Segmental duration in nuclear and post-nuclear syllables in Russian

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Abstract

In this paper we compared durational patterns of two types of nuclei, HL* (used to signal contrast, in addresses, exclamations etc.) and H*L (used in yes/no questions and non-final phrases), for which the role of post-nucleus is different. In a laboratory experiment with the target word “Natasha” placed in different contexts we found that the two types of nuclei differ in the duration of both stressed and post-stressed syllable. The stressed syllable is longer in HL*, while the post-stressed vowel is significantly longer for H*L, where post-nucleus plays a greater role. However, this only holds true when the target word occurs phrase-finally. If the nucleus occurs phrase-medially, the temporal difference between HL* and H*L is much weaker.

Key words: prosody, segmental duration, Russian, general question, contrastive stress

Introduction

In Russian intonation system, there are two common types of nuclei which differ in the role of post-nuclear part. They are:

A rise-fall with an early peak, used in addresses, demands or phrases with contrast, logical stress etc. (in terms of ToRI, HL* (Odé 2008)). Most of the pitch curve is within the nucleus, and the post-nuclear part does not play a significant role.

A rise-fall with a late peak, used in yes/no questions or non-final phrases (in terms of ToRI, H*L). Within the system, this type of nuclei differs from a “rise + level high” (H*H), which is used in exclamations, often with admiring or dreaming connotation. The key difference between H*L and H*H is concentrated within the post-nucleus. Hence the large role of post-nucleus for H*L (see Figure 1).

We hypothesized that if the post-nucleus plays different roles in these two contours, they might differ in durational patterns as well – in particular, we will look for differences in the stressed and post-stressed syllables.

We have to bear in mind that when the nucleus occurs phrase-finally, another factor comes into play – pre-boundary lengthening. The experiment should be designed so as to take this factor into account.

Figure 1. Average pitch curves of the 3-syllable word with penultimate stress in semitones based on CORPRES (Skrelin et al. 2010). Dashed lines show standard deviation. Vertical grey lines mark syllable boundaries.

Experimental method and results

In order to test this hypothesis, we performed a production experiment, where speakers were asked to read a set of utterances containing the target word “Natasha” (/na'taʃa/, a female name with penultimate stress) in five different contexts. In order to elicit the intended melodic contours, the speakers were instructed to put emphasis on the words given in bold.

Neutral context. “Сегодня **Наташа** на рисовании.” (Today Natasha [is] at [the] drawing class.)

Contrastive stress (reassuring) in phrase-*final* position. “Да нет же, приходила **Наташа**!” (Not at all, came Natasha!)

Contrastive stress (reassuring) in phrase-*medial* position. “Вчера **Наташа** приходила, а не Марина.” (Yesterday Natasha came, not Marina.)

Yes/no question (with a hint of surprise) in phrase-*final* position. “Что? Приходила **Наташа**?” (What? Came Natasha?)

Yes/no question (with a hint of surprise) in phrase-*medial* position. “Правда? Сегодня **Наташа** приходила?” (Really? Today Natasha came?)

The material was recorded from six speakers aged 22-50, 3 males and 3 females. All the speakers pronounced the utterances as expected: HL* for contexts 2 and 3, H*L for contexts 4 and 5, no nuclear stress for context 1. The target words were manually segmented into sounds. The utterance-final vowels were judged to end with the end of formant structure.

The duration data for all 6 speakers are shown in Figure 2.

Phrase-final contexts

The stressed syllable, /ta/, was longer in context 2 (contrast) compared with context 4 (yes/no question) for all speakers. The difference ranged between 29 to 46 ms, and most of it was due to the vowel duration.

Figure 2. Duration (in ms) of the segments within the target word “Natasha” for 6 speakers and 5 different contexts (see legend)

The post-stressed syllable, /ʃa/, for context 2 was either of the same duration or shorter than for context 4 for all speakers but M3. If shorter, the difference ranged between 10 and 25 ms. Interestingly, the vowel of the post-stressed syllable was significantly shorter for context 2 for these 5 speakers. The difference ranged between 18 and 35 ms. The consonant of the syllable /ʃa/, on the other hand, was in most cases longer for context 2 than for context 4, and thus seems to be compensating for vowel lengthening. However, in our example the consonant is unvoiced, so this might not be the case with sonorants or voiced obstruents.

Thus, for context 4 (yes/no question), where post-nucleus plays a larger role, post-stressed vowel has higher duration. This might be explained by the fact that speakers need more time to show that pitch is going down; otherwise this tune might be confused with another one –

“rise + level high” – which in its turn would lead to misunderstanding, as the latter contour never marks a question.

The exception, speaker M3, might use a different strategy for temporal marking of these two types of nuclei. More research is needed to find out how frequent this strategy is among Russian speakers.

Phrase-medial contexts

The duration data for phrase-medial show much more variation across speakers. The stressed syllable, /ta/, was longer in context 3 (contrast) compared with context 5 (yes/no question) for 4 speakers; the difference ranged between 18 and 46 ms. Speaker M2 showed an opposite effect, and speaker F1 – almost no difference (2 ms).

For the post-stressed syllable, /ʃa/, the difference between contexts 3 and 5 was in most cases rather small (7 ms and less; 4 speakers). For speaker F1 the syllable /ʃa/ is 16 ms longer in context 5, while for speaker F3 it is 19 ms shorter. As for the final /a/, there is no evidence that it is longer in context 5 than in context 3.

Conclusion

Our data have shown that the two types of nuclei differ in temporal organization, but the latter is highly dependent on whether the nucleus is phrase-final or not. In terms of segmental durations, phrase-final words under nuclear stress are pronounced more carefully, and therefore the melodic difference is supported by difference in duration, while in phrase-medial context the types of nuclei might differ only in terms of melody.

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