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Same Source, Different Shapes: Syllable Structure of Greco-Latin Loanwords in German and Russian

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ABSTRACT

***Background**: German and Russian have both absorbed a large stock of Greek and Latin words, but it is not obvious whether the two languages give these words the same syllabic shape. Because both languages tolerate complex onsets and codas, classical phonotactic repair (epenthesis, deletion) should play only a minor role, and the source of any differences remains an open question.*

***Materials and methods**: We compiled a parallel corpus of 50 German–Russian lexeme pairs traced to Greek (n = 38) or Latin (n = 12) etyma. Each form was syllabified with one shared rule set and coded for syllable count, type of final syllable (open/closed) and the ending of the etymon. Paired and association tests were used (Wilcoxon signed-rank, exact McNemar, Cohen's κ, permutation χ^2).*

***Results**: Mean word length was practically identical (German 2.76, Russian 2.80 syllables; p = .71), the two sets of counts correlated (Spearman's ρ = .67), and no pair differed by more than one syllable. The final-syllable type coincided in only 25 of 50 pairs (κ = −.02), with mismatches running equally in both directions. The direction of a length difference, however, was strongly associated with the ending of the etymon (Cramér's V = .59, permutation p < .001): Russian was longer for all -ia words and for more than half of the feminine -a/-ē nouns, and never longer for -is, -os/-on/-us/-um words.*

***Conclusions**: At the level of the whole corpus the two languages are symmetrical, and this symmetry hides a regular,*

morphology-driven pattern. Differences in syllable shape seem to arise mainly from how each language integrates the inflectional ending of the etymon, and not from repair of unacceptable syllable structures. The result is exploratory and rests on a small, non-random sample.

Keywords: Loanwords, Greco-Latin lexicon, syllable structure, German, Russian, contrastive phonology, loanword adaptation

1. INTRODUCTION

Anyone who reads scientific prose in both German and Russian will notice a body of vocabulary that neither language made for itself: "Theorie" and "теория," "System" and "система," "Kultur" and "культура." These words go back, more or less directly, to Greek and Latin, and they make up a layer of internationalisms that has mostly been described from the lexicological and etymological side (Krysin 1968; Eisenberg 2011). A narrower question has received less attention. When one and the same Greek or Latin source ends up in two languages, does it come out with the same syllabic shape?

The general literature on loanword adaptation would lead us to look for phonotactics first. Early work already treated adaptation as the replacement of foreign sound patterns by native ones (Haugen 1950; Weinreich 1953), and later studies formalised this as repair driven by native constraints on segments and syllables (Paradis & LaCharité 1997; Kang 2011). Epenthesis and deletion are the standard tools, and their behaviour has been analysed at length for languages with strict syllable templates, such as Cantonese (Silverman 1992; Yip 1993) and for the prosodic conditioning of vowel insertion more generally (Itô 1989; Uffmann 2007). (For a broad overview, see the papers in Calabrese & Wetzels 2009.) There is also a continuing debate on whether adaptation happens in perception or in production (Peperkamp 2004; Boersma & Hamann 2009), and evidence that spelling can steer the outcome (Vendelin & Peperkamp 2006). The empirical base, in short, is dominated by

cases in which a restrictive recipient language takes words from a more permissive donor.

German and Russian are a different kind of case. Syllable structure is usually described in terms of sonority sequencing (Selkirk 1984; Clements 1990; Blevins 1995; Zec 2007) and preference laws (Vennemann 1988), and against that background both languages permit complex onsets and fairly complex codas (Hall 1992; Wiese 1996; Kasevich 1983; Bondarko 1998; Timberlake 2004), and both sit in the "complex" group in the typological survey of syllable structure by Maddieson (2013). Most Greco-Latin words therefore did not need phonotactic repair to be pronounceable in either language. If their syllabic shapes still diverge, the reason has to lie somewhere else, and morphology is the obvious candidate: loan nouns are routinely fitted into native inflection or gender classes (Haspelmath & Tadmor 2009), and the treatment of the Latin or Greek ending can add or remove a syllable without any phonotactic motivation.

One further complication should be stated at once. The transmission routes were not the same. German drew heavily on Latin and French (Kluge 2011; Eisenberg 2011), whereas many Russian forms arrived through Church Slavonic, Polish, German and French (Fasmer 1986-1987; Krysin 2004). A German form and a Russian form derived from one etymon are therefore rarely two independent "adaptations" of it. We do not claim to reconstruct individual borrowing events. What we compare are the synchronic outcomes, the German and Russian reflexes of a shared source, and we use "adaptation" in that loose, descriptive sense.

The paper addresses three questions. RQ1: do German and Russian reflexes of the same Greco-Latin etyma differ in syllable count, and if so, in which direction? RQ2: is the type of the final syllable, open or closed, preserved across the two languages? RQ3: are cross-linguistic mismatches spread randomly through the material, or do they line up with the ending of the etymon? Given the common source and the similar tolerance for complex syllables, we expected no overall directional bias for RQ1 and RQ2, but we did expect that mismatches would not be random.

2. MATERIALS AND METHODS

2.1. *Corpus*

The corpus consists of 50 pairs of German and Russian lexemes, each traced to a Greek (38 pairs) or Latin (12 pairs) etymon. Etyma are given in transliterated nominative singular; where the modern forms clearly rest on an oblique stem (klíma → климат; árōma → аромат), this is noted in the annotation. The lexemes belong to academic, technical and cultural vocabulary (Analyse, Theorie, Mechanismus, Universität and similar). The complete corpus, with syllabification and coding, is given in Appendix A. The study involved no human participants.

2.2. *Syllabification and transcription*

The same rules were applied to both languages. (a) A single intervocalic consonant goes to the following syllable (V-CV). (b) A cluster is divided after its first consonant (Sys-tem, сис-те-ма), except that obstruent + liquid clusters (pl, tr, kr, gr, br and the like) go to the following syllable as a whole. (c) Word-final consonants belong to the coda of the last syllable. (d) Vowel sequences in hiatus form separate syllables (*Theorie* [te-o-ʁiː]; теория [те-о-ри-йа]). Long vowels and the German diphthong /aʊ/ were counted as one V, and affricates ([ʦ], [ц]) and the glide [й] as one C.

German forms are given in a simplified IPA transcription, with /r/ written as [ʁ] and the final -er as [ɐ]; Russian forms in a phonemic Cyrillic transcription with final devoicing, without vowel reduction and without marking of palatalisation. Transcriptions were compiled from the standard pronunciation dictionaries (Krech et al. 2009; Duden 2015 for German; Avanesov 1983 for Russian), with etymological information taken from Kluge (2011), Duden (2014), Fasmer (1986-1987) and Krysin (2008). None of the transcriptions is acoustic, so the corpus records citation forms and not measured pronunciation.

2.3. *Variables*

Each form received a syllable count, a syllable formula in C/V notation, and a label for the final syllable, open (ending in a

vowel) or closed (ending in a consonant). The difference in length was defined as $\Delta = N(RU) - N(DE)$. For every pair with $\Delta \neq 0$ or with a change in final-syllable type, the mechanism responsible was described in words (for instance, loss of the Latin nominative ending, or -ia → -ie), and these descriptions were collapsed into four categories: full match; different structure at equal length; Russian shorter; German shorter. For RQ3 the pairs were also sorted into five classes according to the ending of the etymon: -ia (n = 4); feminine -a/-ē including -ma, -ikē (n = 18); -is (n = 8); -os/-on/-us/-um/-ium (n = 12); and consonant stems in -or, -ēr, -ēs, -ens, -ās (n = 8). This classification was made after a first inspection of the data and is therefore exploratory.

2.4. *Statistical analysis*

Syllable counts were compared with the Wilcoxon signed-rank test (Wilcoxon 1945), with a paired t-test as a robustness check, and their association was measured with Spearman's ρ. Because the counts are small integers with many ties, the sign test on non-zero differences was also run. Agreement in final-syllable type was assessed with an exact McNemar test (McNemar 1947) and Cohen's κ (Cohen 1960), interpreted following Landis and Koch (1977). The association between etymon-ending class and the direction of Δ was tested with a χ^2 statistic whose p-value was obtained by Monte Carlo permutation (20,000 permutations), since expected cell counts were small; effect size is reported as Cramér's V. All tests are two-tailed with $\alpha = .05$ and were run in Python with SciPy (Virtanen et al., 2020); for general practice we followed Gries (2013). Annotation was done by a single coder, so no inter-annotator agreement can be reported.

3. RESULTS

3.1. *Syllable count (RQ1)*

German forms had 2.76 syllables on average (SD = 0.89, median 2.5) and Russian forms 2.80 (SD = 1.05, median 3). The difference is negligible (Wilcoxon $W = 188.5$, $p = .71$; paired $t(49) = 0.37$, $p = .71$). The distributions do differ in their tails:

Russian has three monosyllables (метр, центр, ритм) where German has none, while German has slightly more forms of four syllables (9 vs. 5) and Russian more of five (5 vs. 2).

Table 1. *Distribution of lexemes by number of syllables*

Syllables	German (n)	Russian (n)
1	0	3
2	25	19
3	14	18
4	9	5
5	2	5
Mean (SD)	2.76 (0.89)	2.80 (1.05)

Note: N = 50 pairs. Source: authors' calculations from Appendix A.

3.2. *Final syllable (RQ2)*

Closed final syllables predominate in both languages, in 28 German forms (56%) and 29 Russian forms (58%). The marginal totals are almost identical, but the individual pairs are not. Only 25 of the 50 pairs (50%) have the same final-syllable type in the two languages, which is what one would expect by chance: Cohen's $\kappa = -.02$. Of the 25 mismatches, 13 go from an open German to a closed Russian syllable (Analyse → анализ; Theater → театр; Charakter → характер) and 12 in the opposite direction (Musik → музыка; System → система; Dosis → доза); the exact McNemar test gives $p = 1.00$.

Table 2. *Type of final syllable in German and Russian (number of pairs)*

German\Russian	Open	Closed	Total
Open	9	13	22
Closed	12	16	28
Total	21	29	50

Note: Agreement 25/50 (50%); Cohen's $\kappa = -.02$; exact McNemar $p = 1.00$.

3.3. *Categories of correspondence and their relation to the etymon (RQ3)*

Table 3 gives the four descriptive categories. Full matches account for 14 pairs (28%); 8 pairs (16%) have equal length but a different structure, most often because of a change in final-syllable type; the remaining 28 pairs split into 13 with fewer

syllables in Russian and 15 with fewer in German. Of the 14 full matches, 10 end in a closed syllable. They are mostly Latin agent nouns and Greek thematic nouns (Motor/мотор, Doktor/доктор, Atom/атом, Kosmos/космос) together with a handful of -a/-ē feminines (Thema/тема, Epoche/эпоха, Katastrophe/ катастрофа).

The picture changes when the pairs are grouped by the ending of the etymon (Table 4). The association between ending class and the direction of Δ is strong ($\chi^2(8) = 34.27$, permutation $p < .001$, $V = .59$). All four -ia words are longer in Russian, because German contracts the ending to -ie [i:] while Russian keeps a two-vowel sequence (Philosophie 4 syllables, философия 5). Ten of the 18 feminine -a/-ē nouns are also longer in Russian, notably the -ik(ē) series and -ma nouns (Technik/техника, Physik/физика, Musik/музыка, Problem/проблема, Programm/программа, System/система), together with Kultur and Medizin, where German has no final vowel at all. Only two words in this class go the other way (Orchester/оркестр, Apotheke/аптека), and six are identical.

Table 3. *Categories of syllabic correspondence*

Category	n	Share
Full match of syllable structure	14	0.28
Different structure, equal number of syllables	8	0.16
Fewer syllables in Russian (Δ = −1)	13	0.26
Fewer syllables in German (Δ = +1)	15	0.30

Note: Source: authors' calculations from Appendix A.

Table 4. *Direction of the length difference by ending of the etymon (number of pairs)*

Ending of the etymon	RU shorter	Equal	RU longer	Total
-ia	0	0	4	4
-a / -ē (feminine, incl. -ma, -ikē)	2	6	10	18
-is	4	4	0	8
-os / -on / -us / -um / -ium	7	5	0	12
Consonant stems (-or, -ēr, -ēs, -ens, -ās)	0	7	1	8
Total	13	22	15	50

4. DISCUSSION

4.1. *Symmetry in the aggregate, regularity underneath*

The first and second research questions receive a clear answer, and it is a negative one. The two languages are practically indistinguishable in average word length, in the proportion of open and closed endings, and in the number of pairs that are longer or shorter in one direction or the other. Whatever adaptation does here, it does not push Greco-Latin words systematically toward a shorter or a more consonant-final shape in either language. This fits what one would expect from two languages that both accept complex syllables: nothing forces the vowel insertions or deletions that dominate the loanword-phonology literature on languages with restrictive templates.

The third research question shows that this symmetry is a product of averaging. Two opposed tendencies of similar size cancel each other. In one, Russian keeps or adds vowel material where German has none: the feminine -a stays as -a and -ia stays as -ия, while German shortens to -ik, -ie or a bare consonant. In the other, Russian removes what German keeps: the -us/-um endings and, in some words, a final -e. Both patterns are compatible with an account in which each language simply fits the ending into its own gender and declension system. Russian masculine nouns of the hard-stem type end in a consonant and feminine nouns in -a, so a Latin -us is naturally replaced by a zero ending, while a Greek -ē or Latin -a finds a ready place in the feminine class. German behaves differently, presumably in part because of the French mediation of many of these words. On this reading the syllable count is a by-product of morphological integration, and not itself the target of adaptation.

4.2. *Final-syllable type as a measure*

An agreement of 50% with κ close to zero means that knowing the final-syllable type of the German form tells us nothing about that of the Russian form. It is tempting to read the open/closed contrast as a marker of how "native" a loanword has become, for instance in comparisons of Slavic and Germanic material. Our data do not support using it in this way for Greco-Latin words:

the type of the final syllable is determined by which ending each language selects, and the selection is different for different ending classes. A finer measure, perhaps one that separates vowel-final, simple-coda and complex-coda endings, would be more informative than the binary contrast used here.

4.3. *Transmission and orthography*

Because many of the forms passed through third languages, our results should not be read as evidence about how a speaker community treated a foreign sound sequence. They are more plausibly the outcome of long chains of transmission in which written forms played a large part, which agrees with the observation that orthography can shape adaptation and makes purely perceptual accounts a poor fit for this layer of the vocabulary. Etymological work on individual items would be needed before any pair could be used as evidence for a specific route.

4.4. *Limitations*

The study has several limits. The sample is small (50 pairs), was not drawn at random and is not weighted by frequency, so the proportions in Tables 1-4 describe this corpus and should not be generalised to the Greco-Latin lexicon as a whole. Coding was carried out by one person, and the transcriptions come from reference works instead of recordings. Some conventions matter for the counts: [ɐ] in German -er is treated as a vowel, so Theater ends in an open syllable; the Russian glide in -ия is treated as a consonant; and vowel reduction and palatalisation are not marked in the Russian transcription. These choices do not change the number of syllables, but they do bear on the open/closed coding and on any finer-grained analysis of the coda. Finally, our syllabification follows the maximal-onset principle with sonority exceptions, and other analyses of German, for example those that allow ambisyllabic consonants after short vowels, would place some internal boundaries differently.

5. CONCLUSION

In a parallel corpus of 50 German and Russian reflexes of Greek and Latin words, the two languages have the same mean length and never differ by more than one syllable, but they agree on the type of the final syllable no more often than chance would predict. The differences that do exist are not random: they follow the ending of the etymon, and they look more like the results of morphological integration than of phonotactic repair. The next step is a larger, frequency-based sample, with explicit treatment of transmission routes and with acoustic data for the pronunciation of at least a subset of the items.

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