ZSOLT GERGELICS

Diagnostic assessment of cross-linguistic pronunciation differences of Hungarian secondary grammar school students when reading contemporary literature

Abstract:
In case of Hungarian secondary grammar school students, the route that SLA and TLA take is quite characteristic as two foreign languages are learnt simultaneously. The languages subjected to scrutiny are Hungarian, English, German and French, which represent the contrast between true voice and spread glottis languages. Identical extracts of contemporary literature are presented to participants in their languages, their performances are recorded, transcribed and analysed. The findings should facilitate the identification of what the difficulties in learning the given L2 and L3 are and offer practical tools for improving pronunciation in foreign language education.
Keywords: SLA, TLA, aspiration, voicing, foreign language education

1. Introduction

The representation of laryngeal phenomena, especially voicing and aspiration, has drawn a lot of attention on phonological theory. Several authors have discussed what distinctive features would best describe the laryngeal contrasts found in the world's languages, including the discussions by Iverson & Salmons (2003), Keating (1996), Lisker & Abramson (1964), and Petrova et al. (2006) to name just a few. In what follows, I take the representations proposed in Petrova et al. (2006) as the basis for my discussion in that they suggest that so-called true voice languages represent the voicing contrast with the help of the feature [voice] while so-called spread glottis languages employ the feature [spread glottis] to do so.

Following Petrova et al. (2006) we assume that the feature [voice] is narrowly construed and is only used to characterize the contrast between negative and short-lag voice onset time (VOT). In languages such as Hungarian, Russian – as well as a number of Romance languages like French and Spanish, for instance –, the so-called 'voiced stops' are produced with vocal cord vibration often starting even before the closure is produced in all positions including word-initial. Voiceless stops in these languages have no vocal fold vibration but there is no aspiration either.

Following Petrova et al. (2006) we also assume that the feature [spread glottis] represents the contrast between short-lag and long-lag VOT in spread glottis languages. In such languages, e.g. English and German, 'voiced stops' are produced quite a different way from that in true voice languages. In such languages, there is no vocal fold vibration in 'voiced stops' unless they are in an intervocalic, or rather in an intersonorant, position. Thus, what are traditionally referred to as 'voiced stops' – or sometimes as lenis stops – in the literature are actually

voiceless, except when between sonorants. Spread glottis languages tend to have aspiration of what are referred to as voiceless – or fortis – stops. Also, as pre-pause obstruents are clearly not in intersonorant position, they cannot become (passively) voiced but remain voiceless – a phenomenon often dubbed final devoicing.

2. The present research

As the ultimate realisation of the phonological rules of a linguistic system, pronunciation in a foreign language represents an outer yet salient layer of one's language proficiency, which is highly susceptible to cross-linguistic influences, in particular when multiple languages are involved. In cases of Hungarian secondary grammar school students, the route that second language acquisition (SLA) and third language acquisition (TLA) take is quite characteristic as two foreign languages (L2 and L3) are learnt simultaneously following the acquisition of L1. The interactions between these languages are manifold due to the fact that not only does L1 influence L2 and L3, but also the latter ones may have a mutual effect on each other (Jessner, 2006). In addition, several influential criteria, e.g. typological similarity, cultural similarity, level of proficiency, frequency of use and status, must also be considered when examining their interference. The specific languages subjected to scrutiny are Hungarian (L1), English (L2/L3), German (L2/L3) and French (L3), which represent both genetic (Indo-European vs Uralic language) and phonological (true voice vs spread glottis languages) differences. In order to determine participants' linguistic background, which forms the basis for their categorisation, a profile questionnaire is set up that focuses on their age, gender, length of study of L2 and L3, age of language learning (LL) onset L2 and L3, the frequency of L2 and L3 lessons and possibly the duration and frequency of private lessons. Exposure to L2 and L3 according to students' timetable is also expected to trigger a priming effect. As an initial stage of the diagnostic assessment process, identical extracts of contemporary literature are presented to the participants in their respective languages. By having them read out the texts, a comparatively controlled environment ensures the validity of the findings. Results of the piloting period enables the modification of the scheme as well as launching less controlled steps of assessment i.e. topic-related free speech and complete spontaneous speech. Students' performances are recorded, transcribed and analysed so that commonalities can be pinpointed.

The findings of this cross-sectional research should facilitate the identification of what difficulties Hungarian students have to face regarding their given L2 and L3 and might indicate practical tools for improving pronunciation in Hungarian foreign language education.

2.1.1. Research questions and hypotheses

1. How are the laryngeal features [voice] and [spread glottis] represented in Hungarian secondary students' pronunciation of L2 and L3 with reference to their pre-assessed multilingual background?

1.1. Does the laryngeal feature [voice] as a distinctive phonological characteristic of the Hungarian language as L1 exert deteriorating effects on the realisation of stops in foreign languages as L2 and L3 representing the feature [spread glottis]?

1.2. Does the laryngeal feature [voice] as a distinctive phonological characteristic of the Hungarian language as L1 exert facilitating effects on the realisation of stops in a foreign language as L3 representing the same laryngeal feature?

1.3. Does the laryngeal feature [spread glottis] as a distinctive phonological characteristic of the German language as L2 exert facilitating or deteriorating effects on studying additional foreign languages as L3 representing the same and the opposite features?

1.4. To what extent do profile questionnaires based on language history account for individual differences?

1. If the laryngeal feature [voice] as a distinctive phonological characteristic of the Hungarian language as L1 exerts effects on studying foreign languages as L2 and L3 representing the feature [spread glottis], the realisation of stops in question will be deviating from the standard.

2. If the laryngeal feature [voice] as a distinctive phonological characteristic of the Hungarian language as L1 exerts effects on studying a foreign language as L3 representing the same feature [voice], the realisation of stops in question will be undeviating from the standard.

3. If the laryngeal feature [spread glottis] as distinctive phonological characteristic of the German language as L2 exerts effects on studying additional foreign languages as L3 representing the same and the opposite features, the realisation of stops in question will be undeviating or deviating from the standard.

3. Experiment

3.1. Participants

Having obtained a statement of acceptance from the secondary grammar school and handed out information leaflet, sixty-five participants from Zrínyi Miklós Gimnázium in Zalaegerszeg (Hungary) were recruited to participate in the research, all of them giving their, and in case of students under age their parents' preliminary written statement of consent. The sample at the

piloting stage was confined to thirteen secondary school students of the aforementioned educational facility. The reason for the inclusion of a smaller amount of students was, apart from detecting anomalies in the design of the experiment at the piloting stage, the measurement of school leavers that will not attend the secondary school next as of next school year starting in September 2022. The mean age of the sample was 18.5 years (range 17-20). As stated in school documents, participants were healthy individuals without any speech and reading disorders (e.g. dyslexia) or hearing impairment.

Key criteria for each participant was to use Hungarian as their L1. All students studied an aspirated language as L2 (n=13) but their L3 choice was divided between an aspirated (n=11) and a true-voice language (n=2). Participants were allowed to choose German or English as compulsory L2 in their schools and opt for German, English (in each year) and French or Italian (each in every second year) as L3. Due to the limited preference Italian was left out from the current study.

3.2. Procedure

3.2.1. Questionnaire

The profile questionnaire based on Li et al's language history questionnaire (2006) and Bunta's language background questionnaire (2012) was set up in L1 and consisted of questions relating to personal socioeconomic status (SES), L2 and L3. All personal data were to be given anonymously however a number in ascending order starting with 1 was added to each questionnaire so that they can be matched with the respective recordings. Personal questions affected age, gender (binary choice), L1 (if not Hungarian) and country of origin (if not Hungary). Additional subquestions followed such as their parents' L1 (if not Hungarian), country of origin (if not Hungary) and highest level of education (primary school, secondary school without matura exam but with a trade certificate, secondary school with matura exam, university/college).

Questions concerning L2 and L3 were identical but listed in visually well distinguishable sections as follows: giving the particular language officially learnt (as L2 and L3, respectively), starting age of language learning, self-assessment of one's own language knowledge in all four skills (using a Likert scale ranging from 'very poor' to 'nativelike'), self-assessment of one's own foreign accent (using a Likert scale ranging from 'no accent' to 'very strong accent'), attitude towards the given foreign language (using a Likert scale ranging from 'I hate it' to 'I like it very much'), weekly frequency of classes at school, weekly frequency of private lessons, duration of taking private lessons, time spent yearly in a foreign country related to the language

given, frequency of communication with native speakers related to the language given and time of activity spent in the given language (regarding listening to radio/watching TV, reading unrelated to studying, reading related to studying, reading on the internet and writing online texts). The final part of the questionnaire attempts to elicit if participants mix their languages and if so in what frequency.

3.2.2. Texts

In the selection of a suitable literary text familiarity to students, proper language, length and topic appropriacy to their age played the most important roles. Thus, Rowling's Harry Potter and the Sorcerer's Stone (1997) was chosen in all four languages. An extract equal to a single paragraph in the original text was randomly chosen in which the expected proportion of pre-voiced, short lag and long lag stop pairs (*/p/-/b/, /k/-/g/, /t/-/d/*) was not too low, i.e. the number of the highlighted positions was 23 in German as L2, 20 in English as L3 and 39 in French as L3. On the average, participants took less than a minute to read out each extract.

3.2.3. Recording

In order to assess participants' cross-linguistic pronunciation differences with special regard to the laryngeal features [voice] and [spread glottis], identical extracts were presented to them for reading out. This method provides a technique which is capable to pinpoint precisely the segmental variances at the productive level (Némethné Hock, 1998). L1 and exposure to L3 is expected to trigger a priming effect, consequently the order of languages in which the extracts were presented was one starting with L1 and moving towards the later started languages. All extracts were presented on a separate sheet and students were allowed to pause some seconds before moving on to the next extract. Their reading out was digitally recorded by using Samsung Voice Recorder version 21.3.01.22 developed by Samsung Electronics Co., Ltd. between 7th and 20th April 2022. Performances in all three languages for each student were saved in one single file named after the number they had been given when completing the questionnaire.

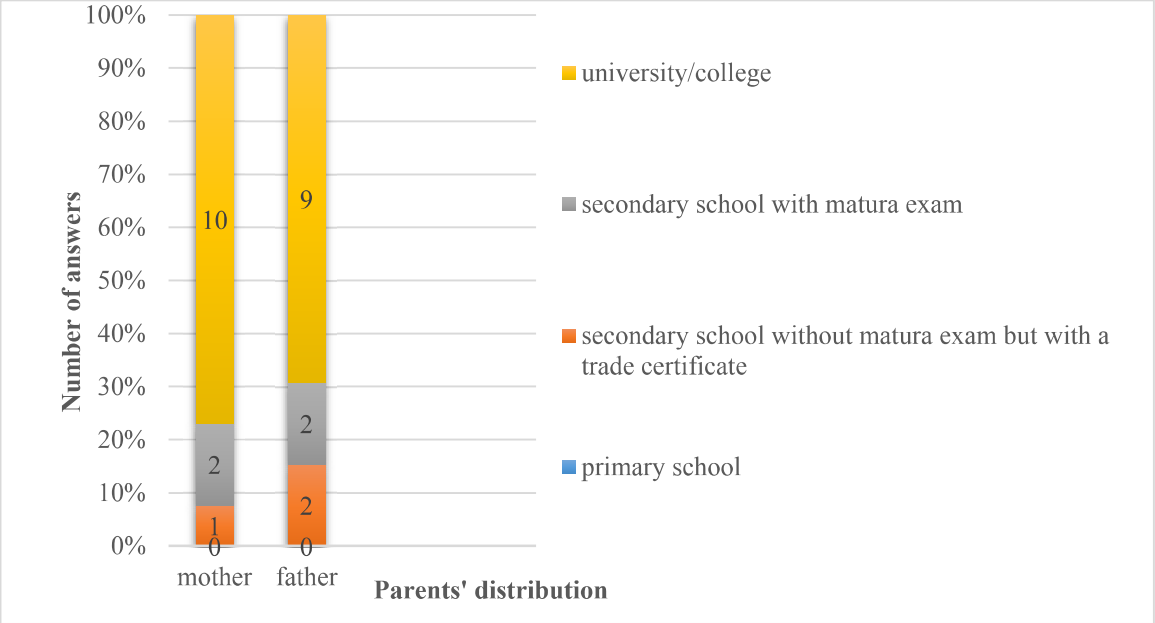
Students were instructed to speak loudly and clearly but without any efforts at a natural pace, reading mistakes were allowed. The recording device was put in front of them on the desk they were sitting at. Participants were recorded one by one only in the presence of the leader of the experiment. Furthermore, they were asked not to inform the others about the content and manner of the process. In this way a comparatively controlled environment was established to ensure the validity of the findings.

4. Results

4.1. Questionnaires

According to the questionnaire all participants' (5 males, 8 females) L1 was Hungarian and country of origin was Hungary and the same holds true for their parents, whose highest education tend to be predominantly 'university/college'.

Figure 1. The highest education of parents



All 13 students examined in the piloting stage studied German as their L2, however it turned out during the completion of the questionnaires that even though it was officially their first foreign language in the educational facility, some of them claimed to have studied another language earlier while others considered other languages as their primary/dominant foreign language despite the fact that German was their registered first language. L3 was predominantly English (n=11) with a minority of French (n=2). The starting age of L3 was overall later than that of L2.

Figure 2. Starting age of L2 and L3

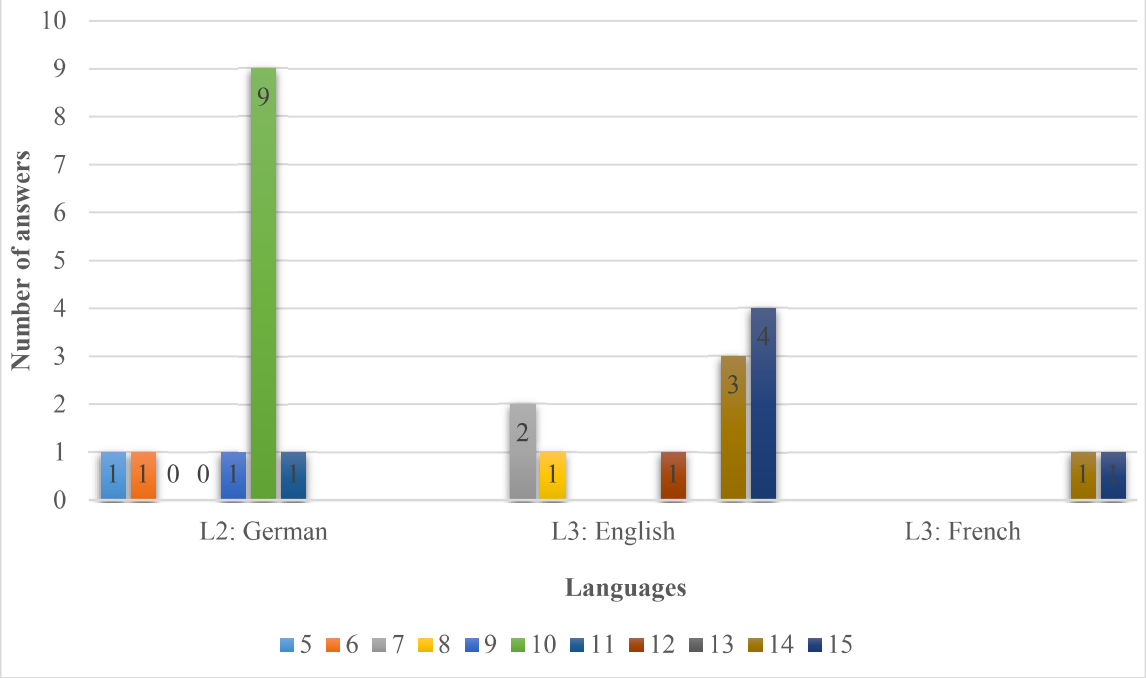


Figure 3. Self-assessment of L2 (German) mastery in all four skills

Figure 4. Self-assessment of L3 (English/French) mastery in all four skills

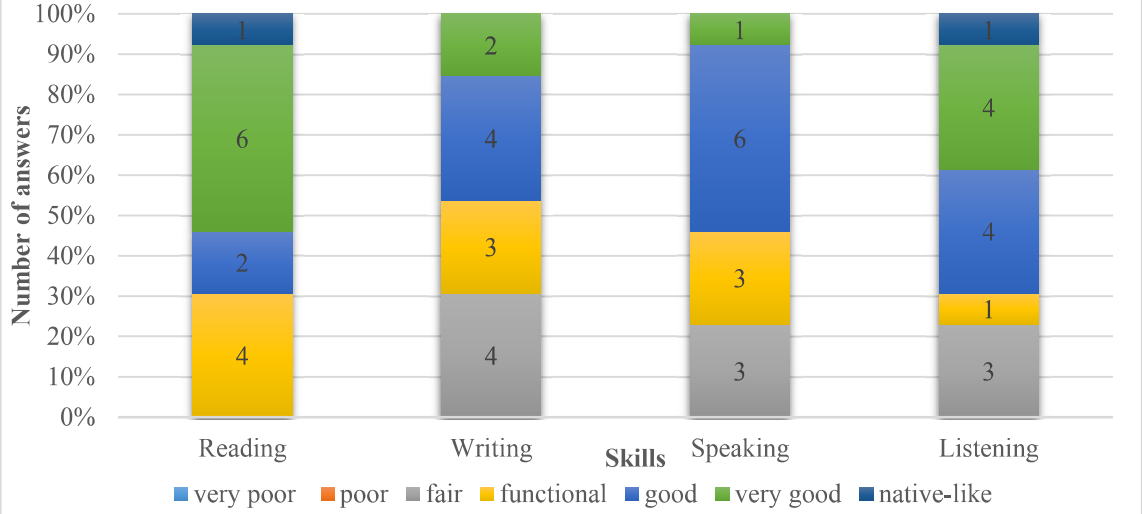


Figure 5. Self-assessment of foreign accent in L2 and L3

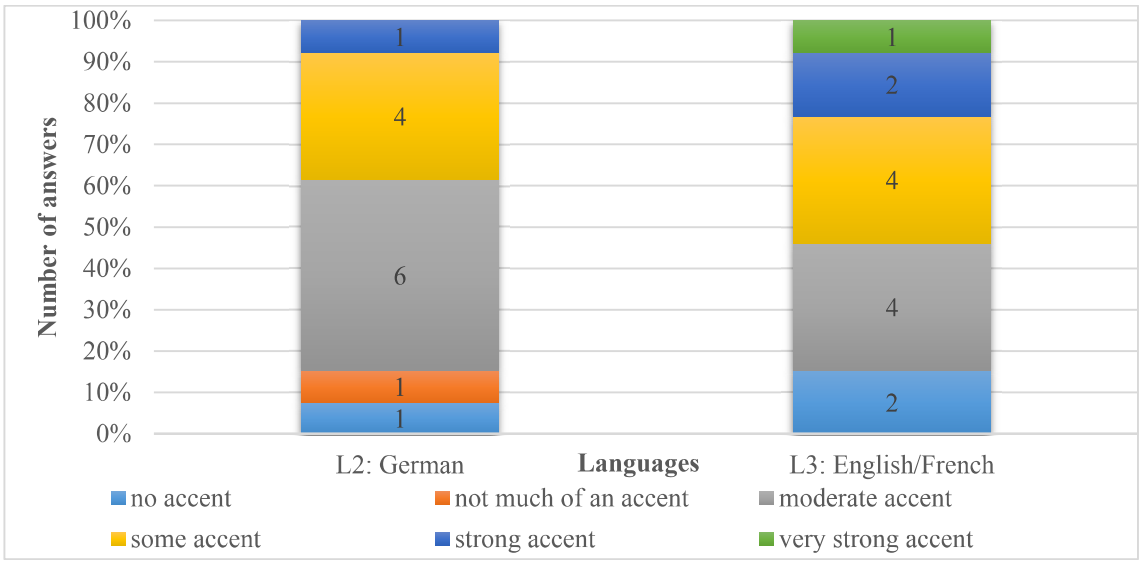
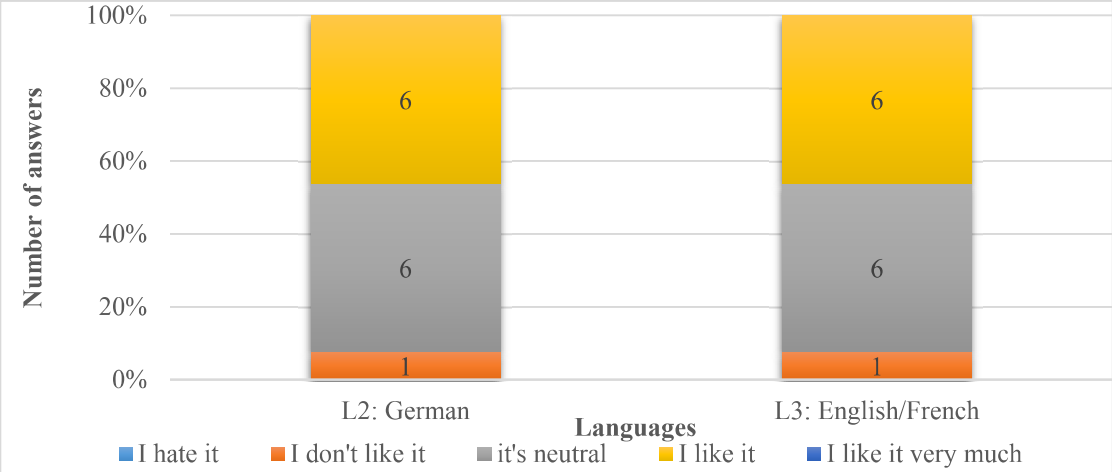


Figure 6. Attitude towards L2 and L3



Most students (n=12) have three lessons a week in their L2 and one of them does not have to attend classes any more due to former completion of the year's material. The tendency is the same for L3 as the majority of students (n=7) study it in three lessons, some of them (n=3) have optional courses resulting in 5 classes a week while the rest (n=3) does not have to attend classes any more due to former completion of the year's material.

There was only one student who has been attending private lessons in L2 for two years, the others have none of it either in L2 or in L3.

In L2 students (n=5) spend no time in a foreign country related to the given language, other answers included two weeks (n=2), one week (n=1), one to three days (n=1), some days (n=1), 3 days (n=2), 4 days (n=1) in a year. There was only one student who spends a week in a foreign country related to her L3.

As far as the frequency of communication with native speakers related to L2 is concerned most participants said never (n=6), others provided varied answers: rarely (n=1), once a year (n=2), a couple of times a year (n=1), once or twice a month (n=3). As for their L3 the situation is more unambiguous as ten students do not communicate at all with native speakers whereas the remaining participants do so on a weekly, yearly and daily basis, respectively.

Figure 7. Time of activity spent in L2

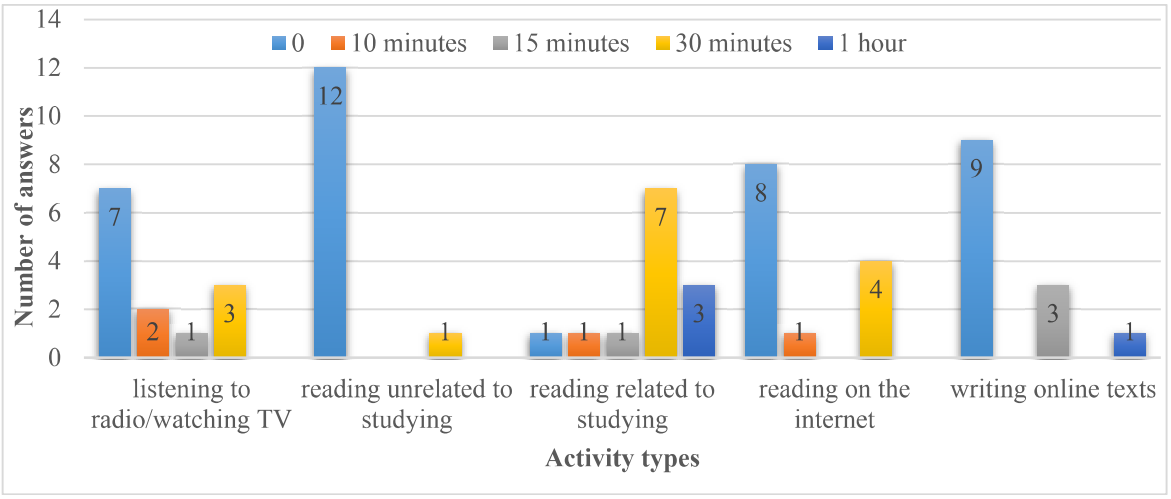
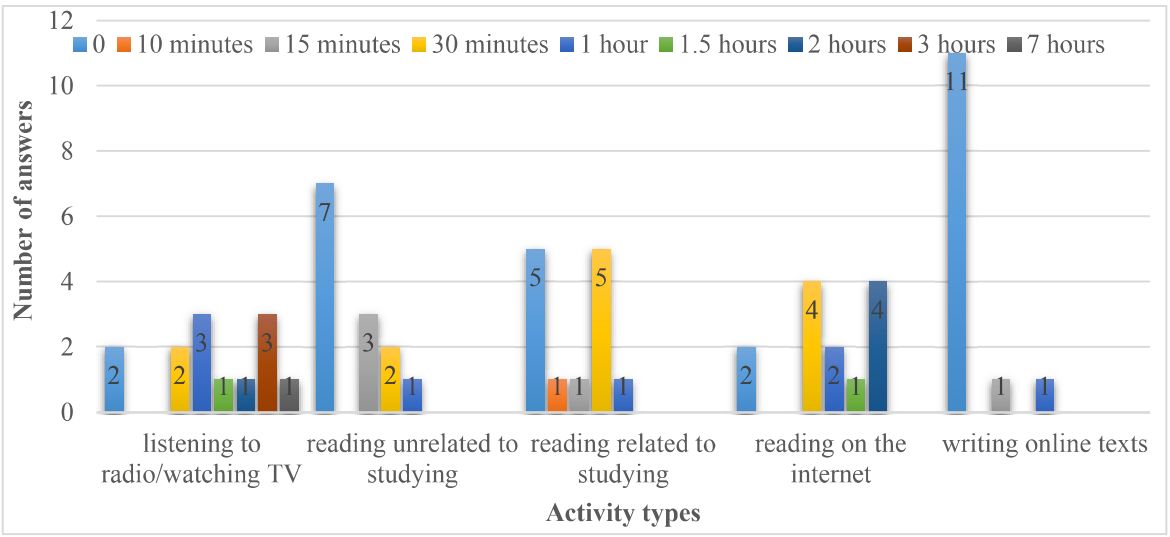
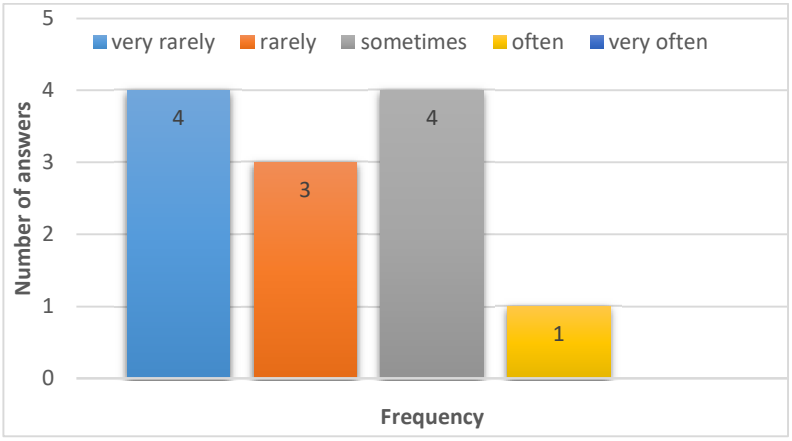


Figure 8. Time of activity spent in L3



Except for one student all participants reported that they mix elements of their spoken languages, the frequency of which is depicted as follows:

Figure 9. Frequency of mixing languages.



4.2. Recordings

In the recording phase, word-initial pre-stress plosives, word-medial pre-stress plosives and unstressed initial plosives were scrutinised as they represent positions in which possible aspirated allophones can be pinpointed in the most unambiguous way (Balogné Bérces & Szentgyörgyi, 2006). The stops under scrutiny are all found in a consonant + vowel (C+V) sound string in order to avoid any distracting effects made by a subsequent consonant.

Initially, students read out the Hungarian extract so as to become familiar with the task and to feel more comfortable with the following foreign language extracts. Another benefit was that Hungarian as students' L1 was strengthened as a starting off point for their coming languages while exerting a certain extent of priming effect. Therefore, Hungarian reading was not transcribed and analysed along the same guidelines as L2 and L3 readings.

In case of French words, liaison and final aspiration of stops were not taken into consideration, only the above described three positions. French words are stressed syllable-finally, hence the comparatively higher number of tokens. The glide [w] in the words *pourquoi* is taken as a vowel due to its phonetically vowel-like i.e. [u] character, thus it is conceived as representation of a C+V string.

Figure 10. Tokens of standard and deviating pronunciations of German aspirated long-lag stops in word-initial pre-stress positions as described in Tables 1-3

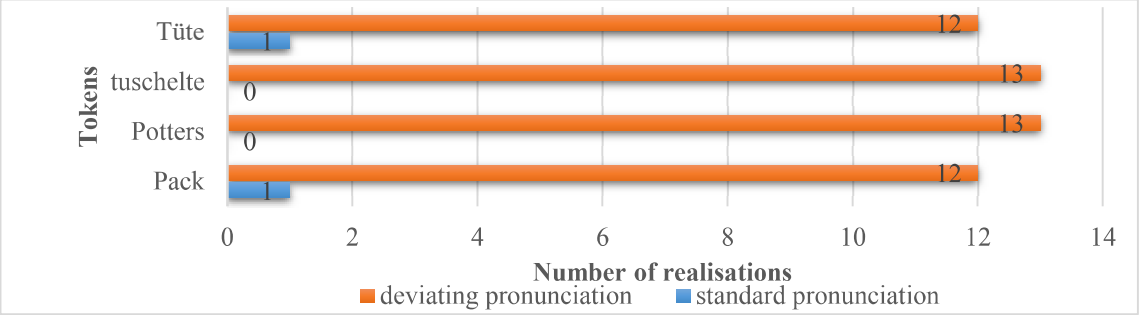


Figure 11. Tokens of standard and deviating pronunciations of German unaspirated short-lag stops in word-initial pre-stress position as described in Tables 1-3

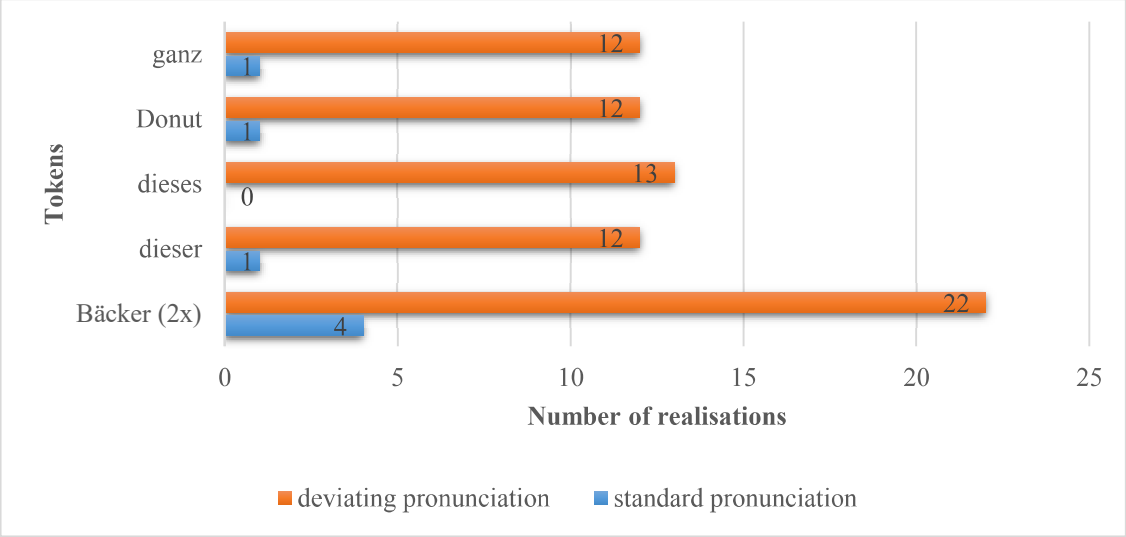


Figure 12. Tokens of standard and deviating pronunciations of German unaspirated short-lag stops in word-medial pre-stress position as described in Tables 1-3

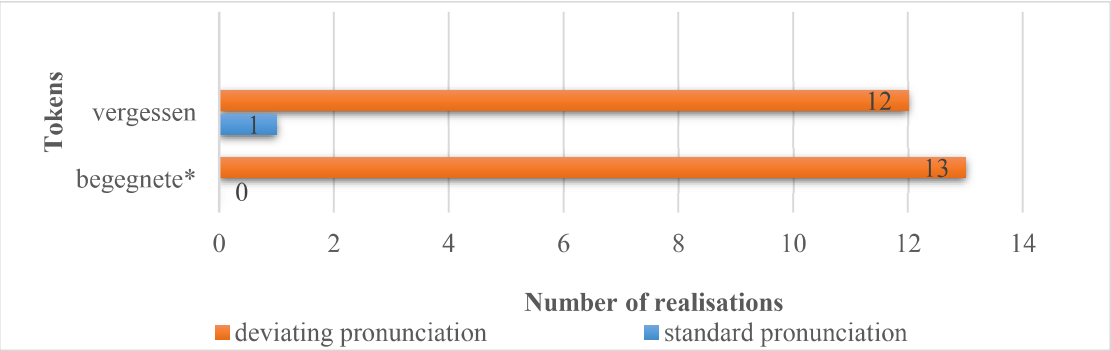


Figure 13. Tokens of standard and deviating pronunciations of German unaspirated short-lag stops in word-initial unstressed position as described in Tables 1-3

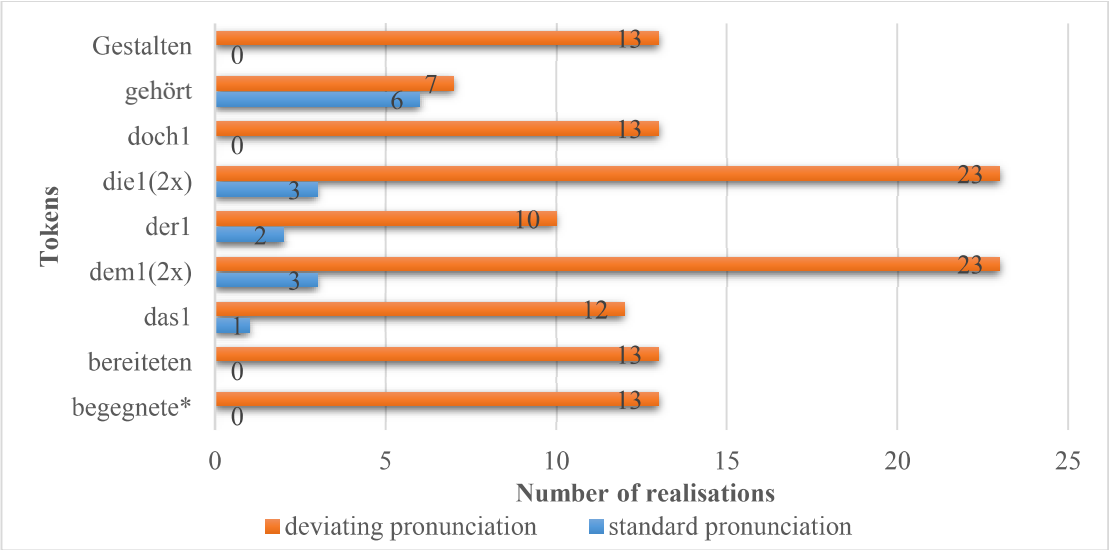


Figure 14. Tokens of standard and deviating pronunciations of English aspirated long-lag stops in word-initial pre-stress position as described in Tables 4-6

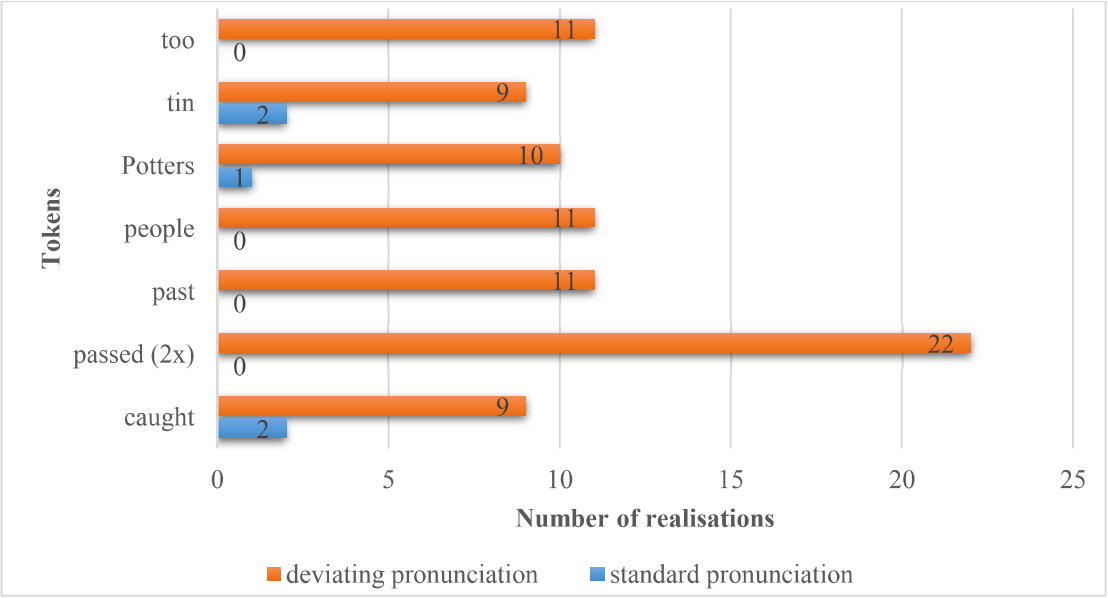


Figure 15. Tokens of standard and deviating pronunciations of English aspirated long-lag stops in word-medial pre-stress position as described in Tables 4-6

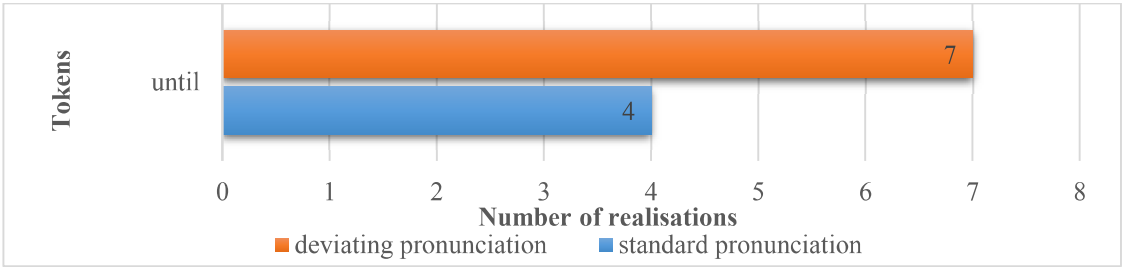


Figure 16. Tokens of standard and deviating pronunciations of English aspirated long-lag stops in word-initial unstressed position as described in Tables 4-6

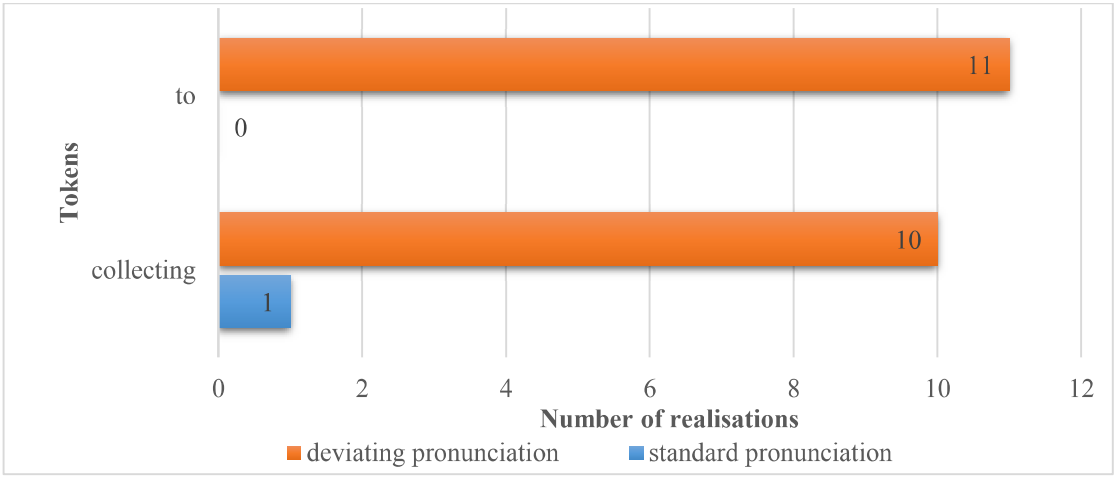


Figure 17. Tokens of standard and deviating pronunciations of English unaspirated short-lag stops word-initial pre-stress position as described in Tables 4-6

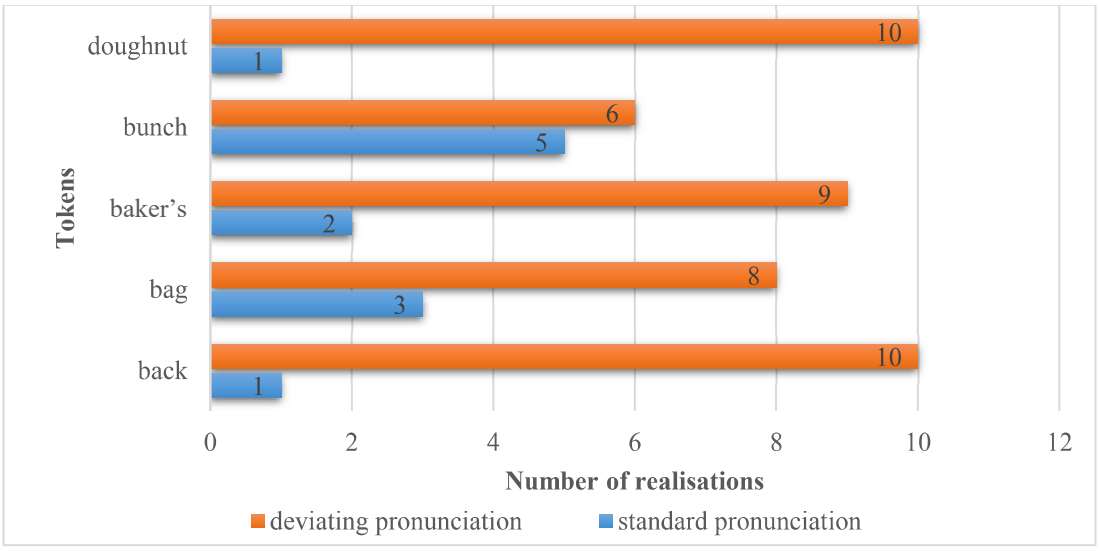


Figure 18. Tokens of standard and deviating pronunciations of English unaspirated short-lag stops in word-medial pre-stress position as described in Tables 4-6

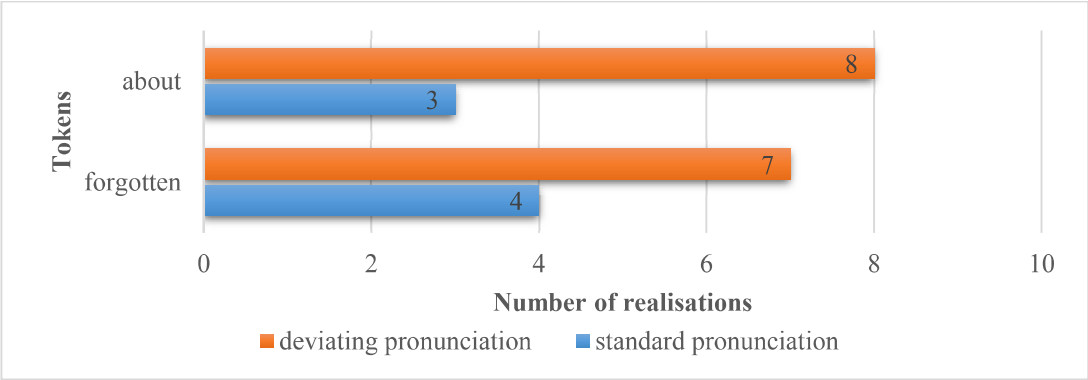


Figure 19. Tokens of standard and deviating pronunciations of English unaspirated short-lag stops in word-medial unstressed position as described in Tables 4-6

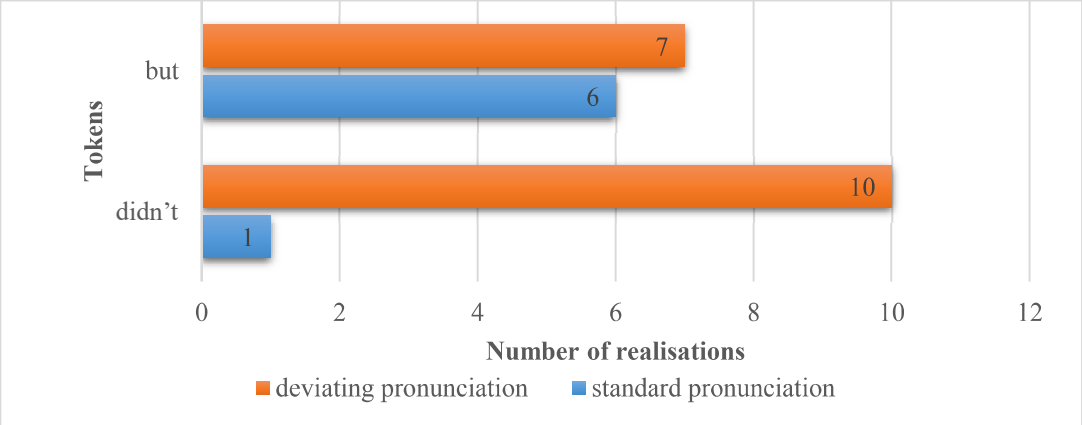


Figure 20. Tokens of standard and deviating pronunciations of French unaspirated short-lag stops in word-initial pre-stress position as described in Table 7

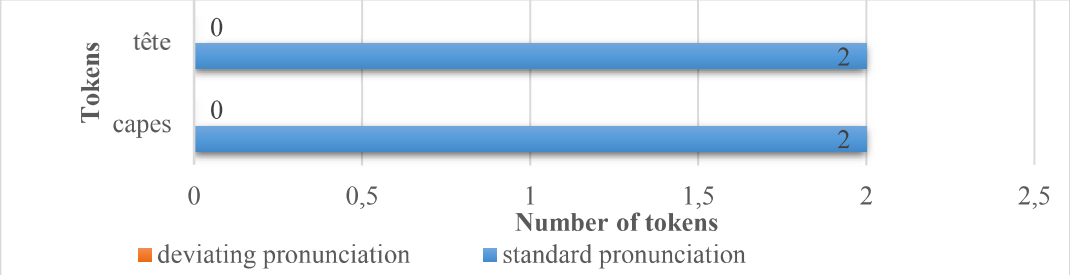


Figure 21. Tokens of standard and deviating pronunciations of French unaspirated short-lag stops in word-medial pre-stress position as described in Table 7

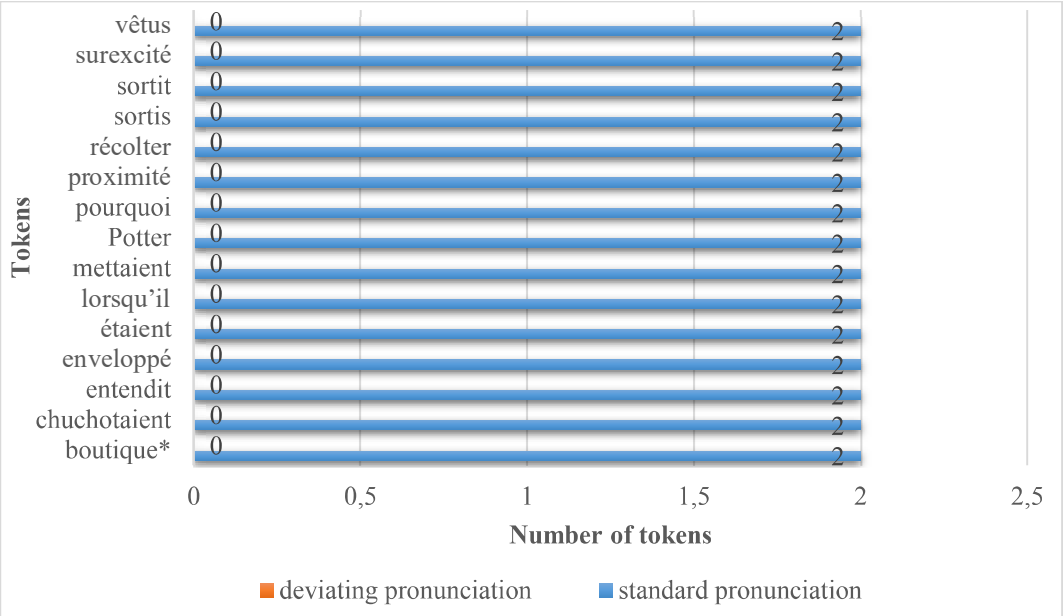


Figure 22. Tokens of standard and deviating pronunciations of French unaspirated short-lag stops in word-initial unstressed position as described in Table 7

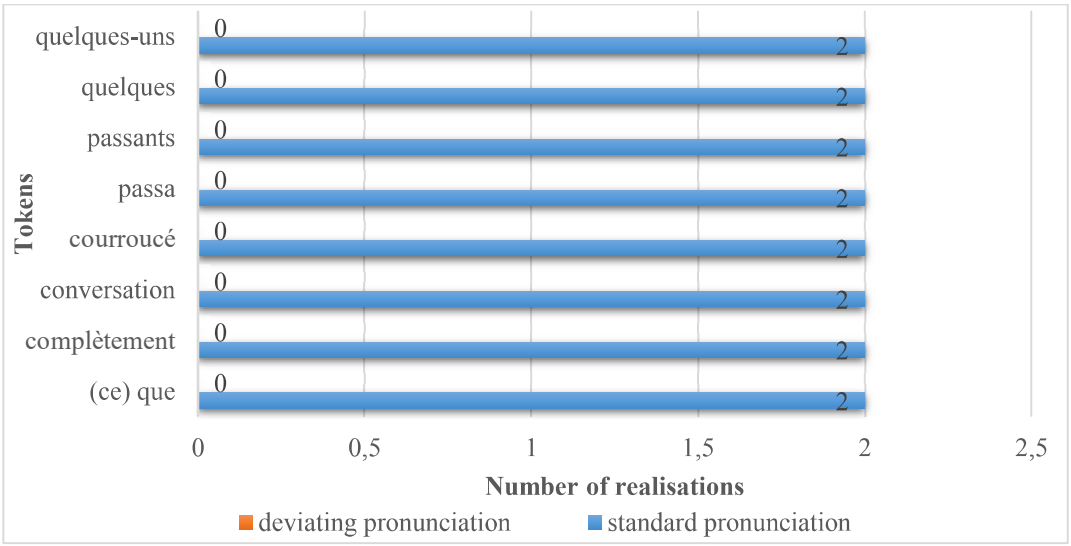


Figure 23. Tokens of standard and deviating pronunciations of French pre-voiced stops in word-initial pre-stress position as described in Table 7

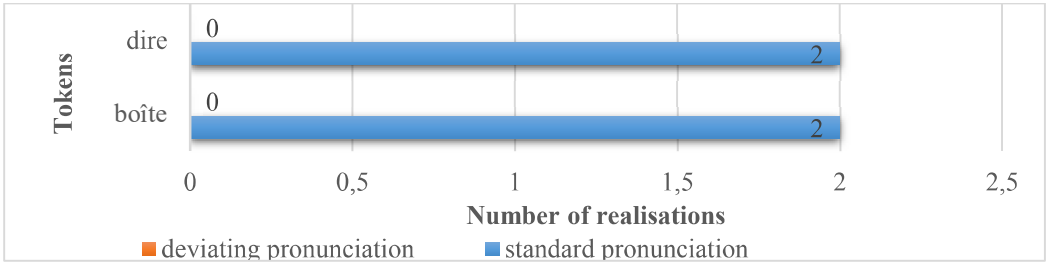


Figure 24. Tokens of standard and deviating pronunciations of French pre-voiced stops in word-initial unstressed position as described in Table 7

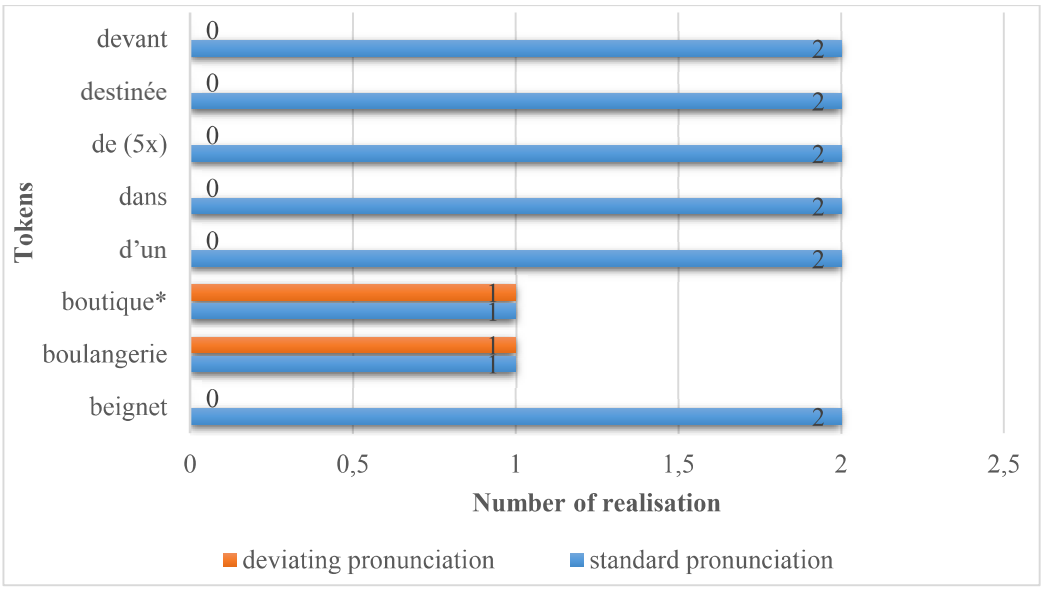


Figure 25. Tokens of standard and deviating pronunciations of German aspirated long-lag stops in all positions as described in Tables 1-3

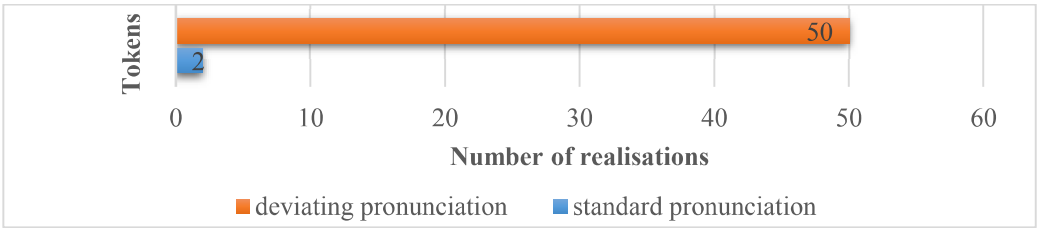


Figure 26. Tokens of standard and deviating pronunciations of German unaspirated short-lag stops in all positions as described in Tables 1-3

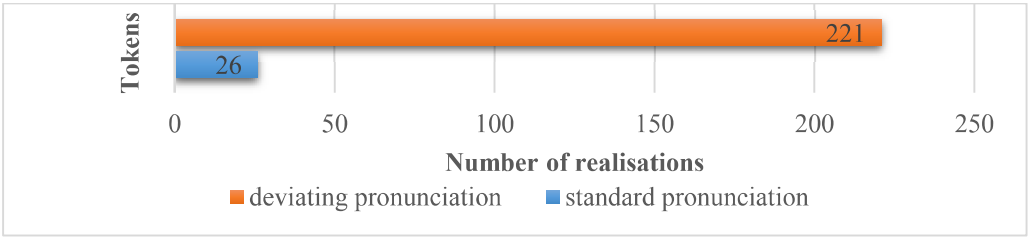


Figure 27. Tokens of standard and deviating pronunciations of English aspirated long-lag stops in all positions as described in Tables 4-6

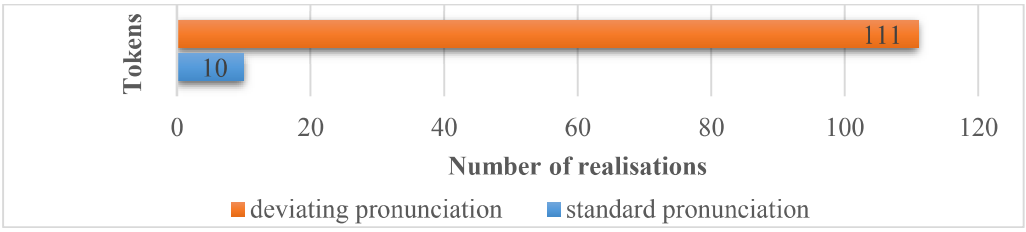


Figure 28. Tokens of standard and deviating pronunciations of English unaspirated short-lag stops in all positions as described in Tables 4-6

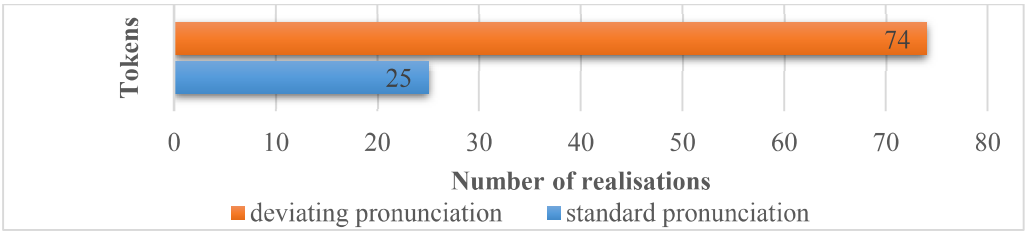


Figure 29. Tokens of standard and deviating pronunciations of French unaspirated short-lag stops in all positions as described in Table 7

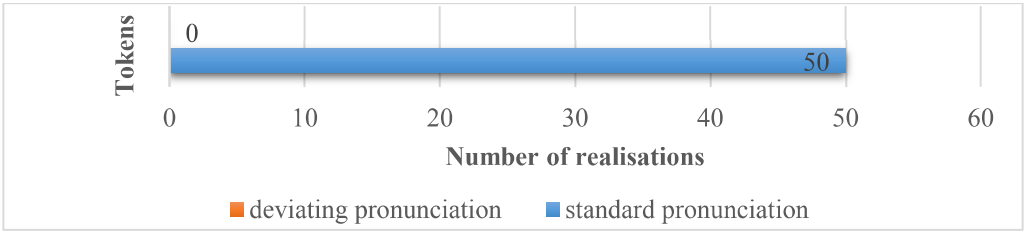


Figure 30. Tokens of standard and deviating pronunciations of French pre-voiced stops in all positions as described in Table 7

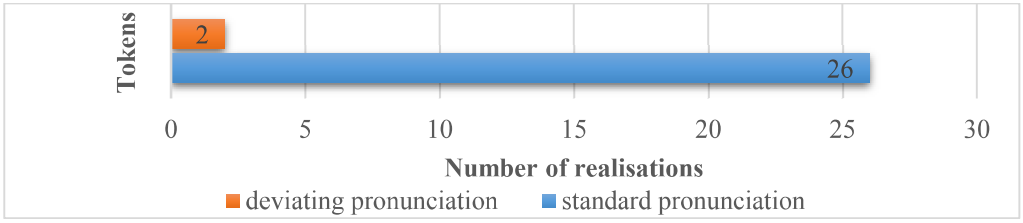


Figure 31. Tokens of standard and deviating pronunciations of all German stops in all positions as described in Tables 1-3

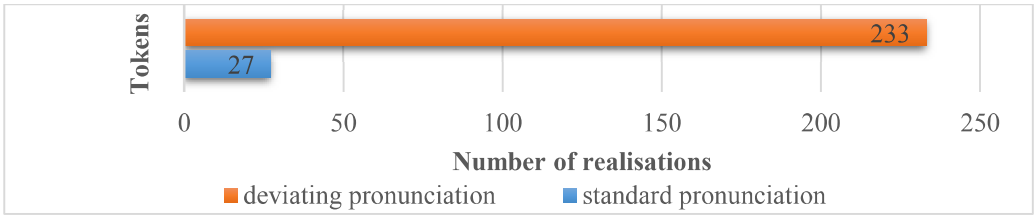


Figure 32. Tokens of standard and deviating pronunciations of all English stops in all positions as described in Tables 4-6

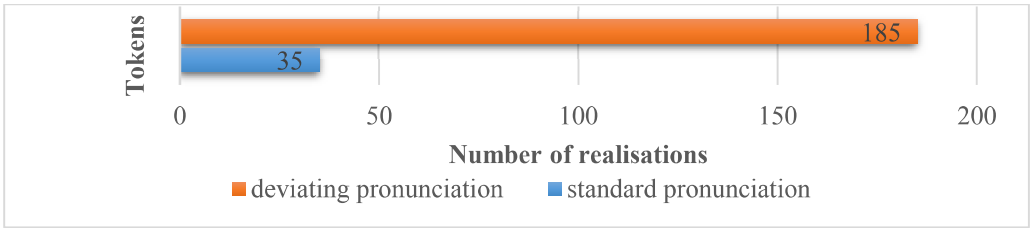
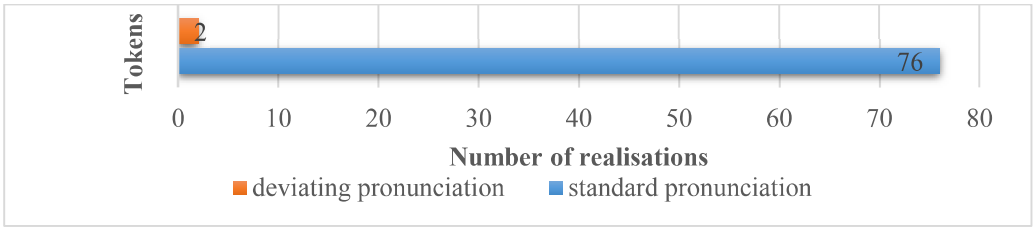


Figure 33. Tokens of standard and deviating pronunciations of all French stops in all positions as described in Table 7



4. Discussion

The findings clearly show a significant difference between the pronunciation of German stops representing a spread glottis language as L2 and that of German and French representing a spread glottis language and a true voice language, respectively, as L3 for Hungarian secondary school students. In case of German as L2 deviating pronunciations substantially outnumber

standard variants in almost all positions. Despite the fact that the aspirated long-lag stops were not found in all positions - as opposed to the unaspirated short-lag ones, which could be examined in both word-initial, word-medial pre-stress and word-initial unstressed position – the tendency hints at a comparative difficulty for students with Hungarian as L1 to correctly pronounce them. This would underpin the theoretical supposition according to which a true voice language as L1 exerts negative effects on the pronunciation of stops of a spread glottis language, in which the voicing contrast is employed by the feature [spread glottis] as suggested by Petrova et al. (2006).

A similar pattern can be seen when examining both aspirated and unaspirated English stops, which were found in all possible positions in the extracts. The overall results indicate a rather negative effect of Hungarian as L1 on the pronunciation of stops of English as L3. In this case, however, the situation is slightly tinged as results show a far better proportion of standard and deviating variants than regarding German stops. The explanations might lie in the fact that English is their L3 following German that represents the very same laryngeal features. It should also be borne in mind that this result may be the immediate consequence of higher exposure to English, as illustrated in Figures 7 and 8 on the time of activity spent in L2 and L3.

As anticipated, French stops were preponderantly pronounced in accordance with its standard forms. Surprisingly though, they were all pronounced correctly with only two exceptions. After multiple times of listening to these words it turned out that a temporary shortage of breath accounts for the absence of pre-voicing, which requires more egressive air amount. Apart from this, it can be stated that the pronunciation of French stops coincides with that of Hungarian ones, a phenomenon explicable by the mutual [voice] feature of both Hungarian and French. Nevertheless, the outcome implies no deteriorating effect of German as L2 representing spread glottis feature on French at all.

Based on evidence from the results and in connection with the research questions and hypotheses, it can be said that

1. the laryngeal feature [voice] as a distinctive phonological characteristic of the Hungarian language as L1 exerts deteriorating effects on the realisations of stops in foreign languages as L2 and L3 representing the feature [spread glottis].
2. the laryngeal feature [voice] as a distinctive phonological characteristic of the Hungarian language as L1 exerts absolutely facilitating effects on the realisations of stops in a foreign language as L3 representing the same laryngeal feature.
3. the laryngeal feature [spread glottis] as a distinctive phonological characteristic of the German language as L2 might exert facilitating effects on studying an additional foreign

language as L3 representing the same feature, however does not exert any deteriorating effect on studying an additional foreign language as L3 representing the feature [voice].

5. Conclusions

Due to the limited range of the article the present report reflects the current stage of the research, nonetheless, a more detailed discussion and further analyses are intended as well as reassessment and possible modification of research methods and conditions. Additionally, the planned future extension may contribute to the validity of the overall findings and prove as expedient to implement practical value of the underlying theory. All documents used throughout the research period are in accordance with the university's ethical approval policies.

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Appendix. Transcription of German, English and French words (Tables 1-7)

Table 1. Transcription of German words representing aspirated long-lag stops and unaspirated short-lag stops in word-initial and word-medial pre-stress and in word-initial unstressed position (participants 1-4)

Participant's number:	*1*	*2*	*3*	*4*
1.1. German aspirated long-lag stops				
1.1.1. word-initial pre-stress position				
Pack	[pak]	[pak]	[pak]	[pak]
Potters	['pottɛːs]	['pɔtəs]	['pottɛrs]	['pottɛrs]
tuschelte	['tuʃɛltɛ]	['t͡ʃuʃɛltɛ]	['tuʃɛltɛ]	['tuʃʃɛltɛ]
Tüte	['tʰytɛ]	['tyːtə]	['tyːtɛ]	['tyːtɛ]
1.2. German unaspirated short-lag stops				
1.2.1. word-initial pre-stress position				
Bäcker (2x)	['bɛkɛr], ['bɛkkɛr]	['b̥ɛkɐ]	['bɛkkɛr]	['bɛkkɛr], ['b̥ɛkɛr]
dieser	['diːzɛr]	['d̥iːzɐ]	['diːzɛr]	['diːzɛr]
dieses	['diːzɛs]	['diːzəs]	['diːzɛs]	['diːzəs]
Donut	['donut]	['doːnut]	['d̥oʊˌnʌt]	['doːnʌt]
ganz	[gant͡s]	[gant͡s]	[gant͡s]	[g̊ant͡s]
1.2.2. word-medial pre-stress position				
*begegnete**	[bɛ'geːgnɛtɛ]	[bɛ'geːgnɛtɛ]	[bɛ'geːgɛntɛ]	[bɛ'geːʔnɛtɛ]
vergessen	[fɛr'gɛssɛn]	[fɛɐ̯'gɛsn̩]	[fɛr'gɛssɛn]	[fɛr'gɛssən]
1.2.3. word-initial unstressed position				
*begegnete**	[bɛ'geːgnɛtɛ]	[bɛ'geːgnɛtɛ]	[bɛ'geːgɛntɛ]	[bɛ'geːʔnɛtɛ]
bereiteten	[bə'raɪ̯t̥ɛtɛn]	[bə'ʁaɪ̯ç̊tɛtɛn]	[bɛ'raɪ̯t̥ɛtɛn]	[bɛ'raɪ̯t̥ɛtɛn]
das[1]	[das]	[das]	[das]	[das]
dem[1] *(2x)*	[deːm]	[deːm], [d̥eːm]	[deːm]	[deːm], [d̥eːm]
der[1]	[dɛr]	[d̥eːɐ̯]	[dɛr]	[d̥ɛ]

die[1] *(2x)*	[di]	[di], [d̥eːɐ̯]	[diː], [di]	[d̥i]
doch[1]	[dɔx]	[dɔx]	[dɔx]	[dɔx]
gehört	[gɛˈhørt]	[g̥ɛˈhøːɐ̯t]	[g̥ɛˈhørt]	[g̥ɛˈhørt]
Gestalten	[gɛˈʃtaltɛn]	[gɛˈʃtaltn̩]	[ˈgɛstaltɛn]	[gɛsˈʃtaltɛn]

* The word *begegnete* represents stops in both word-medial pre-stress and word-initial unstressed positions.

[1] The definite articles (*der, die, das, dem*) and the conjunction *doch* are despite their monosyllabic character pronounced unstressed in the phrases.

Table 2. Transcription of German words representing aspirated long-lag stops and unaspirated short-lag stops in word-initial and word-medial pre-stress and in word-initial unstressed position (participants 5-8)

Participant's number:	*5*	*6*	*7*	*8*
1.1. German aspirated long-lag stops				
1.1.1. word-initial pre-stress position				
Pack	[pak]	[pak]	[pak]	[pak]
Potters	['pɔttɛrs]	['pɔttɛrs]	['pɔttɛrs]	['pɔttɛrs]
tuschelte	['tuʃɛltɛ]	['tuʃɛltɛ]	['tuʃɛltɛ]	['tuʃɛltɛ]
Tüte	['ty:tɛ]	['ty:tɛ]	['ty:tɛ]	['ty:tɛ]
1.2. German unaspirated short-lag stops				
1.2.1. word-initial pre-stress position				
Bäcker (2x)	['b̥ɛkkɛr], ['bɛkkɛr]	['b̥ɛkkɛr], ['bɛkkɛr]	['bɛkkɛr]	['bɛkkɛr]
dieser	['di:zɛr]	['di:zɛr]	['di:zɛr]	['di:zɛr]
dieses	['di:zɛs]	['di:zɛs]	['di:zɛs]	['di:zɛs]
Donut	['do:nut]	['donut]	['do:nʌt]	['do:nʌt]
ganz	[gant͡s]	[gant͡s]	[gant͡s]	[gant͡s]
1.2.2. word-medial pre-stress position				
*begegnete**	[bɛ'ge:gnɛtɛ]	[bɛ'ge:gnɛtɛ]	[bɛ'ge:gnɛtɛ]	[bɛ'ge:gnɛtɛ]
vergessen	[fɛr'gɛssɛn]	[fɛr'gɛssɛn]	[fɛr'gɛs n̩]	[fɛr'gɛssɛn]
1.2.3. word-initial unstressed position				
*begegnete**	[bɛ'ge:gnɛtɛ]	[bɛ'ge:gnɛtɛ]	[bɛ'ge:gnɛtɛ]	[bɛ'ge:gnɛtɛ]
bereiteten	[bɛ'raɪ̯tɛt]	[bɛ'raɪ̯tɛtɛn]	[bɛ'raɪ̯tɛtɛn]	[bɛ'raɪ̯tɛtɛn]
das[1]	[das]	[d̥as], [das]	[das]	[das]
dem[1] *(2x)*	[de:m]	[de:m], [dem]	[de:m]	[de:m]
der[1]	[dɛr]	[dɛr]	[dɛn]	[dɛr]
die[1] *(2x)*	[di]	[di]	[d̥i], [di]	[di]
doch[1]	[dɔx]	[dɔx]	[dɔx]	[dɔx]

gehört	[g̥ə'hørt]	[g̥ɛ'hørt]	[gɛ'hø:rt]	[gɛ'hørt]
Gestalten	[gɛ'ʃtaltɛn]	[gɛ'ʃtaltɛn]	[gɛ'ʃtaltn̩]	[gɛ'ʃtaltɛn]

* The word *begegnete* represents stops in both word-medial pre-stress and word-initial unstressed positions.

[1] The definite articles (*der, die, das, dem*) and the conjunction *doch* are despite their monosyllabic character pronounced unstressed in the phrases.

Table 3. Transcription of German words representing aspirated long-lag stops and unaspirated short-lag stops in word-initial and word-medial pre-stress and in word-initial unstressed position (participants 9-13)

Participant's number:	***9***	***10***	***11***	***12***	***13***
1.1. German aspirated long-lag stops					
1.1.1. word-initial pre-stress position					
Pack	[pak]	[pʰaç]	[pəˈʔak]	[pak]	[pak]
Potters	['pottɛrs]	['pottɛrs]	['pottɛrs]	['pottɛrs]	['pottɛrs]
tuschelte	['tuʃɛltɛ]	['tuʃʃɛltɛ]	['tuʃʃɛltɛ]	['tʊʃɛltɛ]	['tuʃɛltɛ]
Tüte	['tyːtɛ]	['tytɛ]	['tyːtɛ]	['tyːtɛ]	['tyːtɛ]
1.2. German unaspirated short-lag stops					
1.2.1. word-initial pre-stress position					
Bäcker (2x)	['bɛkɛr], ['bɛkkɛr]	['bɛkkɛr]	['bɛkɛr]	['bɛkkɛr]	['bɛkɛr], ['bɛkkɛr]
dieser	['diːzɛr]	['diːzɛr]	['diːzɛr]	['diːzɛr]	['diːzɛr]
dieses	['diːzɛs]	['diːzɛm]	['diːzɛs]	['diːzɛs]	['diːzəs]
Donut	['doːnʌt]	[doˈnuːt]	['donut]	['donaːt]	['doːnut]
ganz	[gant͡s]	[gant͡s]	[gant͡s]	[gant͡s]	[gant͡s]
1.2.2. word-medial pre-stress position					
*begegnete**	[bɛˈgeːgnɛtɛ]	[bɛˈgeːgnɛtɛ]	['bɛgeːgnɛtɛ]	[bɛˈgeːgnɛtɛ]	[bɛˈgeːgnɛtɛ]
vergessen	[fɛrˈgɛssɛn]	[fɛrˈgɛssɛn]	[fɛrˈgɛssɛn]	[fɛrˈgɛssɛn]	[fɛˈgɛsn̩]
1.2.3. word-initial unstressed position					
*begegnete**	[bɛˈgeːgnɛtɛ]	[bɛˈgeːgnɛtɛ]	['bɛgeːgnɛtɛ]	[bɛˈgeːgnɛtɛ]	[bɛˈgeːgnɛtɛ]
bereiteten	[bɛˈraɪ̯tɛtɛn]	[bɛˈraɪ̯tɛtɛn]	[bɛˈraɪ̯tɛtɛn]	[bɛˈraɪ̯tɛtɛn]	[bɛˈraɪ̯tɛtɛn]
das[1]	[das]	[das]	[das]	[das]	[das]

dem[1] *(2x)*	[deːm]	[d̪eːm]	[deːm], [dem]	[deːm]	[deːm]
der[1]	[dɛr]	[dɛr]	[dɛr]	[dɛr]	[dɛr]
die[1] *(2x)*	[di]	[di]	[di]	[di]	[di]
doch[1]	[dɔx]	[dɔx]	[dɔx]	[dɔç]	[dɔx]
gehört	[gɛˈhørt]	[gɛˈhørt]	[gɛˈhørt]	[gɛˈhørt]	[g̪əˈhørt]
Gestalten	[gɛˈʃtaltɛn]	[gɛˈʃaltɛn]	[gɛˈʃtaltɛn]	[gɛˈʃtaltɛn]	[gɛˈʃtaltɛtɛn]

* The word *begegnete* represents stops in both word-medial pre-stress and word-initial unstressed positions.

[1] The definite articles (*der, die, das, dem*) and the conjunction *doch* are despite their monosyllabic character pronounced unstressed in the phrases.

Table 4. Transcription of English words representing aspirated long-lag stops and unaspirated short-lag stops in word-initial, word-medial pre-stress and in word-initial unstressed positions (participants 1-4)

Participant's number:	***1***	***2***	***3***	***4***
2.1. English aspirated long-lag stops				
2.1.1. word-initial pre-stress position				
caught	[koʊt]	[kʰɑt]	[kɑ:t]	[koʊθ]
passed (2x)	[pɛst], [pɛ:sd]	[pæst]	[pæst]	[pɛst], [past]
past	[pɛst]	[pɑ:st]	[pɛst]	[pɛst]
people	['pi:pl̩]	['pi:pl̩]	['pi:pl̩]	['pi:pəl]
Potters	['pɑtəz]	['pʰɑtəˠz]	['podəˠz]	['pɒttərz]
tin	[tin]	[tin]	[tin]	[tɪn]
too	[tu:]	[tu:]	[tu:]	[tu:]
2.1.2. word-medial pre-stress position				
until	[ʌn'tʰɪl]	[ʌn'tʰɪl]	[ʌn'tʰɪl]	[ʌn'tɪl]
2.1.3. word-initial unstressed position				
collecting	['kollɛktɪŋ]	[kə'lɛktɪŋ]	[kə'lɛktɪŋ]	[kə'lɛktɪŋ]
to	[tə]	[tə]	[tə]	[tə]
2.2. English unaspirated short-lag stops				
2.2.1. word-initial pre-stress position				
back	[bɛk]	[bɛk]	[b̥ɛk]	[bɛk]
bag	[bɛg]	[bæg]	[b̥ɛg̊]	[b̥ɛg]
baker's	['beɪkəz]	['beɪkəz]	['bʌkəˠz]	['ˈb̥eɪkəˠs]
bunch	[b̥ʌntʃ]	[bʌntʃ]	[b̥ʌntʃ]	[bʌntʃ]
doughnut	['do:nʌt]	['doʊnʌt]	['d̥oʊˌnʌt]	['doʊnʌt]
2.2.2. word-medial pre-stress position				
forgotten	[for'gɒttɛn]	[fəˠ' g̊ʌtn̩]	[foɹ' g̊ɒtn̩]	[foɹ̈' g̊ʌʔn̩]
about	[ə'b̥aʊt]	[ə'baʊt]	[ə'b̥aʊt]	[ɒ'baʊt]

2.2.3. word-initial unstressed position				
didn't	['dɪdənt]	[dɪd'nʌt]	[d̪ɪdn̪t]	[dɪrn̪t]
but	[b̥ʌt]	[b̥ət]	[b̥ʌʔ]	[b̥ʌt]

Participant's number:	***5***	***6***	***7***	***8***	***9***
2.1. English aspirated long-lag stops		**L3 is French.**			
2.1.1. word-initial pre-stress position					
caught	[kɔːt]		[kɔːt]	[kɔːt]	[kʰɔːt]
passed (2x)	[past]		[paːst], [paːsd]	[paːsd]	[pɛst], [pɛːsd]
past	[pæst]		[paːst]	[paːst]	[pɛːst]
people	['piːpl̩]		['piːpl̩]	['piːpl̩]	['piːpl̩]
Potters	['pottɛrs]		['pottɛrs]	['pɔttəˠz]	['pɑtəˠs]
tin	[tɪn]		[θin]	[tin]	[tin]
too	[tuː]		[tuː]	[tuː]	[tuː]
2.1.2. word-medial pre-stress position					
until	[ʌn'tʰɪl]		['antɪl]	['ʌntɪl]	[ʌn'tɪl]
2.1.3. word-initial unstressed position					
collecting	[kə'lɛktɪŋ]		[kə'lɛktɪŋ]	[kə'lɛktɪŋg]	[kʰo'lɛktɪŋ]
to	[tə]		[tə]	[tə]	[tə]
2.2. English unaspirated short-lag stops					
2.2.1. word-initial pre-stress position					
back	[bæk]		[bɛk]	[bɛk]	[bɛk]
bag	[bæg]		[bɛːg]	[bɛg]	[bɛg]
baker's	['beɪkəˠs]		['beɪkəs]	[' b̥eɪkərs]	['beɪkəˠs]

bunch	[b̥ʌntʃ]		[b̥ʌntʃ]	[b̥ʌntʃ]	[bʌntʃ]
doughnut	['doʊdnʌt]		['dɔːnʌt]	['dɔːnʌt]	['doːnʌt]
2.2.2. word-medial pre-stress position					
forgotten	[foɻ'gʌttɛn]		['foɹg̊ʌtn̩]	[fəɻ'gʌtɛn]	['foɹgʌttɛn]
about	[ə'baʊt]		[ə'baʊt]	[ə'baʊt]	[ə'baʊt]
2.2.3. word-initial unstressed position					
didn't	[dɪdnt]		[dɪʔn̩t]	[dɪdnt]	[dɪdn̩]
but	[bət]		[bʌt]	[b̥ʌt]	[b̥ʌt]

Table 5. Transcription of English words representing aspirated long-lag stops and unaspirated short-lag stops in word-initial, word-medial pre-stress and in word-initial unstressed positions (participants 5-9)

Table 6. Transcription of English words representing aspirated long-lag stops and unaspirated short-lag stops in word-initial, word-medial pre-stress and in word-initial unstressed positions (participants 10-13)

Participant's number:	***10***	***11***	***12***	***13***
2.1. English aspirated long-lag stops		**L3 is French.**		
2.1.1. word-initial pre-stress position				
caught	[kaʊtʃt]		[koʊθ]	[kɔːt]
passed (2x)	[st]		[past], [pɛːsd]	[paːst], [past]
past	[paːst]		[paːst]	[paːst]
people	['piːpl̩]		['piːpəl]	['pipl̩]
Potters	['pʊttəɻs]		['pʊttɛɻs]	['pɔttəɻz]
tin	[tin]		[tʰɪn]	[tʰɪn]
too	[tuː]		[tuː]	[tsuː]
2.1.2. word-medial pre-stress position				
until	['ʌntɪl]		[ʌn'tɪl]	[ʌn'tɪl]
2.1.3. word-initial unstressed position				
collecting	[kəl'lɛktɪŋg]		[kə'lɛkʃən]	[kə'lɛktɪŋ]
to	[tə]		[tə]	[tʊ]
2.2. English unaspirated short-lag stops				
2.2.1. word-initial pre-stress position				
back	[bɛk]		[bɛk]	[bɛk]
bag	[bɛg]		[b̥ɛg]	[bɛg]
baker's	['beɪkəɻs]		['beɪkəɻs]	['beɪkəs]
bunch	[bʌntʃ]		[bʌntʃ]	[bʌntʃ]
doughnut	['dʌnaʊt]		['donaːt]	['doːnʌt]
2.2.2. word-medial pre-stress position				

forgotten	[foɹˈgʌttɛn]		[fəˈgɑtən]	[fɔːˈgʌttɛn]
about	[ɒˈbaʊt]		[əˈb̥aʊt]	[əˈbaʊt]
2.2.3. word-initial unstressed position				
didn't	[dɪdn̩]		[dɪdnt]	[dɪdn̩]
but	[bʌt]		[bʌt]	[bʌt]

Table 7. Transcription of French words representing unaspirated short-lag stops in word-initial, word-medial pre-stress and in word-initial unstressed positions and pre-voiced stops in word-initial pre-stress and unstressed positions (participants 6 and 11)

Participant's number:	***6***	***11***
3.1. French unaspirated short-lag stops		
3.1.1. word-initial pre-stress position		
capes	[kap]	[kap]
tête	[tɛt]	[tɛt]
3.1.2. word-medial pre-stress position		
*boutique**	[b̥utik]!	['butikə]
chuchotaient	[ʃyʃotɛ]	['ʃoko:tɛn]
entendit	['ɒntɒndi]	['ɒntɒndi]
enveloppé	[ãvəlope]	['ãnvɛloppe]
étaient	[etɛ]	[etã]
lorsqu'il	[lorskil]	[lurskil]
mettaient	[mɛttɛ]	['mətɛ]
Potter	[pottɛr]	[pottɛr]
pourquoi	[purkoa]	['purkoa]
proximité	['proksimite]	['proksimite]
récolter	[rekolte]	['rekolte]
sortis	[sorti]	[sorti]
sortit	['sorti]	['sorti:]
surexcité	[syrɛksite]	['syrɛksite]
vêtus	[vəty]	['vəty]
3.1.3. word-initial unstressed position		
(ce) que	[səkə]	[kø:]
complètement	['komplɛtmɑn]	['komplɛtmɑ̃n]

conversation	[konvɛrzasjɔ̃]	[kɔ̃nvɛrzasjɔ̃]
courroucé	[kurəse]	['kurruse]
passa	[pas]	[passa]
passants	['pasɑ̃]	['pasant]
quelques	[kɛlkə]	[kɛlkə]
quelques-uns	[kɛlkəz‿œ̃n]	[kɛlkɛz‿ɛn]
3.2. French pre-voiced stops		
3.2.1. word-initial pre-stress position		
boîte	[bwat]	[bwaʔ]
dire	[dir]	[dir]
3.2.2. word-initial unstressed position		
beignet	[bɛɲa]	[bɛʒne]
boulangerie	[b̥ulaʒəri]	[bulanʒəri]
*boutique**	[b̥utik]!	['butikə]
d'un	[dɛn]	[dɛn]
dans	[dɑ̃]	[dan]
de (5x)	[de], [də] 4x	[de], [də] 4x
destinée	['dɛstine]	['dɛstine]
devant	[dəvan]	[dəvan]

Word stress is only indicated in cases where it was shifted to a syllable different than the final one.

* The word *boutique* represents stops in both word-medial pre-stress and word-initial unstressed positions.