Grammatical Profiles and Aspect in Old Church Slavonic

Abstract

We employ a new empirical approach to an enduring controversy concerning the development of a system of imperfective vs. perfective verbs in Slavic. While scholars once claimed that this is an ancient inherited system, dating from the prehistoric era, most now believe that the Slavic aspect pair system is an innovation. Different opinions concerning the date of this innovation range from the time of the earliest Slavic texts to the late middle ages. We use two different statistical models to sort Old Church Slavonic data from the PROIEL corpus and compare the results to distributions of verb forms in Modern Russian. This comparison shows that there are indeed differences among verbs in Old Church Slavonic that suggest a division into imperfective vs. perfective verbs, although this division is clearly not identical to the division found in Modern Russian.

1. Introduction

The verbal aspect system attested in Old Church Slavonic is a complicated matter. The earliest attested Slavic sources display a system where aspect is clearly grammaticalized in the verbal inflection system,[1] with an aspectually driven division of labor in the past tense between the imperfect, the aorist and the perfect.[2] There is possibly also an aspectual distinction, and not a tense distinction between the past and present participles, at least in the active voice. We will refer to these distinctions as "inflectional aspect". However, in addition, the earliest attestations provide evidence that even at this early stage, Slavic verbs display derivational patterns (prefixation and suffixation) strongly reminiscent of the aspect systems found in modern Slavic languages where verbs are found in perfective/imperfective pairs. We will refer to this distinction as "lexical aspect".[3]

In 1929 van Wijk made a case against the prevailing opinion that the Slavic system of perfective and imperfective verbs had been inherited from Proto-Indo-European,

[1] Not all researchers agree that this is so, see e.g. van Schoneveld 1951.
[2] The imperfect and the perfect *forms* are, however, innovations in the system, see e.g. Schenker 1993:101.
[3] The term "lexical aspect" is often used interchangeably with the term "Aktionsart", but we reserve it exclusively for the aspect pair system.

insisting instead that it was an innovation. Despite the fact that most scholars have since sided with van Wijk, the question of when the innovation took place has remained controversial ever since. The majority view is that the Slavic lexical aspect system took shape in the prehistoric era and is present already in the earliest written texts that make up the canon of Old Church Slavonic. Primary among these is Dostál (1954), who makes a thorough inventory of Old Church Slavonic verbs, labeling each according to its aspect. A prehistoric origin for the Slavic lexical aspect system is asserted or assumed in most theoretical works devoted to the topic (Kuryłowicz 1929, Kuznecov 1953, Kölln 1957, Němec 1956 and 1958, Maslov 1961, Andersen 2009). Reference works on Proto-Slavic (Meillet 1934, Vaillant 1966, Schenker 1993), Old Church Slavonic (Vaillant 1948, Lunt 2001), and the history of Russian (Borkovskij and Kuznecov 1965, Gorškova and Xaburgaev 1981) echo this view, often making explicit statements to the effect that the lexical aspect system of Old Church Slavonic is the same or basically the same as that found in Modern Russian.

However, the uneven modern distribution of aspectual phenomena and the dramatic and varied changes that have occurred in the verbal inflection systems of the Slavic languages give us reason to suspect that aspect has not been a stable fixture of Slavic grammar over the past millenium. Aspect is realized differently in the different Slavic languages, both in terms of its meaning (Galton 1976, Dickey 2000, AUTHOR 2006) and its morphological expression (Schuyt 1990). There is also controversy over what gave rise to aspect in Slavic, with the main candidates being the tense system, determinacy, and lexical aspect. These factors have motivated some scholars to suggest a more recent provenance for aspect in Slavic in general or in Russian in particular (Borodič 1953, Ruzicka 1957, Budich 1969, Bermel 1997, Nørgård-Sørensen 1997, Dickey 2007).

As Bermel (1997:58) notes, however, it is not fair to view the scholarly history as divided into two opposing camps, but rather as a continuum, since several authors have emphasized that the systems found in the earliest attestations are transitional ones (Amse-De Jong 1974, Forsyth 1972) and that the real interest may lie in determining to what extent the early systems differ from the ones attested in modern Slavic languages.

We take an agnostic view on the chronology of Slavic aspect. Our key questions are: Was there an aspectual distinction between imperfective and perfective verbs in Old Church Slavonic? If so, was the aspectual distinction in Old Church

Slavonic different from that in modern Russian? If so, how and to what extent was it different?

In order to answer these questions, we take a fresh, objective approach to this debate. Instead of engaging in further polemics, we use principled quantitative methods to determine whether there was an aspectual division among verbs in Old Church Slavonic. In so doing, we also aim to set an example of how statistical analysis may be applied to problems of grammaticalization in historical linguistics.

This study takes as its point of departure the fact that the aspectual distinction among verbs in modern Russian is associated with a difference between the grammatical profiles of imperfective and perfective verbs. A grammatical profile is the frequency distribution of inflected forms of a verb as attested in a corpus. AUTHOR (2011) show that this difference is statistically significant and that the effect size is medium-to-large. In modern Russian we know that there is an aspect distinction, we know which verbs are imperfective and which verbs are perfective, and we know that aspect is connected to the grammatical profiles of verbs. In Old Church Slavonic we do not know for certain whether there are imperfective vs. perfective verbs, nor how all verbs should be classified, but we do have data on the frequency distributions of inflected forms. We show that given only the grammatical profiles of Old Church Slavonic verbs, it is possible to divide the verbs into two groups and that these two groups do reflect something that resembles an aspectual distinction. However, the aspectual distinction in Old Church Slavonic is perceptibly different from that in modern Russian, as we show by comparing the distributions of verbs that are most strongly represented in various parts of the paradigm.[4]

Section 2 presents the grammatical profile method and reports on findings for modern Russian. An argument is made for applying the grammatical profile method to Old Church Slavonic data and a hypothesis is stated. The database used to test the hypothesis, extracted from an electronic corpus, is described in Section 3. This database represents the grammatical profiles of verbs in Old Church Slavonic. In

[4] Old Church Slavonic is not a direct precursor of modern Russian, but rather of modern Bulgarian and Macedonian. Nonetheless, Old Church Slavonic is the earliest attestation of Slavic and can be taken as the best available source of knowledge of Late Common Slavic, even though its aspectual system may have differed somewhat from the situation in prehistoric East Slavic. A comparison of OCS and modern South Slavic languages using a similar methodology would be a promising avenue for further research.

Section 4 two statistical sorting methods are used to divide the Old Church Slavonic verbs into two groups, and they yield nearly identical results. The two groups of verbs are analyzed with respect to a possible aspectual distinction. In Section 5 the distribution of verbs in each of the subparadigms is inspected and compared with those found in modern Russian. Conclusions are offered in Section 6.

2. What grammatical profiles can tell us about aspect

The grammatical profile method draws inspiration from two sources: behavioral profiling and the observation that verbs can behave very differently in terms of the frequency of their grammatical forms.

Behavioral profiling employs a comprehensive set of tags for a wide range of linguistic factors, among them morphological, syntactic, semantic, and lexical factors (Divjak and Gries 2006; Divjak and Gries 2009). Grammatical profiling includes only morphological factors, thus providing a tighter focus and data that is more amenable to manipulation.[5]

Šteinfeldt (1970: 28) made the observation that some modern Russian verbs "are used in some forms much more frequently than others" and that these differences appear to be connected to aspect, but he had no way to prove that this might be the case. In a series of corpus studies Newman and Rice (Newman 2008; Newman and Rice 2006; Rice and Newman 2005) showed that disparate frequency distributions can also be found in English, even among verbs with very similar meanings.

AUTHOR (2011) devised the grammatical profiling method to discover whether there are differences between the behavior of aspect pairs formed via prefixation, as in *delat'*[imperfective]--*sdelat'*[perfective] 'do', and those formed via suffixation, as in *peredelat'*[perfective]--*peredelyvat'*[imperfective] 'redo' in modern Russian. Whereas no statistically reportable difference is found between the two types of aspectual pairs, the difference between imperfective and perfective verbs on the

[5] The wide variety of factors used in grammatical profiling present both quantitative and qualitative challenges to analysis. If factors are of different types, can they simply be dropped into a statistical model, or do they need to be weighted? On what basis should they be weighted? The proliferation of factors quickly leads to problems due to covariance (when factors are not independent) and paucity of data (when the matrix of factors becomes so large that there are not enough datapoints to populate it sufficiently for analysis). For discussion of these and related problems, see Kuznetsova forthcoming.

whole is both highly significant and of a robust effect size.[6] AUTHOR's database contains the grammatical profiles of over three thousand verbs[7] as represented in nearly six million attestations in the Russian National Corpus (www.ruscorpora.ru). For each verb, the database represents how many forms were attested in the following subparadigms: nonpast (usually interpreted as present for imperfectives, but as future for perfectives), past, infinitive, and imperative. The aggregate grammatical profile of imperfective verbs has its peak in nonpast forms with 47%, followed by the past (33%), infinitive (17%), and imperative (3%). The peak in the grammatical profile of perfective verbs is the past, with 63%, followed by the infinitive (22%), the nonpast (12%), and the imperative (3%). The AUTHOR study specifically excluded grammatical forms that are restricted by aspect in modern Russian, namely gerunds and participles.[8]

In his famous study of Old Church Slavonic verbs, Dostál (1954: 589-617) makes the case that no grammatical forms of verbs were restricted to only one aspect, though some periphrastic uses of verbs do appear to be restricted. Dostál's classification of verbs is such that even the imperfect vs. aorist forms are not restricted by aspect,[9] since more than 40% of aorists are formed from verbs he considers to be imperfective and nearly all of the verb types he considers perfective also form the imperfect.[10] Dostál's classification criteria are somewhat unclear, but

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[6] Chi-squared = 947756, df = 3, p-value < 2.2e-16, Cramer's V = 0.399.

[7] This included all verbs with a single morphologically unambiguous aspectual partner that had 100 or more attestations in the Russian National Corpus.

[8] In modern Russian, perfective verbs generally cannot form present participles and gerunds, and imperfective verbs formed by suffixation are categorically excluded from formation of past gerunds and past passive participles. The aspectual restrictions on modern Russian present participles are not absolute, since perfective present participles are fairly easy to find (with a future meaning), e.g. *sdelajuščij*, which gets 39,000 hits on Google.

[9] Dostál (1954:599) claims that the imperfect and aorist tenses do not express aspect, but it is hard to see what meaning he actually ascribes to them. His definition of the meaning of the aorist is very similar to his definition of the meaning of perfectivity, and the meaning of the imperfect is just the negated meaning of the aorist. We must assume that Dostál thinks the aorist and imperfect express aspect-like meanings, but not the same ones as the lexical aspect forms, to which he ascribes the familiar perfective/imperfective distinction known from modern Slavic languages.

[10] This is not the only view, e.g. Amse-De Jong (1974:43) uses the aorist as a (negative) diagnostic, claiming that imperfective verbs may not occur in the aorist, whereas perfective verbs may occur in the imperfect. Note that she has a narrower

after a thorough critique of previous scholars' criteria, he appears to settle for three criteria that relate to his definition of perfective aspect, namely that the event is seen as a completed whole (Dostál 1954:14–15). He then goes to the monumental task of assessing all examples of every verb in his material on the basis of these three criteria.

1. For the present tense, an event seen as a completed whole allows a future interpretation. Future readings of present forms prove that the verb is perfective.
2. For other verb forms, he uses diagnostic questions such as "At once?", "Suddenly?", "Completely?", probably relying on intuitions from his native Czech to answer them.
3. Although he is skeptical of a simplistic comparison with Greek, he uses the occurrence of Greek present and aorist stem forms as a control on the other two criteria.

Dostál believes that such an approach allows the researcher to discover which aspect a verb had in Old Church Slavonic "with complete confidence", as long as there are enough examples (Dostál 1954:44–57).

Although the distribution of grammatical forms is not explicitly mentioned as a criterion, Dostál repeatedly gives distribution statistics and shows distributional differences between imperfective and perfective verbs. However Dostál's statistics are incomplete in that they reflect only aorist, imperfect and participle forms, excluding the present, infinitive, and imperative.[11] Furthermore, Dostál has first classed the verbs according to their aspect (perfective, mostly perfective, mostly imperfective, and imperfective) and then sought support for his classification in the distribution of verb forms. We believe that his classification criteria are insufficient. The division of labor between inflectional and lexical aspect is not clear in Old Church Slavonic, which makes Dostál's definition of the meaning of perfective verbs highly problematic (recall that his definition of the meaning of the aorist is nearly

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understanding of imperfective verbs than does Dostál, and allows for a class of non-aspectual verbs that may occur freely in any tense form.

[11] Dostál (1954) is also inconsistent about reporting statistics. For example, statistics are given for only some of the forms of prefixed *-byti* 'be' (aorist, imperfect, present active participle and past passive participle, but not for past active participle and present passive participle; p. 291), and in section XXIII of his book (on verbs of the *razouměti* 'come to know', *sъvědětelьstvovati* 'bear witness' type), no statistics are given at all.

indistinguishable from the one he proposes for the perfective aspect), and this definition is the core of his diagnostic criteria. The use of diagnostic questions on material from a dead language is problematic enough in itself. Unsurprisingly, Dostál's classification is controversial, see e.g. Amse-De Jong 1974. Therefore, Dostál, valuable though his work is, cannot settle the dispute over whether Old Church Slavonic had a distinction between perfective and imperfective verbs, since he assumes the existence of such a system to begin with. Still, the connection that Dostál suggests between aspect and the distribution of grammatical forms is tantalizing, particularly in light of the fact that we have proof of such a connection in modern Russian. Might it be possible to use the grammatical profiles alone to probe the verbal lexicon of Old Church Slavonic for aspect?

We build on Dostál's insight about the relationship between the distribution of forms and verbal aspect in Old Church Slavonic to state our hypothesis:

Hypothesis of Grammatical Profiles and Aspect in Old Church Slavonic: If there is an aspectual distinction between imperfective and perfective verbs in Old Church Slavonic, it can be discovered on the basis of the grammatical profiles of verbs.

In other words, we expect that a statistical analysis of grammatical profiles should make it possible to sort verbs in a way that is relevant to aspect. The alternative is the null hypothesis, according to which the grammatical profiles of verbs should yield no discernable aspectual pattern.

In the following section we present a database of grammatical profiles in Old Church Slavonic that we use to test our hypothesis.

3. Database of grammatical profiles in Old Church Slavonic

The data and statistical methods used in this analysis are available at this website: [INSERT URL]. A comma-separated value file (plus an .xls version) of the verb forms can be found there. All calculations are performed in R, a statistical software package that can be downloaded at http://cran.r-project.org/. Also on our site is verbs.r, which is a commented R script that logs all of the operations. The reader is welcome to download both items and run the entire analysis on a computer.

The point in setting up the database was to collect the grammatical profiles of Old Church Slavonic verbs so that these grammatical profiles could then be subjected

to statistical analysis. To this end we sought to collect data that would best represent Old Church Slavonic, and we eliminated items that would be problematic or give a disproportionate skew to the data.

Our database is extracted from the PROIEL corpus (http://foni.uio.no:3000/). PROIEL is a parallel corpus of Ancient Greek, Old Church Slavonic, Classical Armenian, Gothic, and Latin. The Old Church Slavonic portion of PROIEL consists primarily of Codex Marianus (a gospel), supplemented by portions of Codex Zographensis (another gospel) and Codex Suprasliensis (all excerpts are saints' lives); all three date from approximately the 10-11th centuries, and all belong to the canon of texts that defines Old Church Slavonic.[12] At the time of data extraction (September 2011), the total size of the Old Church Slavonic portion of PROIEL was approximately 62,000 words.

Our data set contains 15,720 attestations of verbs in Old Church Slavonic.[13] All of these attestations are tagged for their source, lemma, verb form, and properties of the verbs' dependents (such as subjects and objects). All the example clauses themselves are also included in the comma-separated file.

Byti 'be' is a suppletive aggregate of two verbs, and Dostál routinely segregates it from all other verbs based on its unusual aspectual behavior. Of course *byti* 'be' is by far the most frequent verb in Old Church Slavonic; it is attested 2,117 times in our database. Thus there is the risk that *byti* 'be' could overwhelm all other verbs in our study. This verb, along with the iterative *byvati*, are therefore excluded in the script.[14] Note also that AUTHOR (2011) eliminated the modern Russian equivalent *byt'* 'be' from their study.

Since grammatical profiles are relative frequency distributions of verb forms, they are more accurate and representative when we have more data for each given verb. In other words, if we have 100 attestations for a given verb, it is meaningful to say that the verb occurs 20% of the time in the aorist form, 3% in the imperfect, etc.

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[12] Codex Suprasliensis is the younger of the three texts, and is known to differ linguistically from the other two in some respects. However, we have not found variation that should prevent us from treating these three texts as one corpus in this study.

[13] 14,782 verbs are from Marianus, 628 from Suprasliensis and 310 from Zographensis. This does not make for a balanced sample, but we chose to include all annotated OCS material in order to be able to include as many verbs as possible.

[14] Experiments showed, however, that including these verbs did in fact not skew the results in our statistical analyses.

If, however, we have only three attestations of a verb and all of them are aorist forms, this may be entirely due to chance, and hence it is not meaningful to say that this verb occurs 100% in the aorist and 0% in the imperfect. Rare verbs thus pose a risk for misrepresenting the data and need to be eliminated. The threshold for inclusion in AUTHOR's study was 100 attestations, but their data was extracted from a 92 million word corpus and yielded nearly six million verb forms even after verbs with less than 100 attestations were removed. The PROIEL sample of the Old Church Slavonic canon is of course much smaller, and this means that we must make do with a more modest threshold as well. By setting the threshold at twenty attestations, however, we can protect ourselves fairly well from the risk of misrepresenting the data without losing very much of it.[15] When we eliminate all verbs with fewer than twenty attestations, there remain 9,736 verb forms from 130 verbs. One of these verbs, *sъkazati* 'say, show' cannot be reliably identified as a single verb, which led us to exclude it from the analysis. This brings the selected data set down to 9,694 occurrences of 129 verbs.[16]

Now that we have our verbs and their forms, the next step is to collect the grammatical profiles. Our goal here is to represent all verb forms at the subparadigm level. This means that we include verbal categories that are known to interact with aspect, such as tense and mood, but exclude factors that are less relevant, such as person, number and case (for participles). For Old Church Slavonic the subparadigms are thus: aorist, imperative, imperfect, infinitive/supine, present, past participle, and present participle. The infinitive and supine are taken together because the supine is relatively rare and not used consistently in Old Church Slavonic, and often replaced by the infinitive (Dostál 1954: 598).[17] The resultative l-participle is excluded because

[15] A future study may take the results of this study as a training set and try to use it with a statistical classification model that will also try to classify lower-frequency verbs with low standard deviation, thus making an arbitrary threshold of inclusion unnecessary.

[16] There is evidence that there are two sets of conjugated forms associated with the infinitive form *sъkazati* 'say, show', one with the -a suffix (*sъkažǫ* 'I say, show'), and one with the *-aj* suffix (*sъkazaǫ* 'I say, show'). Our data includes twenty-five verb forms: four of them represent the *-a* suffix, eight of them represent the *-aj* suffix (usually in the presence of the reflexive, with the meaning 'be called'), and the remaining thirteen forms are ambiguous.

[17] Had the supine been more frequent, it might have been a good idea to separate it from the infinitive, since the supine is a clearly delimited group with a

it appears only in a series of rather different periphrastic constructions and should perhaps not be seen as a single category. The inclusion of this data also makes no real difference in the analyses described in sections 4.1 and 4.2. Voice has not been taken into consideration in our analysis.[18]

The array of subparadigms differs from that used by AUTHOR because the verbal paradigms of Old Church Slavonic are very different from those in modern Russian, particularly the past tense system. The grammatical profiles in AUTHOR 2011 excluded participles and gerunds on the grounds that there are aspectual restrictions on these forms. It has not been established that Old Church Slavonic places any absolute aspectual restrictions on any verb forms, which leads us to include the participles. The Old Church Slavonic aorist and imperfect subparadigms clearly have aspectual properties, and these properties may have restricted them to certain verb classes. However, it is not at all clear how the interaction between tense and verb class worked. We therefore chose to include both of them.

To obtain the grammatical profiles for the Old Church Slavonic verbs, we count up the total number of attestations for each verb in each subparadigm. To set this data at the same scale for all verbs, we then calculate the percentages to reflect relative frequency. For example, the grammatical profiles of the verbs *tvoriti* 'make', *jęti* 'take', *prijęti* 'receive' and *priimati* 'receive' are attested in our database as shown in Table 1:

	aorist	imperative	imperfect	infinitive/supine	present	past participle	present participle	total
tvoriti 'make'	0 0%	14 8%	12 7%	23 13%	99 57%	0 0%	26 15%	174 100%
jęti 'take'	25 28%	7 8%	0 0%	10 11%	28 31%	20 22%	0 0%	90 100%
prijęti 'receive'	30 27%	6 5%	0 0%	10 9%	24 22%	41 37%	0 0%	111 100%
priimati 'receive'	0 0%	0 0%	0 0%	2 5%	32 74%	1 2%	8 19%	43 100%

Table 1: Sample grammatical profiles for *tvoriti* 'make', *jęti* 'take', *prijęti* 'receive' and *priimati* 'receive'

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coherent function, whereas the infinitive is used in a number of different constructions, including analytic futures.

[18] Although there is evidence that e.g. past active and past passive participles may not have the same aspectual properties in Old Church Slavonic.

Table 1 lists both the raw frequency and the relative frequency for the verbs in each subparadigm. *Tvoriti* 'make' is not attested in the aorist, but we have 14 attestations of imperfect forms, comprising 8% of the forms for that verb, etc. Overall we see that *tvoriti* 'make' is used mostly in the present tense, present participle, and infinitive. *Jęti* 'take' is also frequent in the present tense, but also in two subparadigms where there are no attestations of *tvoriti* 'make': the aorist and the past participle. *Prijęti*, a prefixed variety of the same verb, has a similar pattern, whereas the secondary prefixed partner *priimati* rather patterns with *tvoriti.*

The grammatical profile of each verb in our database is unique, but is there an overall pattern as suggested in our Hypothesis? In the next section we apply statistical methods to answer this question.

4. Statistical grouping of verbs

In this section we use the grammatical profile data as input to sort the 129 verbs in our study. We apply two different methods to sort the verbs: a correspondence analysis and a divisive clustering analysis. Both methods yield a division of the verbs into two groups, and, remarkably, the results are nearly identical. In other words, given only the frequency distribution of verb forms, two statistical models suggest that they can be separated into two groups, and the groups are very nearly the same even though the methods are different.

4.1 Grouping of verbs via correspondence analysis

The goal of correspondence analysis is to create a map of the data using as few dimensions as possible – since this is primarily a visualization tool, we are best served by a two-dimensional map.[19] The grammatical profiles of the verbs are represented in a dataframe with a row for each verb, columns for the subparadigms, and cells containing the relative frequency of each subparadigm for each verb (similar to Table 1). We then calculate one distance matrix accounting for the differences between the rows in the data set (the grammatical profile of each verb is compared with the grammatical profile of every other verb), and one distance matrix accounting for the differences between the columns in the data set (the occurrence of individual verbs in

[19] Our description of correspondence analysis is based on Baayen 2008: 128-136. The correspondence analysis was performed in R with the corres.fnc function in the languageR package, as demonstrated in Baayen 2008: 128–136.

each subparadigm is compared with the occurrence of individual verbs in every other subparadigm). The distance matrices are represented as faithfully as possible in two two-dimensional scatterplots, which are then superimposed. In the resulting map, if two verbs (= rows) are similar to each other, they will have a short distance between them, but if two verbs are very different from each other, they will have a longer distance between them. Similarly, if two subparadigms (= columns) are similar to each other, they will have a short distance between them, whereas more dissimilar subparadigms will be further apart. Thus, we are left with a representation where similar verbs are clustered, and the superimposed distribution of subparadigms helps us to interpret the characteristics of each cluster.

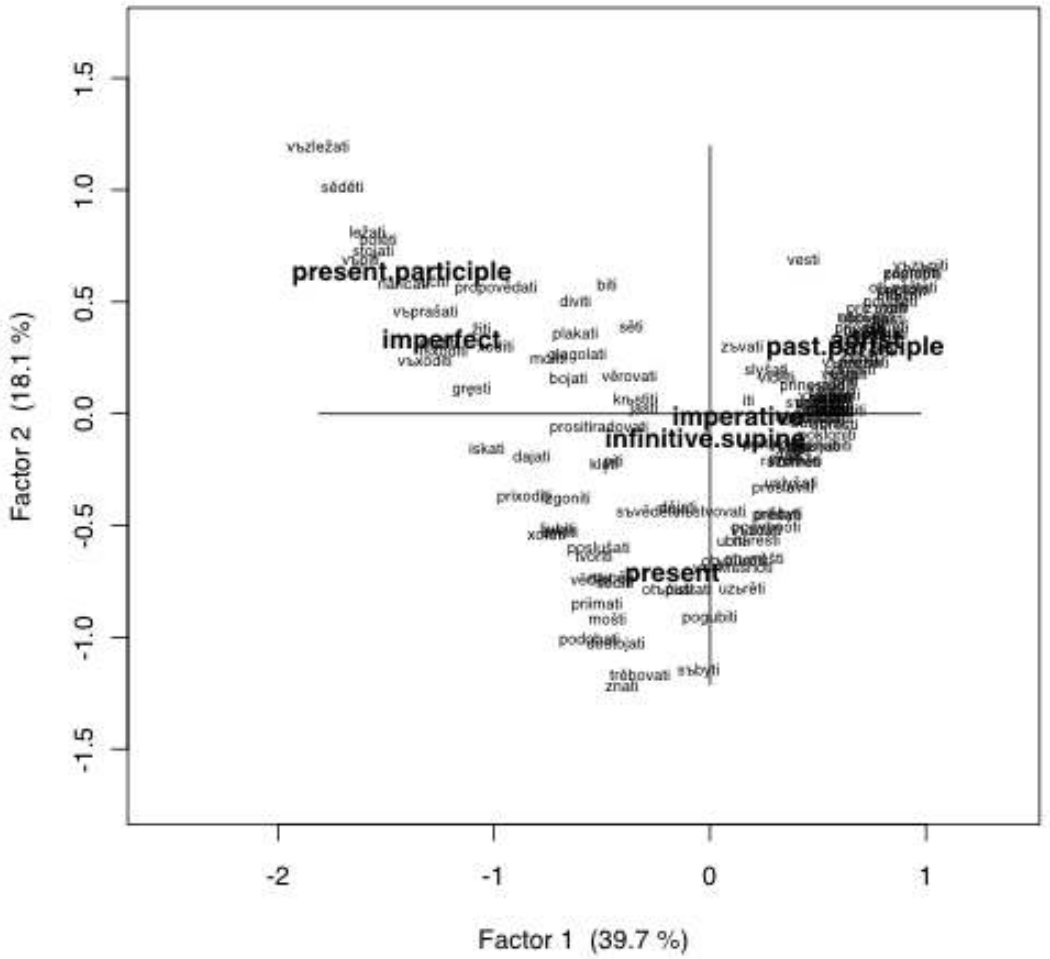

Figure 1a. Correspondence analysis of the grammatical profiles of selected Old Church Slavonic verbs

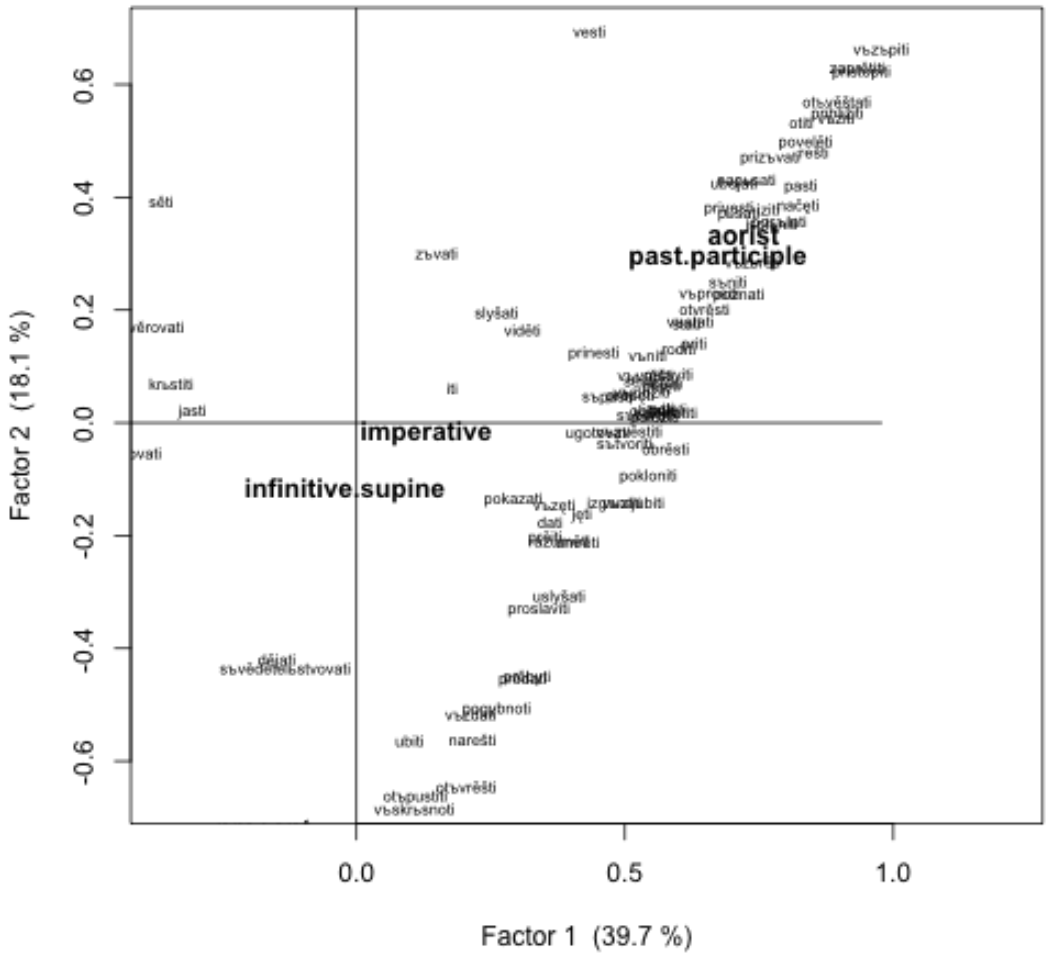

Figure 1b. Zoomed version of the upper right corner of the correspondence analysis plot

The two represented dimensions are the two factors that account for the highest percentage of variance in the data set: Factor 1 (the x-axis) accounts for 39.7% of the variance, and Factor 2 (the y-axis) accounts for 18.1% of the variance. In other words, 39.7% of the differences between the grammatical profiles of verbs are accounted for by a single factor, and no other factor comes even close to dividing the verbs into groups as effectively, since the next largest factor (2, on the y-axis) accounts for less than half as much of the variance and all other factors have even lower values. All verbs receive a coordinate for each factor, and we can thus sort the verbs according to the factor values. If we use the Factor 1 value, we can sort the verbs into two groups, namely those with negative values for Factor 1, which are on the left side of the

graph, as opposed to those with positive values, on the right side of the graph. For now we want to be agnostic about the identity of these two groups, so we will just call them "lefties" and "righties". Table 2 lists the two groups of verbs,[20] arranged in descending order, beginning with the verbs that have the most extreme values for Factor 1. The table also indicates how Dostál has classified these verbs; we come back to this in 4.3. Verbs in bold type were sorted differently in the analysis in 4.2.

"Lefties"			"Righties"		
Verb	Factor 1	Dostál	Verb	Factor 1	Dostál
vъzležati 'lie (at table)'	-1.81	impf	*vъzъpiti* 'cry out'	0.98	perf
sěděti 'sit'	-1.70	impf	*pristǫpiti* 'step up to'	0.94	perf
vъpiti 'cry'	-1.62	impf	*zaprětiti* 'threaten, rebuke'	0.93	perf
ležati 'lie'	-1.59	impf	*približiti sę* 'approach'	0.90	perf
stojati 'stand'	-1.56	impf	*otъvěštati* 'answer, pronounce judgement'	0.90	perf
boleti 'be ill'	-1.54	impf	*vъziti* 'go up'	0.89	perf
naricati (sę) 'name, call, be called'	-1.42	iter	*rešti* 'say'	0.85	perf
vъxoditi 'enter'	-1.32	iter	*poveleti* 'command'	0.84	perf
vъprašati 'question'	-1.32	iter	*otiti* 'go away'	0.83	perf
oučiti (sę) 'teach, learn'	-1.27	impf	*pasti (sę)* 'fall'	0.83	perf
sloužiti 'serve'	-1.26	impf	*načęti* 'begin'	0.82	perf
isxoditi 'exit'	-1.23	iter	*posъlati* 'send'	0.79	perf
grędti 'walk'	-1.10	impf	*isplьniti (sę)* 'fulfill'	0.77	perf
žiti 'live'	-1.06	impf	*prizъvati* 'summon'	0.77	perf
iskati 'seek'	-1.03	impf	*iziti* 'go out'	0.77	perf
xoditi 'walk'	-0.99	iter	*vъzьrěti* 'look up at'	0.74	perf
propovědati 'preach'	-0.99	iter	*napьsati* 'write down, inscribe'	0.73	perf

[20] The glosses for verbs come from Lunt 1959/1969; a few verbs were not listed in that dictionary and glosses were supplied from other sources.

prixoditi ‘arrive’	-0.86	iter	*poznati* ‘recognize’	0.71	perf
dajati ‘give’	-0.83	iter	*pьsati* ‘write’	0.71	impf
xotěti ‘want’	-0.76	impf	*oubojati sę* ‘become afraid’	0.70	perf
moliti (sę) ‘ask, pray’	-0.75	impf	*privesti* ‘bring, lead to’	0.70	perf
ljubiti ‘love’	-0.70	impf	*sъniti* ‘descend’	0.69	perf
iměti ‘have’	-0.69	impf	*vъprositi* ‘question’	0.66	perf
izgoniti ‘chase out’	-0.67	iter	*otvrěsti* ‘open’	0.65	perf
bojati sę ‘fear’	-0.65	impf	*priti* ‘come, arrive’	0.63	perf

prositi ‘ask’	-0.64	bi-impf	*vъstati* ‘stand up, start’	0.63	perf
plakati (sę) ‘weep’	-0.62	impf	*stati* ‘take a stand, stand’	0.62	perf
diviti sę ‘be surprised’	-0.62	impf	*roditi (sę)* ‘give birth’	0.60	perf
glagolati ‘speak’	-0.62	impf	*ostaviti* ‘leave, forget’	0.58	perf
podobati ‘be fitting’	-0.56	impf	*pojęti* ‘take’	0.58	perf
věděti ‘know’	-0.55	impf	*vъzvratiti (sę)* ‘give back, come back’	0.58	perf
tvoriti (sę) ‘make, pretend’	-0.54	impf	*obrěsti (sę)* ‘find, be found’	0.58	perf
priimati ‘receive’	-0.52	iter	*icěliti* ‘heal’	0.58	perf
posloušati ‘obey’	-0.51	bi	*prijęti* ‘accept, receive’	0.57	perf
klęti (sę) ‘curse, swear’	-0.49	bi-perf	*aviti (sę)* ‘reveal, appear’	0.57	perf
biti ‘strike’	-0.48	impf	*položiti* ‘lay down’	0.56	perf
mošti ‘be able’	-0.47	impf	*obratiti (sę)* ‘turn away, convert’	0.55	perf
mьněti (sę) ‘think, believe’	-0.47	impf	*pokloniti sę* ‘bow to, worship’	0.54	perf
piti ‘drink’	-0.45	bi-impf	*vъniti* ‘enter’	0.54	perf
sǫditi ‘judge’	-0.44	bi-impf	*vъvrěšti* ‘throw in’	0.54	perf
dostojati ‘befit’	-0.44	impf	*sъbьrati (sę)* ‘collect, gather’	0.54	perf
radovati sę ‘rejoice’	-0.42	impf	*vъzložiti* ‘put	0.53	perf

			on, around'		
znati 'know'	-0.41	impf	*sěsti* 'sit down'	0.53	perf
věrovati 'believe'	-0.37	impf	*vъzljubiti* 'start to love'	0.52	perf
sěti 'sow'	-0.36	impf	*propęti* 'stretch out, crucify'	0.51	perf
krьstiti (sę) 'baptize'	-0.35	perf	*vъzvěstiti* 'proclaim'	0.51	perf
trěbovati 'need'	-0.32	impf	*sъtvoriti* 'make, accomplish'	0.50	perf
jasti 'eat'	-0.31	bi-impf	*izgъnati* 'drive out'	0.48	perf

otъpouštati 'release, forgive'	-0.15	iter	*sъpasti (sę)* 'save'	0.47	perf
dějati 'do'	-0.15	iter	*ougotovati* 'prepare'	0.45	perf
čisti 'count, read, honor'	-0.14	impf	*prinesti* 'bring'	0.44	perf
sъvědětelьstvovati 'bear witness'	-0.13	bi-impf	*vesti* 'lead'	0.43	bi-impf
sъbyti sę 'happen'	-0.05	perf	*jęti* 'take, grasp, seize'	0.42	perf
			oumrěti 'die'	0.41	perf
			razouměti 'come to know'	0.38	bi-perf
			ouslyšati 'hear, find out'	0.38	perf
			vъzęti 'pick up, take'	0.37	perf
			dati 'give'	0.36	perf
			prěiti 'pass by, go from one place to another'	0.35	perf
			proslaviti 'praise, glorify'	0.34	perf
			prěbyti 'remain, abide'	0.32	perf
			prědati 'betray'	0.31	perf
			viděti 'see'	0.31	bi-impf
			pokazati 'show, instruct'	0.29	perf
			slyšati 'hear'	0.26	bi-impf

			pogybnǫti 'perish'	0.26	perf
			narešti 'name, claim'	0.22	perf
			vъzdati 'give back'	0.21	perf
			otъvrěšti (sę) 'throw away, turn away, reject, deny'	0.21	perf
			iti 'go'	0.18	bi-impf
			zъvati 'call'	0.15	impf

			ouzьrěti 'see, catch sight of'	0.15	perf
			otъpoustiti 'release, let go'	0.11	perf
			vъskrьsnǫti 'rise again, be resurrected'	0.11	perf
			oubiti 'kill'	0.10	perf
			pogoubiti 'destroy, ruin'	0.00	perf

Table 2. Lefties and righties

Figure 2 shows barplots of the aggregate grammatical profiles of the "lefties" and the "righties". The data for these plots is summarized in Table 3.[21]

[21] Note that the percentages do not add up to 100, since the l-participles have been omitted from the set of subparadigms.

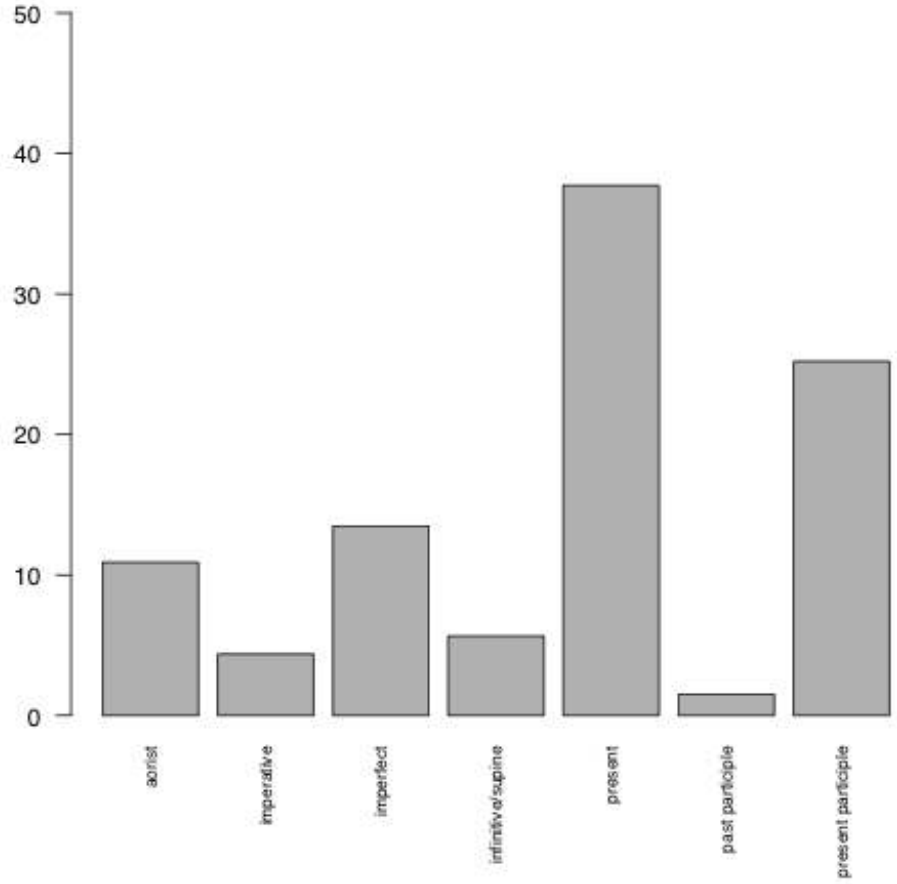

Figure 2a. Aggregate grammatical profile of lefties

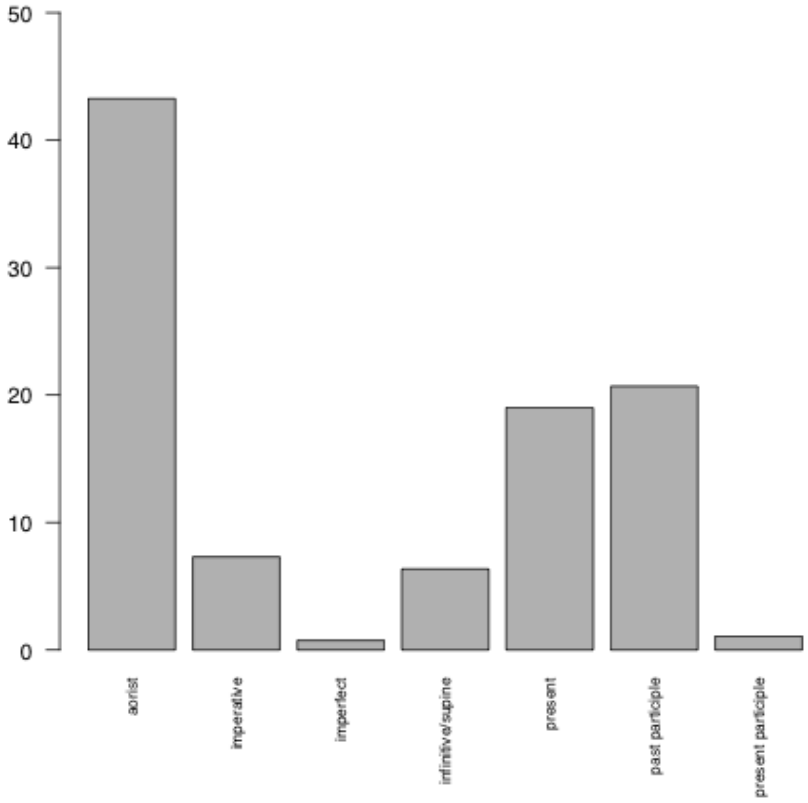

Figure 2b. Aggregate grammatical profile of righties

	aorist	imperative	imperfect	infinitive/ supine	present	past participle	present participle
"Lefties"	11%	4%	14%	6%	38%	2%	25%
"Righties"	43%	7%	1%	6%	19%	21%	1%

Table 3: Aggregate grammatical profiles of "lefties" and "righties"

The difference between the grammatical profiles of the "lefties" and the "righties" is significant, and the effect size is large.[22] The grammatical profiles in Figure 2 are in some ways similar to those AUTHOR found for modern Russian. The grammatical profile of the "lefties" parallels the grammatical profile of the Russian

[22] Chi-squared = 3708.912, df = 6, p-value < 2.2e-16, Cramer's V = 0.6. Of course the fact that these results are significant is no surprise since the verbs were sorted according to the frequency distributions of their forms in the first place. But this does serve as a check to show that the results are in line with those found in modern Russian.

imperfective verbs in that it is dominated by present (= nonpast) tense forms (present and present participle), followed by past tense forms (imperfect and aorist). The grammatical profile of the "righties" parallels the grammatical profile of the Russian perfective verbs in that it is dominated by past tense forms (aorist and past participle). In other ways the grammatical profiles are different. For all types of verbs the infinitive/supine is relatively more rare in Old Church Slavonic, while the imperative is more frequent, particularly for "righties". Of course there are two past tenses in Old Church Slavonic, and while they are nearly equally represented among the "lefties", the aorist is strongly favored by the "righties".

Factor 1, then, appears to account for something similar to aspect. It is tempting to take factor 2 to account for tense.[23] We see that both the past tenses are located around 0.5 on the Factor 2 axis, whereas the present tense is found at around -0.5. The participles group closely with the past tenses: the present participle with the imperfect and the past participle with the aorist. We should remember that the participles are also mostly used in past-tense narrative in our text material, and that they are therefore close to past-tense forms in function.

4.2 Grouping of verbs via hierarchical cluster analysis

For the cluster analysis we use a divisive clustering approach (the diana() function in R). This function also begins with a calculation of distances, like the first step of the correspondence analysis. However, instead of grouping, the model splits: It takes an initial cluster containing all of the data points and begins to partition that cluster into progressively smaller clusters. This method is optimal for finding a small number of large clusters.

We are most interested in the first division of all the verbs into two groups. If we compare the two largest clusters, which we can call cluster 1 and cluster 2, we find that they are nearly identical to the grouping of verbs according to Factor 1 in the correspondence analysis: cluster 1 contains "lefties" and cluster 2 contains "righties".

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[23] We are grateful to Dag Haug for this observation. Note that this observation may also serve as a justification of the value of our two-dimensional plot. The plot accounts for 57.8% of the total variance in the data set. The remaining 32.2 % are accounted for by further factors, which are not plotted. However, since factor 1 appears to account for aspect and factor 2 for tense, the two crucial categories pertaining to OCS verbs, we can assume that the remaining factors primarily account for lexical variation.

Only six verbs, marked with bold type in Table 2, are sorted differently by the two methods. All of them are "righties" according to the correspondence analysis, but in cluster 1 according to the hierarchical cluster analysis: *otъvrěšti (sę)* 'throw away, turn away, reject, deny', *uzьrěti* 'see, catch sight of', *otъpustiti* 'release, let go', *vъskrьsnǫti* 'rise again, be resurrected', *ubiti* 'kill', and *pogubiti* 'destroy, ruin'. All of these verbs have values very close to zero for Factor 1: *otъvrěšti (sę)* is at -0.21, and the five remaining verbs are identical with the five verbs closest to zero in the righties group.[24]

Given that the results from the two analyses are 95% identical, it does not really matter which results we use. However, whereas the hierarchical cluster analysis is merely a division into groups, the correspondence analysis has the advantage that it includes a measure of how much each verb deviates from the dividing line according to Factor 1. Since the correspondence analysis gives us this extra information, we will base the remainder of our discussion on its results.

4.3 Do the verb groups parallel imperfective vs. perfective aspect?

Here we compare the correspondence analysis grouping of "lefties" vs. "righties" with the aspectual designations that have been assigned to Old Church Slavonic verbs by Dostál and other scholars. We begin by looking at how successful the correspondence analysis is in distinguishing potential aspectual pairs and then analyze individually nine verbs that seem to be misclassified by the correspondence analysis.

Let us hypothesize that there is a correspondence between aspect and the values of Factor 1 of the correspondence analysis, such that negative values indicate imperfective and positive values indicate perfective. We can then evaluate the results by seeing whether there are consistent patterns.

The correspondence analysis consistently gives negative Factor 1 values for states, which we would expect to be imperfective. Here are the verbs that describe states from Table 2, with their Factor 1 values: *vъzležati* 'lie (at table)' -1.81, *sěděti* 'sit' -1.70, *ležati* 'lie' -1.59, *stojati* 'stand' -1.56, *bolěti* 'be ill' -1.54, *naricati sę* 'be called' -1.42, *žiti* 'live' -1.06, *xotěti* 'want' -0.76, *ljubiti* 'love' -0.70, *iměti* 'have' -0.69, *bojati sę* 'fear' -0.65, *diviti sę* 'be surprised' -0.62, *podobati* 'be fitting' -0.56, *věděti* 'know' -0.55, *mošti* 'be able' -0.47, *mьněti sę* 'think, believe' -0.46, *dostojati*

[24] The values in Table 2 have been rounded. The value for *pogubiti* 'destroy, ruin' is listed as 0.00, but that was rounded from 0.0001787632.

'befit' -0.44, *radovati sę* 'rejoice' -0.42, *znati* 'know' -0.41, *věrovati* 'believe' -0.37, *trěbovati* 'need' -0.32. No verbs denoting states receive a positive value for Factor 1.

The correspondence analysis also does a remarkably good job of sorting the respective partners of potential aspectual pairs, as shown in Table 4,[25] where all the potential imperfective partners have negative values and all the perfective partners have positive values.

Potential imperfective partner verbs		Potential perfective partner verbs	
vъpiti 'cry'	-1.62	*vъzъpiti* 'cry out'	0.98
naricati (sę) 'name, call, be called'	-1.42	*narešti* 'name, claim'	0.22
vъprašati 'question'	-1.32	*vъprositi* 'question'	0.66
dajati 'give'	-0.83	*dati* 'give'	0.36
ljubiti 'love'	-0.70	*vъzljubiti* 'come to love'	0.52
znati 'know'	-0.41	*poznati* 'recognize'	0.71
bojati sę 'fear'	-0.65	*ubojati sę* 'become afraid'	0.70
tvoriti (sę) ''make, pretend	-0.54	*sъtvoriti* 'make, accomplish'	0.50
priimati 'receive'	-0.52	*prijęti* 'accept, receive'	0.57
biti 'strike'	-0.48	*oubiti* 'kill'	0.10
otьpuštati 'release, forgive'	-0.15	*otьpustiti* 'release, let go'	0.11

Table 4: Potential aspectual partners correctly sorted by correspondence analysis

The analysis works also for *glagolati* 'speak' -0.62 vs. *rešti* 'say' 0.85, which arguably function as a suppletive aspectual pair in Old Church Slavonic.

There are only two potential aspectual pairs that are not sorted in this way by the analysis: *pьsati* 'write' 0.71 vs. *napьsati* 'write' 0.73 and *slyšati* 'hear' 0.26 vs. *uslyšati* 'hear, find out' 0.38. In both of these cases, the potential imperfective partner verb has a positive value in the correspondence analysis. Both *pьsati* 'write' and *slyšati* 'hear' constitute mismatches between designations offered by Dostál (and other scholars) and our statistical model. We take up these two verbs along with the other seven items apparently misclassified below.

[25] Note that *oubiti* and *poznati* are probably not aspectual partners to *biti* and *znati* in a strict sense, since semantic shift is clear. However, the prefixed variants of the simplex verbs are still expected to be perfective.

Although Dostál makes a global distinction between perfective and imperfective, the specific designations he assigns to verbs are more detailed. Table 2 contains abbreviations indicating the aspect of each verb as listed in Dostál 1954. The abbreviations can be interpreted as follows:

iter = iterative
impf = imperfective
bi-impf = biaspectual but mostly imperfective
bi = biaspectual
bi-perf = biaspectual but mostly perfective
perf = perfective

None of these designations is specifically restricted to a certain morphological shape, though there are of course patterns. Iterativity, for example, is expressed by simplex verbs such as *tręsti* 'shake, tremble', suffixed verbs such as *dajati* 'give', verbs with both a prefix and a suffix such as *ubivati* 'kill', and verbs with a prefix and an indeterminate verb of motion stem such as *prixoditi* 'come'.

If we assume that imperfective is compatible with all of these designations except the last one, perfective, and that perfective is compatible with all of these designations except the first two, iterative and imperfective, there are only two cases in which a "lefty" is incompatible with imperfective and only two cases in which a "righty" is incompatible with perfective. By this criterion, the correspondence analysis concurs with Dostál in 97% of cases, based only on the grammatical profiles of verbs. Table 5 gives a breakdown of Dostál's designations for our "lefties" and "righties".

aspectual designation in Dostál 1954	# of "lefties" with that designation	# of "righties" with that designation
iterative	12	0
imperfective	32	2
biaspectual mostly imperfective	5	4
biaspectual	1	0
biaspectual mostly perfective	1	1
perfective	2	69
Total	53	76

Table 5: Aspectual designations of "lefties" and "righties" according to Dostál

We could take a more conservative view, and consider only iterative, imperative, biaspectual mostly imperfective, and biaspectual as "imperfective" designations for "lefties"; and only perfective, biaspectual mostly perfective, and biaspectual as "perfective" designations for "righties". But even in this case there is a 93% match between the division of verbs suggested by the correspondence analysis and Dostál's aspectual designations. Under either analysis, we have compelling support for the hypothesis that the grammatical profiles of verbs can be used to sort Old Church Slavonic verbs into aspectual categories, or at least into groupings that strongly resemble aspectual categories.

Let's examine the nine verbs that deviate from this pattern a bit more closely. As a group, these verbs are nearly all located near the middle (where Factor 1 = 0) of the correspondence analysis distribution: all but one of them have Factor 1 values between -0.5 and +0.5. The one exception is *pьsati* 'write', with a value of 0.71, but we suggest that there may be other factors at work here. We go through each verb in turn and consider their individual grammatical profiles (see Table 6). Where appropriate we compare Dostál's designations with those made by other scholars.

	aorist	imperative	imperfect	infinitive/ supine	present	past participle	present participle
sъbyti sę 'happen'	3	0	0	0	17	0	0
krьstiti (sę) 'baptize'	4	1	1	8	8	4	8
klęti (sę) 'curse, swear'	2	2	0	5	9	0	6
zъvati 'call'	1	3	4	1	4	16	2
iti 'go'	79	65	25	25	63	56	13
vesti 'lead'	14	1	2	0	0	3	2
viděti 'see'	82	22	4	32	59	92	26
slyšati 'hear'	39	5	5	19	34	63	17
pьsati	5	1	1	1	4	28	0

'write'							

Table 6: Grammatical profiles of verbs do not match Dostál's designations

Table 6 presents the raw frequencies of grammatical forms for the nine verbs where we find deviation between Dostál's designations and the correspondence analysis. The three verbs at the top of the table (above the thick line) are "lefties" that Dostál classifies as perfectives or as biaspectual verbs that are mostly perfective. The six verbs in the bottom of Table 6 are "righties" that Dostál classifies as imperfectives or as biaspectual verbs that are mostly imperfective. We will take up each verb in turn.

sъbyti sę 'happen' Factor 1: -0.05, Dostál designation: perf
Of all the verbs that fail to match Dostál's designation, this is the nearest miss, since its Factor 1 value is very close to zero. We have sparse data on this verb, which with only twenty attestations just crossed the threshold for inclusion in our study. Furthermore, the verb is primarily attested in a single construction, namely in subordinate clauses (sometimes pseudo-imperatives) introduced by *da* (14 occurrences). In such clauses the verb will occur in the present tense with a future interpretation. In total, seventeen attestations are in the present tense, and though present tense is well represented for both "lefties" and "righties", it is nearly twice as common among the former. The large number of present tense forms is probably what led to its classification as a "lefty".

krьstiti (sę) 'baptize' Factor 1: -0.35, Dostál designation: perf
Nearly half of the attestations in our data are of present and present participle, and given that the present participle is very rare among "righties", these two subparadigms likely motivated classifying this verb as a "lefty". Though Dostál designates this verb as perfective, he admits (1954: 82-84, 103) that there are "deviations", including uses with gnomic, iterative, and illocutionary ('I baptize you in the name of...') interpretations, all of which point to the imperfective. According to Dostál, Meillet considered this verb imperfective, and Polívka and Weingart termed it biaspectual.

klęti (sę) 'curse, swear' Factor 1: -0.49, Dostál designation: bi-perf

Again we have sparse data on this verb: there are only twenty-four attestations in our database, and over half of these (fifteen) are in the present and present participle, which points toward classification as a "lefty". Dostál contradicts himself in evaluating this verb: whereas he classes it among the biaspectual verbs for which the perfective predominates, he claims that the two aspects are attested in equal numbers for this verb (1954: 107-108). Dostál also notes that both Boehme and Hermelinová class this as an imperfective verb, whereas Weingart believes it has variable aspect.

zъvati 'call' Factor 1: 0.15, Dostál designation: imperf
Among "mismatches" on the right side of the correspondence analysis, this verb is closest to zero, with a very low value for Factor 1. Over half of all attestations are of past participle forms, which is rare among "lefties" and this is likely why it received a positive value for Factor 1.

iti 'go' Factor 1: 0.18, Dostál designation: bi-imperf
vesti 'lead' Factor 1: 0.43, Dostál designation: bi-imperf
These two stems, which yield determined verbs of motion in many modern Slavic languages, can be examined together. Dostál (1954: 36, 119-125) writes that all determined motion verbs had the potential to become perfective verbs, and that there is considerable variation and controversy over how to classify these verbs in Old Church Slavonic. Amse-De Jong (1974:55-56) categorically refuses to ascribe aspect to unprefixed motion verb pairs. In our data for both verbs the aorist is several times more frequent than the imperfect. In addition, for *iti* 'go' the past participle is more than four times as frequent as the present participle. *Vesti* 'lead', with only twenty-two attestations, gives rather sparse data for forms other than the aorist.

viděti 'see' Factor 1: 0.31, Dostál designation: bi-imperf
slyšati 'hear' Factor 1: 0.26, Dostál designation: bi-imperf
These two verbs of perception can also be taken together. Dostál (1954: 136-145) again finds considerable controversy among scholars about their aspectual status, which he attributes to the fact that these verbs can refer either to a single sudden perception or to an experience of longer duration. For both of these verbs the aorist is many times more frequent than the imperfect and the past participle is several times

more frequent than the present participle, which likely motivated the classification in our statistical model.

pьsati 'write' Factor 1: 0.71, Dostál designation: imperf
Despite the fact that Dostál lists this verb as an imperfective, he notes that it is often used in the past participle form and that it does express perfective aspect in this form (1954: 181-182, 618). This distributional fact is confirmed by our data as well, since over two-thirds of our attestations are of past passive participles. There is one additional striking fact about this verb: its nearest neighbor in our correspondence analysis plot is *napьsati* 'write', which scores 0.73 for Factor 1 and should be the perfective partner verb. Here we probably have evidence of a lexical effect, where the basic meaning is nearly indistinguishable, particularly in the past passive participle.

Overall, we see that except from *sъbyti sę* 'happen' at -0.05, all the mismatches with Dostál's classification involve simplex verbs occurring in all or most of our seven subparadigms. It is likely that *sъbyti sę* is misclassified due to its skewed distribution; it primarily occurs in dependent purpose clauses. Unsurprisingly, it appears that the aspectual status of the simplex verbs is a matter of controversy in the literature, and in most of the cases we find that Dostál has deemed them to be biaspectual. Simplex verbs have no overt morphological markers of lexical aspect, and Dostál's method of using diagnostic questions backed by modern Czech intuitions may be particularly unfortunate in such cases.

5. Distributions across the subparadigms

Given the distributions of forms across the subparadigms, it is possible to get a division of Old Church Slavonic verbs into two groups that strongly resembles a distinction between imperfective and perfective. But to what extent is this distinction similar to the one we find in modern Russian? One way to look at this question is to compare the behavior of verbs that are particularly attracted to certain subparadigms in the two languages. AUTHOR (2011) found a number of strong patterns showing the relationship between lexical meanings, tense, aspect, and mood in modern Russian. Some of these findings supported claims made in previous scholarship, while others were new; for example it was found that the imperfective non-past strongly attracts verbs that express gnomic facts rather than durative situations as had been

traditionally claimed. In this section we examine the distribution of Old Church Slavonic verbs for each subparadigm and make comparisons (where possible) with modern Russian.

This section is divided into seven subsections, each devoted to one of the subparadigms of Old Church Slavonic verbs, following the same order of presentation as in Tables 1 and 3 and Figure 2. Each subsection starts with a boxplot of the distribution of "lefties" and "righties" for the given subparadigm, like the one shown in Figure 3 below. The thick line inside the box shows the position of the median (the number that cuts the distribution in half, so that half of the verbs are above that number and half are below). The box itself represents what is called the "interquartile range" of the distribution, which is the central 50% of the distribution, with 25% above the median and 25% below it. Extending from the box are the "whiskers" which reach up to 1.5 times the length of the interquartile range into the top and bottom quartiles. Any data that exceed the extremes of the whiskers are represented as circles, and those are referred to as "outliers". For example, if we look at the right-hand side of Figure 3, we see the distribution of "righties" whose grammatical profiles contain various percentages of aorists. The median is at 35%, which means that one-half of all "righties" have grammatical profiles containing more than 35% aorists, and one-half of all "righties" have grammatical profiles containing less than 35% aorists. The top edge of the box is at 51%, which tells us that 25% of all "righties" have between 35% and 51% aorists in their grammatical profiles. Conversely, there are also 25% of all "righties" with between 23% and 35% aorists in their grammatical profiles; these are represented by the bottom part of the box. The whiskers reach up to 90% and down to 3%, and there are no circles above or below them, hence no outliers. This means that all the "righties" are located between the two ends of the whiskers. In the left-hand side of Figure 3 we see a different distribution, since 50% of all "lefties" have 2% or fewer aorists in their grammatical profiles. The next quartile brings us up to 6% (the top of the box), and if we extend that by another 1.5 times the interquartile range, we reach the top of the whisker at 14%. Above the whisker we see some circles that represent the "lefties" that have more aorists than any others in the distribution and are statistically considered outliers. In each subsection we list and discuss all the outliers and make comparisons with modern Russian where possible. All examples are from Codex Marianus unless otherwise noted.

5.1. Verbs that are strongly attracted to the aorist

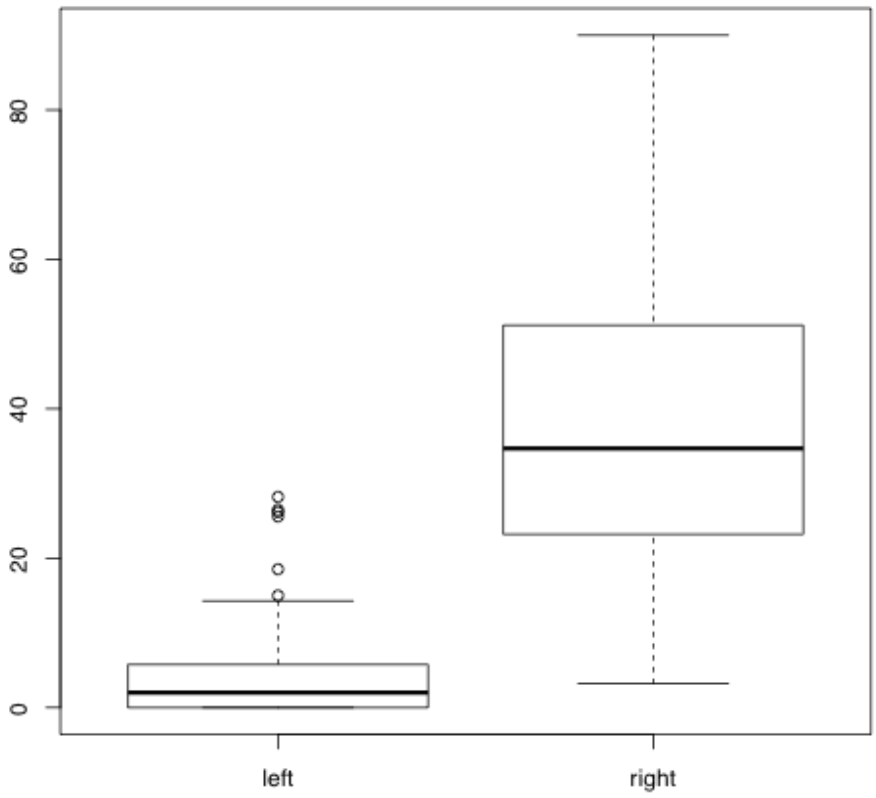

Figure 3: Distribution of verbs according to percentage of aorist forms

Of the two past tenses in Old Church Slavonic, aorist and imperfect, there is good reason to consider the aorist to be the more neutral past tense, since it is more freely formed by all types of verbs than the imperfect (see 5.3. below).[26] The aorist is therefore more comparable to the modern Russian past tense. One parallel between the two languages is striking in this connection. Of all the distributions of verbs across subparadigms in modern Russian, there is only one that has such a diverse distribution

[26] Amse-De Jong (1974) uses the aorist as a negative diagnostic, claiming that "true" imperfective verbs do not occur in the aorist. If this were the case, we would expect to find the verbs that never occur in the aorist in an isolated group on the far left of the plot. However, even though we do find that these verbs are almost all left of -0.4, we also see that they are mixed with "lefties" that do occur in the aorist in the same area, e.g. *sěděti* 'sit' at -1.70, *ležati* 'lie' at -1.59 and *boléti* 'be ill' at -1.54. Hence, our analysis does not support Amse-De Jong's position.

that there are no outliers, and it is the distribution of perfective verbs in the past tense. There are only two distributions of Old Church Slavonic verbs that are equally diverse and lacking in outliers, and one is the distribution of "righties" in the aorist form (the other is that of "lefties" in the present, see 5.6. below). Thus the modern Russian perfective past and the Old Church Slavonic "righty" aorist share a similar position in the tense-aspect systems of these languages. However, it must be noted that the center point of these two distributions is not the same, since the median for Old Church Slavonic is 35%, whereas for Russian it is over 60%. The difference is probably partially due to the larger number of subparadigms in the present study, but also to the fact that Old Church Slavonic freely uses past participles instead of finite past tense verbs both in adverbial expressions and in narrative chains.

"Lefties" are much less attracted to the aorist, though there are six outliers, listed in Table 6. Five of these verbs express speech or mental/emotional reactions. These are the types of verbs that could describe either a durative state (or activity) or a brief unique action or change of state. The use of the aorist form with these verbs emphasizes the suddenness of the latter type of situation, as in (1), where the news that someone wants Jesus' dead body surprises Pilate. Contrast this with the use of the imperfect for the same verb in (2), where the scribes and chief priests were frightened about the stative situation of having so many Jews who are amazed at Jesus.

(1)	*pilatъ*	*že*	***divi***	***sę***	*ašte*	*ouže*
	Pilate.NOM.SG	PTCL	wonder.AOR.3SG	REFL	if	already
	oumьrětъ					
	die.AOR.3SG					
	'And Pilate **marveled** if he were already dead' (Mark 15:44)					

(2)	*bojaxǫ*	*bo*	*sę*	*ego*	*jako*	*vesь*
	fear.IMPERFECT	for	REFL	3SG.PN.M.GEN	that	whole.M.NOM.SG
	narodъ	***divljaxǫ***		***sę***	*o*	*oučenii*
	people.NOM.SG	wonder.IMPERF.3PL		REFL	about	doctrine.LOC.SG
	ego					
	3SG.PN.M.GEN					
	'for they feared him, because all the people **was astonished** at his doctrine' (Mark 11: 18)					

The sixth verb is *sъbyti sę* 'happen', which we recall from section 4.3. The verb has a Factor 1 coordinate very close to zero and is a mismatch with Dostál's classification, and we have already noted that this is due to the verb's low frequency and highly skewed distribution.

verb	% aorist forms in this verb's grammatical profile
sъvědětelьstvovati 'bear witness'	28% (11)
věrovati 'believe'	26% (22)
glagolati 'speak'	26% (289)
diviti sę 'be surprised'	26% (9)
plakati (*sę*) 'weep'	19% (5)
sъbyti sę 'happen'	15% (3)

Table 7: "Lefty" outliers most attracted to the aorist

5.2. Verbs that are strongly attracted to the imperative

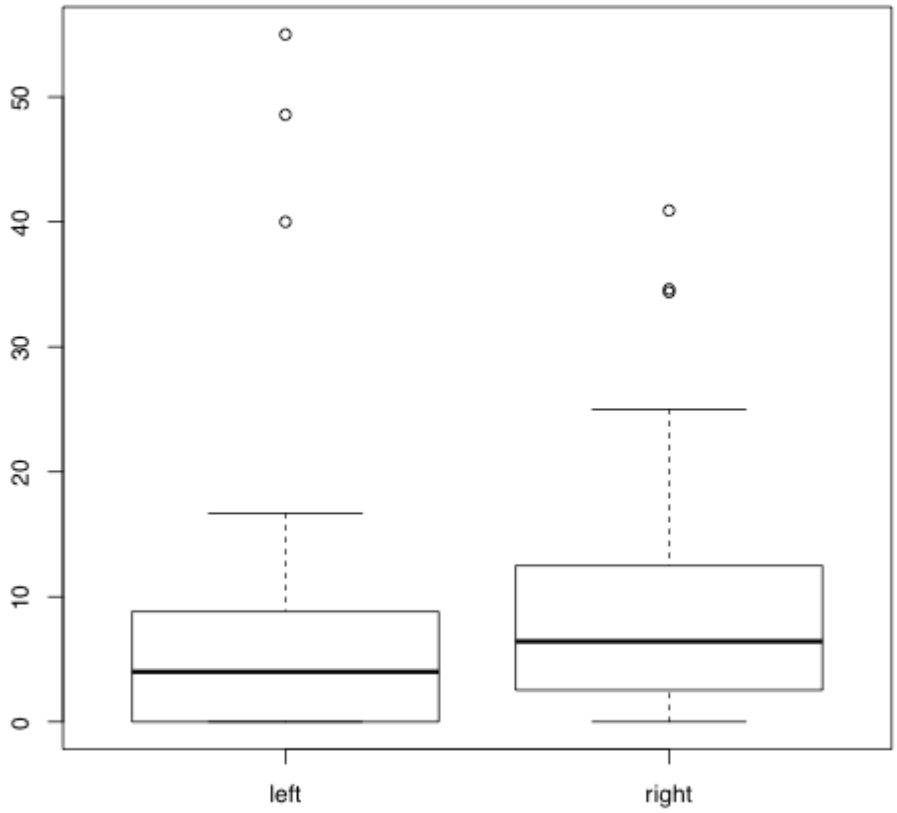

Figure 4: Distribution of verbs according to percentage of imperative forms

This form is relatively infrequent for both groups of verbs, and we should be wary of attaching too much importance to the absence of certain usages. The median for "lefties" is 4% and the median for "righties" is 6%. Each group contains only three outliers, shown in Table 7. The pattern of similarly low medians for both groups of verbs is the same in modern Russian, but in Russian there are vastly more outliers among both imperfective and perfective imperatives than elsewhere in the verbal paradigm, whereas this is not the case in Old Church Slavonic. In Russian we find that imperfective imperatives are associated with negation and expressions of politeness and urgency, and that imperatives are often represented in idiomatic expressions (AUTHOR 2011). Negation seems to be a relevant factor in Old Church Slavonic, but not necessarily for all lexemes. Whereas sixteen out of seventeen imperative forms of *bojati sę* 'fear' are negated (and modern Russian also lists *bojat'sja* 'fear' among imperfective outlier verbs for the imperative) and the same goes for seven out of eight imperative forms of *dějati* 'do', no forms of *radovati sę* 'rejoice' are negated. Idiomatic expressions are a factor here, as we see in (3), where *radovati sę* 'rejoice' is used to render the Greek *khaire* 'Hail!' and this exact collocation is repeated also in Matthew 27:29 and John 19:3.

(3) ***radoui*** *sę* *c-srju* *ijudeiskъ*
rejoice.IMP.2SG REFL king.VOC.SG Jewish.M.NOM.SG
'**Hail**, King of the Jews!' (Marianus Mark 15:18)

Lefties:

verb	% imperative forms in this verb's grammatical profile
radovati sę 'rejoice'	55% (11)
bojati sę 'fear'	49% (17)
dějati 'do'	40% (8)

Righties:

verb	% imperative forms in this verb's grammatical profile
pokazati 'show, instruct'	41% (9)
ubojati sę 'become afraid'	35% (9)
prinesti 'bring'	34% (11)

Table 8: Outliers most attracted to the imperative

For modern Russian, perfective imperatives are associated with instructions, rude demands, requests, and idiomatic expressions (AUTHOR 2011). In Old Church Slavonic, however, the "righty" verbs most strongly attracted to the imperative focus only on instructions. In (4) Jesus is instructing the multitudes about who they should and should not be afraid of. And in (5) Jesus instructs the leper whom he has cleansed about what he should do next.

(4) *ne* ***ouboite*** ***sę*** *otъ* *oubivajǫštiixъ* *tělo* *i*
not fear.IMP.2PL REFL from kill.PRS.PTCP.GEN.PL body.ACC.SG and
po *tomь* *ne* *mogǫštemь* *lixa*
after that.N.LOC.SG not be.able.PRS.PTCP.DAT.PL evil.N.GEN.SG
česo *sъtvoriti.* *sъkazajǫ* *že*
something.GEN.SG do.INF tell.PRES.1SG PTCL
vamъ *kogo* ***sę*** ***ouboite.*** ***ouboite*** ***sę***
2PL.PN.DAT who REFL fear.IMP.2PL fear.IMP.2PL REFL
imǫštaago *vlastь* *po* *oubьenii*
have.PRS.PTCP.M.GEN.SG power.ACC.SG after killing.LOC.SG
vьvrěšti *vъ* *geonǫ*
throw.INF in Gehenna.ACC.SG

'**Be** not **afraid** of them that kill the body, and after that have no more that they can do. But I will forewarn you whom ye shall **fear**: **Fear** him which after he hath killed hath power to cast into hell' (Luke 12:4-5)

(5) *nъ* *šedъ* ***pokaži*** *sę* *arxiereovi* *i*
but go.PST.PTCP.M.NOM.SG show.IMP.2SG REFL priest.DAT.SG and
prinesi *za* *očištenie* *tvoe* *eže*
bring.IMP.2SG for cleansing.ACC.SG your.N.ACC.SG which.N.ACC.SG
povelě *mosi* *vъ* *sъvěděnie*
order.AOR.3SG Moses.NOM.SG in testimony.ACC.SG
imъ
3PL.PN.M.DAT

'but go thy way, **shew** thyself to the priest, and **offer** for thy cleansing those things which Moses commanded, for a testimony unto them' (Mark 1:44)

We cannot be sure whether this reflects a real difference between Old Church Slavonic and Modern Russian, or whether this is just a particularity of the New Testament text.

5.3. Verbs that are strongly attracted to the imperfect

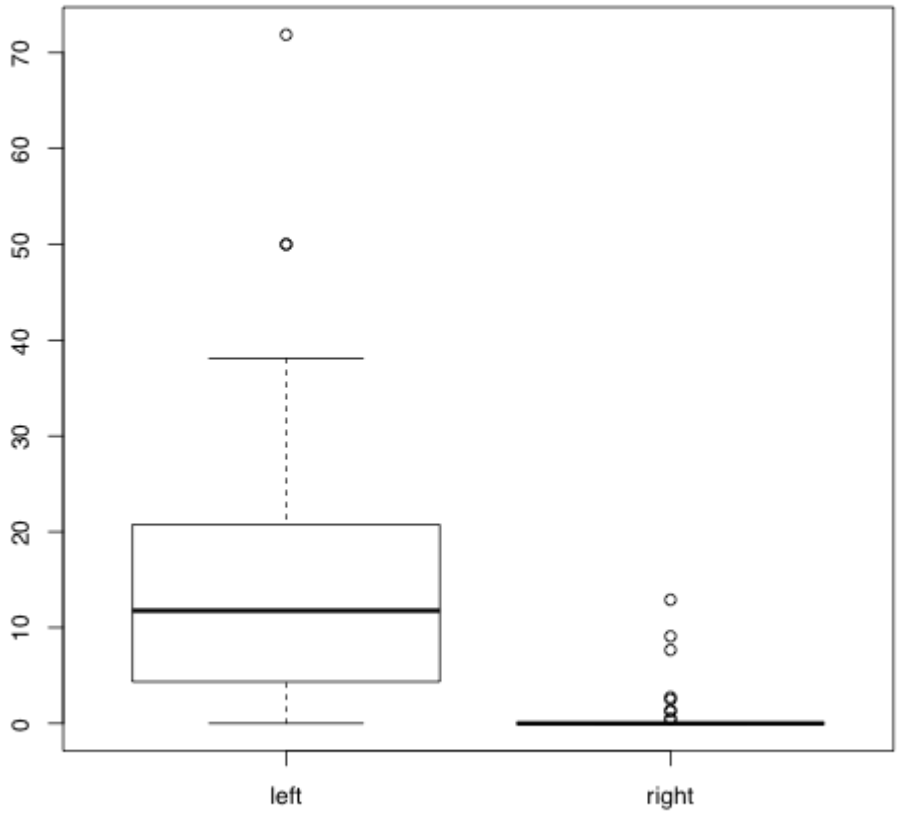

Figure 5: Distribution of verbs according to percentage of imperfect forms

The norm is that only "lefties" are attracted to the imperfect, though not strongly so. The median for "lefties" is 12%. There are only three outliers that exceed the top whisker of this distribution, which reaches to 38%, and they are listed in Table 8.

One of the three outliers is *diviti sę* 'be surprised' which we saw above among the aorist outliers. Nearly all our attested forms for this verb are either imperfect (seventeen tokens) or aorist (nine tokens) and the distribution seems semantically motivated as illustrated in examples (1) and (2) above. Simultaneity is a strong factor for *vъpiti* 'cry', where ten out of twelve attestations involve crying while saying

something, as in (6), while both simultaneity and durativity are relevant for examples of *vъprašati* ‘question’.

(6) *ona* *že* *pače* ***vъpijašete*** *g-ljǫšta*
3DU.PN.M.NOMPTCL more cry.IMPERF.3DU say.PRS.PTCP.M.NOM.DU
‘but they **cried** the more saying’ (Matt. 20:31)

Both duration and simultaneity are evident in attestations of *vъprašati* ‘question’.

Lefties:

verb	% imperfect forms in this verb’s grammatical profile
vъprašati ‘question’	72% (23)
vъpiti ‘cry’	50% (12)
diviti sę ‘be surprised’	50% (17)

Righties:

verb	% imperfect forms in this verb’s grammatical profile
zъvati ‘call’	13% (4)
vesti ‘lead’	9% (2)
iti ‘go’	8% (25)
pьsati ‘write’	3% (1)
slyšati ‘hear’	3% (5)
viděti ‘see’	1% (4)
razouměti ‘come to know’	1% (1)
dati ‘give’	0.5% (1)
otъveštati ‘answer, pronounce judgement’	0.4% (1)

Table 9: Outliers most attracted to the imperfect

There are only nine “righties” that have any imperfect forms at all, and all are outliers. The largest number of tokens in this group is twenty-five (*iti* ‘go’), and four of these verbs (*pьsati* ‘write’, *razouměti* ‘come to know’, *dati* ‘give’, *otъveštati* ‘answer, pronounce judgement’) have only one attestation of an imperfect form. The first six items in this table are exactly the same six verbs that are “righties” that do not match Dostál’s aspectual designations (see Table 5). We should note that all but two of these are simplex verbs, and that both *iti* and *vesti* are determinate verbs of motion, which are known to have deviant aspectual behavior. This part of the paradigm seems particularly closely aligned to the designation of verbs as “lefties” vs. “righties” since the imperfect form is almost exclusively restricted to “lefties”.

5.4. Verbs that are strongly attracted to the infinitive/supine

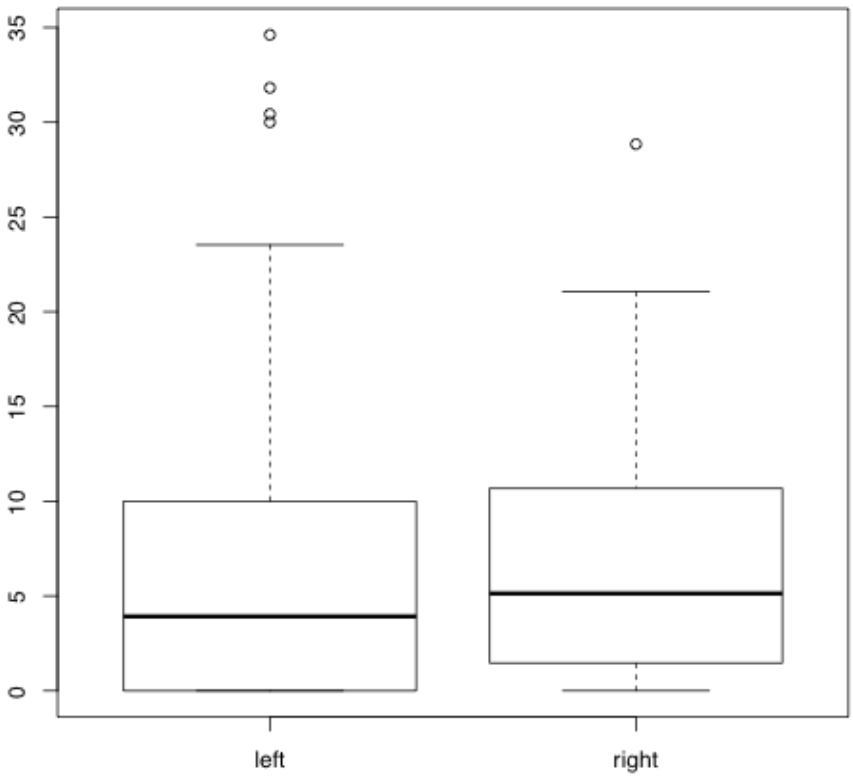

Figure 6: Distribution of verbs according to percentage of infinitive/supine forms

The distributions here are fairly similar for both "lefties" (with a median of 4%) and "righties" (with a median of 5%), so this form does not seem to tell us much about how the two groups of verbs might differ. Given that differences between imperfective and perfective infinitive forms in modern Russian are motivated by the use of modal constructions that are less relevant to Old Church Slavonic, there are no interesting parallels to draw between the two languages either. There are four outliers among the "lefties", listed in Table 10. In this group we find both *piti* 'drink' and *jasti* 'eat' which are usually collocated with finite forms of *dati* 'give' and *imati* 'have' in the sense 'have/give something to eat/drink'; the other two verbs are often collocated with forms of motion verbs and phasal verbs like *počęti* 'begin'. The one outlier among the "righties" is *oubiti* 'kill' with 29% infinitive/supine forms.

verb	% infinitive/supine forms in this verb's grammatical profile
piti 'drink'	35% (18)
propovědati 'preach'	32% (7)
otъpouštati 'release, forgive'	30% (7)
jasti 'eat'	30% (30)

Table 9: "Lefty" outliers most attracted to the infinitive/supine

5.5. Verbs that are strongly attracted to the past participle

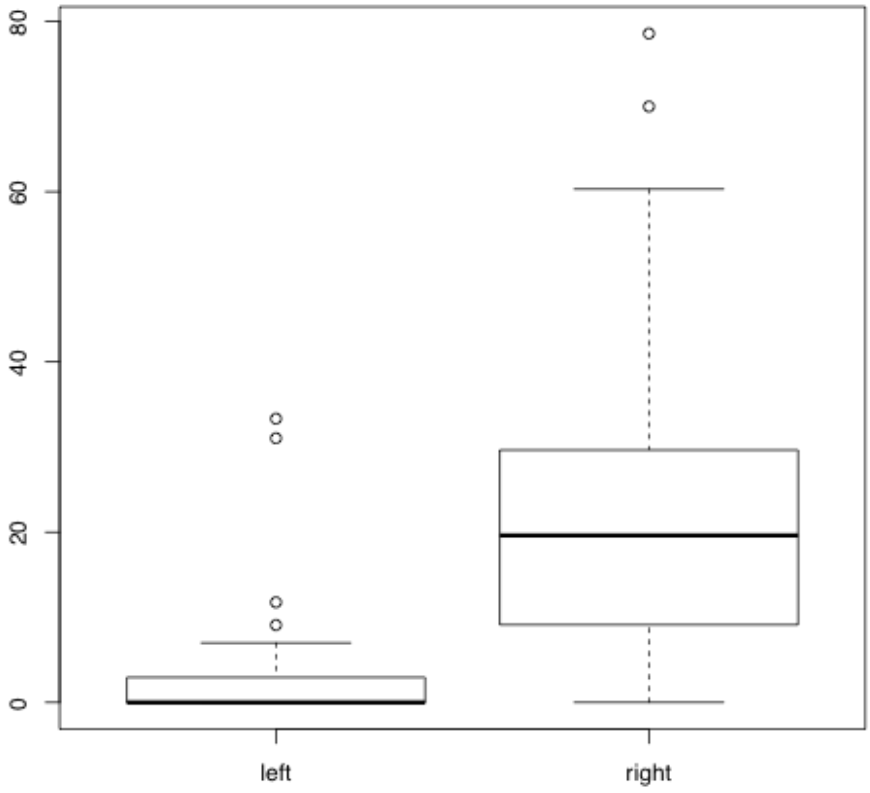

Figure 7: Distribution of verbs according to percentage of past participle forms

Since the modern Russian study did not include participles (by necessity, since they have strong aspectual restrictions), we cannot draw any parallels between the two languages. Past participles are certainly entirely possible for both groups of verbs, though "righties" are much stronger. Also, the restrictions may be different for past active participles and past passive participles – we note that *sěti* 'sow', the "lefty" with the largest share of past participles, has mostly passive participle occurrences

(eight out of eleven). Note that two of our "mismatched verbs" (see Table 5) appear here: *krьstiti (sę)* 'baptize' and *pьsati* 'write'. For the latter, we note that all 28 past participle occurrences are passive.

Lefties:

verb	% past participle forms in this verb's grammatical profile
sěti 'sow'	33% (11)
biti 'strike'	31% (9)
krьstiti (sę) 'baptize'	12% (4)
žiti 'live'	9% (2)

Righties:

verb	% past participle forms in this verb's grammatical profile
vъzьrěti 'look up at'	79% (22)
pьsati 'write'	70% (28)

Table 11: Outliers most attracted to the past participle

5.6. Verbs that are strongly attracted to the present

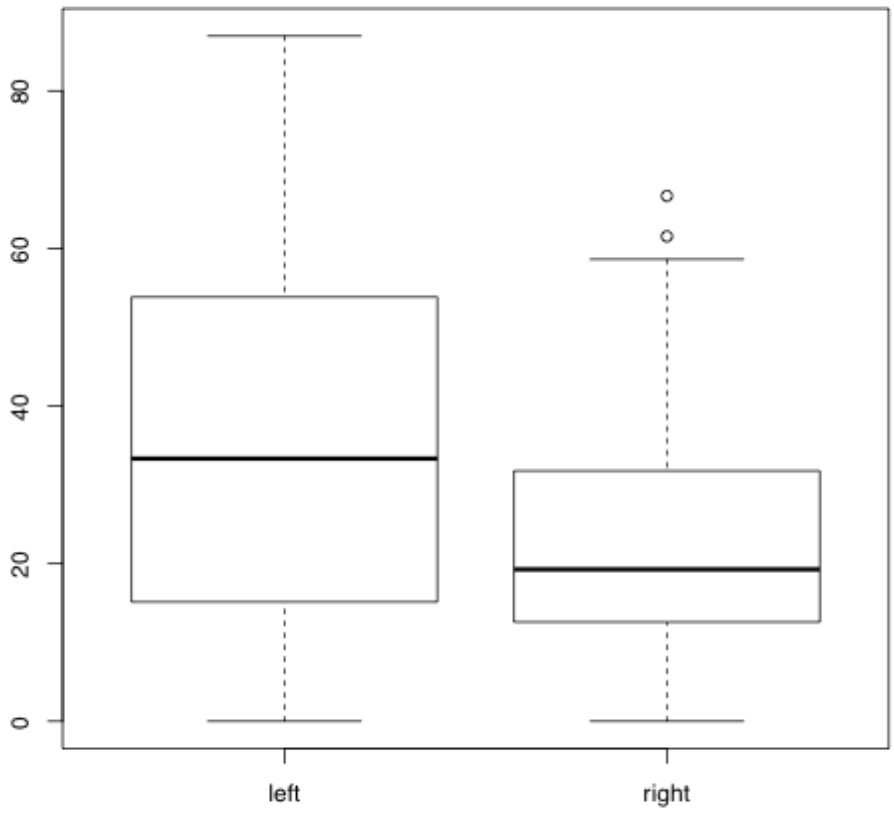

Figure 8: Distribution of verbs according to percentage of present forms

Both groups of verbs are attracted to the present tense, though the "lefties" are more so (with a median of 33%) than the righties (with a median of 19%). The distribution for lefties is very diverse, with no outliers. There are only two outliers for righties: *ouzьrěti* 'see, catch sight of' with 67% present forms (34 occurrences) and *pogoubiti* 'destroy, ruin' with 62% (24 occurrences). The outliers of the perfective present (non-past) in modern Russian express predictions, and this is certainly true for the Old Church Slavonic "righty" outliers in the present tense as well, as shown in (7) and (8).[27]

(7) *i tъgda* ***ouzьrętъ*** *s-na* *č-lovčskaago*
and then see.PRS.3SG son.ACC/GEN.SG of.man.M.ACC/GEN.SG
grędęšta *na* *oblačěxъ* *sъ* *silojǫ*
walk.PRS.PTCP.M.ACC/GEN.SG on cloud.LOC.PL with power.INST.SG
mъnogojǫ *i* *slavojǫ*
great.F.INST.SG and glory.INST.SG
'And then they **shall see** the Son of Man coming in the clouds with great power and glory' (Mark 13:26)

(8) *pridetъ* *i* ***pogoubitъ*** *tężatelę*
come.PRS.3SG and destroy.PRS.3SG husbandman.ACC.PL
'he **will** come and **destroy** the husbandmen' (Mark 12:9)

5.7. Verbs that are strongly attracted to the present participle

[27] Far from all "righty" presents express futures. An easy way to check this is by looking at the Greek source text. Of the occurrences in our material that have a Greek alignment in the PROIEL corpus, 41.5 % translate future indicatives, 30.3 % translate aorist subjunctives and 17.5 % translate present indicatives. The rest translate various other finite and infinite verb forms.

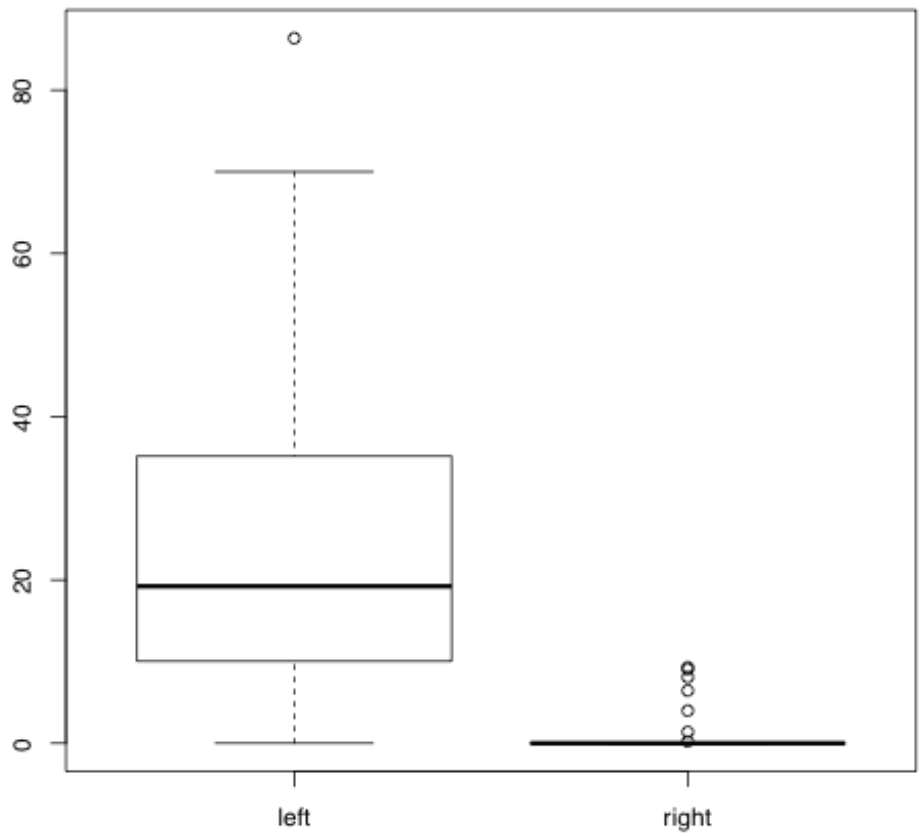

Figure 9: Distribution of verbs according to percentage of present participle forms

The "lefties" have a very diverse distribution for the present participle, with a median of 19%, and just one outlier: *vъzležati* 'lie (at table)' with 86% present participles. Many of these occurrences are nominalizations meaning simply 'dinner guest'. For righties, the entire boxplot is collapsed at 0%. All righty verbs that have one or more attestation of a present participle count as outliers here, and these are listed in Table 12.

vesti 'lead'	9% (2)
slyšati 'hear'	9% (17)
viděti 'see'	8% (26)
zъvati 'call'	6% (2)
iti 'go'	4% (13)
razouměti 'come to know'	1% (1)
rešti 'say'	0.2% (only 2 tokens out of over 800)

Table 12: "Righty" outliers, present participle occurrences

Like the imperfect, the present participle is very restrictive in its relation to "righties", and five out of six of the "righty" "mismatches" are among the outliers in Table 11 (those listed first). The only one that is missing is *рьsati* 'write', which prefers the past (passive) participle as noted above.

5.8 What does the outlier analysis tell us?

In the outlier analysis, we have gone through the distribution of "lefties" and "righties" subparadigm by subparadigm and used boxplots to look for outliers – verbs that have an atypical distribution in the subparadigm in question. As we have seen, the outlier analysis reveals verbs that have been discussed at length in the literature, and pinpoints the difficulties in classifying them. Some verbs recur as outliers in several subparadigms. These verbs suggest that the aspect system is not yet completely mature, and that some verbs may not have a clear aspectual identity in Old Church Slavonic.[28] We see that virtually all of these recurring outliers are unprefixed, suggesting that simplex verbs are overrepresented among verbs with unstable aspectual behavior. We also see that several of the recurring outliers are determinate verbs of motion, which have long been known to have deviant aspectual behavior. The ability to identify such deviant verbs proves the value of our strictly statistical approach.

6. Conclusions

In this paper we have taken a strictly empirical approach to the long-disputed question of whether, or to what extent, Old Church Slavonic had a system of imperfective and perfective verbs. Taking as our point of departure the fact that Modern Russian imperfective and perfective verbs differ significantly in their distribution across subparadigms, we found that Old Church Slavonic verbs could be classified into two groups based on their distribution across subparadigms alone, that this split closely resembles an aspectual split, and that the classification is in fact nearly identical to the classification found in Dostál 1954, even though that classification was at least allegedly based on a qualitative examination of the examples alone. Our results thus

[28] A caveat may be in place here. Some of the outliers may be here merely because of their high frequency: the more frequent a verb is, the more likely is it to be attested in deviant forms.

independently support Dostál's claim that Old Church Slavonic had an aspectual verb pair system, or something very similar. In particular, our "righties" look like a strong and coherent group of apparently perfective verbs, while there is much more variation among the "lefties". Our results thus do not support scholars who have claimed a late provenance for the Slavic lexical aspect system, but are compatible with scholars that have suggested that not all verbs participated in the lexical aspect system at the time of Old Church Slavonic (e.g. Forsyth 1972; cf. also Ruzicka 1957 for Old Russian).

Comparing the two Old Church Slavonic verb groups to the Modern Russian imperfectives and perfectives, we find both similarities and differences. One striking similarity is the strong preference with both the Russian perfective verbs and the Old Church Slavonic "righties" for the past tense: 63% of Russian perfectives are in the past tense, and 43% of the "righties" occur in the aorist. Conversely, both the Russian imperfectives and the Old Church Slavonic "lefties" predominantly occur in the nonpast/present tense – 47% of the imperfectives and 38% of the "lefties". A very obvious difference is the fact that the Old Church Slavonic set of subparadigms is much larger. Although many scholars have claimed that Old Church Slavonic does not have clear paradigmatic restrictions for aspect, our results clearly suggest that the distinction between the aorist and the imperfect, and likewise between the past (active) and the present (active) participles, was aspectual in nature and interacted with lexical aspect. The exact relationship between lexical and inflectional aspect remains an issue for further research.

These results clearly demonstrate the advantages of bringing a strictly empirical and statistical approach to this much-debated question, and open several interesting avenues for further research. Our study encompasses only the data currently available in the PROIEL corpus, a larger and more varied dataset could refine our results considerably. Further contrastive work using similar methodology could be of great interest – a comparison with the modern South Slavic systems could shed more light on the specific development in Slavic, whereas a comparison with languages without grammaticalized aspect could further validate the method.

References

Amse-De Jong, Tine, 1974. *The meaning of the finite verb forms in the Old Church Slavonic Codex Suprasliensis. A synchronic study*. The Hague: Mouton.

Andersen, Henning, 2009. 'On the origin of the Slavic aspects: Questions of chronology', in Vit Bubenik, John Hewson and Sarah Rose (eds.). *Grammatical change in Indo-European languages. Papers presented at the Workshop on Indo-European linguistics at the 18th International Conference on Historical Linguistics, Montreal, 2007*. Amsterdam: John Benjamins, 123–140.

Baayen, R.H., 2008. *Analyzing Linguistic Data. A Practical Introduction to Statistics Using R*. Cambridge: Cambridge University Press.

Bermel, Neil, 1997. *Context and the Lexicon in the Development of Russian Aspect*. Berkeley: University of California Press.

Borkovskij, V.I. and P.S. Kuznecov, 1965. *Istoričeskaja grammatika russkogo jazyka*. Moscow: Nauka.

Borodič, V.V., 1953. *K voprosu o formirovanii soveršennogo i nesoveršennogo vida v slavjanskix jazykax*. Voprosy jazykoznanija 2, 68–86.

Budich, Wulf, 1969. *Aspekt und verbale Zeitlichkeit in der I. Novgoroder Chronik*. Graz: Akademischer Druck- u. Verlagsanstalt

Dickey, Stephen, 2000. *Parameters of Slavic Aspect: A Cognitive Approach*. Stanford: CSLI Publications.

Dickey, Stephen. 2007. 'A Prototype Account of the Development of Delimitative PO- in Russian', in Dagmar Divjak and Agata Kochanska (eds.). *Cognitive Paths into the Slavic Domain*. Berlin: Mouton de Gruyter, 326—371.

Divjak, Dagmar S. and Stefan Th. Gries, 2006. 'Ways of trying in Russian: clustering behavioral profiles'. *Corpus Linguistics and Linguistic Theory* 2(1), 23–60.

Dostál, Antonin, 1954. *Studie o vidovém systému v staroslověnštině*. Prague: Státní pedagogické nakladatelství.

Forsyth, James, 1972. 'The nature and development of the aspectual opposition in the Russian verb'. *The Slavonic and East European Review*, 50(121).

Galton, Herbert, 1976. *The main functions of the Slavic verbal aspect*. Skopje: Macedonian Academy of Sciences and Arts.

Gorškova, K.V. and G.A. Xaburgaev, 1981. *Istoričeskaja grammatika russkogo jazyka*. Moscow: Vysšaja škola.

Divjak, Dagmar and Stefan Th. Gries, 2009. 'Corpus-based cognitive semantics: A contrastive study of phasal verbs in English and Russian'. Katarzyna Dziwirek

and Barbara Lewandowska-Tomaszczyk (eds.). *Studies in cognitive corpus linguistics*. 273–296. Frankfurt am Main: Peter Lang, 123–140.

AUTHOR, 2006. A Metaphor for Aspect in Slavic. *Henrik Birnbaum in Memoriam* (= *International Journal of Slavic Linguistics and Poetics* 44-45), 249-60.

AUTHOR, 2011. 'Grammatical profiles and the interaction of the lexicon with aspect, tense and mood in Russian'. *Cognitive Linguistics* 22(4), 719–763.

Kölln, Herrmann, 1957. 'Vidové problémy v staroslověnštině'. *Universitatis Carolina, Philologica* 3(1), 67–100.

Kuryłowicz, Jerzy, 1929. 'La genèse des aspects verbaux slaves'. *Prace filologiczne* 14, 644–657.

Kuznecov, P.S., 1953. 'K voprosu o genezise vido-vremennyx otnošenij drevnerusskogo jazyka'. *Trudy instituta jazykoznanija AN SSSR* 2, 220–253.

Kuznetsova, Julia, forthcoming. *Linguistic Profiles: Correlations between Form and Meaning*. PhD dissertation, University of Tromsø.

Lunt, Horace, 1959/1969. *Old Church Slavonic Glossary*. Cambridge MA: Harvard University, Department of Slavic Languages and Literatures.

Lunt, Horace, 2001. *Old Church Slavonic Grammar*. Seventh revised edition. Berlin: Mouton de Gruyter.

Maslov, Ju.S., 1961. 'Rol' tak nazyvaemoj perfektivacii i imperfektivacii v processe vozniknovenija slavjanskogo glagol'nogo vida'. *Issledovanija po slavjanskomu jazykoznaniju*. Moscow: Izdatel'stvo AN SSSR, 165–195.

Meillet, Antoine, 1934. *Le slave commun*. Paris: H. Champion.

Němec, Igor, 1956. 'Kategorie determinovanosti a indeterminovanosti jako základ slovanské kategorie vidu'. *Slavia* 25(4), 299–317.

Němec, Igor, 1958. 'Genese slovanského systému vidového'. *Rozpravy ČSAV, Řada společenských věd* 68,7. Prague: Nakladatelství ČSAV.

Newman, John. 2008. 'Aiming low in linguistics: Low-level generalizations in corpus-based research'. *Proceedings of the 11th International Symposium on Chinese Languages and Linguistics*, National Chiao Tung University, Hsinchu, Taiwan. May 24 2008. http://www.ualberta.ca/~johnnewm/Aiming%20Low.pdf.

Newman, John and Sally Rice. 2006. 'Transitivity schemas of English EAT and DRINK in the BNC', in S. Th. Gries and A. Stefanowitsch (eds.). *Corpora in*

Cognitive Linguistics: Corpus-based Approaches to Syntax and Lexis. Berlin and New York: Mouton de Gruyter, 225-260.

Nørgård-Sørensen, Jens. 1997. Tense, aspect and verbal derivation in the language of the Novgorod birch bark letters. *Russian Linguistics* 21:1–21.

Rice, Sally and John Newman, 2005. 'Inflectional islands'. Presentation at the 9th International Cognitive Linguistics Conference, Yonsei University, Seoul, Korea. Available at http://www.ualbera.ca/~johnnewm.

Ruzicka, Rudolf, 1957. *Der Verbalaspekt in der altrussischen Nestorchronik*. Berlin: Akademie-Verlag.

Schenker, Alexander M., 1993. 'Proto-Slavonic', in Bernard Comrie and Greville G. Corbett (eds.). *The Slavonic Languages*. London: Routledge, 60–124.

Schuyt, Roel, 1990. *The morphology of Slavic verbal aspect: A descriptive and historical study*. Amsterdam: Rodopi.

Šteinfeldt, E., 1970. *Russian Word Count*. Moscow: Progress.

Vaillant, André, 1948. *Manuel du vieux slave. v. I : Grammaire*. Paris: Institut d'études slaves.

Vaillant, André, 1966. *Grammaire Comparée des langues slaves. v. III: Le verbe.* Paris: Klincksieck.

van Schooneveld, C. H., 1951. 'The aspect system of the Old Church Slavonic and Old Russian verbum finitum byti'. *Word* 7.

van Wijk, Nicolaas, 1929. Sur l'origine des aspect du verb slave. *Revue des études slaves* 9:237–252.