

“Aspectual pairs in the Russian National Corpus”*

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Abstract

The status of aspectual pairs formed by prefixation (as in *delat'*[i]:*sdelat'*[p]¹ ‘do’) vs. suffixation (as in *peredelat'*[p]:*peredelyvat'*[i] ‘redo’) is the topic of a long-standing debate in Russian linguistics. Whereas most scholars assume the same aspectual relation is present for both types of pairs, some (Isačenko, Zaliznjak, Timberlake) hypothesize that only pairs derived via suffixation are true pairs. We present empirical evidence that aspectual pairs behave the same way in terms of the distribution of their forms regardless of whether they are formed via prefixes or suffixes. We examine nearly six million verb forms from the Modern subcorpus of the Russian National Corpus and show that there are no reportable statistical differences between the distributions of forms for perfective and imperfective verbs that can be attributed to the morphology (prefixes vs. suffixes) used to derive paired verbs.

Keywords: Russian, aspectual pairs, derivational morphology, corpus linguistics

1. Introduction

The Russian aspectual system is often described as involving “pairs” of verbs with the same lexical meaning, differing only in aspect. Dictionaries, textbooks, and most scholars (Vinogradov 1938, Šaxmaťov 1941, Švedova et al. 1980, Bondarko 1983, Čertkova 1996, Anna Zaliznjak & Šmelev 2000) present pairs derived via both prefixes and suffixes. However, a minority of scholars (Isačenko 1960, Andrej Zaliznjak 1980, Timberlake 2004) recognize as aspectual pairs only verbs related via suffixation. At the level of intuitive analysis, it has not been possible to resolve this debate.

We suggest that the advent of digital corpora and statistical methods provide an opportunity to shed new light on this question. We offer the “grammatical profile” as a means for measuring whether the creation of aspectual correlates yields the same results when it is achieved via prefixes as opposed to suffixes. A grammatical profile is the distribution of forms (past, present, infinitive, imperative) of a given verb in a corpus. The grammatical profile method is a specific version of the behavior profile method advanced by Divjak and Gries (Divjak & Gries 2006, Gries & Divjak 2009). Divjak and Gries used a comprehensive set of ID tags covering a range of morphological, syntactic, semantic, and lexical factors. Grammatical profiles focus exclusively on the morphological data that is encoded in verb forms. Greenberg's (1974/1990) pioneering work on the correlation between case distribution and semantic categories of Russian nouns is also an inspiration here, given that he discusses the frequency distributions of inflected forms.

If the traditional view is correct, we expect the grammatical profiles of perfective vs. imperfective verbs to be the same, regardless of whether they are related via prefixation or suffixation. If the minority view is correct, we expect to find differences in the grammatical profiles of perfective and imperfective verbs corresponding to the different patterns of derivational morphology. In this article we present a statistical study of data extracted from the Modern subcorpus of the Russian National Corpus (henceforth “RNC”)² to address this key issue of Russian aspectology.

Section 2 presents the facts of Russian aspectual morphology relevant to the analysis, identifying both the derivational patterns that most typically yield aspectual

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¹ Imperfective and perfective are marked as [i] and [p] respectively throughout.

² The Modern subcorpus of the Russian National Corpus (www.ruscorpora.ru), covers the period 1950-2007 and contains 92 million words.

pairs and those that yield other relationships among verbs. On this basis we determine which verbs to target in the analysis. This section also contains a precise statement of our hypotheses. In section 3 we introduce the “grammatical profile” method and how it has been tailored to the specifics of the Russian verbal paradigm. Analysis of the grammatical profiles of Russian verbs demonstrates a robust difference between the distributions of forms for imperfective vs. perfective verbs. The statistical study contrasting the morphological means for deriving purely aspectual pairs is presented in section 4, where we show that there are no real differences between aspectual pairs based on prefixation vs. suffixation. We offer conclusions in section 5.

2. Aspectual Pairs in Russian

The purpose of this study is to test the traditional definitions of aspectual pairs against corpus data. For this reason we limit ourselves to a study of the two most typical morphological patterns that have been suggested in the literature and accepted standards for the recognition of “purely” aspectual pairs. There are certainly other relationships between aspect and morphology in the Russian verbal system, but they go beyond the scope of this study.

According to the traditional view of Russian aspect, there are two main patterns for the formation of purely aspectual relations among verbs, namely prefixation and suffixation. Since we want to leave open for now the question of whether or not aspectual pairs can be formed using both patterns, we will use the term “partners” to refer to verbs that are possible candidates for the status of “pairs”. A crucial criterion for recognizing partners is identical lexical meaning for both verbs involved.³ In other words, we have partner verbs only when the perfective and the imperfective verb have the same meaning, differing only in aspect. We will use the following labels to classify partner verbs according to their morphological pattern:

“p-partners”, where prefixation is the means of deriving a perfective partner for an imperfective simplex verb, as in *delat'*[i]:*sdelat'*[p] ‘do’; and

“s-partners”, where suffixation is the means of deriving an imperfective partner for a prefixed perfective verb, as in *peredelat'*[p]:*peredelyvat'*[i] ‘redo’.

In the case of p-partners, the imperfective verb is a simplex verb, and the perfective verb is its prefixed counterpart. In the case of s-partners, the perfective verb is also prefixed, but its imperfective partner is derived via a suffix.

For a number of reasons, p-partners form a smaller group of verbs in Russian than s-partners. The p-partners are limited by the number of imperfective simplex verbs in the lexicon. There are a few thousand imperfective simplex verbs (Townsend 1975: 98-104), and not all of them form aspectual partners, such as for example *značit'*[i] ‘mean’. Most imperfective simplex verbs select only one prefix to create their p-partner (although about 27% of imperfective simplex verbs can use more than one prefix; see the example of *gruzit'*[i] ‘load’ below and Janda & Lyashevskaya forthcoming a), further limiting the pool of p-partner verbs. Altogether we have identified 1,981 sets of p-partners attested in Russian in the “Exploring Emptiness” database at the University of Tromsø, which has been aggregated from three sources (Cubberly 1982, Evgen'eva 1999, Ožegov & Švedova 2001) and verified by a panel of native speakers.⁴ However, the potential number of s-partners is vastly greater because s-partners draw upon perfective verbs containing both a verbal stem and up to 20 different prefixes which can motivate the derivation of secondary imperfectives. Combining data from Andrej Zaliznjak 1980 and the RNC yields 19,208 sets of s-partners.

³ This criterion comports well with the famous “Maslov criterion” (see discussion in Anna Zaliznjak and Šmelev 2000:45), according to which pairs can be identified when a perfective verb can be substituted by its imperfective partner in contexts where the perfective is not allowed, such as the historical present. This method relies on the intuitions of native speakers, which are also the main resource for the presentation of verbs as “pairs” in dictionaries.

⁴ For more details on the Exploring Emptiness database, see Janda & Nessel 2010: 481.

Since the goal of this study is to examine the behavior of p-partners and s-partners in terms of the distribution of their grammatical forms, it is important first to distinguish p-partners and s-partners from other verbs in the lexicon, and to weed out all data that is either irrelevant or might misrepresent the p-partners and s-partners. The following three paragraphs describe the types of data that needed to be eliminated from the study in order to yield meaningful results.

In addition to p-partners and s-partners, a number of other minor aspectual phenomena in Russian deviate from these two patterns. These phenomena are restricted to a small portion of the lexicon and/or do not form candidates for the status of “pairs”. The following is a list of phenomena that have been excluded from this study on these grounds. There are some aspectual isolates in Russian that cannot form aspectual partners; these include perfective isolates such as *ucelet'*[p] ‘survive’ and imperfective isolates such as *zdravstvovat'*[i] ‘thrive’.⁵ There are also some simplex perfective verbs that have aspectual partners, but these are not classed among s-partners since the perfective is unprefixated, as in *dat'*[p]:*davat'*[i] ‘give’. Some aspectual partners involve suppletion rather than morphological derivation, as in the case of *govorit'*[i]:*skazat'*[p] ‘say’. The *-iyvaj* suffix can be used to form habitual verbs such as *govarivat'*[i] ‘say habitually’, yielding an aspectual relation between two imperfective verbs. Numerous verbs representing Aktionsart categories do not enter into partnerships because they resist the derivation of imperfectives with the same meaning: the main types here are delimitatives (like *počitat'*[p] ‘read for a while’), perduratives (like *promolčat'*[p] ‘be quiet for a time’), ingresses (like *zarydat'*[p] ‘start sobbing’), and semelfactives (like *sglupit'*[p] ‘do one stupid thing’).⁶ Approximately 300 semelfactive perfective verbs are formed with the *-nu* suffix, such as *čichnut'*[p] ‘sneeze once’ from *čichat'*[i] ‘sneeze’ (Dickey & Janda 2009), and nearly 200 more are formed with both a prefix and *-nu*, as in *zachlopnut'*[p] ‘slam shut once’ (Makarova & Janda 2009). Russian marginally forms verbs with multiple prefixes such as *poperepisyvat'*[p] ‘spend some time re-writing’. None of these phenomena can be classed among either p-partners or s-partners, despite some superficial morphological resemblances.

There are additionally a number of situations in which the aspectual distinction involves more or less than two morphologically distinct verbs. In most cases the relevant verbs were eliminated since they are not candidates for “pairs” and the data would potentially cause an imbalance between perfective and imperfective verbs. Thus we excluded both situations in which an imperfective base verb was associated with more than one prefixed purely aspectual partner, as well as situations in which a perfective verb could form a secondary imperfective with more than one suffix. We give some examples here to illustrate. Some imperfective base verbs have two, three, or as many as six different prefixed perfectives with the same meaning, as for example *gruzit'*[i] ‘load’ with the perfectives *nagruzit'*[p], *pogruzit'*[p], and *zagruzit'*[p]. More rarely, some perfective verbs can use more than one suffix to derive an imperfective with the same meaning, as in *zagotovit'*[p] ‘stockpile’ with the derived imperfectives *zagotovljat'*[i] and *zagotavlivat'*[i]. Biaspectual verbs like *arendovat'*[i/p] have only one morphological form and are not relevant to this study. There are also some verbs with aspectual homophony like *sxodit'*[i/p] ‘descend[i]; walk someplace and back once[p]’ and semantic homophony like *sžat'*[p] ‘squeeze; harvest’ that had to be eliminated from the study since they could not only be disambiguated by hand, and manual disambiguation was not feasible for a large study. Finally, this study does not take into account the attestation of so-called “triplets”,

⁵ Because the Russian aspect system is dynamic, it is possible to find corpus and internet attestations of aspectual partners even for verbs such as *ucelet'*[p] ‘survive’, which are listed in standard reference works as aspectual isolates. However, since our goal was to test standard classifications of verbs and pairs, we excluded all verbs identified as isolates. The frequency of partner verbs such as *ucelevat'*[i] ‘survive’ is also so low that they do not cross the threshold of 100 attestations set in our study.

⁶ Secondary imperfectives of Aktionsart perfectives such as *počityvat'*[i] ‘read for a while’ are attested occasionally, but these are not included in this study.

secondary imperfectives formed from the prefixed verbs of p-partners, such as *sdelyvat'*[i] 'do' that compete with a simplex imperfective such as *delat'*[i] 'do'. We have retained p-partner verbs for which such attestations exist because despite the fact that this is a fairly widespread phenomenon, no standard reference work provides clear guidance on which verbs this includes and which it does not.

Data on verbs of very low frequency can misrepresent the behavior of a verb, since they will not give an accurate view of how the forms of a verb are distributed across the paradigm. In other words, if we have only a few attestations of a given verb and they are all past tense forms, this might just be due to the fact that our sample for that verb is small, or it might be the case that this verb has a strong preference for the past tense, but it is impossible to tell. For this reason, we excluded all verbs that fell below a threshold of 100 attestations in the Modern subcorpus of the RNC. Only p-partners and s-partners for which both verbs met the threshold requirement were included in the study. This yielded 264 p-partner sets with over 1.6 million attestations and 1,311 s-partner sets with over 4.3 million attestations.

Our goal is to discover which type of partner relationship yields aspectual pairs. The traditional view is that both p-partners and s-partners constitute pairs, whereas the alternative view (espoused by Isačenko, Andrej Zaliznjak, and Timberlake) is that only s-partners constitute pairs. These two views on aspectual derivation can be stated in terms of two hypotheses that can be tested empirically.

Traditional hypothesis: There should be no difference between the aspectual behavior of p-partners and s-partners since both yield aspectual pairs.

Alternative hypothesis: There should be a difference between the aspectual behavior of p-partners and s-partners since only s-partners yield aspectual pairs.

In order to address these hypotheses, we first establish a statistical method to evaluate the aspectual behavior of verbs and then use that method to see whether there is any difference in the behavior of p-partners as opposed to s-partners. Section 3 details the grammatical profiles method and how it evaluates the aspectual behavior of verbs. Section 4 uses the grammatical profile method to test these two hypotheses.

3. Grammatical Profiles

We define a grammatical profile as the frequency distribution of the various inflected forms of lexeme in a corpus. In other words, if we look at all the forms of a given verb attested in a corpus, we will find x forms of the first person singular non-past, y forms of the second person singular non-past, z forms of the third person singular non-past, etc. Thus we can discover the frequency of each form in the paradigm for a given verb. The grammatical profile is the distribution of these frequencies across the paradigm. The aggregated grammatical profiles of perfective and imperfective verbs in our study are presented in Table 1. We show that the grammatical profiles of perfective and imperfective verbs are different and that the difference is both statistically significant and robust. Therefore, grammatical profiles give us a measure of the aspectual behavior of verbs.

It is important to note that in this article we focus only on the aggregated grammatical profiles of large groups of verbs. We do this because our goal is to seek generalizations relevant to the behavior of p-partners as opposed to s-partners. However, there is of course variation among the individual verbs represented in these aggregate figures. At a more fine-grained level, different verbs have different grammatical profiles, and it is likely that each verb has a unique distribution of grammatical forms in the corpus. The semantic classes of verbs are relevant to the variance observed within the groups of imperfective and perfective verbs. In Janda & Lyashevskaya forthcoming b we investigate the verbs that deviate strongly from the mean distributions of grammatical forms and show that they shed light on the relationships between tense, mood, and aspect in Russian.

Thanks to the rich inflectional morphology of Russian, a given verb has numerous forms variously distinguished by tense, mood, person, gender, voice, number, and, for participles, case and length of form. A perfective verb can have a maximum of 68 forms, while an imperfective verb can have a maximum of 121 forms. However, the majority of these forms involve gerunds and participles, and

there are three good reasons for removing them from this study: 1) there are restrictions on the formation of gerunds and participles that could skew the data, 2) gerunds and participles are marginal to the verbal paradigm, and 3) these forms are also of low frequency. We discuss each of these three reasons in turn in more detail.

1: Passive participles are formed only from transitive verbs, the vast majority of them are forms from perfective verbs, and verbs with imperfectivizing suffixes cannot form past gerunds or past passive participles. Given these restrictions, inclusion of data on gerunds and participles would yield incommensurate data not appropriate for comparison of perfective vs. imperfective. We have therefore retained only the forms that are symmetrically represented for both aspects. 2: Gerunds and participles behave like adverbs or adjectives and are thus arguably peripheral to a study of verbs. 3: Removing gerunds and participles leaves nearly 85% of the data intact, and thus should not have a negative impact on the comparison.

When the gerunds and participles are removed, there remain fifteen forms in each paradigm (perfective and imperfective). These remaining forms can furthermore be grouped according to tense, mood, and finiteness. This grouping yields the following four subparadigms: non-past (6 forms), past (4 forms), imperative (4 forms), and infinitive (1 form). The subparadigm grouping is optimal for this study because it includes factors that are known to interact with aspect (namely tense, mood and finiteness), and excludes factors that are less likely to be relevant (person, number, and gender).

Table 1 presents the aggregated grammatical profiles of perfective and imperfective verbs in this study, listing the raw frequencies of forms for each subparadigm and each aspect. Below the raw frequencies the percentages are also listed for each aspect. Thus, for example, for imperfective verbs there are 1,330,016 non-past forms, which constitute 47.4% of all imperfective forms. We performed a chi-square test on the raw frequencies to determine whether there is a relationship between the distribution of grammatical forms and aspect.

	Nonpast	Past	Infinitive	Imperative	row totals
Imperfective	1,330,016 47.4%	915,374 32.6%	482,860 17.2%	75,717 2.7%	100%
Perfective	375,170 11.9%	1,972,287 62.7%	688,317 21.9%	111,509 3.5%	100%

Table 1: Grammatical profiles of imperfective vs. perfective verbs

Before presenting the results of our statistical tests, we must recognize a limitation to the chi-square model: when large quantities of data are evaluated, chi-square is empowered to detect “differences” that become infinitesimally small. This risk of detecting effects too small to be meaningful is a well-know flaw of the chi-square test (cf. Baayen 2008: 114-16; Tabachnik & Fidell 2007: 54-55), which is why it is necessary to measure the effect size in terms of Cramer’s V. The standard for evaluating the Cramer’s V value is that 0.1 qualifies as a small effect, 0.3 is a medium effect, and 0.5 is a large effect (Cohen 1988: 215-271, King & Minium 2008: 327-330). The Cramer’s V is an important measure since it sorts out differences that are too small to be reported.

In table 1, we see that the distributions of forms are very different. The non-past dominates the grammatical profiles of imperfective verbs, followed by the past, infinitive, and imperative. For the perfective verbs, it is the past subparadigm that dominates, with the infinitive form in second place, followed by the non-past and imperative. These differences are statistically significant: a chi-square test⁷ yields the

⁷ All statistical calculations were carried out using the R software package. The value of 2.2e-16 is 0.00000000000000022 (2.2 with the decimal moved 16 places to the left), and this is the lowest score that R can compute for the probability value of a chi-square test.

following values: chi-squared = 947756, df = 3, p-value < 2.2e-16. The last value indicates that there is a close to zero chance that this distribution of data could have come from a population of data in which the grammatical profiles of perfective and imperfective verbs were the same. Even more importantly, the Cramer's V is 0.399, which indicates the effect size of the difference measured by the chi-square test. Since this Cramer's V value is between "medium" (0.3) and "large" (0.5), we can safely conclude that the effect of aspect on grammatical profiles is not only significant, but also robust.

We have thus established that grammatical profiles give us a measure of the aspectual behavior of verbs, since there is a significant and robust relationship between the frequency distribution of grammatical forms and the aspect of verbs. Our next task is to apply this method to try to find whether there are similar differences in the behavior of p-partners vs. s-partners. We do this by disaggregating the data in Table 1 to show the breakdown according to the two different types of partners.

4. Statistical Study of p-partners vs. s-partners

Table 2 presents the grammatical profiles of the p-partner verbs and the s-partner verbs. Parallel to Table 1, Table 2 shows the raw frequencies and percentages for each subparadigm. However in Table 2 the data is broken down according to both aspect and the morphological relationship (prefixation vs. suffixation) used to mark aspect, yielding four sets of data to be compared in the four quadrants of the table: imperfective p-partner verbs (like *delat'*[i] 'do') in the upper left-hand quadrant, imperfective s-partner verbs (like *peredelyvat'*[i] 'redo') in the lower left-hand quadrant, perfective p-partner verbs (like *sdelat'*[p] 'do') in the upper right-hand quadrant, and perfective s-partner verbs (like *peredelat'*[p] 'redo') in the lower right-hand quadrant. The percentages add to 100% within each quadrant. Thus for example we see that there are 475,893 attestations of non-past forms for p-partner imperfectives, and this constitutes 43% of all attestations of p-partner imperfectives.

	Imperfective				Perfective			
	Nonpast	Past	Inf	Imper	Nonpast	Past	Inf	Imper
p-partners	475,893 43.0%	397,409 35.9%	195,926 17.7%	36,427 3.3%	72,439 13.7%	317,570 60.1%	114,460 21.6%	24,280 4.6%
s-partners	854,123 50.3%	517,965 30.5%	286,934 16.9%	39,290 2.3%	302,731 11.6%	1,654,717 63.2%	573,857 21.9%	87,229 3.3%

The data in Table 2 is visualized in Figure 1, which makes two comparisons. The top graph compares the two left-hand quadrants, showing how imperfective verbs (Ipv) behave. The bottom graph compares the two right-hand quadrants, showing how perfective verbs (Pfv) behave. In each graph the p-partner verbs are represented by dark grey bars, and the s-partner verbs are represented by light grey bars for comparison.

Imperfective

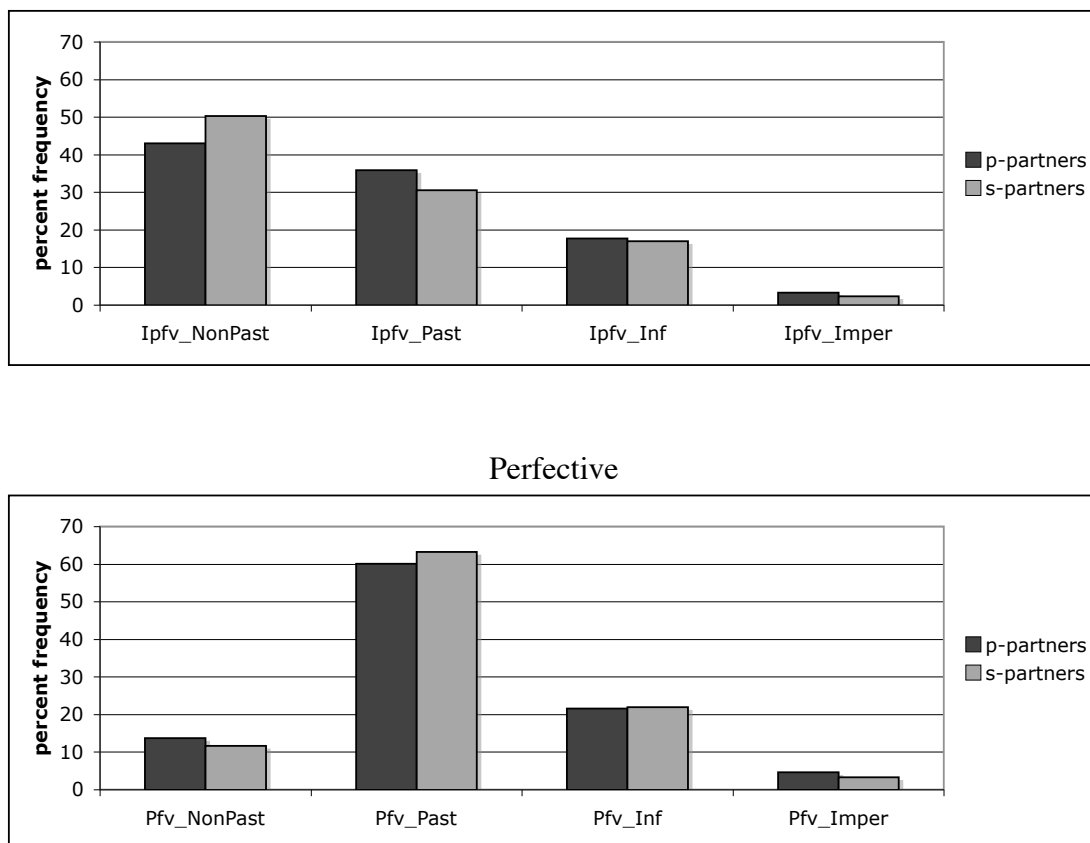


Figure 1: Distribution of p-partner (dark grey) and s-partner (light grey) forms

Statistical tests confirm what the graphs show: that there is no appreciable difference between the behavior of p-partner and s-partner verbs.⁸ We present two comparisons of p-partner and s-partner grammatical profiles below, one for the imperfective verbs and one for the perfective verbs. In both cases we see that while the chi-square test reports a significant result, the Cramer's V shows that the effect is an order of magnitude below "small" (0.1).

For the imperfective forms (the left-hand portion of Table 2 = top graph in Figure 1), the results are: chi-squared = 16155.13, $df = 3$, $p\text{-value} < 2.2e\text{-}16$, but the Cramer's V value is 0.076 and thus does not reach the threshold for a small effect. Similarly for the perfective forms (the right-hand portion of Table 2 = bottom graph in Figure 1), the results are: chi-squared = 4365.078, $df = 3$, $p\text{-value} < 2.2e\text{-}16$, but the Cramer's V value is 0.037, falling far short of the threshold for a small effect. In both cases the sheer mass of data has overwhelmed the chi-square test, but we have corrected for this by examining the effect size, which shows that any differences are so small as to be negligible.

These results indicate that the morphological strategy for marking perfective and imperfective verbs, namely the use of prefixes as opposed to suffixes, does not correspond to any real differences in the grammatical profiles of such verbs. Perfective verbs have the same distribution of forms, regardless of whether their

⁸ Visually it appears that there are two places where there might be a real difference between the p-partners and the s-partners, namely in the distribution of imperfective non-past and past forms (see the left half of the top diagram in Figure 1). In order to check whether there is a real difference here, we also ran a test on just the imperfective non-past and past forms for the p-partners and s-partners. However, even when the data is narrowed down in this way, we do not observe a reportable difference, since the Cramer's V is 0.076, far below the threshold for a small effect.

partners are imperfective base verbs or suffixed secondary imperfectives. Likewise, imperfective verbs show the same pattern of distribution, regardless of whether they are perfectivized via prefixation or they are themselves the secondary imperfectives of perfective verbs. For both p-partner and s-partner verbs we see the same patterns. Among imperfective verbs, the non-past forms dominate the grammatical profiles, followed by past tense forms, infinitives and imperatives. Among perfective verbs the dominant forms belong to the past tense, followed by the infinitive, non-past, and then imperative.

The results of this study can be corroborated by studies of synonymy in which we find that the statistical profiles (behavioral profiles, or subsets thereof) of synonymous words are more similar to each other than those of unrelated words (Janda & Solovyev 2009). In a parallel fashion, the aggregate profiles of verbs of the same aspect are overall closely similar regardless of whether they are derived via prefixation or via suffixation, whereas the aggregate profiles of verbs of different aspect are different.

5. Conclusions

Our statistical study addresses a long-standing debate over the role of morphology in aspectual derivation in Russian. The traditional view is that both prefixes and suffixes create aspectual pairs of verbs, while some dissenters suggest that only suffixes play this role. We found that the distribution of grammatical forms is clearly sensitive to aspect, since there are significant and robust differences between the grammatical profiles of perfective and imperfective verbs. Thus grammatical profiles can serve as an indication of the aspectual behavior of verbs. However, we do not find reportable differences between the grammatical profiles of aspectual partners formed with prefixes as opposed to suffixes. Our study thus supports the traditional hypothesis that aspectual pairs are formed both via prefixation and via suffixation.

It is important to recognize that this study does not completely lay to rest the debate over whether aspectual pairs are formed by both prefixes and suffixes or by suffixes alone. The grammatical profile method is only one possible measure for the aspectual behavior of verbs. Many other measures might be devised using other means, such as grammatical constructions, equivalents in parallel translations, and psycholinguistic tests. Thus the jury is still out, although our study provides corpus evidence for the majority opinion as represented in grammars and dictionaries.

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