

Suffix shift in Russian verbs: a case for markedness?

Суффиксальный сдвиг в русских глаголах: вопрос маркированности?

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Abstract This article presents a corpus-based study of suffix shift, the diachronic process that creates vacillation between inflected forms of a number of Russian verbs (e.g. *каплют* and *капают* of *капать* ‘drip’). It is demonstrated that four factors have a statistically significant impact: root-final place of articulation, root-final manner of articulation, consonant alternation and perfectivizing prefixes. The paper furthermore discusses the question as to whether or not suffix shift can be regarded as a unified process, whereby marked elements are more prone to undergo change than are unmarked elements. Three of the factors under scrutiny display clear relationships to markedness, while for the fourth factor (manner of articulation) the relationship is less straightforward.

Аннотация В настоящей статье представлены результаты корпусного исследования суффиксального сдвига—исторического процесса, который приводит к колебаниям в формообразовании ряда русских глаголов (напр., *каплют* и *капают* от *капать*). В статье показано, что статистически значимое воздействие на протекание данного процесса оказывают четыре фактора, а именно место образования конечного согласного корня, его способ образования, чередование согласных и видовые приставки. Кроме того, в статье обсуждается вопрос о том, можно ли рассматривать суффиксальный сдвиг как единый процесс, которому более подвержены маркированные элементы. Из рассматриваемых в статье релевантных факторов, три обнаруживают явную связь с маркированностью элементов, тогда как в отношении четвертого фактора (способа образования конечного согласного корня) данная связь представляется менее очевидной.

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Suffix shift is an ongoing diachronic process whereby the non-productive suffix *-a* is being replaced by the productive *-aj* in Russian verbs. For instance, older forms like *каплют* ‘drip’ with *-a* compete with innovative forms like *капают* with *-aj*, as illustrated in (1) and (2):¹

- (1) Слезы *каплют* одна за другой на клавиши. (with *-a* suffix)
(I. A. Gončarov (1859), *Oblomov*, <http://www.ruscorpora.ru>)
‘Tears are dripping one after another onto the keyboard.’
- (2) Слезы в щи *капают*. (with *-aj* suffix)
(A. Bitov (1969), *Vin’etka*, <http://www.ruscorpora.ru>)
‘Tears are dripping into the cabbage soup.’

The present study addresses two questions: which factors facilitate suffix shift in Russian verbs, and what is the relationship between suffix shift and markedness? On the basis of a detailed analysis of corpus data it is shown that language change does not happen uniformly, since the verbs under scrutiny are affected by suffix shift to different degrees. However, suffix shift does not occur in a random fashion. It is shown that four factors pertaining to morphological and (morpho)phonological properties of the verbs have a statistically significant impact: root-final place of articulation, root-final manner of articulation, consonant alternation and perfectivizing prefixes. Statistical analysis indicates that root-final place of articulation and perfectivizing prefixes have the largest effect. Three out of four factors display straightforward relationships to markedness, whereas for manner of articulation the relationship is at best indirect.

After a presentation of the data in Sect. 1 and a discussion of markedness in Sect. 2, the four factors are explored in Sects. 3 through 6. Section 7 addresses the relative impact of the relevant factors, and the contribution of the article is summarized in Sect. 8.

1 Suffix shift in Russian verbs

In the terminology of Andersen (1973), suffix shift is an example of abductive change. From infinitives like *делать* ‘do’ and *капать* ‘drip’ and past tense forms like *делал* and *капал*, there is no way to infer that *делать* has the *-aj* suffix, whereas *капать* belongs to the non-productive pattern with *-a*. Presumably, the homophony in the infinitive and past tense has paved the way for a diachronic change, in which the productive suffix supplants its non-productive competitor in the remaining verb forms. Based on the ambiguous evidence of the infinitive and past tense forms, the speakers make the wrong inference about the suffix in the present tense and imperative. As a result, suffix shift takes place.

Suffix shift is well attested in Russian and has been studied from a variety of angles, including language acquisition, psycholinguistics, stylistic variation, sociolinguistics and dialectology (cf. e.g. Andersen 1980; Comrie, Stone and Polinsky 1996; Gagarina 2003; Gor 2007; Gor and Chernigovskaya 2001, 2003, 2004, 2005; Gorbačević 1978; Graudina, Ickovič and Katlinskaja 2001; Kiezbak-Mandera, Smoczyńska and Protassova 1997; Krysin 1974; Svistunova 2008; Tkachenko and Chernigovskaya 2006 and references therein). As

¹Throughout this article, I use *-a* and *-aj* as mnemonic tags for the classes of verbs that inflect like *писать* ‘write’ and *делать* ‘do’, respectively. This does not indicate a commitment to a ‘one-stem’ analysis in terms of underlying suffixes (cf. Jakobson 1948). The question of whether one prefers a one-stem or two-stem approach to Russian conjugation is not relevant for the present study.

Table 1 Simplex verbs

Verb	#a	#aj	#Total	%aj
алкать	123	10	133	8
блистать	249	272	521	52
брызгать	222	119	341	35
внимать	95	273	368	74
глодать	158	6	164	4
дремать	492	1	493	0.2
двигать	1093	479	1572	30
жаждать	1239	16	1255	1
капать	78	106	184	58
клепать	15	15	30	50
кликать	184	11	195	6
клохтать	10	1	11	9
колебать	134	1	135	0.7
колыхать	79	9	88	10
крапать	1	2	3	67
кудахтать	22	19	41	46
курлыкать	15	5	20	25
махать	930	302	1232	25
метать	185	7	192	4
мурлыкать	91	61	152	40
мыкать	1	11	12	92
пахать	353	2	355	0.6
плескать	165	18	183	10
полоскать	80	5	85	6
прятать	1341	2	1343	0.1
прыскать	11	35	46	76
пыхать	201	9	210	4
рыскать	114	99	213	46
стонать	698	17	715	2
свистать	7	1	8	13
тыкать ^a	439	119	558	21
хлестать	313	1	314	0.3
хныкать	96	33	129	26
черпать	4	304	308	99
щекотать	267	1	268	0.4
щепать	0	2	2	100
щипать	150	8	158	5
Total	9655	2382	12037	

^aThere are two homonymous verbs *тыкать* meaning ‘point’ and ‘address with *ты*’. Since only the former permits suffix shift, the latter was excluded from the database.

Table 2 Verbs with prefixes^a

Verb	#a	#aj	#Total	%aj
ПРЕФ-блистать	13	3	16	19
ПРЕФ-брызгать	8	7	15	47
ПРЕФ-черпать	0	28	28	100
ПРЕФ-двигать	0	287	287	100
ПРЕФ-кликать	32	0	32	0
ПРЕФ-махать	40	14	54	26
ПРЕФ-метать	0	195	195	100
ПРЕФ-плескаться	4	9	13	69
ПРЕФ-щипать	9	1	10	10
ПРЕФ-тыкать	0	138	138	100
Total	106	682	788	

^aAs can be seen from the table, far from all verbs under scrutiny were attested with prefixes in the relevant inflected forms. Since some of the verbs combine with more than one prefix, the presence of a prefix is marked as PREF. The data material was not large enough to facilitate statistical analyses of individual prefixes.

pointed out by Andersen (1980, 297), the synchronic situation of the relevant verbs “has all the earmarks of a change in progress” with considerable variation and vacillation in present-day Russian. For instance, Zaliznjak (1977, 2003) considers both the conservative form of *канать* ‘drip’ in (1) and the innovative form in (2) acceptable in Contemporary Standard Russian. However, when *канать* is used transitively, Zaliznjak (1977, 2003) accepts only the *-aj* suffix. Other sources, e.g. Ušakov (1935), Graudina, Ickovič and Katlinskaja (2001, 290) and Ožegov and Švedova (2005) give slightly different accounts of the situation for this and other verbs.

Despite the rich scholarly literature on suffix shift, I am not aware of any large-scale studies of data from electronic corpora. Large electronic corpora provide a unique source of information about morphological variation and change. In order to shed light on the factors that facilitate suffix shift, a database was established on the basis of the Russian National Corpus.² All verbs for which the Academy Grammar (Švedova 1980) lists the suffix *-a* were examined. Data were gathered for all inflected forms that could potentially reveal suffix shift: present tense (1, 2, 3 singular and plural), active and passive participles and gerund (verbal adverb)) and imperative (2 singular and plural). Infinitive and past tense forms were not considered, since the *-a* and *-aj* suffixes are homophonous for these forms. The corpus searches revealed that suffix shift occurs in the 37 simplex verbs in Table 1. In order to investigate the impact of perfectivizing prefixes, corpus searches were carried out for simplex and prefixed forms, which for the purposes of the present study are considered independent lexical items. The results for verbs with prefixes are listed in Table 2. All in all, the database consists of 12,825 data points (corpus examples with *-a* or *-aj*).

The tables are organized as follows. The leftmost column lists the verbs in alphabetical order. The columns labeled ‘#a’ and ‘#aj’ give the raw numbers of examples with the *-a*

²Corpus searches were carried out from May to July 2006. Although the Russian National Corpus may be too heterogeneous to shed light on subtle diachronic and stylistic/pragmatic factors, it is well suited for the quantitative analysis pursued in the present study.

and *-aj* suffixes. The next column provides the total number of examples for each verb, while the rightmost column gives the percentage of the examples that display the *-aj* suffix.

The tables reveal large differences between individual verbs; the percentage with the *-aj* suffix varies from less than 1% to 100%. It is therefore safe to conclude that suffix shift is anything but a uniform process—different verbs behave differently.³ However, in the following we will not be concerned with differences between individual verbs. Instead, the focus will be on factors that apply to classes of verbs and lend themselves to statistical analysis. However, before we turn to the analysis of suffix shift, a discussion of markedness is required.

2 Markedness

Markedness is a concept that linguists love—and love to hate. Ever since the term was coined by Trubetzkoy in 1930 (cf. Trubetzkoy 1975, 162ff.), markedness has been used in a variety of ways, not all of which are consistent with each other (cf. Andersen 1989, 2001; Battistella 1990, 1996; Haspelmath 2006). Although a comprehensive overview of the literature on markedness is beyond the scope of the present article, I will clarify how I use the term and then advance a hypothesis about the relationship between markedness and suffix shift.

As pointed out by Janda (1995, 209), markedness is often defined as an “asymmetric relationship between two or more elements”. This definition does not mention language or linguistics. Like Andersen (2001), I will assume that markedness pertains to the domains of cognition and culture. However, insofar as language is embedded in cognition and culture, markedness is also relevant for language. Relating markedness to cognition is not a new idea. According to Andersen (2001, 45), Trubetzkoy drew “the parallel between the distinction marked vs. unmarked and the figure-ground relation of Gestalt psychology”. In a similar way, Janda (1995) relates markedness to prototype theory, which came to linguistics from the work of Rosch in cognitive psychology (e.g. Rosch 1978). If one accepts a cognitive approach to markedness, it comes as no surprise that markedness manifests itself in other aspects of culture than language. A case in point is ritual. Andersen (2001, 25ff.) discusses funeral ceremonies on the island of Roti southwest of Timor, where the unmarked rite is replaced by a special, marked set of procedures in cases where the deceased has died a bad death.

Markedness values can be assigned to oppositions of different kinds. Privative oppositions (Trubetzkoy 1939, 67) represent the simplest case, since such oppositions are inherently asymmetrical. Thus, to take a pedestrian example, in the voiced-voiceless opposition voiced is marked since it has a property that voiceless lacks. However, the human inclination to conceptualize the world in asymmetrical terms extends to gradual and equipollent oppositions as well. There is no inherent reason to consider *narrow* marked and *wide* unmarked; these terms represent endpoints on a scale, where neither pole is logically privileged. Nevertheless, speakers of English tend to conceptualize *wide* as unmarked, as is evident from the naturalness of the question *How wide is X?* compared to the pragmatically

³An additional indication of the non-uniformity of suffix shift is the fact that there is substantial variation among the inflectional forms of a verb. A detailed account of this variation is beyond the scope of the present study, but the reader is referred to Janda, Nessel and Baayen (2010) and Janda and Nessel (to appear), who demonstrate that the 3rd singular present tense is most likely to keep the *-a* suffix, while the imperative gerund (verbal adverb) is most prone to adopt the *-aj* suffix.

less felicitous [?]*How narrow is X?* Another example concerns the male-female opposition. There is no biological rationale for considering male unmarked. However, in patriarchal cultures men are privileged, and language reflects this in a variety of ways. For instance, the word *forefathers* can be used about ancestors of both sexes (Andersen 2001, 45).

In the following, it will be shown that Russian verbs are involved in a number of asymmetrical oppositions, and we will see that markedness is relevant for suffix shift. This is the hypothesis I wish to entertain:

- (3) Marked members of an opposition are more prone to undergo suffix shift than unmarked members.

The idea behind this hypothesis is simple. Suffix shift is a regularization process in which verbs migrate from an unproductive and irregular pattern to a maximally productive and regular class. We expect regularization to apply to marked elements, which deviate from the normal, unmarked state of affairs. In order to test the hypothesis, in Sects. 3 through 6 I will consider four factors that are relevant for suffix shift. Since markedness values can in principle be assigned to any opposition, markedness has the potential of generalizing across levels of language. For this reason, I have chosen to examine factors from different levels. I will consider the sound shape of the verbs (root-final consonant), morphophonological properties (consonant alternations), as well as morphological structure (prefixation). An additional reason for focusing on these factors is that they are suitable for quantitative analyses of corpus data. However, semantic and pragmatic/stylistic factors are relevant as well. For polysemous verbs, it is likely that different sub-meanings react differently to suffix shift. For instance, Gorbačevič (1978, 169) remarks that *двигать* ‘move’ tends to be used with *-aj* about spatial movement (e.g. *двигает шкаф* ‘moves a cupboard’), while *-a* prevails in more abstract uses (see also Comrie, Stone and Polinsky 1996, 136; Graudina, Ickovič and Katlinskaja 2001, 289). It is furthermore likely that in general *-aj* is more widespread in oral language and informal registers (cf. Graudina, Ickovič and Katlinskaja 2001, 286). However, semantic and pragmatic/stylistic factors will not be investigated in the present study.

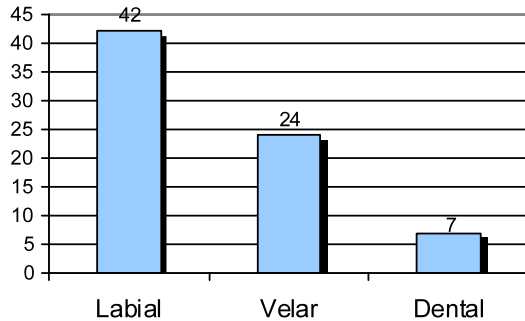
3 Suffix shift and root-final place of articulation

The first factor I will explore is the root-final consonant’s place of articulation. Are verbs with labial consonants in root-final position (e.g. *канать* ‘drip’) more likely to undergo suffix shift than verbs in dental (e.g. *глодать* ‘gnaw’) or velar consonants (e.g. *мурлыкать* ‘purr’)? In order to test the markedness hypothesis in (3), we need to assess the relative markedness of the relevant places of articulation. A large body of typological evidence suggests that dentals represent the unmarked place of articulation.⁴ Paradis and Prunet (1991, 10f.) claim that languages tend to have more dental sounds than sounds at other places, and Clements (2009, 36) points out that all known languages seem to have dental consonants (albeit not necessarily */t/*), while phoneme systems may or may not include labial or velar consonants. Data from language acquisition are also often cited as evidence

⁴Some researchers, notably Lombardi (2002), claim that glottal stops are less marked than dentals, but since glottal stops are not part of the Russian phoneme inventory, this discussion is irrelevant for the present paper. Note that for convenience I use the traditional ‘dental’ as a label for all coronal sounds, since the difference between dental, alveolar and postalveolar places of articulation is irrelevant for my line of argument.

Table 3 Root-final consonant's place of articulation

	#a	#aj	#Total	%aj
Labial	969	712	1681	42
Velar	4197	1327	5524	24
Dental	4489	343	4832	7

Fig. 1 Root-final consonant's place of articulation

for the unmarked status of dentals (Jakobson 1971, 391; Macken 1995, 676; Fikkert 2010; Fikkert and Levelt 2008). These facts suggest that the dental-labial-velar opposition tends to be conceptualized in asymmetrical terms. In view of this, I will regard dental as the unmarked place of articulation.

Since labials and velars are marked, we expect verbs with such sounds in root-final position to be more prone to undergo suffix shift than verbs with the unmarked dentals. The relevant data are given in Table 3. Figure 1 presents the percent frequencies of the different root-final consonants, which suggest that the markedness hypothesis yields a correct prediction.

In order to see whether the differences shown in Table 3 and Fig. 1 are statistically significant, Pearson's Chi-squared test was carried out by means of the statistics software package R. The results were: Chi-squared = 1091.953, degrees of freedom = 2 and p-value < 2.2e-16 (i.e. 0. ...22 with fifteen zeros before 22). The p-value indicates the likelihood that the results in Table 3 occurred by chance. The number 2.2e-16 is the smallest number the R statistics package operates with, so for all practical purposes the likelihood that the results are due to chance is zero. Since the p-value is much smaller than 0.05, we can safely conclude that the differences reported in the table are statistically highly significant.

Using the chi-squared value we can compute Cramer's V, which measures effect size. Simply put, effect size shows how big the impact of the factor in question is. Importantly, p-value and effect size are not the same. Even if it is unlikely that a result occurred by chance, the impact of the factor might not be very strong. The Cramer's V value can theoretically vary from 0 to 1, but 0.5 is considered high, while 0.3 represents a moderate value and 0.1 a low value (cf. King and Minium 2008, 327–329). The Cramer's V value for the data in Table 3 is 0.3, so we are dealing with a moderate effect size.

To summarize, the analysis shows that the differences between labial, dental and velar consonants are statistically significant, and that the effect size of the root-final consonant is moderate. In other words, we can state the following hierarchy in (4), where the likelihood of suffix shift decreases from left to right:

Table 4 Root-final consonant's manner of articulation

	#a	#aj	#Total	%aj
Velar plosive	2634	1005	3639	28
Velar fricative	1563	322	1885	17

- (4) The place hierarchy:
Labial > velar > dental

The hierarchy in (4) reflects statistically significant differences, so we can safely conclude that the prediction from the markedness hypothesis in (3) is borne out by the facts.

4 Suffix shift and root-final manner of articulation

We now turn to a second factor concerning the root-final consonant, namely, manner of articulation. Is the difference between plosive (oral stop) and fricative relevant for suffix shift? It is generally accepted in the literature that plosives are unmarked and fricatives are marked. In child language, plosives are acquired first, they are most frequent in the lexicon, they have fewer restrictions on distribution, and they serve as replacements for corresponding marked segments (cf. Macken 1995, 676f.). Typological evidence points in the same direction. Clements (2009, 35) argues that fricatives are more marked than plosives, since some languages lack oral continuants. For the purposes of this article, I will consider plosives unmarked. In other words, the markedness hypothesis in (3) predicts a larger proportion of forms with *-aj* in verbs with fricatives than in verbs with plosives.

In order to test this prediction I will focus on velar consonants. Labial consonants cannot be considered for the simple reason that there are no verbs with the *-a* suffix and a labial fricative in root-final position (Švedova 1980, 653–654).⁵ As for dental consonants, there are verbs in both plosives (e.g. *злодать* 'gnaw') and fricatives (e.g. *мазать* 'smear'), but as observed in Nessel (2008), verbs in dental fricatives never undergo suffix shift, so statistical analysis of such verbs is futile. However, the fact that suffix shift is blocked for verbs in dental fricatives suggests that a fricative in root-final position inhibits suffix shift. As can be seen from Table 4 and Fig. 2, the data about velars confirm this and go against the prediction from the markedness hypothesis in (3).

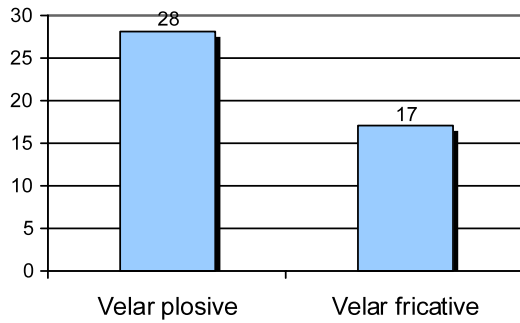
Are the differences in Table 4 and Fig. 2 statistically significant? Two statistical tests were used to find out. Pearson's Chi-squared test with Yates' continuity correction and The Fisher exact test gave the p-value 2.2e-16.⁶ This indicates that the likelihood that the observed results are due to chance is practically zero.

Even though manner of articulation is statistically significant, this factor does not have a very strong impact on suffix shift. Pearson's Chi-squared test gave 0.1 as the Cramer's V value for the data in Table 4, which represents a small effect size. Manner of articulation

⁵Admittedly, the verb *рвать* 'tear' has root-final /v/, but since monosyllabic verbs never undergo suffix shift this verb is not relevant here (cf. Nessel 2008).

⁶Notice that it is possible to apply the Chi-squared test to these data, since R automatically applies continuity correction when computing the test for 2 × 2 tables, i.e. tables with four cells with numbers. The Chi-squared value is 74.9378 with degrees of freedom = 1. The Fisher exact test is applicable to 2 × 2 tables, and was therefore not applied to the data in Table 3 in Sect. 3.

Fig. 2 Root-final consonant's manner of articulation



therefore has a weaker impact compared to place of articulation, but it is still possible to state the following hierarchy:

- (5) The manner hierarchy:
Velar plosive > velar fricative

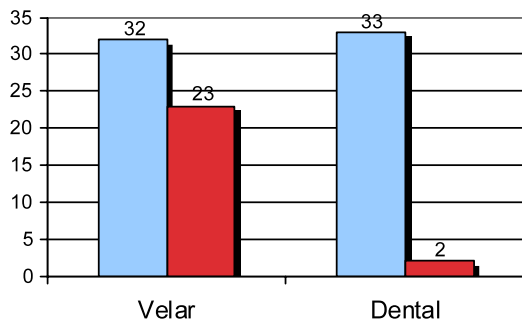
The hierarchy in (5) is at variance with the predicted pattern. We expected fricatives to favor suffix shift, but we observe the opposite pattern. Does this mean that the markedness hypothesis in (3) should be abandoned? Careful investigation of the relevant data suggests that this decision may be premature. The *-a* verbs involve consonant alternations: /k/~/č'/ (e.g. *мурлыкать* 'purr'), /sk/~/š'/ (e.g. *плескать* 'splash'), /g/~/ž'/ (e.g. *двигать* 'move') and /x/~/š'/ (e.g. *махать* 'wave'). The strategy I propose is to focus on the consonants to the right of the tilde, i.e. the consonants that are the products of the alternations. I suggest that suffix shift targets verbs where alternations produce unmarked consonants. Which of the alternation products /č', š', ž, š/ is least marked? The privative oppositions of voice and palatalization are relevant here. The voiced consonants involve a property that their voiceless counterparts lack, and the palatalized consonants have a secondary place of articulation that is absent in the non-palatalized consonants. This suggests that /č', š', ž/ are more marked than /š/. The fact that affricates are complex segments involving a combination of the properties of plosives and fricatives further suggests that /č'/ is marked. A similar argument can be made for /š'/. As is well known, this sound has longer duration than other Russian consonants and is often analyzed as a sequence of two segments (Halle 1959; Isačenko 1969; see also Timberlake 2004, 65–67 for critical discussion). All in all, /š/ seems to be less marked than the other alternation products.

In view of these markedness assignments, the prediction from the markedness hypothesis in (3) is that verbs producing /č', š', ž/ are more prone to undergo suffix shift than are verbs producing /š/. This prediction is borne out by the facts. Of the 3639 examples with /č', š', ž/, 1005 examples (28%) have *-aj*, whereas only 322 out of 1885 examples with /š/ (21%) display the *-aj* suffix. This difference is statistically highly significant; Pearson's Chi-squared test with Yates' continuity correction gave the p-value 2.2e-16 (Chi-squared = 74.9378, degrees of freedom = 1). Cramer's V value was measured to 0.1, so we are dealing with a small effect size.

To summarize, these data suggest that the tendencies observed in Table 4 and Fig. 2 can be reconciled with the markedness hypothesis in (3) if the consonants produced by consonant alternations are taken into account. Although this analysis is somewhat speculative, it would be premature to reject the markedness hypothesis at this point. As we shall see in the following sections, the decision to maintain the markedness hypothesis receives further support from the fact that it yields correct predictions for the remaining factors explored in this article.

Table 5 Standard vs. non-standard alternations

	#a	#aj	#Total	%aj
Velar non-standard	592	276	868	32
Velar standard	3605	1051	4656	23
Dental non-standard	569	274	843	33
Dental standard	3920	69	3989	2

Fig. 3 Standard vs. non-standard alternations

5 Suffix shift and root-final alternation

The previous section alluded to the relevance of consonant alternations for suffix shift. In this section, I wish to examine whether the non-standard alternations /sk/~/š'/ and /st/~/š'/ facilitate suffix shift. I refer to these alternations as non-standard, since they represent a special case that overrides the normal pattern whereby /k/ and /t/ alternate with /č/. For this reason I consider the non-standard alternations marked, and the standard alternations unmarked. Accordingly, the markedness hypothesis in (3) predicts that verbs with the non-standard alternations are more prone to undergo suffix shift than verbs with standard alternations. The results summarized in Table 5 and Fig. 3 suggest that this prediction is true.

Let us consider the velars first. The difference between 32% and 23% with *-aj* may not seem big, but both Pearson's Chi-squared test (Chi-squared = 33.6028, degrees of freedom = 1) and The Fisher exact test yield quite low p-values (6.76e-09 and 1.301e-08). It is thus extremely unlikely that the observed difference is due to chance. Although the Cramer's V value for velars was 0.1, which represents a small effect size, the results for velars confirm the markedness hypothesis in (3).

For dentals, Table 5 and Fig. 3 suggest a dramatic effect. For verbs with the non-standard alternations there are 274 examples with *-aj*, which constitute 33% of the examples. However, there are only three verbs in this group, namely *блистать*, *свистать* and *хлестать*, and 272 of the examples with *-aj* are from *блистать*, while *свистать* and *хлестать* account for only one example each. This uneven distribution suggests that the non-standard alternation is not the decisive factor for roots in dentals. It seems that the non-standard alternation alone is not enough to facilitate suffix shift in such roots.

Why is suffix shift so widespread for *блистать*? Are there other idiosyncrasies that facilitate suffix shift for this particular verb? There are two synonymous infinitives, *блистать* and *блестеть*, which correspond to three sets of present tense endings: (i) *блистаю*, *блесташь*, *блестают*, (ii) *блещу*, *блестишь*, *блестят*, and (iii) *блещу*, *блещешь*, *блещут*. Pattern (i) clearly belongs to *блистать* and pattern (ii) to *блестеть*,

but which infinitive does pattern (iii) correspond to? Ožegov and Švedova (2005) assign pattern (iii) to the infinitive *блестеть*, presumably because all these forms are written with the letter *e* in the root. However, from a morphological point of view, this decision does not make much sense, since Russian verbs in *-et'* do not display consonant alternation throughout the present tense forms. Morphologically speaking, one should match *блещу*, *блещешь*, *блещут* with the infinitive *блестать* since the *-a* suffix does trigger consonant alternation throughout the present tense forms (cf. *нисать*, *нишу*, *нишаеть*, *нишут*). However, on the orthographic level this decision entails an irregular alternation between the letters *i* and *e* in the root. Regardless of which analysis one adopts, it is clear that *блестать/блестеть* involves a number of idiosyncrasies. If we assume that idiosyncratic verbs are marked, the markedness hypothesis in (3) predicts that such verbs would be particularly prone to undergo regularization through suffix shift. However, this remains speculative and cannot be tested statistically on the basis of the data presented in this study.

It is interesting to take a closer look at the examples where suffix shift was attested in the database, even if the verb does not involve a non-standard alternation. There were a total of 69 examples with *-aj* in this group, but 33 of them come from two verbs: *стонать* and *жаждать*. These two verbs do not have the regular alternations for *-a* verbs, so in a sense *стонать* (*стону*, *стонишь*, *стонут*) and *жаждать* (*жажду*, *жаждешь*, *жаждут*) lend further support to the claim that idiosyncrasies in consonant alternations facilitate suffix shift. However, once again, these are speculations that cannot be tested statistically.

To summarize, the data do not allow us to draw clear conclusions about roots in dentals, but we see that a non-standard alternation has a significant, but small effect on suffix shift in verbs with velars in root-final position. On this basis, the hierarchy in (6) can be stated:

- (6) The alternation hierarchy (velars):
Non-standard alternation > standard alternation

This hierarchy comports with the prediction from the markedness hypothesis in (3).

6 Suffix shift and prefixation

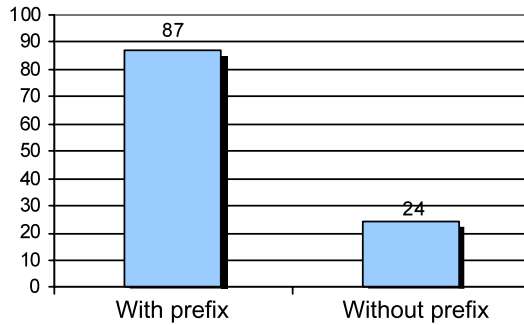
A factor that has not received much attention in the scholarly literature on suffix shift is aspectual prefixation. I regard prefixed verbs as marked since they signal perfective aspect, which has been considered the marked member of the opposition ever since Jakobson's pioneering studies (Jakobson 1984, 3, 48). Some researchers, e.g. Forsyth (1970), argue that Russian aspect constitutes a privative opposition (cf. Zaliznjak and Šmelev 2000, 16f. for discussion). However, even if one does not accept an analysis in terms of a privative opposition, it is evident that we are dealing with an asymmetrical relationship. A case in point is what is known as general-factual use of the imperfective aspect.

- (7) Ты показывал ей это письмо? (Zaliznjak and Šmelev 2000, 26)
'Did you show her this letter?'

This sentence can be uttered even if we are dealing with an event that occurred once. In other words, the imperfective aspect sometimes replaces the perfective in situations that normally favor the perfective aspect, and the imperfective is therefore considered unmarked. Notice that this is an example of constructional iconicity (cf. Dressler 2005). Constructional iconicity obtains when formal marking mirrors conceptual marking. This

Table 6 Verbs with and without prefix

	#a	#aj	#Total	%aj
With prefix	106	682	788	87
Without prefix	2359	747	3106	24

Fig. 4 Verbs with and without prefix

is the case with Russian aspect, insofar as the conceptually marked aspect (the perfective) is formed by the addition of a formal marker (the perfectivizing prefix) to the formally and conceptually unmarked imperfective verb.⁷

Since prefixed verbs are marked, the markedness hypothesis predicts that they are more prone to undergo suffix shift than non-prefixed verbs. The results reported in Table 6 and Fig. 4 suggest that this is correct. Notice that only numbers for finite forms (1, 2, 3 singular and plural present, as well as imperative) are included. This is because participles and gerunds normally do not combine with prefixes in the non-past tense. (As elsewhere in this study, infinitive and past tense forms were not included, since suffix shift does not occur in these forms where the *-a* and *-aj* suffixes are homophonous.)

The difference is statistically significant. Pearson's Chi-squared test (Chi-squared = 1054.145, degrees of freedom = 1) and The Fisher exact test show that the p-value is < 2.2e-16. Clearly, the observed distribution is not due to chance. Furthermore, since the Cramer's V-value is 0.5, we can conclude that prefixation has a strong effect on suffix shift. The hierarchy in (8) captures this and indicates that prefixation provides strong evidence in favor of the markedness hypothesis in (3):

- (8) The prefixation hierarchy:
With prefix > without prefix

7 An 'impact hierarchy' for suffix shift

We have now considered the relevance of four different factors for suffix shift. The question now arises as to what is the relative importance of these factors. Consider Table 7, which summarizes the statistical results for the four hierarchies stated in Sects. 3 through 6.

⁷Secondary imperfectives formed by suffixation of a perfective verb are irrelevant for the present study, since suffix shift is not attested in imperfectives of this type.

Table 7 Relative importance for suffix shift

Hierarchy	p-value	Effect size
Labial > velar > dental	p < 0.0001	0.3
Velar plosive > velar fricative	p < 0.0001	0.1
Non-standard alt. > standard alt.	p < 0.0001	0.1
With prefix > without prefix	p < 0.0001	0.5

All factors are statistically highly significant, but the variation with regard to effect size (measured by Cramer's V-value) is interesting. As shown in Table 7, the effect sizes range from 0.5 to 0.1, i.e. from what is considered a large effect to a small effect. Prefixation has a strong impact on suffix shift, place of articulation yields a moderate effect, while the remaining factors display small effect sizes. I propose capturing this in the following 'impact hierarchy' where $X > Y$ indicates that X has a stronger impact than Y:

(9) Impact hierarchy:

Prefixation > place of articulation > manner of articulation/alternation

The impact hierarchy calls for two comments. First, the fact that prefixation has such a strong effect on suffix shift suggests that this factor should be subjected to more detailed research. For instance, one must wonder whether different prefixes behave differently with regard to suffix shift. Unfortunately, the database underlying the present study is not large enough to support this analysis, so the question must be left open for future research.

A second comment concerns the low end of the impact hierarchy. Andersen (1980, 297), who refers to Kiparsky (1967, 208ff.), points out that suffix shift "has been in progress throughout the attested history of Russian". Given that the verbs have had a thousand years or so at their disposal, one cannot help wondering why they have not all migrated to the productive *-aj* pattern long ago. Why has variation not been eliminated once and for all? The impact hierarchy indicates that the factors that apply to non-prefixed verbs have a low or moderate effect size. I speculate that the small effect sizes observed in this study provide a (partial) explanation for why suffix shift is progressing slowly. Even if the factors in question are statistically highly significant, their impact is so limited that radical changes over time do not take place. Needless to say, this proposal must be backed up with data comparing the situation at different points in time. For this purpose, however, one would need a larger database than the one available for the present study.

8 Conclusion

The statistical analysis of corpus data carried out in the present study facilitates five conclusions. First, suffix shift shows that language change does not happen uniformly, insofar as different verbs are affected to different degrees. Second, suffix shift does not occur in random fashion, but depends on the morphological and (morpho)phonological properties of the verb. In particular, we have seen that all the factors of root-final place, root-final manner, consonant alternation and prefixation are statistically highly significant. Third, four hierarchies capture the factors favoring suffix shift. Simply put, a verb is more likely to undergo suffix shift if (i) the root-final consonant is a labial or a velar, (ii) the root-final consonant is a plosive, (iii) the verb has a non-standard alternation, and (iv) the verb is prefixed. Fourth, the statistical analysis has shown that the factors differ in effect

size. An ‘impact hierarchy’ was proposed, showing that prefixation has a strong effect and root-final place a moderate effect, while the other factors display low effect sizes. Finally, this study has explored the relationship between suffix shift and markedness. For three of the factors, straightforward relationships to markedness have been established. This suggests that the factors can be united by one single underlying principle, according to which marked elements are prone to undergo suffix shift. However, for one of the factors (manner of articulation), the relationship to markedness is at best indirect. Therefore, the present study does not afford a conclusive answer to the question about the exact role of markedness in suffix shift.

By singling out significant factors and determining their relative strength, this study paves the way for further research on suffix shift. First of all, one must ask how the factors explored above change over time. Is their impact decreasing or increasing? Second, since the present paper focuses on morphological and (morpho)phonological factors, the question arises as to whether semantic and syntactic parameters also have a bearing on suffix shift. This article contributes a methodology for the study of these issues, but since more data are needed in order to address these questions, they are left open for future research.

References

- Andersen, H. (1973). Abductive and deductive change. *Language*, 49(4), 765–793.
- Andersen, H. (1980). Russian conjugation: acquisition and evolutive change. In E. C. Traugott, R. Labrum & S. Shepherd (Eds.), *Papers from the 4th International Conference on Historical Linguistics* (Amsterdam Studies in the Theory and History of Linguistic Science. Series IV: Current Issues in Linguistic Theory, 14) (pp. 285–301). Amsterdam.
- Andersen, H. (1989). Markedness theory—the first 150 years. In O. Mišeska Tomić (Ed.), *Markedness in synchrony and diachrony* (Trends in Linguistics. Studies and Monographs, 39) (pp. 11–46). Berlin, New York.
- Andersen, H. (2001). Markedness and the theory of linguistic change. In H. Andersen (Ed.), *Actualization. Linguistic change in progress* (Amsterdam Studies in the Theory and History of Linguistic Science. Series IV: Current Issues in Linguistic Theory, 219) (pp. 21–57). Amsterdam.
- Battistella, E. L. (1990). *Markedness. The evaluative superstructure of language*. New York.
- Battistella, E. L. (1996). *The logic of markedness*. Oxford.
- Clements, G. N. (2009). The role of features in phonological inventories. In E. Raimy & C. Cairns (Eds.), *Contemporary views on architecture and representations in phonological theory* (pp. 19–68). Cambridge.
- Comrie, B., Stone, G., & Polinsky, M. (1996). *The Russian language in the twentieth century*. Oxford.
- Dressler, W. U. (2005). Word-formation in natural morphology. In P. Štekauer & R. Lieber (Eds.), *Handbook of word-formation* (pp. 267–284). Dordrecht.
- Fikkert, P. (2010). Developing representations and the emergence of phonology: evidence from perception and production. In C. Fougerson, B. Kühnert, M. D’Imperio & N. Vallée (Eds.), *Laboratory Phonology, 10* (to appear).
- Fikkert, P., & Levelt, C. (2008). How does Place fall into place? The lexicon and emergent constraints in children’s developing phonological grammar. In P. Avery, B. E. Dresher & K. Rice (Eds.), *Contrast in phonology. Theory, perception, acquisition* (Phonology and Phonetics, 13) (pp. 231–301). Berlin.
- Forsyth, J. (1970). *A grammar of aspect. Usage and meaning in the Russian verb*. Cambridge.
- Gagarina, N. (2003). The early verb development and demarcation of stages in three Russian-speaking children. In D. Bittner, W. U. Dressler & M. Kilani-Schoch (Eds.), *Development of verb inflection in first language acquisition. A cross-linguistic perspective* (Studies on Language Acquisition, 21) (pp. 131–169). Berlin.
- Gor, K. (2007). Experimental study of first and second language morphological processing. In M. Gonzalez-Marquez, I. Mittelberg, S. Coulson & M. J. Spivey (Eds.), *Methods in cognitive linguistics* (pp. 367–398). Amsterdam.
- Gor, K., & Chernigovskaya, T. (2001). Rules in the processing of Russian verbal morphology. In G. Zybatow, U. Junghanns, G. Melhorn & L. Szucsich (Eds.), *Current issues in formal Slavic linguistics* (pp. 528–535). Frankfurt.

- Gor, K., & Chernigovskaya, T. (2003). Mental lexicon structure in L1 and L2 acquisition: Russian evidence. *Glossos*, 4, 1–31.
- Gor, K., & Chernigovskaya, T. (2004). Generation of complex verbal morphology in first and second language acquisition: evidence from Russian. *Nordlyd*, 31(6), 819–833.
- Gor, K., & Chernigovskaya, T. (2005). Formal instruction and the acquisition of verbal morphology. In A. Housen & M. Pierrard (Eds.), *Investigations in instructed second language acquisition* (Studies on Language Acquisition, 25) (pp. 131–164). Berlin.
- Gorbačević, K. S. (1978). *Varijantnost' slova i jazykovaja norma*. Leningrad.
- Graudina, L. K., Ickovič, V. A., & Katlinskaja, L. P. (2001). *Grammatičeskaja pravil'nost' russskoj reči. Stilističeskij slovar' variantov*. Moskva.
- Halle, M. (1959). *The sound pattern of Russian. A linguistic and acoustical investigation* (Description and Analysis of Contemporary Standard Russian, 1). 's-Gravenhage.
- Haspelmath, M. (2006). Against markedness (and what to replace it with). *Journal of Linguistics*, 42(1), 25–70.
- Išačenko, A. V. (1969). The development of the clusters *sk', *zg' etc. in Russian. *Scando-Slavica*, 15, 99–110.
- Jakobson, R. (1948). Russian conjugation. *Word*, 4(3), 155–167.
- Jakobson, R. (1971). Kindersprache, Aphasie und allgemeine Lautgesetze. In *Selected writings 1* (pp. 328–401). The Hague.
- Jakobson, R. (1984). *Russian and Slavic grammar. Studies 1931–1981* (Janua Linguarum. Series Maior, 106). Berlin, New York, Amsterdam.
- Janda, L. A. (1995). Unpacking markedness. In E. H. Casad (Ed.), *Cognitive linguistics in the redwoods. The expansion of a new paradigm in linguistics* (Cognitive Linguistics Research, 6) (pp. 207–233). Berlin.
- Janda, L. A., & Nessel, T. (to appear). Paradigm structure: evidence from Russian suffix shift. *Cognitive Linguistics*.
- Janda, L. A., Nessel, T., & Baayen, R. H. (2010). Capturing correlational structure in Russian paradigms: a case study in logistic mixed-effects modeling. *Corpus Linguistics and Linguistic Theory*, 6(1), 29–48.
- Kiebzak-Mandera, D., Smoczyńska, M., & Protassova, E. (1997). Acquisition of Russian verb morphology: the early stages. In W. U. Dressler (Ed.), *Studies in pre- and protomorphology* (Veröffentlichungen der Kommission für Linguistik und Kommunikationsforschung, 26) (pp. 101–114). Wien.
- King, B. M., & Minium, E. W. (2008). *Statistical reasoning in the behavioral sciences*. Hoboken.
- Kiparsky, V. (1967). *Russische historische Grammatik. Band 2: Die Entwicklung des Formensystems*. Heidelberg.
- Krysin, L. P. (Ed.) (1974). *Russkij jazyk po dannym massovogo obsledovanija. Opyt social'no-lingvističeskogo izučenija*. Moskva.
- Lombardi, L. (2002). Coronal epenthesis and markedness. *Phonology*, 19(2), 219–251.
- Macken, M. A. (1995). Phonological acquisition. In J. A. Goldsmith (Ed.), *The handbook of phonological theory* (Blackwell Handbooks in Linguistics, 1) (pp. 671–696). Oxford.
- Nessel, T. (2008). Ob'jasnenie togo, čto ne imelo mesta: blokirovka suffiksāl'nogo sdviga v russkix glagolax. *Voprosy jazykoznanija*, 6, 35–48.
- Ožegov, S. I., & Švedova, N. Ju. (2005). *Tolkovyj slovar' russkogo jazyka*. Moskva.
- Paradis, C., & Prunet, J.-F. (1991). Introduction: asymmetry and visibility in consonant articulations. In C. Paradis & J.-F. Prunet (Eds.), *Phonetics and phonology. Vol. 2: The special status of coronals: internal and external evidence* (pp. 1–28). San Diego.
- Rosch, E. (1978). Principles of categorization. In E. Rosch & B. B. Lloyd (Eds.), *Cognition and categorization* (pp. 27–48). Hillsdale.
- Švedova, N. Ju. (Ed.) (1980). *Russkaja grammatika. Tom 1*. Moskva.
- Svistunova, T. I. (2008). *Organizacija mental'nogo leksikona: formirovanie v ontogeneze i raspad pri narušenijax jazykovej sistemy glagol'noj slovoizmenitel'noj morfologii (eksperimental'noe issledovanie)* (Avtoreferat kandidatskoj dissertacii). Sankt-Peterburg.
- Timberlake, A. (2004). *A reference grammar of Russian*. Cambridge.
- Tkachenko, E., & Chernigovskaya, T. (2006). Focus on form in the acquisition of inflectional morphology by L2 learners: evidence from Norwegian and Russian. *Paper presented at the Second Biennial Conference on Cognitive Science. June 9–13 2006, St. Petersburg*. http://www.cogsci.ru/cogsci06/index_e.htm. Accessed 10 March 2010.
- Trubetzkoy, N. S. (1939). *Grundzüge der Phonologie* (Travaux du Cercle Linguistique de Prague, 7). Prague.
- Trubetzkoy, N. S. (1975); Jakobson, R. (Ed.) (1975). *N. S. Trubetzkoy's letters and notes*. The Hague, Paris.
- Ušakov, D. N. (Ed.) (1935). *Tolkovyj slovar' russkogo jazyka*. Moskva.

- Zaliznjak, A. A. (1977). *Grammatičeskij slovar' russkogo jazyka. Slovoizmenenie*. Moskva.
- Zaliznjak, A. A. (2003). *Grammatičeskij slovar' russkogo jazyka. Slovoizmenenie*. Moskva.
- Zaliznjak, A. A., & Šmelev, A. D. (2000). *Vvedenie v russkiju aspektologiju*. Moskva.