YOUNG RUSSIAN IMMIGRANTS' SEGMENTAL DURATION AND LENGTH IN FINNISH

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ABSTRACT

This pilot study sheds light on how young Russian immigrants (n=10) produce Finnish segmental duration and length in read-aloud speech as compared to native Finnish speakers (n=5). Segment duration is distinctive in Finnish and an important feature of Finnish phonology, whereas in Russian it only plays a marginal role. The results show a general tendency of durational contrasts being difficult to learn with great interspeaker differences.

Keywords: L2 learning, length, duration, Finnish.

1. INTRODUCTION

Despite the fact that learning to produce prosody is crucial for being intelligible in the second language (L2), other prosodic features than intonation are rarely investigated in L2 speech. Instead of actual language features to be learnt, it has been investigated e.g. as means of determining fluency or degree of foreign accent. The current pilot study builds basis for a new research project (*Focus on learning pronunciation: Swedish as L1/L2*, 2015-2017), where L2 prosody of Swedish, Russian, Finnish and English will be investigated in different oral proficiency levels (www.jyu.fi/fokus).

In this study we report on how young Russian immigrants produce segmental duration and length in Finnish read-aloud speech. Apart from focusing on the production of this distinctive feature of Finnish, the novelty of our study is also the young participants, who are rarely the subjects in L2 phonetic studies. However, this mostly pre-puberty learner group is interesting from L2 perspective because of the rather common assumption that the critical period for acquiring (a native-like) pronunciation is supposed to end at puberty [15, 7, 8] (for critical remarks and an overview see [17, 2]). Another novel aspect of the study from a L2 point of view is that the L1 and L2 are unrelated and neither of them is English, as by far the majority of previous studies focus on English as L2.

In Finnish, the short-long contrast is extensively used for both vowels and consonants. In Russian, the role of duration is limited to signaling word stress, stressed vowels being longer than unstressed ones. The duration ratio of Russian stressed to unstressed vowels has been said to be the same as that of the Finnish long vowels to short vowels [6]. Thus, one might expect that producing the duration contrast in vowels would not be very difficult for Russian learners of Finnish. However, as we argue below, Finnish quantity system is a lot more complex and e.g. perception studies [26, 27] have shown that perceiving the durational contrasts is difficult for Russian learners of Finnish. In fact, the durational contrasts are difficult even for native speakers, who have been shown to learn the quantity distinction early on, but not to master the durational differences in the unstressed vowel in CVCV/CVCCV patterns even at the age of six [9].

While the first extensive experimental analyses of Finnish quantity were conducted in the 1970's [14], it is surprising that only a few studies [25, 22, 20, 24] have attempted to investigate the production of quantity distinction in L2 Finnish. In Vihanta's study [25], the French L1 speakers had a tendency to exaggerate the duration of the word-final short vowel in all word types. They also exaggerated the duration of the stressed long vowel and did not produce native-like distinction between the duration of the final vowel in CVCV vs. CVVCV/CVCCV words. Similarly, Toivola [22] observed that Russian L1 speakers often produced either too short or too long segments in word-medial position, and exaggerated the duration of the word final vowel.

1.1. Segment duration in Finnish

Finnish has a highly complex quantity system. For instance, in the very common disyllabic structure there are eight possible combinations of short and long vowels and consonants: *tule, tulle, tulee, tullee, tuule, tuulle, tuulee, tuullee* are all Finnish words (inflections of the verbs *tulla* 'come' and *tuulla* 'blow') [13, see also 24]. All eight vowels can be long and short in all stressed and unstressed syllables, and also most of the consonants can occur as long or short between vowels making a single-double contrast as in *muta* (mud), *mutta* (but) [11]. The extensive phonological use of segment and syllable duration in Finnish presents a great challenge to L2 speakers, especially because the phonetic realisation of quantity in Finnish is more complex than the short description above suggests

[19]. For instance, in CVVCV and CVCCV structures not only the long segment has longer duration but also the second-syllable vowel is shorter than in CVCV, where the second-syllable vowel is phonetically long. Thus, segment durations in Finnish words interact with each other. From the learners' point of view the word internal durational relations are difficult to master, because L2 speakers cannot only concentrate on the durations in the stressed syllables but they also have to produce the appropriate durational pattern in the whole word. In Finnish the quantity is mostly related with time but also F0 pattern is different and might contribute to the phonological distinction between short and long vowels in the initial, stressed syllable [16, 18].

1.2. Segment duration in Russian

For Russian vowels, duration is one of the main cues for word stress, stressed vowels being longer than unstressed ones. Consonantal length is not distinctive in Russian in general. However, a few consonantal minimal pairs can be found, such as *страны* ['strɑnɨ] '*countries*' *странны* ['strɑnːɨ] '*strange*' *(plural)*. In addition, there are two palatoalveolar soft sibilants [ʃʲː] and [ʒʲː] that are longer than all other consonants, but they lack the short variant. [4, 5, 6, 12].

2. MATERIAL AND METHODS

The data for the study come from a psycholinguistic test used in a research project DIALUKI (www.jyu.fi/dialuki). In the test (adapted from the Lukilasse test battery [10]) the pupils were asked to read aloud a list of Finnish words as fast and accurately as they could during one minute. The data offer interesting possibilities for the study of segmental length, as the quantity distinction needs to be respected even when reading fast. The reading aloud was recorded in .wav (22 050 Hz sample rate, 32 bit resolution). The stimuli for the present analysis were four different disyllabic word types as shown in Table 1. Only the productions (n=219) that respected the syllable structure (but not necessarily the length contrasts) of the target stimuli (judged auditorily by the authors) were analysed.

The speakers were 10 young Russian immigrants (aged 9-13, mean age 11), non-native speakers of Finnish (5 girls, 5 boys) from different parts of Finland (further NNSs, RU01-10) and 5 young native Finnish speakers (aged 9-10) from one school in central Finland (further NSs, FI01-05). All NNSs had immigrated to Finland from Russia within the past year, and came from predominantly Russian speaking homes. NSs were chosen from central Finland, an area with no strong dialectal features but a pronunciation close to standard Finnish. None of the speakers reported any hearing problems.

First, manual segmentation was carried out in Praat [3]. The segment onsets and offsets were defined mainly using auditory cues, but also by observing the intensity, F0 and formant changes in the spectrogram. The occlusion phase was excluded in word-initial plosives, but included in the plosive in the intervocalic position. The relative segment durations were averaged and calculated. The segment durations are expressed as ratios When there were enough data, the groups were statistically compared using the non-parametric Independent samples Mann-Whitney U-test, as the data were not normally distributed.

Table 1: The data.

Type	Stimuli	In English
CVCV	talo, poro, lasi, kala, nami	house, reindeer, glass, fish, candy
CVVCV	vaari, kuulo, puuro, sääri	grandpa, hearing, porridge, leg
CVCCV	kissa, kalle	cat, proper name
CVCCCV	kelkka, purkki	sleigh, jar

3. RESULTS

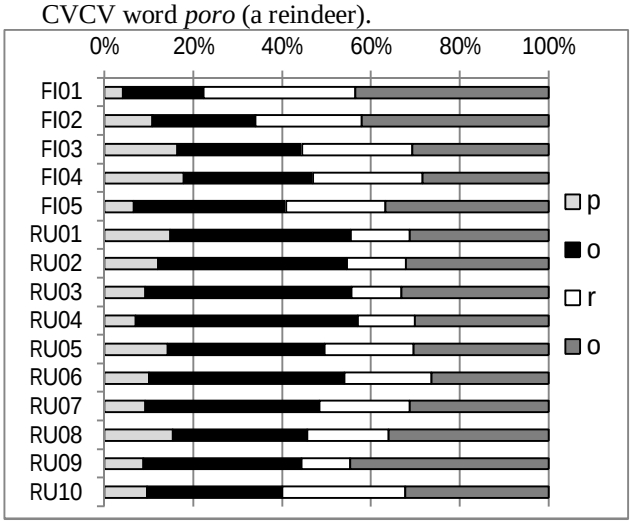
3.1. Segmental duration in CVCV

The ratio of short unstressed vowel to short stressed vowel in CVCV words was on average 1.50 (std = 0.498; range 1.02-2.28) for NSs as compared to 0.75 (std=0.244; range 0.61-0.93) for NNSs. This means that the NSs produced their unstressed vowels about 1.5 times longer as the short stressed vowels, whereas the NNSs' unstressed vowels were 0.25 times shorter than the stressed ones. The groups differed significantly from each other at 0.001 level (Mann Whitney U-test). For consonants the ratio of the short intervocalic consonant to short stressed vowel in CVCV words was on average 1.01 (std=0.392; range 0.8-1.42) for NSs and 0.68 (std=0.338; range 0.49-0.81) for NNs. In other words NSs' short stressed vowel duration matched on average the duration of the short intervocalic consonant, but NNS' short intervocalic consonant was on average much shorter than the stressed vowel. The groups differed significantly from each other at 0.001 level (Mann Whitney U-test).

Figure 1 shows an example of a CVCV word by proportioning the segmental durations in percentage to the duration of the whole word. Despite the general tendency of NNSs failing to produce the NS-like segment durations, there is much interspeaker variation. It is especially manifested in the duration of the stressed short vowel: for two NNSs (RU08

and RU10) the stressed vowel duration fitted within the rather wide NS range (18%-34%), but one NNS (RU04) was very far from that being about half of the duration of the whole word. To conclude, NNSs as a group had too long stressed vowels and too short intervocalic consonants in CVCV structures.

Figure 1: The relative segmental durations in CVCV word *poro* (a reindeer).

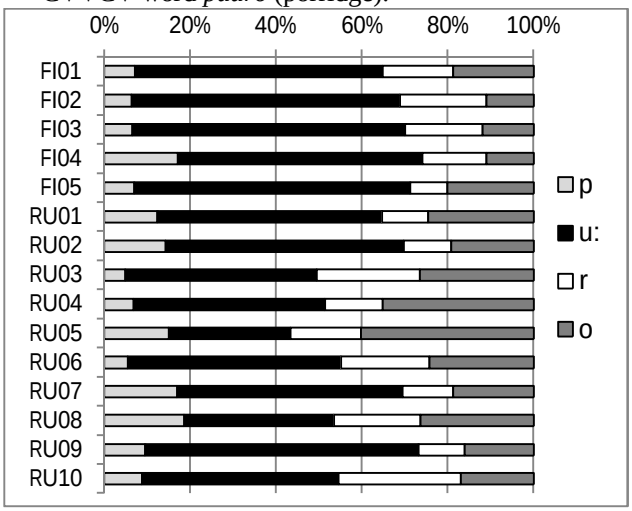


3.2. Segmental duration in CVVCV

In CVVCV structures, the stressed vowel duration was proportionally almost the same as the intervocalic consonant duration in NSs' speech. The ratio of the unstressed short vowel to the long stressed vowel was 0.24 (std=0.099; range 0.20-0.33) and the ratio of the short consonant to the stressed long vowel was 0.23 (std=0.101; range 0.18-0.33). The NNSs' productions differed from NSs. For them the ratio of the unstressed short vowel to the stressed long vowel was 0.59 (std=0.311; range 0.26-1.09) and the ratio of the short consonant to the stressed long vowel was 0.32 (std=0.179; range 0.21-0.48). In NNSs' speech the intervocalic consonant was proportionally much shorter than the long stressed vowel. The difference between NSs and NNSs was statistically significant at 0.05 level for vowels.

Figure 2 shows the relative segmental durations of the word *puuro* (porridge) as an example of the interspeaker variation in the CVVCV structure. Similarly as in the CVCV structure in Figure 1, the greatest differences for NNSs are observed in the duration of the stressed vowel. Of course the violation of its duration influences the proportional duration of the other segments also. For NSs, the stressed long vowel is proportionally over half of the duration of the whole word (range 57%-64%), whereas for most NNSs it is less than a half. However, two NNSs (RU07, RU09) are very NS-like, matching proportionally almost exactly to NSs' (FI04, FI05) productions. In sum, the NNSs exaggerated the duration of the unstressed vowel in CVVCV words.

Figure 2: The relative segmental durations in CVVCV word *puuro* (porridge).



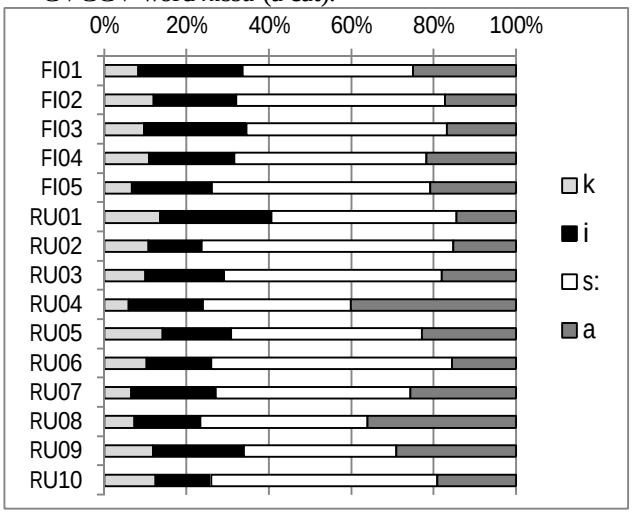
3.3. Segmental duration in CVCCV and CVCCCV

Similarly as for CVCV and CVVCV, NNSs differed from the NSs in CVCCV and CVCCV. In CVCCV, the duration ratio of unstressed vowel to stressed vowel was 0.65 for NSs (std=0.324; range 0.55-0.83) and 1.17 for NNSs (std=0.525; range 0.80-1.74). Also the duration ratio of intervocalic consonant to stressed vowel was smaller, 1.49, for NSs (std=0.789; range 0.252-0.896) as compared to 1.95 for NNSs (std=1.164, range 1.32-2.86). On average, NNSs tended to exaggerate the consonant duration as compared to NSs. Figure 3 shows the productions of a CVCCV. Here the NNSs are rather successful in producing the relative durations in comparison to the previous word types. For all NSs the sibilant has the longest relative duration, which is about half of the duration of the whole word (ranging from 41% to 53%). Most NNSs respect this durational structure, but for one NNS (RU04) the unstressed vowel has the longest duration and for two NNSs (RU02 and RU06) the sibilant duration is proportionally much longer, 59%-61% of the duration of the whole word.

In CVCCCV structures (words *purkki* 'a jar' *and kelkka* 'a sleigh'), the ratio of unstressed short vowel to stressed short vowel was 0.81 (std=0.375; range 0.59-1.11) for NSs and 1.35 (std=0.681; range 0.86-2.08) for NNSs respectively. The ratio of short pre-geminate consonant to stressed short vowel was 0.97 (std=0.77; range 0.77-1.43) for NSs, as compared to 1.1 (std=0.784; range 0.49-2.25) for NNSs. The long plosive is considerably longer than other segments of the word, the ratio of geminate to stressed short vowel being 2.07 (std=0.831; range 1.76-2.8) for

NSs and 2.45 (std=1.609; range 1.26-4.78) for NNSs. In short, there is much variation in the NNSs productions in CVCCCV structures in the relative duration of all segments, but there is a tendency to pronounce the long consonant as too long.

Figure 3: The relative segmental durations in CVCCV word *kissa* (a cat).



3.4. Length

Phonologically, the differences between NSs and NNSs can be seen by comparing the productions of the short and long stressed vowel in Figures 1–2. Proportionally, NSs clearly contrasted the two durational degrees, but only one NNS (RU09) produced the contrast to the same extent. Other NNSs have slightly shorter short vowel, but for three NNSs (RU03, RU04 and RU05) the short vowel is proportionally longer than the long one. As for consonant length, comparison of Figures 1 and 3 shows that for all NSs and NNSs the short intervocalic consonant is shorter than the long one. For most NSs the relative duration of the short consonant is about half of that of the long one (FI01 being an exception), whereas for most NNSs it is about a third of that of the long one.

4. DISCUSSION

In sum, even though our data (rapid reading aloud of isolated words) differed from that of the previous studies, we confirmed the general tendency of NNSs to exaggerate the duration of the final vowel, mentioned in previous research [25, 22], except in the CVCV structure. We also found that the NNSs pronounced the phonologically long segments as too long (vowels in CVVCV and consonants in CVCCV and CVCCCV). However, the relative segmental durations of the NNSs were the most successful in the two CVCCV words. Thus, our findings confirm the earlier results that learning to produce Finnish duration is difficult for L2 speakers. Difficulties concern both vowels and consonants, long and short, as well as stressed and unstressed syllables, i.e. there is - quite naturally due to the complexity of the durational system in Finnish - no single problem that could be pointed out to cause most problems for the Russian L2 speakers.

Similarly to previous studies that have shown great interspeaker variation in learning prosody, e.g. prosodic phrasing and intonation for Russian speakers [1], we also found individual differences in learning, even though we studied a somewhat homogenous learner group (of similar age, language background and length of residence). As Figures 1-3 showed, one NNS (RU04) did not master the durational differences at all and two (RU07, RU09) were very NS-like. The difficulties of RU04 can be due to the more general learning problems (she reported having learnt to read slower than others). Interestingly, there was also interspeaker variation in NSs' productions. For example, some (FI01 and FI05) used an overlong last unstressed vowel, which is a dialectal feature of central Finland Finnish. In the future, it would be interesting to compare NSs from different dialects in this respect (as, e.g. [28]) or to study a more substantial number of NSs of the same dialect. As NS variation of duration is always manifested by respecting the phonological quantity distinction, from L2 perspective it would also be interesting to study, firstly, which durations in the word structure vary the most and how much variation is tolerated auditorily by NSs and, secondly, the role of F0 in this language pair. Thus far, only little is known about such prosodic variation compared with e.g. research on variation on the segmental level.

5. CONCLUSIONS

The current study was unique in targeting learning of segmental length, an important prosodic feature of Finnish, in an understudied learner group, that is young immigrant pupils. While this was a pilot study in nature, the fact that individual differences were found while controlling for length of residence, age, gender and language background suggests potential for further studies, especially by analysing the under investigated prosodic features in L2 speech.

6. ACKNOWLEDGEMENTS

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