



# Prosody in first-generation adult immigrants and second-generation heritage-language users: the timing of prenuclear rising accents

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## Abstract

Our study examines the extent to which successive generations of Greek speakers in Austria show similarities or differences in the timing of prenuclear rises in Greek. Three first-generation adult immigrants from Greece, and three second-generation Austrian born adult heritage-language users read out a set of sentences in Greek. Two Austrian and two Greek monolingual control speakers read out a set of sentences in their respective native languages. Measurements of the timing of the start and end of the rise were taken in Praat.

Results show that Greek and Austrian German differ in the timing of the start of the rise (which begins well into the stressed vowel of the prenuclear target word in Austrian, and just before the onset consonant of the prenuclear target word's stressed syllable in Greek), but not in the end of the rise. The findings for the first-generation immigrants show evidence of L1 attrition, with a later alignment of the start of the rise compared to the Greek monolingual controls. The second-generation heritage speakers showed similar values to the first-generation speakers. Both groups were observed to produce intermediate values between the Greek and Austrian monolingual control groups.

**Index Terms:** L1 prosodic attrition, Greek, Austrian German, first-generation immigrants, second-generation heritage speakers, L2 acquisition

## 1. Introduction

A growing body of research suggests that when immigrants become more proficient and more dominant in the second language (L2), the first language (L1) may decrease in proficiency. This non-pathological decline from an individual's previous linguistic abilities in a healthy individual is referred to as L1 attrition ([25], [15], [24]). While L1 attrition is well attested in syntax, morphology, and the lexicon, more recent research has established that the L2 learning experience can also affect pronunciation in the L1 ([5], [6], [8], [9], [10], [19], [20], [23], [27]), even to the extent that some individuals sound foreign in their native language ([7], [14]). Research has shown that segmental as well as prosodic aspects of speech can be susceptible to L1 attrition under conditions of diminished exposure and use, often resulting in divergences from the L1 monolingual norm (e.g. [4], [9], [10], [6], [8], [19], [20], and [27], for segments, [5]; [23], for prosodic aspects).

Divergences from the L1 monolingual norm have also been observed in second-generation heritage speakers raised in a minority language setting. Second-generation heritage speakers are often found to pronounce the heritage language with non-native features, and many are perceived as foreign in

that language ([16], [17], [18]). Hence, non-native patterns are found in second-generation heritage speakers as well as in first-generation speakers, and both can be perceived to have a foreign accent in, respectively, the host language or the L1. However, little is known about the similarities or differences between the non-native features observed in L1 attriters and those observed in second-generation heritage speakers (but see [16], [22], and [13], for notable exceptions), particularly in the prosodic domain. This raises a number of questions: Are the same properties that are prone to L1 attrition also the properties that are variable in second-language heritage speakers? Do the second-language heritage speakers, whose main source of input in the heritage language comes from the first-generation adults in the community, adopt their speech patterns, which may have been prone to L1 attrition? Are the non-native features that are present in the first-generation attriters more similar to the monolingual norm than those present in the second-generation heritage speakers?

### 1.1. The present study

This paper will attempt to provide answers to the above questions by examining the realization of a prosodic feature, i.e. the timing of prenuclear rises, in successive generations of Greek speakers in Austria: (i) first-generation adult immigrants from Greece, and (ii) second-generation Austrian born adult heritage-language users.

Prenuclear tonal alignment refers to how tonal elements are coordinated in time with specific locations in the segmental string. There are many reports of cross-language differences in prenuclear alignment patterns, and there is evidence that native patterns of alignment may carry over into the pronunciation of an L2 ([23], [2]), and may be susceptible to L1 attrition ([5], [26]). For example, in prenuclear declarative pitch accents, Greek native speakers show a rise in pitch that begins roughly at the beginning of the accented syllable and ends 10 to 20 ms after the beginning of the following unstressed vowel [1]. In contrast, in similar rising prenuclear accents in similar contexts, German native speakers begin the rise considerably later (55 ms on average after the beginning of the accented syllable), although they align the end of the rise in roughly the same location (27 ms on average after the beginning of the following unstressed vowel) [2]. There is also evidence for cross-varietal differences in this dimension. For example, Southern speakers of German begin prenuclear rises later (68 ms on average after the beginning of the accented syllable) than Northern speakers (38 ms on average after the beginning of the accented syllable) [2]. It is as yet unclear how Austrian speakers align such prenuclear rises, but we speculate that due to its geographical location it is closer to Southern than to Northern German.

In light of the above, this preliminary study will first establish whether Greek and Austrian German differ in the

timing of prenuclear rises, and to what extent Austrian German is comparable to the values reported for Southern or Northern German speakers in [2]. It then aims to identify whether and on what basis L1 attrition occurs in the timing of prenuclear rises in first-generation adult immigrants from Greece living in Austria; and to evaluate whether there are differences between first-generation immigrants and second-generation Austrian born adult heritage-language users in the realization of this prosodic feature.

## 2. Method

### 2.1. Participants

We collected speech data from ten speakers: three first-generation adult Greek immigrants to Austria; three second-generation Austrian born adult heritage-language users (SG); two monolingual Greek controls (GC); and two monolingual Austrian controls (AC). The overall age range of the first and second-generation speakers was 34–77 years, with a mean age of 55 years. Participants in the first-generation group were born in Greece, moved to Austria in adulthood (between the ages of 18 and 22; mean age of arrival of 22) and had been residing in the L2 environment (Graz) for an average of 48 years at the time of data collection. Participants from the second-generation group were born in Austria as children of Greek immigrants, had a mean age of 40 years, and grew up in Graz. The participants in the control groups were native speakers of Greek or Austrian German, respectively. They were raised monolingually in the respective language and had not lived abroad for extended periods of time. They had a mean age of 38,5 (GC) and 36 (AC) years.

The Greek community in Austria is relatively small. It is estimated that some 4000 to 5000 people of Greek origin are living in Austria (Statistics Austria, reference date: 01.01.2011), of which approximately 512 reside in or near Graz. It is thought that the first Greeks came to Austria during the 11<sup>th</sup> century, but larger groups of Greek merchants, bankers and industrialists arrived during the 18<sup>th</sup> and 19<sup>th</sup> centuries, and laid the foundation for the Greek community in Austria. Although Greek is still widely spoken in the community, the situation in Graz is such that most families are mixed, with one Greek and one Austrian parent. This has affected language patterns, such that in second and third-generation speakers, Austrian German has become the dominant language.

In order to collect biographical data and assess the language use patterns of the participants, we administered a questionnaire (adapted from [21]), which uses self-reported data on language use, identity, and attitudes. This showed that for the first-generation adult Greek immigrants, Greek was the home language during their childhood and early adulthood. After their arrival in Austria, their predominant home and community language became Austrian German, although they reported mainly consuming Greek-language media. The second-generation Austrian born adult heritage-language users all came from families with at least one Greek parent. They reported to have acquired Greek from their parents and grandparents, and some received private classes in Greek. Contrary to the group of first-generation immigrants, the predominant home language of the second-generation heritage speakers is Austrian German, with Greek being spoken just 23% of the time in the home and even less in the community where Greek is used just 13% of the time. Not surprisingly,

the first-generation Greek speakers rated themselves as better in Greek, whereas the second-generation heritage speakers found themselves much better in Austrian German and they felt the need to improve their Greek. The two groups were, however, similar in their attitudes towards the Greek language, and all stated their identity as Greek Austrian.

### 2.2. Materials and Procedure

All speakers participated in a sentence reading task. To this end, two sets of 20 sentences (one Greek, one German) were used to elicit prenuclear rises. The sentences for the Greek set were taken from [1]. The German set was designed to mirror the Greek set as closely as possible. This meant that we chose proparoxytone test words that were either adjectives or nouns, followed by a noun or a genitive construction, e.g. ‘Die längere Befragung brachte keine weiteren Erkenntnisse’ (The longer survey did not yield any further insights), or ‘Der Lungenkrebs des Patienten wurde zu spät diagnostiziert’ (The patient’s lung cancer was diagnosed too late). This ensured in most cases that a prenuclear accent was elicited on the antepenult of the test word, followed by a nuclear accent on the following noun or genitive construction. The test word was followed by two to five unaccented syllables to avoid stress clashes and the syllable bearing the prenuclear accent was flanked by sonorants to ensure a continuous F0 contour [1].

The first and second-generation groups read both sets of sentences in two recording sessions, each taking place on a different day. The German and Greek monolingual controls read sentences in their respective native languages. Speakers read each sentence two times in random order. Prior to the recording the speakers were instructed to read the sentences as naturally as possible, and were asked to repeat any misread sentence.

Data collection took place in a quiet room in the participants’ home or office, or in a sound-attenuated booth, using a Zoom H4n Recorder with an integrated condenser microphone. The speakers were not paid for their participation.

### 2.3. Annotation and Measurement

For each speaker, the first acceptable repetition that was not affected by obvious dysfluencies, hesitation, or noise, was selected for further analysis. Using PRAAT software [3], durational measurements were taken from waveforms in combination with wide-band spectrograms and F0-tracks. In each test word, the following six landmarks were identified and annotated: the consonant onset of the accented syllable (C0), the vowel onset of the accented syllable (V0), the beginning of the final consonant of the test syllable (C1), the end of the final consonant of the test syllable, i.e., the beginning of the vowel of the post-accentual syllable (V1), the beginning of the prenuclear F0 rise (L), and the end of the prenuclear F0 rise (H). The landmarks are exemplified in Figure 1. Data were annotated by the second author after which they were verified by the first author. From these we calculated the alignment measures of L and H:

- Mindel.C0: the timing of the start of the rise measured from the onset consonant of the prenuclear target word’s stressed syllable (in ms)
- Pkdel.V1: the alignment of the end of the rise, measured from the start of the post-stress vowel (in ms)

- RatioV1: the alignment of the end of the rise (Pkdel.V1) divided by the duration of the stressed syllable

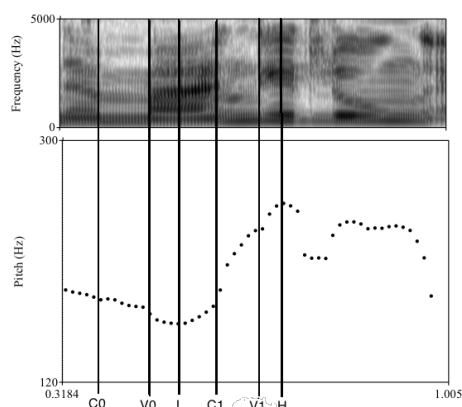


Figure 1. One of the control speaker's production of the utterance of the test word 'Ermangelung', showing the location of the six landmarks from which our alignment measures were calculated.

### 3. Results

#### 3.1. Greek and Austrian German monolingual controls

In order to determine whether Greek and Austrian German differ in the timing of prenuclear accents, we first compared the two groups of monolingual controls. To that end, we ran a multivariate analysis of Variance (MANOVA) with Mindel.C0, Pkdel.V1 and ratioV1 as dependent variables and Group (GC, AC) as the independent variable. Results showed a main effect of Group for Mindel.C0 [ $F(1,66)=132.766$ ;  $p < 0.0001$ ], but no significant effect for Pkdel.V1 or ratioV1. This shows that Greek and Austrian German only differ in the timing of the start of the rise, which is considerably later in Austrian German (where the rise begins 129 ms on average after the onset consonant of the prenuclear target word's stressed syllable) than in Greek (where it begins at or just before the consonant onset). It can therefore be concluded that Austrian German speakers begin prenuclear rises even later than the Southern speakers of German reported in [2], where average values of 68 ms were found. Figure 2 exemplifies the differences in the beginning of the rise between Austrian German, Northern-German, Southern-German and Greek.

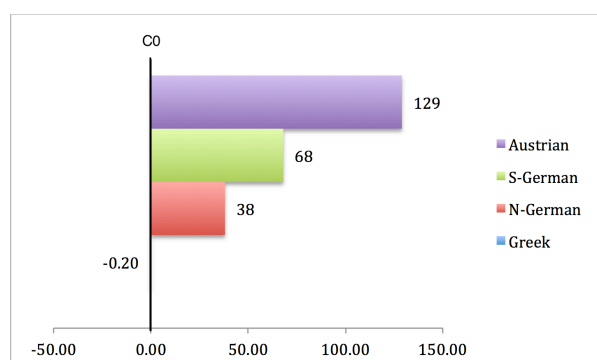


Figure 2: Means for Mindel.C0 (in ms), for Austrian, Southern-German (S-German), Northern-German (N-German) and Greek speakers. Values for S-German and N-German are as reported in [2].

As mentioned above, no significant differences in the location of the end of the rise were found between the Austrian German and the Greek monolingual speakers. Both produce values which are similar to those produced by the Northern and Southern German speakers in [2], with average values of 18 ms after the start of the post-stress vowel for the Greek speakers, 21 ms for the Northern German speakers, 26 ms for the Austrian speakers, and 34 ms for the Southern German speakers.

#### 3.2. First-generation immigrants and second-generation heritage speakers

Given that the Greek and Austrian monolinguals did not differ in the alignment of the *end* of the rise, we decided to restrict our analysis to the alignment of the *start* of the rise. We ran a one-way ANOVA with Mindel.C0 as the dependent variable and Group (GC, AC, FG, and SG) as the independent variable. The results showed a significant main effect of Group [ $F(3, 177)=48.82$ ,  $p < 0.001$ ]. Post hoc Bonferroni tests were conducted to determine which speaker groups were different from which others. As shown in Figure 3, the first and second-generation speakers show very similar results, beginning rises on average 67 and 68 ms after the onset consonant of the prenuclear target word's stressed syllable, respectively. However, the two groups differ significantly (at the level of significance of 0.001) from both monolingual groups, with the rise beginning earliest in group GC, followed by the FG and SG groups (which do not differ from one another), followed by AC. In other words, the values for the two successive generations of Greek speakers in Austria did not differ from one another, and were both found to be intermediate between Austrian German and Greek.

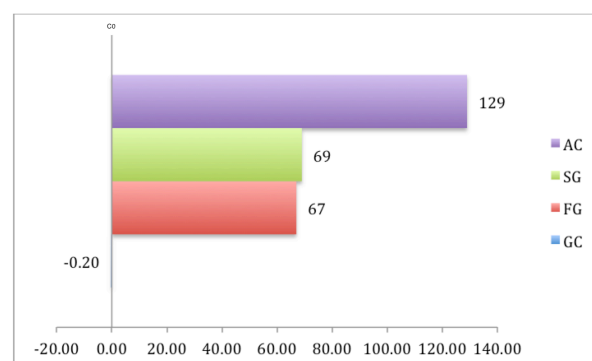


Figure 3: Means for Mindel.C0 (in ms), for the Austrian controls (AC), first-generation immigrants (FG), second-generation heritage speakers (SG) and Greek controls (GC).

#### 3.3. Individual speakers

To determine the effect of individual variation in the production of prenuclear alignment in Greek, we entered the overall means for the Austrian (AC) and Greek controls (GC), and the individual means for each speakers in the FG and SG groups into SPSS. We ran a one-way ANOVA with Mindel.C0 as the dependent variable and Speaker (GC, FG1, FG2, FG3, SG1, SG2, SG3, and AC) as the independent variable. The results showed a significant main effect of Speaker [ $F(7, 173)=30.18$ ,  $p < 0.001$ ]. Bonferroni post hoc tests revealed that all FG speakers begin prenuclear rises significantly later than the monolingual Greek controls. That is, all the first-generation immigrants tested here show signs of

L1 attrition. Furthermore, all but speaker FG2 also differ significantly from the monolingual Austrian controls. Speaker FG2, however, shows values in Greek prenuclear statements that are in line with those found for the monolingual Austrian speakers.

The post hoc tests also revealed that all second-generation heritage speakers differ significantly from both the Greek and the Austrian monolingual controls, with intermediate values between the monolingual values of each language. However, individual speakers vary in the extent to which they differ from the monolingual controls (see Figure 4).

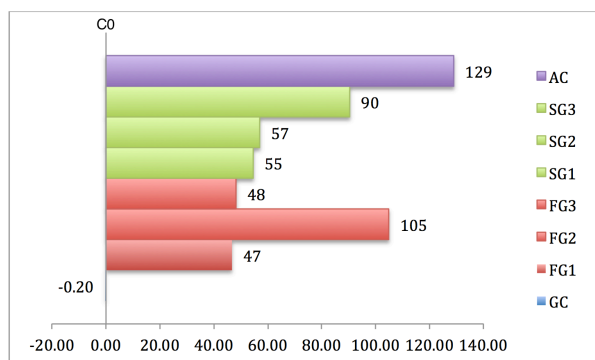


Figure 4: Means for Mindel.C0 (in ms) for the individual speakers in group SG (SG1, SG2, SG3) and FG (FG1, FG2, FG3) compared to overall means AC and GC.

#### 4. Discussion

Our results showed that the Greek and Austrian monolingual controls behaved as expected, both in terms of the start as well as the end of the rise. The Greek control speakers aligned the start of prenuclear rises just before the onset consonant of the prenuclear target word's stressed syllable. The Austrian control speakers began rises well within the stressed vowel of the target word, and even later than the values reported for Southern German speakers in [2]. As predicted, no cross-language differences were found for the end of the rise.

The two successive generations of Greek speakers in Austria showed a different pattern. Both the first-generation immigrants to Austria and the second-generation heritage speakers showed a significantly later alignment of the start of the rise than the Greek monolingual control speakers. Individual analyses revealed that *all* the first-generation speakers showed signs of attrition, although they differed in the extent to which this was evident. It can therefore be concluded that all the first-generation immigrants used a clearly non-native alignment pattern in their Greek. Interestingly, the second-generation speakers also showed a clearly non-native pattern of alignment in their Greek, which was found to be similar to the pattern found for the first-generation immigrants. Both groups produced intermediate values between the Austrian and Greek monolingual groups. On the one hand, it is possible that these intermediate values result from the interaction between the L1 and L2 sound systems, an interaction which is typically present in L2 learners (cf. [11] and [12]). On the other hand, it is equally plausible that the second-generation heritage speakers have adopted the intermediate values they have been exposed to through their parents and the Greek community in Graz.

Our results also revealed that all the second-generation heritage speakers and all but one of the first-generation speakers differed from the monolingual Austrian control group in the timing of the rise. Interestingly, the speaker who performed clearly within the Austrian monolingual norm in their Greek is one of the first-generation speakers (FG2). Intuitively, one would expect those speakers with less exposure and language use to show less signs of attrition. This speaker, however, reported the highest level of L1 language use, suggesting that other factors may be important in the maintenance of L1 speech patterns.

#### 5. Conclusion

To conclude, the results of our pilot study indicate that there are rather striking similarities in the timing of Greek prenuclear rising accents between first-generation adult immigrants from Greece, and second-generation Austrian born adult heritage-language users. This raises the question whether the similarity is due to an interaction between the L1 and L2 sound systems or whether it has arisen from cross-generational transmission, where the attrited timing patterns of the first-generation speakers have been adopted by the second-generation heritage speakers who have been exposed to such non-native patterns in their community.

A further question that arises is the extent to which the alignment of the start of the rise in the speakers' production of Greek sentences is related to their productions of Austrian German sentences.

A major limitation of the present study is the rather small number of speakers, so that our findings should be viewed with caution. Future analyses will include more speakers and will also examine the alignment of the start of prenuclear rises in the speakers' Austrian German.

#### 6. Acknowledgements

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#### 7. References

- [1] A. Arvaniti, D.R. Ladd, and I. Mennen, I., "Stability of tonal alignment: The case of Greek prenuclear accents" *Journal of Phonetics*, vol. 26, no. 1, pp. 3–25, 1998.
- [2] M. Atterer, and D.R. Ladd, "On the phonetics and phonology of "segmental anchoring" of F0: evidence from German," *Journal of Phonetics*, vol. 32, no. 2, pp. 177–197, 2004.
- [3] P. Boersma, and D. Weenink, PRAAT: Doing phonetics by computer. <<http://www.praat.org/>>, 2010.
- [4] C.B. Chang, "Rapid and multifaceted effects of second-language learning on first-language speech production," *Journal of Phonetics*, vol. 40, no. 2, pp. 249–268, 2012.
- [5] E. de Leeuw, I. Mennen, and J.M. Scobbie, "Singing a different tune in your native language: first language attrition of prosody," *International Journal of Bilingualism*, vol. 16, no. 1, pp. 101 – 116, 2012.
- [6] E. de Leeuw, I. Mennen, and J.M. Scobbie, "Dynamic systems, maturational constraints and L1 phonetic attrition," *International Journal of Bilingualism*, vol. 17, no. 6, pp. 683–700, 2013.
- [7] E. de Leeuw, M.S. Schmid, and I. Mennen, "The effects of contact on native language pronunciation in an L2 migrant setting," *Bilingualism: Language and Cognition*, vol. 13, no. 1, pp. 33–40, 2010.

- [8] E. de Leeuw, A. Tusha, and M.S. Schmid, "Individual phonological attrition in Albanian-English late bilinguals," *Bilingualism: Language and Cognition*, (in press).
- [9] O. Dmitrieva, A. Jongman, and J. Sereno, "Phonological neutralization by native and non-native speakers: The case of Russian final devoicing," *Journal of Phonetics*, vol. 38, pp. 483–492, 2010.
- [10] J.E. Flege, "The production of "new" and "similar" phones in a foreign language: evidence for the effect of equivalence classification," *Journal of Phonetics*, vol. 15, pp. 47–65, 1987.
- [11] J. E. Flege, "Second language speech learning: Theory, findings, and problems," In W. Strange (ed.), *Speech perception and linguistic experience: Issues in cross-language research* Timonium, MD: York Press, pp. 233–277, 1995.
- [12] J.E. Flege, C. Schirru, and I.R.A. MacKay, "Interaction between the native and second language phonetic subsystems," *Speech Communication*, vol. 40, 467–491, 2003.
- [13] K. Gharibi, "Incomplete Acquisition, Attrition and Maintenance of Heritage Speakers' Family Language: Iranians in New Zealand," *Unpublished PhD*, Victoria University of Wellington, 2016.
- [14] H. Hopp, and M.S. Schmid, "Perceived foreign accent in first language attrition and second language acquisition: The impact of age of acquisition and bilingualism," *Applied Psycholinguistics*, vol. 34, no. 2, pp. 361–394, 2013.
- [15] B. Köpke, and M.S. Schmid, "Language Attrition: The Next Phase," In M. S. Schmid, B. Köpke, M. Keijzer, and L. Weilemar (Eds.), *First Language Attrition: Interdisciplinary Perspectives on Methodological Issues*, vol. 28, pp. 1–46. Amsterdam: John Benjamins Publishing, 2004.
- [16] T. Lein, T. Kupisch, and J. van de Weijer, "Voice onset time and global foreign accent in German–French simultaneous bilinguals during adulthood," *International Journal of Bilingualism*, first published 2015.
- [17] T. Kupisch, D. Barton, K. Hailer, E. Klaschik, I. Stangen, T. Lein, and J. van de Weijer, "Foreign accent in adult simultaneous bilinguals," *Heritage Language Journal*, vol. 11, pp. 123–150, 2014.
- [18] N. Nagy, and A. Kochetov, "VOT across the generations: A cross-linguistic study of contact-induced change," In P. Siemund, I. Gogolin, M. Schulz, and J. Davydova, (eds.), *Multilingualism and language diversity in urban areas: Acquisition, identities, space, education*, Amsterdam/Philadelphia: John Benjamins, pp. 19–38, 2013.
- [19] R.C. Major, "Losing English as a First Language," *The Modern Language Journal*, vol. 76, no. 2, pp. 190–208, 1992.
- [20] R. Mayr, S. Price, and I. Mennen, "First language attrition in the speech of Dutch-English bilinguals: the case of monozygotic twin sisters," *Bilingualism: Language and Cognition*, vol. 15, no. 4, pp. 687–700, 2012.
- [21] R. Mayr, J. Morris, I. Mennen, and D. Williams, "Disentangling the effects of long-term language contact and individual bilingualism: The case of monophthongs in Welsh and English," *International Journal of Bilingualism*, first published online 2015.
- [22] R. Mayr, and A. Siddika, "Inter-generational transmission in a minority language setting: Stop consonant production by Bangladeshi heritage children and adults," *International Journal of Bilingualism*, first published online 2016.
- [23] I. Mennen, "Bi-directional interference in the intonation of Dutch speakers of Greek," *Journal of Phonetics*, vol. 32, pp. 543–563, 2004.
- [24] M. S. Schmid, M. "Languages at play: The relevance of L1 attrition to the study of bilingualism," *Bilingualism: Language and Cognition*, vol. 13, pp. 1–7, 2010.
- [25] H. W. Seliger, and R.M. Vago, "The study of first language attrition: an overview," In H.W. Seliger, and R.M. Vago (eds) *First Language Attrition*. Cambridge: Cambridge University Press, pp. 3–30, 1991.
- [26] P. Trofimovich, and W. Baker, "Learning second-language suprasegmentals: Effect of L2 experience on prosody and fluency characteristics of L2 speech," *Studies in Second Language Acquisition*, vol. 28, pp. 1–30, 2006.
- [27] C. Ulbrich and M. Ordin, "Can L2-English influence L1-German? The case of post-vocalic /r/," *Journal of Phonetics*, vol. 45, pp. 26–42, 2014.