

Voice Coarticulation Across Word Boundaries in /v/+v/ Sequences in Standard Russian

KNYAZEV* Sergey, PETROVA⁺ Irina, VORONTSOVA⁺ Irina

(*Russian Department, Moscow State Lomonosov University; svknia@gmail.com

⁺English Department, Russian State University for the Humanities)

Abstract

The paper reports some results of the research, aimed at finding out whether regressive and/or progressive voice coarticulation is available in clusters of homorganic labiodental consonants /v/ (/f/) + /v/ in an external sandhi position in Modern Standard Russian; and if yes, to which extent this phenomenon is spread in Standard Russian and is dependent on some segmental, prosodic, genre/stylistic, or extralinguistic conditions.

Introduction

The voiced labiodental consonant [v] ranks specially in the phonetic system of Standard Russian as, on the one hand, a number of grounds close it with a group of sonorant consonants (it does not cause voice assimilation of preceding obstruents), while on the other hand it approaches obstruents (being devoiced word finally and before voiceless obstruents).

This state of things is historically determined: the Old Russian consonant phonemic system inherited from Common Slavic contained the only (voiced) non-plosive bilabial approximant [w].

Word finally voiced and voiceless obstruents in Standard Russian do not differ neutralizing in a sound dependent on the right context: voiceless before a pause, a vowel, a sonorant, [v] or a voiceless obstruent of the succeeding word and voiced before a voiced obstruent.

Thus, the norms of Modern Russian pronunciation suggest that in Standard Russian word finally labiodental voiced /v/ before /v/ of the succeeding word should be realized in its voiceless allophones similarly to other voiced obstruents, i.e. pronouncing *plo[f # v]ydalsa* (*plov vydalsa* 'pilaf is') matching obvious *pru[t # v]ysoh* (*prud vysoh* 'pund has dried out') [1: 97-98] is quite likely.

However the auditive analysis demonstrates that in external sandhi position clusters of homorganic consonants with the second /v/ may be pronounced unlike clusters of consonants of different places of articulation, i.e., the final /f/ and /v/ may be realized as a voiced [v] before [v] of a succeeding word; also, in a case of a word final consonant's devoicing the initial /v/ of the succeeding word may turn not completely voiced.

The goals of the research, structured as four succeeding experiments, were to find out whether regressive and/or progressive voice coarticulation in the external sandhi position is available in clusters of labiodental consonants

with the second voiced /v/ (in combinations of words not divided by syntactic boundaries), and if yes, to which extent this phenomenon is spread in Standard Russian and is dependent on some supplementary conditions – segmental, prosodic, genre, stylistic, or extralinguistic.

Experiment 1

In Experiment 1 the pronunciation of labiodental consonants in the word junctures was analyzed on the previously recorded material – a specialized phonetic database of the speech corpus [2].

The segment surveyed featured 67 phrases with combinations of /v/ + /v/ in external sandhi position pronounced by 45 subjects (in building up the corpus different subjects recorded a different number of phrases) and further analyzed with the *Praat* program.

Three main types of speech signal between two vowels were obtained: 1) a period of fricative noise with no F₀ traces followed by (a pause and) a voiced period with formant structure; 2) a fully voiced period with formant structure; 3) a fully voiceless period with fricative noise. Here and elsewhere type one signal is considered to be a [fv] sequence, type two is considered to be a [vv] sequence, and type three is considered to be a [ff] sequence (see Figure 1). No cases of consonant deletion in -VCCV- sequences were mentioned during all the experiments (the duration of -CC- more than 120 ms).

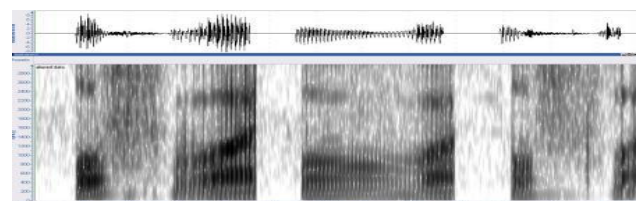


Figure 1 : Waveform and spectrogram of the sequences being considered as [ofva], [ovva], [offa] (left to right).

It should be noted that a devoiced consonant in the position of the initial /v/ in the second phonological word in most cases was not a true [f] – the noise intensity in its pronunciation is much lower than in pronouncing [f]; according to the subjects this sound is perceived as an intermediary of [v] and [f].

Table 1 shows the **results**: they suggest, that the pattern of realizing clusters of labiodental consonants in external sandhi position is quite individual and idiolect dependent – thus, if a subject pronounces [vv] there should be no [ff] traced in his speech, while [fv] may be noted both with [vv] and [ff] cases.

It naturally follows that choosing [ff] or [vv] pronunciation is inherent in one's individual strategy, while choosing [fv] or [ff] / [vv] is specified by merely phonetic conditions. The fact that the same phrase may be pronounced differently by different subjects testifies to it.

This being said, the most frequent pronunciation is [ff], less frequent still quite widespread is [vv], and the rarest is [fv], which is considered normative for the position in question but appears mostly across a prosodic boundary, making only 3% of the cases investigated.

In Table 1a the pronunciation of the underlying /z + z/ sequences in the same position on the same material is shown as a control case.

Table 1 : [fv], [vv] or [ff] pronunciation of the underlying /v + v/ sequences in an external sandhi position within an intonation group and across a prosodic boundary on the material of the Russian speech corpus

	total	within an intonation group	across a prosodic boundary
total	67	56	11
pronounced [fv]	14 (21%)	3 (5%)	11(100%)
pronounced [vv]	15 (22%)	15 (27%)	0
pronounced [ff]	38 (57%)	38 (68%)	0

Table 1a : [sz], [zz] or [ss] pronunciation of the underlying /z + z/ sequences in an external sandhi position within an intonation group and across a prosodic boundary on the material of the Russian speech corpus

	total	within an intonation group	across a prosodic boundary
total	19	14	5
pronounced [sz]	5 (26 %)	0	5 (100%)
pronounced [zz]	14 (74%)	14 (100%)	0
pronounced [ss]	0	0	0

Experiment 2

The results of Experiment 1 may be considered but preliminary as they draw on the analysis of the material available which provides no reliable control either over the language competence of the subjects or over the identical terms of carrying out the experiment for all the subjects (the phrases recorded were different).

Thus, the objective of the second experiment was to investigate the rate of occurrence of pronouncing [fv], [ff] or [vv] in clusters of labiodental consonants in external sandhi position in Standard Russian.

The investigated object was Hamlet's soliloquy from Shakespeare's tragedy in three different translations into Russian containing quite a frequent combination *takov vopros* ('that's the question') with the /v/ + /v/ cluster in in the external sandhi position within an intonation group. 197 subjects took part in the experiment. The material was read thrice and further processed with the Praat program.

Table 2 shows the **results** which reasonably argue that:

- The cluster of homorganic labiodental consonants /v/ + /v/ in an external sandhi position presumes pronunciation of [fv], [ff] or [vv], whereas one and the same subject in the majority of cases demonstrates one and the same type of pronunciation in all the phrases read;
- The most frequent pronunciation in this case is [ff], the less frequent is [vv], and the most infrequent is [fv], which is considered the only normative for this position.

Table 2 : [ff], [vv] or [fv] pronunciation of the *takov vopros* combination in various "Hamlet" translations

pronunciation translation	[ff] (%)	[vv] (%)	[fv] (%)	total
translation 1	145 (79%)	30 (16%)	9 (5%)	184 (100%)
translation 2	142 (72%)	36 (18%)	19 (10%)	197 (100%)
translation 3	144 (73%)	37 (19%)	16 (8%)	197 (100%)
all translations	431 (74%)	103 (18%)	44 (8%)	578 (100%)

Experiment 3

A fairly considerable volume of the material (578 phrases) in the second experiment accounts for a great number of subjects (197 participants) and their threefold reading the same combination of words. However the pronunciation of consonant clusters in the same positions in some particularly frequent word combinations is likely to be different from the same clusters in less frequent combinations. This hypothesis determined the objectives of the third experiment:

1) to analyze the realization of labiodental consonants' clusters /v/ or /f/ + /v/ in an external sandhi position of some considerable volume grounded by increasing number and variety of cluster types;

2) to spot the pronunciation controlling factors grouped in 2 basic categories:

a) segmental: the right context type (a segment preceded by the labiodental cluster – a vowel, /v/, a sonorant) and the phonemic status of the first consonant cluster (/v/ or /f/);

b) genre/stylistic: colloquial or poetic texts.

The experiment engaged 30 subjects chosen at random from the 197 participants of the previous experiment.

According to the conditions stated the material was made of 4 phrases from poetic texts and 63 colloquial phrases: 33 with /v/ # /v/+vowel sequences (e.g., *mesyacev voyni*); 13 with the sequence of /f/ # /v/+vowel (e.g., *Iosif Vissarionovich*); 9 with the sequences of /v/ or /f/ # /v/+sonorant (e.g., *organov vlasti*), 9 with the sequences of /v/ or /f/ # /v/+/v/ (e.g., *pryzhkov v vodu*).

The **results** of Experiment 3 are given in Tables 3, 4 and carry inference that:

- A pronunciation type of the labiodentals cluster is specified by its right context: a number of [vv] pronunciation cases increases in the position before [v] as compared to the pre-vowel position, while a number of cases with [ff] pronunciation increases before a sonorant (largely, at the expense of fewer [vv] cases);
- The phonological status of the first word final consonant hardly ever influences the type of realization of the investigated clusters;
- Poetic texts unlike colloquial ones feature a greater deal of [fv] pronunciation cases at the expense of substantial decreasing [vv] pronunciation cases with approximately the same amount of [ff] pronunciation which may result from the specific prosodic organization of poetic texts;
- Pronouncing [ff], [vv] or [fv] in the cluster of /v/ or /f/ + /v/ in an external sandhi position obviously depends on the frequency rate of certain word combinations: the higher is the rate the more likely is [vv] and the less likely is [fv].

Table 3 : [ff], [vv] or [fv] pronunciation in /v/ (/f/) + /v/ combinations in an external sandhi position depending on the phonemic status of the first consonant and on the right context (colloquial texts)

pronunciation combination	[ff] (%)	[vv] (%)	[fv] (%)	total (%)
<v> #	651	219	120	990
<v>+vowel	(66 %)	(22 %)	(12 %)	(100%)
<f> #	274	78	38	390
<v>+vowel	(71 %)	(20 %)	(9 %)	(100%)
<v>/<f> #	153	72	15	240
<vv>+vowel	(64 %)	(30 %)	(6 %)	(100%)
<v> /<f> #	230	33	7	270
<v>+sonorant	(85 %)	(12 %)	(3 %)	(100%)
total	1308 (69%)	402 (21 %)	180 (10%)	1890 (100%)

Table 4 : [ff], [vv] or [fv] pronunciation in /v/ (/f/) + /v/ combinations in an external sandhi position depending on the phonemic status of the first consonant and on the right context (poetic texts)

pronunciation combination	[ff] (%)	[vv] (%)	[fv] (%)	total (%)
<v> #	60	7	23	90
<v>+vowel	(67 %)	(8%)	(25%)	(100%)
<v>/<f> #	27	1	2	30
<v>+sonorant	(90 %)	(3%)	(7%)	(100%)
total	87 (72%)	8 (7 %)	25 (21%)	120 (100%)

Experiment 4

It is well known that the boundary between two words may trigger different phonological effects according to the strength of the boundary, as measured by its place on the prosodic hierarchy [3], [4]. The objective of experiment 4 was to investigate how the pronunciation in question may be influenced by

- prosodic factors, such as a) strength of a prosodic boundary between phonological words; b) absence or presence of a phrase accent on one of the words and
- extralinguistic factors (subjects' age profile).

The material investigated was a text fragment with the same segmental composition *plov varitsya 7 chasov* ('rice pilaf is cooked for 7 hours') pronounced by all the subjects in phrases with different prosodic settings:

- 1) an accent on *plov*, zero accent on *varitsya*, (no breath holding respiratory pause, a prosodic boundary of maximum strength within a phrase);
- 2) an accent on *varitsya*, no accent on *plov* (a prosodic boundary of minimum strength);
- 3) no accent on *plov* and *varitsya*, no boundary.

The experiment involved 158 subjects of those 197 who took part in experiment 2. They were divided into 3 age groups: 1) under 25 (78 subjects); 2) 25-35 (42 subjects); 3) over 35 (38 subjects).

Table 5 : [ff], [vv] or [fv] pronunciation in the *plov varitsya* combinations depending on the prosodic settings of the utterance

pronunciation prosody	[ff] (%)	[vv] (%)	[fv] (%)	total
type1	111 (70%)	11 (7%)	36 (23%)	158 (100%)
type2	120 (76%)	24 (15%)	14 (9%)	158 (100%)
type3	106 (67%)	49 (31%)	3 (2%)	158 (100%)
all types	337 (71%)	84 (18%)	53 (11%)	474 (100%)

Table 6 : [ff], [vv] or [fv] pronunciation in the *plov varitsya* combinations depending on the speakers' age (total of all the utterances and of all prosodic types)

pronunciation age	[ff] (%)	[vv] (%)	[fv] (%)	total
under 25	165 (71%)	51 (22%)	18 (8%)	234 (100%)
25-35	84 (68 %)	27 (20%)	15 (12%)	126 (100%)
over 35	88 (77%)	11 (10%)	15 (13%)	114 (100%)
total	337 (71%)	84 (18%)	53 (11%)	474 (100%)

The **results** of the experiment shown in Tables 5 and 6 give reason to believe that the percentage of pronouncing [ff], [vv] or [fv] in labiodentals clusters in an external sandhi position depends on the type of the prosodic setting of the utterance containing the concerned combination and, consequently, the strength of the prosodic boundary between two words.

Thus, [ff] pronunciation appears fairly stable and makes about 70% of the total case number – therefore an utterance prosodic setting influences, primarily the percentage of [vv] / [fv] pronunciation:

- Maximum [fv] and minimal [vv] pronunciation is found in the cases when the thematic accent is placed on the first word with a prosodic boundary of maximum strength between the words, i.e. in minimal merge in pronouncing the combination within an intonation phrase;
- Maximum [vv] and minimum [fv] pronunciation is found in the cases of no prosodic prominence of the words and therefore of maximum merge – i.e. in the cases lacking both a prosodic boundary between the words and phrase accents on these words;
- An absence of a phrase accent on one of the words and presence of the prosodic boundary of minimum strength produce an intermediary picture;
- Minimal [vv] and maximum [fv] pronunciation is observed among the subjects in the over 35 age group; vice versa, maximum [vv] and minimal [fv] pronunciation is found among the subjects under 25, which gives reasons to believe that [vv] pronunciation appears to be relatively new and increasingly spreading among speakers of Modern Russian.

Thus, [vv] pronunciation in labiodentals combinations at the junctures of phonological words is most likely to occur with the least control of the speaker over the speech production (in a weak phrase position – with no prosodic prominence of the relevant phonological words) as a sign of the maximum merge of the relevant phonetic units, while [fv] pronunciation demonstrates a minimal merge degree (in other words maximum separateness of these units).

Conclusion

The paper features the results of the research of possible voice coarticulation of labiodental consonants /v/ (/f/) and /v/ in an external sandhi position within an intonation group in Standard Russian.

Combinations of labiodental fricatives /f/, /v/ + /v/ at the word junctures within an intonation group result in [ff], [vv] or [fv] pronunciation (with the decreasing abundance) in Modern Standard Russian.

The percentage ratio of the above mentioned pronunciation types depends on the right context of the labiodentals cluster (a vowel, a sonorant or /v/), on the phonemic status of the final consonant of the first word, on the genre/style of the text, the rate of frequency of certain word combinations, on the prosodic type of the utterance, on the strength of the prosodic boundary between two words and on the speakers age.

Combinations of consonants differing only in voice characteristics are not allowed in Modern Standard Russian within an intonational group with no syntactic boundaries. Thus, a speaker of Standard Russian in a situation of underlying /v (f) + v/ sequences in an external sandhi position within an intonation group after the applying the phonological rule of word-final /v/ → [f] devoicing can choose one of three possible strategies:

- if possible, to insert a prosodic boundary which leads to [fv], pronunciation being a manifestation of a prosodic boundary of maximum strength between the words in question;
- to apply the phonological rule of (anticipatory) voice assimilation, characteristic to case of all other fricatives in this position, in which course the consonants come to complete neutralization on <+/- voice> distinctive feature; this leads to [vv] pronunciation being a manifestation of no prosodic boundary between the words in question;
- not to use any of the strategies described; this leads to perseverative accommodation in which course the consonants come to incomplete neutralization on the +/- voice distinctive feature: the second (phonologically voiced) consonant accommodates to the voiceless first one only by the parameter of [vocal folds' vibration], while retaining the other parameters appropriate of a voiced consonant; this type of pronunciation may manifest a boundary of minimum strength between the words.

BIBLIOGRAPHIE

- [1] *Avanesov R.I.* Russkoe Literaturnoe Proiznoshenie (Standard Russian Pronunciation, in Russian). Moscow, 1972.
- [2] *Krivnova O.F., Bogdanov D.S., Podrabinovich A.Y.* Creation of Russian Speech Databases: Design, Processing, Development Tools // International Conference SPECOM'2004. Proceedings. Saint Petersburg. 2004.
- [3] *Nespor M., Vogel J.* Prosodic phonology. Dordrecht, 1986.
- [4] *Krivnova O.F.* Dynamic Approach to Rhythmization and Intonation Phrasing (Problems of theory and application) // International seminar "ELSEnet goes east". On Integration Language and Speech. Moscow. 1996.