc.;
- experience in L2 (in this study meaning English both as a second and foreign language) usage; stay in an English-speaking country;
- type of writing; alphabet (Volín, 2010); orthography (Volín, 2010);
- level of socialisation; acceptance into society, distance, pressure; membership of a social group or class (Szalkowska-Kim, 2014), specifically the "group affiliation" factor (Kenworthy, 1987, p. 8);
- feeling of identity; prestige of a dialect or language (Crystal, 2010; Kenworthy, 1987; Szalkowska-Kim, 2014);
- education; conditions related to L2 acquisition: use of L2 in class and in real communication situations; influence of multilingualism in a society (Szalkowska-Kim, 2014);
- schooling system, methods of language teaching; over-reliance on the written form of a language (Szalkowska-Kim, 2014); setting a realistic and adequate pronunciation goal with respect to the needs of a group of foreign language learners (Kenworthy, 1987, p. 9) ranging from intelligible and comprehensible pronunciation to near-native pronunciation;
- different conditions of exposure to L2 (Kenworthy, 1987); the role of ICT and media; the concern of English teacher(s) for learners' pronunciation (Kenworthy, 1987, p. 8); the role of English teachers who are native speakers of English and their non-native counterparts (Medgyes, 1999).

Because all the informants in this study share the same mother tongue as all of them are native speakers of Czech, L1 is not a variable in this study, though it undoubtedly influenced the process of the acquisition of English pronunciation and phonemes in particular (Ivanová, 2016). In this study, however, we choose to consider selected extralinguistic factors which appear to be relevant to the acquisition of English phonemes: internal factors (the age factor, gender, attitudes toward the English language and toward learning English) and contexts of learning. These factors are considered since they contributed to inter-individual differences among the Czech learners' histories of learning English (Černá, 2016). Furthermore, this study is a continuation of the research into possible influences on the Czech students' acquisition of selected English phonemes (Ivanová & Černá, 2016).

2.1 The age factor

Given the topic of the study, it is essential to discuss how the starting age influences L2 acquisition. Such an influence is complex; Ellis (2015) distinguishes the effect of age on ultimate attainment, the rate of acquisition, and the route of acquisition. In this study, the effect of age on ultimate attainment is of interest, more specifically the possible effects of early exposure to English on the acquisition of selected English phonemes.

The relationship between the beginning of L2 learning and the successful acquisition of L2 pronunciation lies at the heart of the Critical Period Hypothesis (CPH) (Lenneberg, 1967, in Harley, 1986). The existence of such a "biological timetable" (Brown, 2007, p. 57) was postulated by Penfield and Roberts (1959, in Harley, 1986), who proposed the Critical Period Hypothesis (CPH) and who are also proponents of the so-called brain plasticity hypothesis. They attribute a diminished ability to learn an L2 to the loss of brain plasticity between nine and twelve years of age. Recently, researchers have rather referred to a "sensitive period" and used "critical period" only to denote a special category of sensitive periods resulting from irreversible changes in the brain (Knudsen, 2004, in Hummel, 2014, p. 170).

There is also a lack of consensus among researchers concerning the end of the sensitive period. Lenneberg (1967, in Harley, 1986) is persuaded that at about thirteen years of age learners arrive at the end of the sensitive period and its closure is related to "a loss of adaptability and inability for reorganization in the brain" (p. 5). Herschensohn (2013), having summarised more recent research, maintains no terminus position, but some other scholars propose that the end of the sensitive period might vary, depending on the aspect of language under investigation. For example, Granena and Long (2012, in Ellis, 2015) propose that the window of opportunity closes first for L2 phonology (perhaps as early as at four years old), then for lexis and collocation, and finally (in the mid-teens) for grammar. Consequently, post-pubertal learners might find it rather difficult to get rid of their foreign accent.

Further on, pre-school learners may seem to have a "better ear" for English because: (a) all the input which they are exposed to at the pre-school age is spoken and, unlike older learners, they are used to processing spoken input in real time; (b) in listening and follow-up speaking in most cases there is no interference of the written form of English as Czech orthography, unlike English, is very phonemic (Volín, 2010); (c) learners at this age are accustomed to learning new features of language; consequently they might be better at, and more flexible in, the development of pronunciation skills, which are termed by Kenworthy (1987) as "'aptitude for oral mimicry', 'phonetic coding ability' or 'auditory discrimination ability'" (p. 6). It may be concluded by quoting Ellis (2015) that "child learners are likely to rely on implicit learning [see Section 2.4] while older learners are likely to make use of explicit learning" (p. 34).

The research findings which have been reported so far originate in the second language environment. It means that learners learn the target language in the environment in which it is spoken (Gass & Selinker, 2008). The question is, however, whether they are applicable in foreign language settings, in which, according to Cameron (2001), learners have "very little experience of the language outside the classroom" (p. 11) and the contact with the target language is limited to "several hours of teaching in a school week" (p. 11). This concerns some studies in the Japanese educational context, which confirmed that younger learners outperformed older ones in their phonological skills (Oyama, 1976) and in their perception of unfamiliar foreign phonemes (Tahta et al., 1981).

Moreover, Ojima et al. (2011a), using multiple regression analyses, explored the relationship between the effects on 350 Japanese children over a three-year period of their age at the time of their first exposure to English and their total hours of exposure. They concluded that the total hours of exposure contributed to the improved proficiency of 6-9-year-olds more than the age of their first exposure, which did not prove to be a decisive factor in lexical learning and semantic processing in the auditory modality. This seems to contradict the underlying principles of the phonological bottleneck hypothesis (Ojima et al., 2011b), because younger learners are more sensitive to FL sounds they are supposed to acquire and process auditory input more successfully than older learners (Yamada et al., 1980). As a result, Ojima et al. (2011a) agree with Carroll (1967), who asserts that the amount of exposure to English is a more important variable in the attainment of a higher level of phonological proficiency than the age at the time of the first exposure.

Regarding the pronunciation-oriented studies conducted in the Czech context, Ivanová and Černá (2016) conclude that the acquisition of selected English phonemes does not correlate with the number of years of FL instruction. Those who started to learn English earlier at school did not outperform those who started later in producing English phonemes. Thus, the effects of an early start seem to be eclipsed by the influence of other variables.

2.2 Gender

Regarding the effects of gender on the acquisition of pronunciation, the research results are inconclusive. As concerns overall L2 pronunciation accuracy, it does not seem to be affected by gender, as Piske et al. (2001) found out in their study of Italian-English bilinguals. There are also studies which report that women tend to use more prestigious and standard forms (Ellis, 2008, p. 146). Concerning segmental pronunciation features, Hariri (2012) concludes in her review of the literature that females produce more accurate and clear consonants, but otherwise there are no significant differences in pronunciation between men and women.

2.3 Attitudes toward the English language and toward learning English

Though attitudes toward the English language and toward learning English at school (i.e. to the school subject) were not explicitly mentioned among the factors influencing the acquisition of pronunciation, nevertheless, they are inbuilt in the construct of integrative motivation (Gardner, 1985). Attitudes in general develop during the process of socialisation; therefore, the family, the school class, and the peer group are the main influences. In the second language environment, as pointed out by many authors (e.g. Brown, 2007; Gardner, 1985), positive attitudes to the target language and the target language culture are believed to enhance the outcomes of language acquisition. As concerns the foreign language environment, there are several studies which investigated Czech basic and/or secondary school learners' attitudes to English. Rendl and Škaloudová (2004) surveyed 500 basic school pupils from Prague schools and found out that only 5.4 per cent of the pupils considered English their favourite school subject, while 13.4 per cent chose it as the one they liked least. Similarly, Hrabal and Pavelková (2010) were interested in Czech learners' perceptions of school subjects, including English, and concluded that the learners (in grades 6 to 9) perceived English as a moderately popular subject which is rather difficult but very important. Černá (2016) explored the relationships between learners' attitudes toward the English language and toward learning English while at basic and secondary school, which turned out to be statistically significant (pp. 88-90), as well as the relationship between attitudes toward English and the learners' engagement in individual autonomous English-related activities (pp.

89-90). Apart from that, she also examined sources of positive attitudes and the sound of English turned out to be one of them (Černá, 2016, p. 76).

2.4 Contexts of learning

Learning a language is either explicit or implicit. Explicit learning is a conscious process which takes effort and strategic expertise (Dörnyei, 2009, p. 136). It means that learners consciously and deliberately attempt to master some material or solve a problem. Unlike explicit learning, implicit learning is more difficult to define since the term is used with multiple meanings. Dörnyei (2009, p. 138) summarises the main properties of implicit learning: (a) bottom-up mechanisms are involved in language processing; (b) there is no conscious attempt to learn the target material; (c) learners are not aware of learning; (d) implicit learning is an automatic process; (e) learners lack awareness of the result. On top of that, a temporal dimension may be added since implicit learning needs a substantial amount of time (Ellis, 2005; Ellis, 2015).

Explicit and implicit learning, being "dissociable but cooperating" systems (Ellis, 2005, p. 305), cooperate in various ways; for example, explicit learning increases the overall level of accuracy of implicit knowledge (Dörnyei, 2009). Thus, the two systems contribute to the development of different aspects of language proficiency and, consequently, it is desirable to create balanced learning opportunities.

Even though it is not possible to make straightforward links between the types of learning and a particular context, it is possible to hypothesise that learning in a formal context, i.e. at school, will mainly offer opportunities for explicit learning. Implicit learning, which happens in fluent communication, will probably not be extensive in the majority of learning situations.

In relation to formal (basic and secondary) education, we took into consideration the following characteristics: the grade in which learners started compulsory English learning; whether the school was located in a village or in a town, and the number of non-native speaker (NNS) and native speaker (NS) English teachers the respondents experienced.

The grade is deemed to be a variable because prior to the curricular reform, which introduced a new system of curricular documents (Greger & Walterová, 2007), the learners varied considerably in terms of the number of years of formal education in English they received. Though a previous study did not confirm the hypothesis (Ivanová & Černá, 2016), this study investigates the potential significance of the variable in a complex model. The same applies to the number of NNS and NS teachers, who are considered especially in relation to the input they are likely to provide.

Exposure to English may be perceived in terms of its quantity (Kenworthy, 1987; Ojima et al., 2011a) and quality (Ellis, 1997). The nature of the study, i.e. a retrospective longitudinal study, minimised the characteristics of formal education which could be explored, and therefore only the quantity of input is discussed. While Czech NNS teachers vary noticeably in the amount of target language they provide (Najvar et al., 2013), it has been suggested that NS teachers provide massive exposure to English, which, according to the conclusions of Turnball and Arnett (2002, in Ellis, 2008), leads to higher achievement by learners, theoretically in pronunciation, too. Lastly, the location of a school in a town or a village was deliberated because it may also be linked to the availability of NS teachers.

Contrary to formal learning, learning in an informal context, i.e. using English for communication outside school without the intention to learn, may engage learners in implicit learning to a considerable extent, depending on the situation. The use of English for the following purposes is considered in the study: (a) reading magazines; (b) reading books; (c) watching TV series, films, and videos; (d) listening to songs in English; (e) listening to radio programmes (e.g. the BBC); (f) playing PC games; (g) browsing the internet; (h) communication via social networks; (i) e-mail communication; (j) personal encounters with English-speaking friends; (k) talking to English-speaking friends via Skype; (l) translating (e.g. lyrics), and (m) self-study.

Moreover, some learners experienced a stay in an English-speaking country, during which they had an opportunity to interact with NSs. However, not all of them used the chance and were proactive in interaction with NSs (Černá et al., 2016). Consistently with Ellis (2015), there is an assumption that those learners who have been involved in implicit learning for a long period of time should achieve a higher level of proficiency since, in the long run, implicit learning wins out.

3. Research design

This section will discuss the research design of the study, including, first, the two research instruments, then the research aims and questions, the procedure, and finally, the results.

3.1 Research instruments

Two different types of research instruments were deployed in the study: a questionnaire and two pronunciation tests.

3.1.1 Questionnaire

In order to elicit the data regarding individual learners' learning histories, a questionnaire was constructed as a research instrument (Černá, 2016) and used for data collection in autumn 2013. The questionnaire contained 62 items. Most of the items were closed (77%); four different formats were used, depending on the nature of the required response: categorical items, multiple-choice with one possible answer or with several possible answers, and a Likert-type scale (Švec, 2009). The remaining questions were open-ended (23%).

The content of the questionnaire is divided into six sections. The first section is introductory and focuses on the respondents and their family background. Each of the following sections targets a specific period of the respondents' lives (pre-school period (up to the age of six); basic school (BS) period (6 to 15); secondary school (SS) period (15 to 19); the period between the maturita exam and admission to university) and, lastly, a specific context of learning (informal learning).

The last section will be introduced in detail. It aims to find out about the subjects' experience of English outside school, more specifically, about the real-life activities in which the respondents might have used English. The activities constitute three groups (Table 1): (1) comprehension-based activities (a-e) in which the subjects were exposed to target language input and no production was required on their part; (2) activities (h-k) in which they used English to interact with other speakers, and (3) specific activities: playing PC games (f), browsing the internet (g), translating (l), and self-studying (m). Browsing the internet might

also be included in the first group, since it is mainly about comprehension, but because of its close link to ICT, it is considered as a specific category.

Table 1
Use of English in real life

Group 1 Comprehension-based activities	Group 2 Interaction-oriented activities	Group 3 Specific activities
(a) Reading magazines	(h) Communication via social networks	(f) Playing PC games
(b) Reading books	(i) E-mail communication	(g) Browsing the internet
(c) Watching TV series, films, videos	(j) Personal encounters with English-speaking friends	(l) Translating (e.g. lyrics)
(d) Listening to songs in English	(k) Talking to English-speaking friends via Skype	(m) Self-study
(e) Listening to radio programmes (e.g. BBC)		

The respondents indicated what they used English for in real life and how often while at basic and secondary school. The frequency was expressed using the following scale:
1 – never, 2 – occasionally, 3 – weekly, 4 – daily.

It was specified in the instructions that the subjects should not consider those activities which are somehow related to learning at school (e.g. reading books as a home assignment). The aim is the activity itself, not learning English. However, self-study is included as an option. Obviously, the aim of self-study is to progress in English but the decision to study is autonomous – not initiated by the teacher.

The questionnaire was successfully piloted from May to August 2013 and the reliability of the instrument was checked using the test-retest method. Since all the correlations revealed a very good or excellent agreement ($0.837 \leq r_p \leq 0.999$), the questionnaire was considered reliable enough to be administered to the first cohort of subjects.

3.1.2 Pronunciation tests

The pronunciation accuracy of seven English segmental features was examined. They are the front open vowel ash, the weak central mid vowel (schwa), the voiced and voiceless dental fricatives, the bilabial approximant /w/, the velar nasal, and the pronunciation of word-final voiced consonants. In their research-based studies Černá, Urbanová, and Vít (2011), Volín and Poesová (2008), and Nádraská (2013) indicated these phonemes as being troublesome for university learners of English who want to become teachers of English.

Each of 112 learners was asked to carry out two reading-aloud tasks which were designed with the aim of enabling the pronunciation analysis of the seven pronunciation features in the context of a text and in isolation.

The diagnostic passage consisted of 153 words, out of which 98 were different words. Although the learners read the whole text, the pronunciation of 24 words was analysed. These words appeared in the second reading-aloud task. Words such as *had*, *that*, however, had to be

read as weak forms of function words (Roach, 2009) in the context of the passage, unlike their pronunciations as individual words in the second reading-aloud task.

The second reading-aloud task drew on a list of 24 words: *lamp, watch, bag, had, locking, away, again, long, that, bag, everything, suspected, away, threw, twenty, planned, thought, they, bed, waited, again, everything, suspected, then*. Out of the 24 words 19 were different, so the words *bag*, *away*, *again*, *everything*, and *suspected* were read twice.

3.1.2.1 Control corpus

The British (BBC English) and American (General American) standards as represented in Wells' Longman Pronunciation Dictionary (2008) served as a point of reference for pronunciation analysis because, first, this supplied the assessor with acceptable standard pronunciations of the same word in two pronunciation varieties and, second, the dictionary includes model sound files of BBC English and General American pronunciations of individual words.
Moreover, the choice of the control corpus is also relevant to the subjects' personal goals of pronunciation learning. Most of them want to acquire, although few of them succeed in doing so, a near-native pronunciation in English, doing their best to achieve either of the above-mentioned standards. Neither English as a lingua franca (Jenkins, 2007) nor global English (Crystal, 2010) is considered a suitable pronunciation model for would-be teachers of English.

3.1.2.2 Assessment procedure

To ensure good-quality recordings, the Sound Forge Pro 10 software was used. This software allowed multiple listenings of a chosen sequence and the slowing down of the chosen sequence of each recording.

The analysis was carried out using auditory assessment by one university teacher who is a non-native speaker of English and whose mother tongue is Czech. The assessor was not the students' regular teacher as the students came from three different universities in the Czech Republic. The assessor listened to each recording several times during each of two rating periods and assessed the same sample of recordings after a brief period of time and in a rearranged order, as suggested by Bachman (2004), with intra-rater reliability α=0.63.

The pronunciation assessment drew on dichotomous data; the individual pronunciation features were scored right-wrong (Bachman, 2004). That means each correctly pronounced feature was assigned one point, while each incorrectly produced phoneme was classified as zero. One word, e.g. *bag*, represented two test items: the front open vowel ash and the word-final voiced consonant; as a result, the reader could get two points. For reading the passage aloud the student might achieve a maximum of 36 points, representing 36 pronunciation items; the same holds for reading the list of words aloud. Both pronunciation scores per individual student were added and averaged in order to achieve the final score per each student, maximum=36 points.

The results are shown in Table 2 and prove that the distribution of scores is nearly perfectly symmetrical as the mode (20), median (20), and mean (20.33036) are approximately the same. As for the indicators of variability, there is a wide range between the lowest and highest score (29), standard deviation is provided as the indicator of variability (S=4.569161).

Table 2
Descriptive statistics of grouping averaged scores (N=112).

Mean	Max.	Min.	Median	Mode	Stan. dev.	Range
20.33036	33	4	20	20	4.569161	29

In order to categorise the data from the point of view of each individual pronunciation feature, seven pronunciation categories were established (Cf. Table 3). For example, all the words containing /æ/ (lamp, bag, had, that, planned) were put under one heading, and then the total number of correct pronunciations was counted and afterwards calculated as percentages, that is, difficulty indices telling us "how a given group of individuals performed on average on a particular item" (Bachman, 2004, p. 122). In both reading-aloud tasks the difficulty indices (p_i) were calculated and then their means. Table 3 shows that the segmental features that were inspected proved to be of varying degrees of difficulty. The Czech learners experienced most problems with the production of the velar nasal in the word final position, the schwa, the voiced dental fricative in word-initial position, and the front open ash, while they were more successful at the production of the voiced consonants /g/, /d/ in word-final position, the bilabial consonant /w/, and the voiceless dental fricative.

Table 3
Mean p_i of individual segmentals in both reading aloud tasks (N=112).

Phoneme	ŋ	schwa	ð	æ	voiced g, d	w	θ
Words	long, locking, everything 2x	again 2x, away, suspected 2x	then they that	lamp, bag 2x, had, that, planned	bag 2x, had, bed, suspected 2x, waited, planned	waited, watch, away, twenty	threw, thought, everything 2x
mean p_i	43.40	47.79	47.80	49.03	60.68	63.39	81.74

3.1.2.3 Aims of the study and research questions

The questionnaire provided a comprehensive characterisation of the subjects' learning histories and some of the characteristics are assumed to have the potential to influence the acquisition of the selected English phonemes. So the aims of this study are to answer the following questions:

1. Which variables influenced the acquisition of the selected English phonemes?
2. What is the strength of the relationship between the acquisition of the selected English phonemes and independent variables?
3. Which of these chosen variables, if examined separately, best predict the appropriate acquisition of the selected English phonemes?

3.1.2.4 Subjects

The subjects in the study were Czech students in their first year of English language teacher education study programmes at Czech universities in České Budějovice, Olomouc, and Pardubice. The cohort includes 112 subjects, 67 per cent females, 33 per cent males; the average age is 20.2 years. However, the original cohort of 112 questionnaire respondents who

at the same provided pronunciation data was reduced to 84 subjects for the purposes of multiple regression analysis because some data was missing; in the case of the *t*-test and Spearman's correlation coefficient the number of students varied from 110 to 112.

3.1.2.5 Procedure and results

In order to answer the research questions the method of multiple regression analysis (Hair et al., 2014, pp. 151-230; Meloun & Militký, 2002, pp. 514-516; Hebák et al., 2005, pp. 34-55; Ellis, 2012, pp. 55; Hendl, 2012, p. 383) was used. In order to carry out regression model analysis and produce graphs, the R language was employed (The R Project for Statistical Computing, https://www.r-project.org/). Multiple regression is used to predict the values of a dependent variable, here the acquisition of selected English phonemes, from two or more independent variables (Brown, 1988, p. 147), here generated by the questionnaire.

First, we searched for an optimal model by eliminating the number of independent variables with the least influence over the acquisition of the selected English phonemes (Hebák et al., 2005, pp. 103-112), such as the respondents' age, the parents' ability to communicate in English, the mothers' education, attitudes toward English and learning English, attendance of an English language course outside BS, and a stay abroad while at BS and also after the maturita exam. The remaining variables are outlined in Table 4.

Table 4
Multiple Regression Model

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Residuals:
    Min      1Q  Median      3Q     Max
-8.2597 -2.1062 -0.7125  2.1499  8.4883

Coefficients:
                   Estimate Std. Error t value Pr(>|t|)
(Intercept)        18.94064    8.71008   2.175  0.03564 *
Gender_1b          -5.25358    1.98676  -2.644  0.01164 *
LocationBS_4ab      3.11499    3.74550   0.832  0.41054
LocationBS_4b      -2.21416    1.94945  -1.136  0.26281
LevelEng_5         -1.01379    1.21692  -0.833  0.40975
FatherEdu_9        -0.99355    1.44620  -0.687  0.49604
PreschoolExp_10b   -6.45390    1.35430  -4.765 2.49e-05 ***
EngStartGrade_20    1.37773    0.67499   2.041  0.04788 *
NoTsBS_21           1.01934    0.71066   1.434  0.15924
NoNTsBs_22         -4.94114    1.69603  -2.913  0.00583 **
PrivateBS_27b       3.05748    2.47398   1.236  0.22372
NoTsSS_38          -1.46392    0.65617  -2.231  0.03135 *
NoNTsSS_39         -1.60128    1.01340  -1.580  0.12196
AttEngSS_41        -4.45228    1.51547  -2.938  0.00546 **
AttLearnEngSS_42    1.95910    0.89487   2.189  0.03447 *
CourseSS_43b       -6.23923    2.11890  -2.945  0.00537 **
PrivateSS_44b       3.53107    2.09525   1.685  0.09972 .
StaysAbroadSS_47   -1.02323    0.52694  -1.942  0.05922 .
BS_ReadMagaz_60a   -0.51367    1.02692  -0.500  0.61967
BS_ReadBook_60b     2.10826    1.61408   1.306  0.19896
BS_WatchFilm_60c    3.74871    1.21752   3.079  0.00374 **
BS_ListenSong_60d   0.73320    1.22021   0.601  0.55131
BS_ListenRadio_60e -1.94801    1.55922  -1.249  0.21880
BS_PCgames_60f     -0.16136    1.09190  -0.148  0.88326
BS_Internet_60g    -3.05975    1.16252  -2.632  0.01200 *
BS_SocNetworks_60h  0.39622    0.94672   0.419  0.67781
BS_Email_60i        1.20754    1.32466   0.912  0.36745
BS_F2Fcom_60j       0.16904    0.99444   0.170  0.86588
BS_Skype_60k       -1.51181    1.47928  -1.022  0.31293
BS_Transl_60l       2.78607    1.13639   2.452  0.01868 *
BS_SelfStudy_60m   -2.40847    1.25041  -1.926  0.06121 .
SS_ReadMagaz_61a   -0.17365    1.53493  -0.113  0.91049
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SS_ReadBook_61b     0.90685    1.18936   0.762  0.45025
SS_WatchFilm_61c    1.61607    1.33709   1.209  0.23390
SS_ListenSong_61d   1.44357    1.44348   1.000  0.32329
SS_ListenRadio_61e -1.58400    1.01957  -1.554  0.12816
SS_PCgames_61f      0.24330    1.20741   0.202  0.84133
SS_Internet_61g    -0.06349    1.47534  -0.043  0.96589
SS_SocNetworks_61h -2.22632    1.10648  -2.012  0.05098 .
SS_Email_61i       -0.49299    1.09369  -0.451  0.65460
SS_F2Fcom_61j       2.71271    1.40207   1.935  0.06011 .
SS_Skype_61k        2.32674    1.28085   1.817  0.07678 .
SS_Transl_61l      -2.28246    1.05817  -2.157  0.03707 *
SS_SelfStudy_61m    2.96470    1.40011   2.117  0.04049 *
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 4.501 on 40 degrees of freedom
  (28 observations deleted because of missing data)
Multiple R-squared: 0.7233,     Adjusted R-squared: 0.4258
F-statistic: 2.431 on 43 and 40 DF, p-value: 0.002716
```

Within the reduced set of independent variables, “the degree of relationship among all variables and with each other” (Brown, 1988, p. 148) was investigated. As a result the multiple correlation (R) “between the dependent variable and different combinations of independent variables” (Brown, 1988, p. 148) was calculated. We arrived at the coefficients of the multiple coefficient of determination R-squared (0.7233) and adjusted R-squared (0.4258), which means that both indices suggest strong relationships among the variables higher than 0.35 (Hendl, 2012, p. 415). All the independent variables considered together explain 42.58 percent of the variability of the dependent variable, which is the acquisition of the selected English phonemes. The P-value of the F-test in the final set of independent variables is 0.002716.

In order to evaluate the quality of the regression model, the following diagnostic procedures were employed, the results of which are illustrated in four diagnostic plots in Figure 1 below; they show no pitfalls in terms of linearity, normality, homoscedasticity, and influential points (Hendl, 2012, pp. 282-292; Hebák et al., 2005, pp. 84-102; Meloun & Militký, 1998, pp. 399-442). On top of that the characteristics of residuals such as the minimum (-8.2597), maximum (8.4883), median (-0.7125), and first (-2.1062) and third (2.1499) quartiles point to the normal distribution of residuals.

On the basis of the regression model, 13 statistically significant variables were identified as having an impact on the acquisition of the selected English phonemes with significant codes ranging from 0 to 0.05 ($0<p<0.05$ with $N=84$). As shown in Table 4, among those independent variables the most significant is pre-school exposure to English ($p=0.0000249$). At the one percent significance level it is followed by watching films, TV, TV series, and videos while at BS ($p=0.00374$), attendance of an English course while at SS ($p=0.00546$), and positive attitudes toward the English language while at SS ($p=0.00374$). In the event of being taught by a native-speaker teacher(s) while at BS ($p=0.00583$) the relationship is negative, i.e. the more native-speaker teacher(s) the respondent experienced while at BS, the worse the pronunciation results they displayed in the observed pronunciation phenomena.

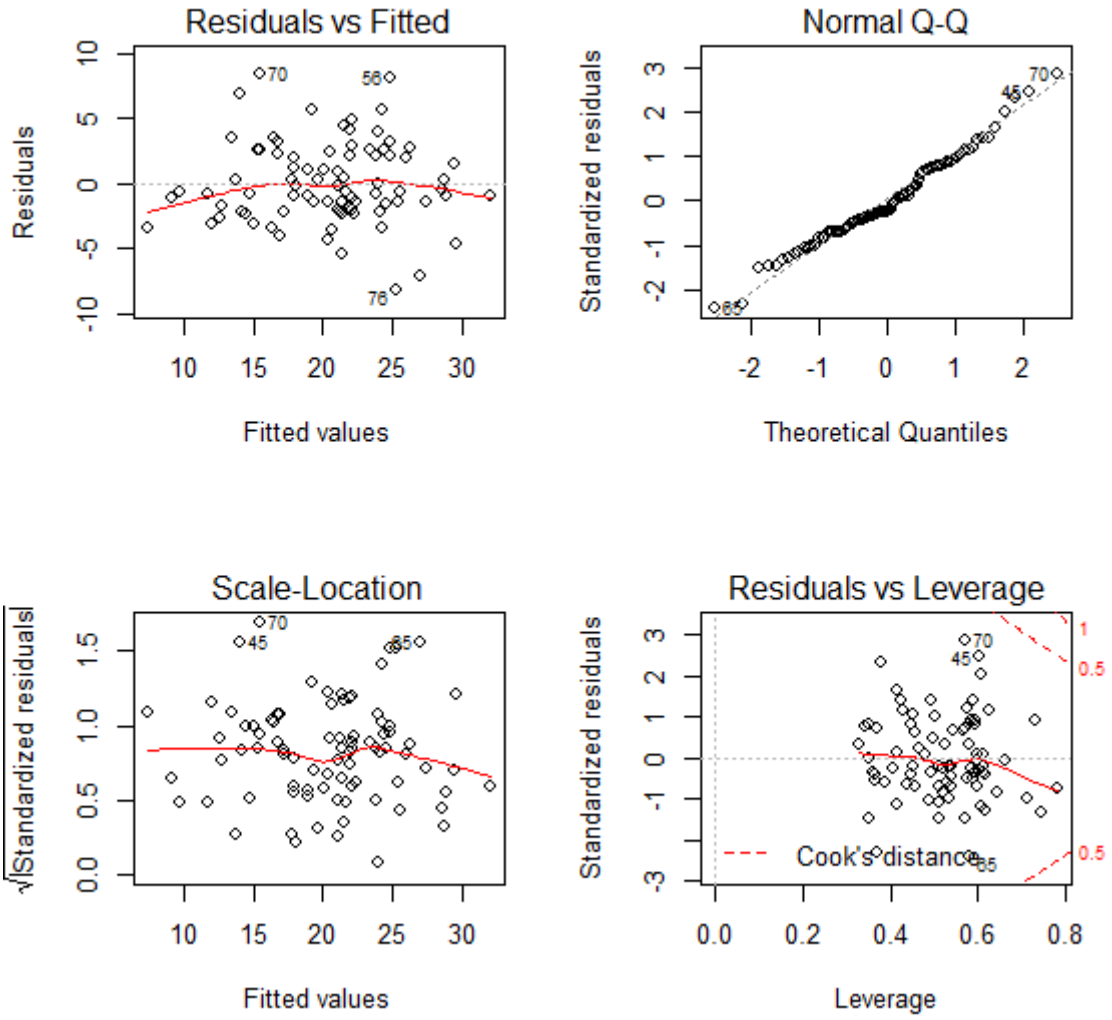

Figure 1. Diagnostic plots

At the five percent significance level (p=0.05), the following variables affect the pronunciation in question. The respondents' gender (p=0.01164) favours men over women, and translating, mostly song lyrics, while at BS (p=0.01868), and self-study while at SS (p=0.04049) have a positive influence on the acquisition of the selected phonemes in English. On the contrary, surfing the internet while at BS (p=0.01164), as well as the number of teachers of English while at SS (p=0.03135), translating, mostly song lyrics, while at SS (p=0.03707), the duration of formal instruction in English (p=0.04788), and positive attitudes toward English as a school subject (p=0.03447) have a negative influence on the acquisition of the selected phonemes.

Taking into account only the statistically significant variables stemming from the multiple regression model, we tried to identify the independent influence of individual variables on the acquisition of the selected English phonemes employing a *t*-test and Spearman's correlation coefficient.

T-test and Spearman's correlation coefficient results

A *t*-test was employed as it does not require extremely large samples (Brown, 1988, p. 165). We received answers concerning their exposure to English at pre-school age from 112 (37 men, 75 women) respondents, out of whom 43 were exposed to English, and data concerning students' attendance of an English course while at SS from 110 respondents, out of whom 14 took part in such an activity.

In the case of categorical variables (the respondents' gender, pre-school exposure to English, attendance of an English course while at SS) the pronunciation results are always normally distributed (tested by Shapiro-Wilk's test). Consequently, Student's two-sample *t*-test was used to verify the equivalence of the means of two independent samples (the equivalence of variances was tested by an F-test). The *t*-test confirmed the significance solely in the case of pre-school exposure to English. The average pronunciation score of those who were exposed to English before entering BS (21.9535) is statistically significantly higher (p=0.01634) than the scores of those who were not exposed to English at pre-school age (19.3188). In the case of gender, although on average the males achieved slightly better results (20.7838) than the females (20.1067), the difference is insignificant (p=0.59258). Similarly, the respondents who attended an English course while at SS showed better pronunciation results in the acquisition of selected English phonemes (22) than those who did not (20.1563), but there is no significant difference (p=0.26028) between the above-mentioned groups.

As far as numerical variables are concerned, no normal distribution was identified with the exception of pronunciation scores (tested by Shapiro-Wilk's test). Therefore, in order to explore the relationship between the numerical variables and the dependent variable of the acquisition of the selected phonemes, Spearman's correlation coefficient was deployed. Positive attitudes toward the English language turned out to be the only statistically significant influence on the acquisition of the pronunciation features in question (p=0.0216).

4. Discussion

Before discussing the results, it should be stated that we are well aware of the limits of the retrospective study, which investigated learners' subjective perceptions: (a) no possibility of validating the data; (b) the impossibility of addressing some issues, e.g. the quantity of the target language input they were exposed to while at BS. Furthermore, regarding the assessment of the learners' pronunciation, there are also obvious limits: (c) inevitable selectiveness in terms of focus; (d) the assessment procedure being conducted by a single assessor, though strategies were used to check the reliability of the assessment.

The variables whose influence was identified as statistically significant will be discussed first. The significant influence of pre-school exposure, which was identified using both methods of analysis, seems to be consistent with the theory proposing the existence of the sensitive period for L2 learning. Importantly, it is vital to emphasise that in this study pre-school exposure does not equate to the onset of formal instruction. Nevertheless, some of the respondents first encountered English on a pre-school course. The exposure was mediated by family members, including English-speaking relatives, media, or course teachers; however, we cannot draw conclusions about the quantity and quality (both NS and NNS) of the input.

Learners' watching films, TV series, and videos while at BS appeared to have influenced their pronunciation significantly as well. Since this concerns learners up to the age of 15, the finding seems to support the idea that the sensitive period does not have any definite terminus (Heschersohn, 2013); the exposure to English up to the age of 15 obviously played a role. We

cannot draw any definite conclusions regarding the quality of the input they were exposed to; it was presumably native speaker English, including both standard and non-standard forms. Since the learners did not have to produce any language, they were in a safe environment, and at the same time they were intrinsically motivated to understand all kinds of speakers of English, and they took a risk in exposing themselves to English which might not be fully comprehensible to them. Their ability to distinguish target language phonemes was challenged, which contributed to the quality of their own production of those sounds.

Quite as expected, learners' positive attitudes to the English language while attending SS also positively influenced their acquisition of the selected English phonemes. This is consistent with the research findings proposing the impact of positive attitudes toward the target language and the target culture on overall L2 proficiency. Being tightly linked to motivation, the finding also confirms the role of this factor in pronunciation learning. Similarly to pre-school exposure to English, the influence of attitudes to the English language on the acquisition of selected individual sounds was confirmed by both methods of analysis.

Learners' attendance of a free-time English course while at SS turned out to be another significant factor which affected their acquisition of pronunciation in a positive sense. In order to explain the effect, several options will be considered. First, those who decided to attend such a course were driven by intrinsic motives, especially by the enjoyment stemming from the learning experience, which included learning pronunciation, too. Second, the course teachers put emphasis on teaching and learning pronunciation or provided an attractive model themselves. Thus, the learners' concern for good pronunciation increased, and this might have been facilitated by the teachers' positive feedback. Last, under different circumstances they might have lost their inhibitions about producing English, which also influenced their production of individual sounds.

Gender also appeared to have significantly influenced the pronunciation results; surprisingly, the men outperformed the women. The literature related to this issue either favours women or suggests no gender-related effects. In the context of our study, we attribute the results to the level of stress; though measures were taken to reduce it to a minimum, the female students most probably perceived the data collection as a formal test. Thus, they might have been influenced by "exam" stress more than the men, who may not have perceived the diagnostic testing as such an important event.

Among the variables with a significant and positive influence on the acquisition of the selected phonemes, translating while at BS is included. This is not surprising, because it was mainly about translating song lyrics. Listening to English songs, which was a popular daily activity of the learners (Černá, 2016, p. 81), generated their motivation to understand the lyrics. The activity thus included amounts of listening (i.e. exposure) coupled with a conscious attention to the meaning and form of English – apart from grammar and lexis the accuracy of English phonemes and their presentation in a continuous text.

The last factor to discuss is the learners' engagement in self-study, which appeared to have a positive and significant effect on their pronunciation. Though we do not know whether autonomous learning activities were targeted at pronunciation or not, the finding confirms the link between learners' metacognition and achievement.

As concerns the variables with a significant but negative influence on the respondents' acquisition of the selected English phonemes, they are mostly related to learning at school.

It was hypothesised that NS teachers would provide massive exposure to the target language, which might influence the learners' pronunciation. Nevertheless, this was not confirmed, since the number of NS teachers that the learners experienced while at BS appeared to have had a negative influence on their pronunciation. The reason may be that having a higher number of teachers actually meant a frequent turnover of NS teachers rather than a longer experience. Thus, learners were probably challenged by the accent of a particular NS teacher; before they got used to it, a new teacher with a different accent came. Furthermore, NS teachers might represent either of the standard pronunciation varieties, BBC pronunciation (RP), or General American, or might produce some non-standard variety. Then we do not know whether NS teachers were able to provide L2 input which was comprehensible to BS learners. One way to ensure the consistency of a desirable pronunciation model is by means of the choice of a qualified NS with appropriate pronunciation by the school in question or providing learners with recorded NS input featuring pronunciation with adequate quality.

Similarly, the number of NNS teachers the learners experienced while at SS had the same influence. The negative effects might possibly be linked to the inconsistency of input in terms of quality, possible differences in quantity, including the use of recordings, and also variations in the emphasis NNS teachers put on pronunciation.

Surprisingly, positive attitudes toward English as a school subject had a negative influence on the accuracy of pronunciation. It is possible that the subject may be perceived as being too easy, i.e. the low level of requirements may generate positive attitudes in some learners. Furthermore, the easiness of the subject may be enhanced by a possible negative backwash effect of the one-level common maturita exam, which might be perceived as being very easy by the students. However, the research sample is specific in that it consists of university students of English whose average common maturita score was 1.17 (Černá, 2016, p. 69).

Since the preceding three variables related to formal education were identified as having a negative effect (number of NS teachers at BS, number of NNS teachers at SS, positive attitudes toward English as a school subject) on learners' pronunciation, it is not surprising that the later they started their formal education in English, the better the pronunciation results they had. The students who "missed" the experience of learning English at school because of a delayed onset of formal instruction in this language actually benefited from it, at least in terms of pronunciation.

Lastly, surfing the internet while at BS turned out to influence pronunciation in a significant but negative way. The reason may be that the primary purpose of this autonomous activity on the part of the learners is to find personally relevant information about a topic. They process all kinds of input. Regarding texts, the written form of English obviously influences pronunciation because of the interference of the Czech language, which has a more obvious phoneme-grapheme correspondence. However, some internet input might also be spoken (the role of podcasts); there are many online videos providing simultaneous written and oral input while listening to songs, videos, stories, etc. Then the orthography of English might not function as an obstacle.

5. Conclusion

In the sample that was studied the most influential predictors of good results in the acquisition of selected English phonemes are exposure to English when the respondents were of pre-school age and positive attitudes toward the English language in young adulthood. These predictors have an impact on the acquisition of pronunciation, whether inspected in

combination with all the other selected independent variables (multiple regression model) or alone (*t*-test, Spearman's coefficient).

To summarise, the predictors of the acquisition of selected English phonemes are multiple; they constitute a mosaic of positive and negative influences originating in all contexts of learning and in all phases of life. Regarding positive influences, the most significant one is pre-school exposure to English, followed by exposure to English through media up to the age of fifteen, both of which influence the process positively. Furthermore, other positive influences are linked to learners' conscious effort to learn driven by positive attitudes to the English language. As concerns negative influences, there is an array of factors which are linked to formal education (number of NS teachers at BS, number of NNS teachers at SS, positive attitudes toward the school subject, onset of formal education). Moreover, surfing the internet in the earlier stages of learning English exerted a negative influence.

Applying a macro perspective, this study seems to suggest the following sequence of implicit and explicit learning: in order to acquire English phonemes, it seems beneficial for foreign language learners to go through a phase of implicit learning (with the onset before the age of six) before they start formal education in English. Towards the end of basic school, reflecting their cognitive development, they should start to engage in autonomous, conscious, and deliberate learning of particular elements of the language, including pronunciation.

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