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To inflect, or not to inflect, that is the question: an experimental study of indeclinability in Russian

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ABSTRACT

We present two experiments in which Russian speakers used nonce nouns ending in *-a, -o, -e, -i* and *-u*, producing a form or selecting it from the list. Most forms from *-a* stimuli were inflected, as expected. We also received many inflected answers for other stimuli, although real *-i/u* nouns are always indeclinable, as well as new loanwords ending in *-o/e*. Notably, the majority of inflected instrumental singular forms from *-i/u* stimuli and more than half of such forms from *-o/e* stimuli used suffixes of the declension I, although all real declinable *-o/e* nouns belong to the declension II, neuter gender. We suggest an explanation for these findings and discuss why the II declension neuter gender pattern is unproductive.

KEYWORDS indeclinability · declension choice · experiments with nonce nouns

1 INTRODUCTION

In Russian, the majority of nouns are inflected for case and number, but about 1% are indeclinable. This group has been analyzed in several dictionary and corpus studies (e.g. Murphy 2000, Savchuk 2011, Sitchinava & Chuprinko 2022, Chuprinko et al. 2023, Magomedova et al. 2024). However, since it is relatively small and extremely heterogeneous, it is often difficult to tease apart different factors leading to indeclinability, and some questions cannot be addressed at all. We offer a new perspective on this problem in two experiments with nonce nouns.

The structure of the paper is as follows. We present some background information on indeclinable nouns in Russian and then proceed to our experiments. In the discussion section, we interpret the results, paying special attention to the indeclinability of nouns ending in *-o* and *-e*, because they resemble a large group of declinable neuter nouns. The work on this project was carried out in the framework of the Basic Research Program at the HSE University, Russia.

1.1 INDECLINABLE NOUNS IN RUSSIAN

Depending on their inflections, Russian nouns are divided into several inflectional classes, or declensions. In this study, we rely on a widely accepted system with three declensions, illustrated in Table 1 (e.g. Aronoff 1994, Halle 1994, Shvedova 1980). Declensions IIa and IIb have the same inflections in all singular forms except for nominative and accusative. Table 1 presents the distribution of Russian nouns between different declensions and genders, as well as the counts by Slioussar & Samojlova (2015) based on the Russian National Corpus (www.ruscorpora.ru). Gender and declension strongly correlate in Russian, especially in inanimate nouns.[1]

[1] In the plural, different genders and declensions have the same inflections, with the following exceptions. In nominative, all feminine, most masculine and several neuter nouns have *-y/i*, while the majority of neuter

Declension	Gender	NomSg inflection	% in RNC
I	F	-(*j*)*a*	29% nouns
I	M (only animate)	-(*j*)*a*	1% nouns
IIa	M	Ø	46% nouns
IIb	N	-*o*/*e*	18% nouns
III	F	Ø	5% nouns
indeclinable	various genders	—	1% nouns

Table 1: Genders and declensions of Russian nouns.

Russian indeclinable nouns are discussed in a number of studies relying on different methods and frameworks (Chuprinko et al. 2023, Comrie et al. 1996, Galbreath 2010, Magomedova et al. 2024, Mjakilja 2000, Muchnik 1971, Murphy 2000, Savchuk 2011, Sitchinava & Chuprinko 2022, Unbegaun 1947, among others). Below, we summarize some of findings most relevant for our study. Indeclinable nouns are mainly recent borrowings ending in vowels: -(*j*)*a*, -*o*, -*e*, -*i*, -(*j*)*u*, as well as -*y* and -*è* in several cases.[2] The final vowel of these nouns belongs to the stem, while all declinable Russian nouns have consonant-final stems.

Most borrowings ending in -(*j*)*a* become declinable feminine nouns of class I. Factors that may lead to indeclinability include monosyllabicity (*fa* 'note F', *bra* 'sconce lamp'), ultimate stress (*antuka* 'umbrella against the sun (obsolete)', *bakkara* 'a card game'), hyphens in the orthographic form (*cha-cha-cha* 'cha-cha-cha', *fua-gra* 'foie gras'), and a double vowel sequence at the end (*kinoa* 'quinoa', *boa* 'boa'). Borrowings ending in any other vowel are indeclinable in literary Russian. The endings -*i*, -(*j*)*u*, -*y* and -*è* cannot be reanalyzed as a nominative singular suffix of any declension, although some nouns ending in -*i* are reanalyzed as pluralia tantum, if their semantics allows for that because -*i* is a nominative plural inflection. Nouns ending in -*o*/*e* could enter the declension IIb containing all declinable neuter nouns, but at least since the 19th century, this does not happen: all these nouns become indeclinable. This phenomenon has not been satisfactorily explained before, so we will pay special attention to it in the present study.

Finally, let us note that declinable variants of standardly indeclinable nouns can be found in colloquial speech (for example, *bez pal'ta* 'without a coat' instead of *bez pal'to* from *pal'to* 'coat'). Such examples are very infrequent. They have not been discussed in any large-scale quantitative studies, but some information on their existence can be found in (Muchnik 1971: p.262–276, Comrie et al. 1996: p.118–120, Sitchinava & Chuprinko 2022).

1.2 THE PRESENT STUDY

We conducted two experiments in which participants were prompted to produce forms from nonce nouns ending in -*a*, -*o*, -*e*, -*i* and -*u* (the choice of stimuli is discussed below). Firstly, by turning to nonce words, we could address several questions that have not received enough attention in the previous studies. We analyzed how often participants chose to decline these stimuli and, if they did, which declension they opted for and how the forms were constructed (by removing the final vowel or by adding the inflection to it). As we mentioned above, declinable variants of standardly indeclinable nouns were noted

nouns and a number of masculine nouns have -(*j*)*a*; a small number of masculine nouns denoting people also have -*e*. There are several inflections for genitive, and their distribution is complex. Accusative coincides with nominative or with genitive depending on animacy and declension. Table 1 does not include a number of exceptions, like diminutive nouns that break the correlation between genders and declensions, or nouns with irregular inflections. An overview of these groups with some corpus and experimental data can be found in Magomedova & Slioussar (2023).

[2]All borrowings ending in a consonant are declinable, except for feminine proper names and some rare exceptions like *alma-mater* 'alma mater'. In this paper, we use the so-called scholarly transliteration system of Cyrillic.

Final vowel	Indeclinable		Declinable		% indeclinable
	Final stress	Non-final stress	Final stress	Non-final stress	
-a	18 (41%)	26 (59%)	622 (5%)	11662 (95%)	0.4%
-o	75 (27%)	205 (73%)	159 (10%)	1381 (90%)	18.2%
-e	123 (79%)	32 (21%)	0	4411 (100%)	3.5%
-u	27 (48%)	29 (52%)	0	0	100%
oi	37 (20%)	145 (80%)	0	0	100%

Table 2: Declinable and indeclinable polysyllabic nouns ending in *-a*, *-o*, *-e*, *-i* and *-u* in nominative singular with different stress patterns in the Grammatical Dictionary of the Russian Language.

by several authors, but were not analyzed in any detail. Secondly, real indeclinable nouns are a small and extremely heterogeneous group, they differ in frequency and in the time when they were borrowed. As a result, it is difficult to estimate the role of different factors leading to indeclinability because it is impossible to create a balanced dataset. Working with nonce words solves some of these problems: obviously, all stimuli are equal in terms of frequency and novelty, and can be balanced for length, which allows exploring other factors.

We considered the following factors in our study: (i) the final vowel, (ii) the presence of a pseudosuffix, and (iii) the position of the stress. Let us discuss them one by one. (i). We created stimuli ending in *-a*, *-o*, *-e*, *-i* and *-u*. Indeclinable nouns ending in other vowels are rare in Russian, and these five vowels allow us to make to different predictions. Nonce nouns ending in *-a* are expected to decline in the majority of cases. Nonce nouns ending in *-i* and *-u* are expected to remain indeclinable. For nonce nouns ending in *-o* and *-e*, participants could either rely on the analogy with numerous declinable nouns or follow the pattern associated with similar novel nouns in modern Russian.

(ii). In her experiments on Polish Dąbrowska (2008) demonstrated that if the final substring of a novel word resembles a large group of words, this increases the chances that this novel word will be inflected using the same pattern as in this group. To test this hypothesis in our study, we created some stimuli with final strings resembling productive derivational suffixes. We will further call them pseudosuffixes.

(iii). It was hypothesized in the previous studies (e.g. Chuprinko et al. 2023) that the position of the stress may affect declinability: *-(j)a* nouns with the final stress are more likely to be indeclinable than those with a non-final stress. However, the absolute majority of *-(j)a* nouns are declinable, so the role of factor was never tested properly. We decided to test it on nonce stimuli. We also calculated the numbers of nouns with different stress patterns in the Grammatical Dictionary of the Russian Language Zaliznjak (1987) in Table 2, as well as the share of indeclinables among nouns ending in different vowels.

Table 2 does not include substantivized adjectives (they belong to the adjectival declension and were not represented in Table 1). It should also be noted that Russian has the letter *ë*: it is pronounced as /(j)o/ (unlike *o*, it signals that the preceding consonant is palatalized), but very often, is not distinguished from *e* in spelling. The Grammatical Dictionary of the Russian Language contains 79 nouns ending in *-ë*, and they are all declinable, polysyllabic and stress-final.

As for the distribution of stress patterns in Table 2, it is clear that indeclinable nouns indeed have the final stress more often than declinable ones. However, the picture is very different for different final vowels: the difference is dramatic for *-e*, but not so dramatic for *-a* and especially *-o*. Indeclinable nouns ending in *-i* have the smallest share of stress-final words. In the pool of indeclinables selected by Chuprinko et al. (2023) and Magomedova et al. (2024) for their studies (they chose only the nouns that are used relatively frequently based on corpus counts), the difference between this

group and other indeclinables is more pronounced than in Table 2 (see Appendix at *https://osf.io/xnzpe/?view_only=5ad7288161524b10a24e31682711bf45*). Our experiments with nonce words will show whether speakers of Russian are sensitive to these distributional patterns.

2 EXPERIMENT 1

2.1 METHOD

Participants. 82 native speakers of Russian (24 female, 58 male) participated in the study. Their age ranged from 21 to 74 (mean = 37, SD = 10). They were recruited through the crowdsourcing platform Toloka (*https://toloka.yandex.ru*) and were reimbursed for their participation. All of them provided informed consent to participate in the study.

Data from 27 participants were not included in the final analysis. We excluded participants who reported to be non-monolingual, and the ones who misunderstood the task, i.e. did not respond with nonce noun forms, as instructed. Another exclusion criterion was the percentage of indeclinable forms for *-a* nouns exceeding 75%. We reasoned that participants who systematically did not decline *-a* nouns were not paying attention to the task. Fifty-five participants were left as a result (19 female, 36 male, mean age = 36, SD = 9).

Materials. We created 52 disyllabic nonce nouns ending in a vowel. All of them were possible phonetic strings of the Russian language. We intently avoided similarities with real nouns. Firstly, there were 40 nonce nouns ending in *-a*, *-o*, *-e*, *-i* and *-u*. For each final vowel, we had four stimuli with the final stress and four stimuli with a penultimate stress. Examples of stimuli with a marked stress are *gvígo*, *čuxá*, *šúni*. All stimuli are listed in Appendix.

Secondly, there were 12 pseudosuffixed nonce nouns with a penultimate stress (because real nouns with the relevant suffixes are not stress-final). The following suffixes were used to create them: *-išč*(*e*), an augmentative suffix (as in *domišče* 'big house'); *-n'*(*e*) used to form deverbal nouns (as in *siden'e* 'seat'); *-stv*(*o*) deriving abstract nouns (as in *bratstvo* 'brotherhood'); *-išk*(*o*), a diminutive suffix (as in *domiško* 'small house'); *-k*(*a*) and *-ic*(*a*) — suffixes that have multiple functions, including diminutive. Examples of stimuli with a marked stress are *ktíšče*, *vúka*, *mástvo*.

Procedure. The experiment was conducted online on the PCIbex platform (Zehr & Schwarz 2018). In each trial, a nonce noun was shown in the upper part of the screen with a marked stress. Under the noun, a three-sentence preamble like (1) or (2) was placed. Participants were instructed to finish the preamble with a form of the noun that fits the context by typing it in the box.

(1) [nonceword]
Ètogo odin èkzempljar. Moj drug prišel s ètim. Drug prišel s… (Ins.Sg required)
'There is one thing like this. My friend came with it. The friend came with …'

(2) [nonceword]
Ix mnogo. O nix vse govorjat. Vse govorjat o… (Loc.Pl required)
'There are many of them. Everyone talks about them. Everyone talks about …'

We chose instrumental singular and locative plural contexts to avoid syncretic case inflections and inflections that might be difficult to analyze with some stimuli (e.g. *-u* is an accusative singular inflection in the declension I, so it might be difficult to distinguish indeclinability and declension I usage for nonce nouns ending in *-u*). Instrumental singular inflections also do not coincide in different declensions, so for these forms, we could analyze which declension participants chose if they opted to inflect these nouns. Since the stimuli were diverse enough, there were no fillers.

Instructions explicitly stated that the stimulus noun was in the citation form. Before the main experiment, four training trials were provided. In these trials, real indeclinable

Final	Ins.Sg		Loc.Pl		Total	
vowel	Declinable	Indeclinable	Declinable	Indeclinable	Declinable	Indeclinable
-a	301 (95%)	16 (5%)	237 (96%)	10 (4%)	538 (95%)	26 (5%)
-o	163 (50%)	161 (50%)	132 (44%)	166 (56%)	295 (47%)	327 (53%)
-e	119 (36%)	209 (64%)	150 (46%)	175 (54%)	269 (41%)	384 (59%)
-i	55 (25%)	161 (75%)	120 (59%)	84 (41%)	175 (42%)	245 (58%)
-u	55 (25%)	161 (75%)	53 (23%)	158 (77%)	108 (25%)	319 (75%)

Table 3: Experiment 1: The distribution of answers depending on the final vowel and the grammatical context (all stimuli).

and declinable nouns were used. In the main experiment, every participant saw each stimulus noun only once, with one of the two preambles, so there were two experimental lists with 52 trials. The number of stimuli with different characteristics (with different final vowels and stress patterns, with and without pseudosuffixes) was balanced across the two preambles in both lists. The order of trials was randomized for every participant.

2.2 RESULTS AND DISCUSSION

The answers with inflections that did not match the given grammatical context and those with critical misspellings of the stem were discarded as errors. As a result, 2686 valid answers were left. Every participant gave at least 75% valid answers, 93% on average. The statistical analysis was done in the R programming environment (R Core Team 2022). We used the *lme4* package (Bates et al. 2015) for mixed-effects logistic regressions and the multcomp and emmeans packages for the post-hoc Tukey tests (Hothorn et al. 2008, Lenth 2024). We built several models for different subsets of the data with different fixed effects, they will be discussed below. Items and participants were treated as random effects. Full outputs of all models are available in Appendix.

Valid answers (with pseudosuffixes and without them, with different final vowels) were classified into 1384 inflected and 1302 uninflected forms. In 98% of the inflected forms, participants removed the final vowel and added an inflection (e.g. *benu* + *ax* – *benax*). However, there were also 29 answers with inflections added directly to the final vowel (e.g. *benu* + *ax* – *benuax* or *benujax*) and 31 answers with the final consonant of the inflection added to the final vowel (e.g. *benu* + *ax* – *benux*). 19 out of 55 participants used such strategies at least once. Since we examined many factors, we present separate comparisons below one by one, but also created a large overview table for both experiments that can be found in Appendix.

Table 3 shows the distribution of answers depending on the final vowel and the grammatical context. Nouns ending in *-a* are mostly declinable, as expected. For *-u* stimuli and *-i* stimuli in the singular, about ¼ of the forms were inflected. This share is smaller than in any other group, but still surprisingly large given that similar real Russian nouns never decline. This shows that the general pressure to decline is very strong. In the plural, the number of inflected forms grows starkly for *-i* nouns: apparently, participants often treated *-i* as a nominative plural affix despite our instructions. Nonce nouns ending in *-o* and *-e* are in the middle with respect to declinability.

According to the model with the final vowel and the grammatical context as fixed effects, followed by post-hoc comparisons, *-a* nouns are more likely to be inflected than nouns with other final vowels (*-e* vs *-a*: β = -4.74, SE = 0.48, $p < 0.001$; *-o* vs *-a*: β = -3.79, SE = 0.47, $p < 0.001$; *-i* vs *-a*: β = -5.36, SE = 0.52, $p < 0.001$; *-u* vs *-a*: β = -5.45, SE = 0.52, $p < 0.001$), and *-o* nouns are more likely to be inflected than *-i* and *-u* nouns (*-i* vs *-o*: β = -1.58, SE = 0.44, $p < 0.05$, *-u* vs *-o*: β = -1.66, SE = 0.44, $p < 0.05$). Here and below, *-a* was taken as the reference level. Other comparisons did not reach significance. The grammatical context factor was not significant as a main effect, but a post hoc analysis

Final	Penultimate stress		Final stress		Total	
vowel	Declinable	Indeclinable	Declinable	Indeclinable	Declinable	Indeclinable
-a	181 (97%)	5 (3%)	177 (92%)	15 (8%)	358 (95%)	20 (5%)
-o	80 (38%)	133 (62%)	69 (32%)	145 (68%)	149 (35%)	278 (65%)
-e	103 (47%)	115 (53%)	54 (25%)	165 (75%)	157 (36%)	280 (64%)
-i	77 (36%)	134 (64%)	98 (47%)	111 (53%)	175 (42%)	245 (58%)
-u	60 (28%)	151 (72%)	48 (22%)	168 (78%)	108 (25%)	319 (75%)

Table 4: Experiment 1: The distribution of answers depending on the final vowel and the grammatical context (all stimuli).

revealed that *-i* nouns are significantly more likely to be declinable in the locative plural than in the instrumental singular ($\beta = 1.89$, SE = 0.26, $p < 0.001$). This can be explained by the fact that many declinable nouns have the *-i* inflection in nominative plural.

Table 4 focuses on stimuli without pseudosuffixes and shows the role of stress position. We modelled this subset of data separately with the final vowel and stress position as fixed effects (firstly, all stimuli with pseudosuffixes had penultimate stress; secondly, we wanted to estimate the role of the final vowel in the absence of pseudosuffixes). Stimuli with the final stress were less likely to be inflected ($\beta = -1.23$, SE = 0.58, $p < 0.05$). This tendency was especially strong for *-e* nouns, which manifested itself in the significant interaction in the post hoc analysis ($\beta = -1.40$, SE = 0.31, $p < 0.001$). This may be explained by the absence of real declinable nouns with a stressed final *-e* (see Table 2). Stimuli ending in *-i* are the only ones for which the share of inflected forms is larger with the final stress — accordingly, the interaction between the *-i* vowel and the stress position was significant in the regression model ($\beta = -1.85$, SE = 0.66, $p < 0.05$). This might be due to the fact the largest share of indeclinables with non-final stress is found among the nouns ending in *-i* (see Table 2 and Appendix). Thus, our participants were sensitive to fine-grained distribution patterns of real nouns.

As for the final vowel factor, the results were similar to the previous model.[3] Notably, although the share of indeclinables is larger among real nouns ending in *-o* than among those ending in *-e* (see Table 2), experimental data do not follow this pattern, as Tables 3 and 4 show. We hypothesize that this might be due to the fact that the absolute majority of declinable words ending in *-e* have several productive suffixes, especially *-ij-* and *-(e)nij-* used to derive abstract nouns (3757 words out of 4411), as well as to the fact that all stress-final words ending in *-e* are indeclinable.

Table 5 explores the role of pseudosuffixes. For nouns ending in *-a*, they played no role because these nouns were almost always inflected anyway. For nouns ending in *-o* and *-e*, it is evident that some suffixes triggered declinability more often than the others. Firstly, we modelled the data using the final vowel and the presence of a pseudosuffix as factors. Pseudosuffixes did not significantly increase the general likelihood of declinability, but post-hoc analyses revealed that *-o* nouns with pseudosuffixes are significantly more likely to decline ($\beta = -2.27$, SE = 0.47, $p < 0.001$).

Secondly, we decided to have a closer look at the differences between specific pseudosuffixes, so we modelled the same dataset treating them as fixed effects. Posthoc analyses showed that *-stvo* nouns are significantly more likely to be inflected than *-o* nouns without pseudosuffixes ($\beta = 3.23$, SE = 0.43, $p < 0.001$), and the same is true for *-ško* nouns ($\beta = 1.45$, SE = 0.35, $p < 0.001$). Nouns ending in *-stvo* decline significantly more often than *-ško* nouns ($\beta = 1.78$, SE = 0.47, $p < 0.01$). For the stimuli ending in *-e*, only the difference between *-išče* and *-nʹe* was significant ($\beta = 1.21$, SE = 0.39, $p <$

[3]Nonce nouns with final vowels other than *-a* were less likely to be inflected (*-e* vs *-a*: $\beta = -4.74$, SE = 0.48, $p < 0.001$; *-o* vs *-a*: $\beta = -3.79$, SE = 0.47, $p < 0.001$; *-i* vs *-a*: $\beta = -5.36$, SE = 0.52, $p < 0.001$; *-u* vs *-a*: $\beta = -5.45$, SE = 0.52, $p < 0.001$). *-o* nouns are more likely to be inflected than *-i* and *-u* nouns (*-i* vs *-o*: $\beta = -1.57$, SE = 0.44, $p < 0.05$, *-u* vs *-o*: $\beta = -1.66$, SE = 0.44, $p < 0.05$). Other comparisons did not reach significance.

Final vowel	Type	Ending in...	Declinable	Indeclinable
-a	pseudosuffix	*-ka*	88 (95%)	5 (5%)
		-ica	92 (99%)	1 (1%)
	no pseudosuffix	*-ža*, *-fa*	181 (97%)	5 (3%)
-o	pseudosuffix	*-stvo*	82 (87%)	12 (13%)
		-ško	64 (63%)	37 (37%)
	no pseudosuffix	*-go*, *-zo*	80 (37%)	133 (63%)
-e	pseudosuffix	*-išče*	67 (63%)	40 (37%)
		-nʹe	45 (41%)	64 (59%)
	no pseudosuffix	*-če*, *-že*	103 (57%)	115 (53%)

Table 5: Experiment 1: The distribution of answers for stimuli with and without pseudosuffixes (stimuli ending in unstressed *-a*, *-o* and *-e*).

Final vowel	Declension I	Declension II
-a	286 (95%)	14 (5%)
-o	90 (55%)	73 (45%)
-e	61 (52%)	56 (48%)
-i	46 (88%)	6 (12%)
-u	42 (84%)	8 (16%)

Table 6: Experiment 1: Answers of different declensions in the instrumental singular contexts (all stimuli).

0.05). Thus, our results show that different pseudosuffixes may have different effects on declinability, which probably depends on their frequency and other factors.[4] For a proper comparison, further research is required.

As a next step, in Table 6 we looked at inflected instrumental singular forms to analyze which declension participants opted for. Declension III was never chosen, as expected. The absolute majority of *-a* stimuli had declension I inflections, like real declinable nouns. However, although all real declinable nouns ending in *-o* and *-e* belong to the declension II, less than a half of inflected nonce forms followed this pattern.[5] As we show below, the share may be even smaller for nonce nouns without pseudosuffixes. For *-i* and *-u* nouns, not so many inflected instrumental singular forms were produced, but those that were also predominantly belonged to the declension I. Since declension II is more frequent and should be more readily available for *-o* and *-e* nouns, this is an unexpected finding, and we will come back to it in the discussion section.

We modelled the likelihood of having declension I affixes depending on the final vowel. The post hoc analysis revealed that *-o* and *-e* nouns are significantly less likely to have them than *-a* nouns (*-o* vs *-a*: $\beta = -4.69$, SE = 0.59, $p < 0.001$; *-e* vs *-a*: $\beta = -4.79$, SE = 0.62, $p < 0.001$). Also, *-u* nouns were more likely to be in the declension I than *-e* and *-o* nouns ($\beta = 2.88$, SE = 0.79, $p < 0.01$; $\beta = 2.78$, SE = 0.77, $p < 0.01$), and *-i* nouns had declension I affixes more frequently than *-o* nouns ($\beta = 3.22$, SE = 0.77, $p < 0.01$). Other comparisons were not significant.

In Table 7, we examined the role of pseudosuffixes in the choice of declension. We compared nonce nouns with pseudosuffixes to other nouns with penultimate stress in two models (taking only the presence of pseudosuffixes or particular suffixes into

[4]The number of words with these suffixes in the Grammatical Dictionary of the Russian Language Zaliznjak (1987) points to frequency differences, but to estimate them properly, a corpus study would be necessary. To give an example of other factors, in addition to the suffix *-nʹe* Russian has *-nie*, which has roughly the same meaning, but is much more frequent. Maybe, this makes *-nʹe* less salient. In any case, in this study our goal was not to estimate different factors, but to show that pseudosuffixes can influence declinability.

[5]Our experimental design did not include adjectives, so we do not know whether opting for the declension I would trigger feminine gender assignment, but we suppose that this should be the case.

Final vowel	Type	Stress	Ending in...	Declension I	Declension II
-a	pseudosuffix	penultimate	*-ka*	49 (96%)	2 (4%)
		penultimate	*-ica*	51 (98%)	1 (2%)
	no pseudosuffix	penultimate	*-ža*, *-fa*	96 (97%)	3 (3%)
		final	*-pa*, *-xa*	90 (91%)	8 (9%)
-o	pseudosuffix	penultimate	*-stvo*	17 (36%)	30 (64%)
		penultimate	*-ško*	24 (67%)	12 (33%)
	no pseudosuffix	penultimate	*-go*, *-zo*	24 (63%)	14 (37%)
		final	*-so*, *-to*	25 (60%)	17 (40%)
-e	pseudosuffix	penultimate	*-išče*	13 (36%)	23 (64%)
		penultimate	*-nʹe*	9 (56%)	7 (44%)
	no pseudosuffix	penultimate	*-če*, *-že*	24 (53%)	21 (47%)
		final	*-be*, *-ge*	15 (75%)	5 (25%)

Table 7: Experiment 1: Answers of different declensions in the instrumental singular contexts depending on the presence of pseudosuffixes (stimuli ending in *-a*, *-o* and *-e*).

account). We added words with the final stress to Table 7 to present a full picture, but did not include them into statistical comparisons. In *-o* nouns, pseudosuffixes significantly decreased the share of the declension I (β = -2.27, SE = 0.47, $p < 0.001$). Nouns ending in *-ško* were more likely to be in the declension I than *-stvo* nouns (β = 2.24, SE = 0.73, $p < 0.05$). In other words, the suffix *-stv(o)* that was the most successful in promoting declinability was also more often associated with the declension II. However, even with this suffix, more than one third of the inflected forms belonged to the declension I, which shows how pervasive this tendency is.

Some results we got in Experiment 1 were unexpected: in particular, a considerable share of inflected forms from *-i* and *-u* nouns and a significant number of declension I forms from *-o* and *-e* nouns. We wanted to check whether these results could be due to the fact that at least in some cases, the option to not to inflect the stimulus does not readily come to our participants' mind. Therefore, we conducted Experiment 2 using a very similar design, but offering participants to choose a form from the list.

3 EXPERIMENT 2

3.1 METHOD

Participants. 39 native speakers of Russian (17 female, 22 male) participated in the study. Their age ranged from 22 to 62 (mean = 35, SD = 8.6). They were recruited through the crowdsourcing platform Toloka and were reimbursed for their participation. All of them provided informed consent to participate in the study.

Later, the data from one participant were excluded following the same principles as in Experiment 1. This participant chose indeclinable answers for *-a* nouns in more than 75% cases. Experiment 1 had a much higher exclusion rate — presumably, because it was more difficult for the participants.

Materials and procedure. We used almost the same stimuli as in Experiment 1. A couple of nonce words were slightly modified because one of the forms we generated according to the rules outlined below resembled real noun forms (see Appendix). The same preambles as in Experiment 1 were used. However, instead of typing their answers, participants were asked to choose them from the drop-down list. There were five options for both case conditions, illustrated in Table 8. We created them based on the responses we received in Experiment 1. The order of options in the list was randomized for each trial for each participant.

Ins.Sg		Loc.Pl	
benu	indeclinable	*benu*	indeclinable
benoj	declension I with root vowel deletion	*benax*	with root vowel deletion
benom	declension II with root vowel deletion	*benujax*	without deletion, with /j/
benuej	declension I without deletion, with /j/[6]	*benuax*	without deletion, no /j/
benuem	declension II without deletion, with /j/	*benux*	with suffix vowel deletion

Table 8: Answer options in Experiment 2 (illustrated with the nonce noun *benu*).

Final	Ins.Sg		Loc.Pl		Total	
vowel	Declinable	Indeclinable	Declinable	Indeclinable	Declinable	Indeclinable
-a	192 (84%)	36 (16%)	203 (89%)	25 (11%)	395 (87%)	61 (13%)
-o	117 (52%)	107 (48%)	157 (68%)	75 (32%)	274 (60%)	182 (40%)
-e	122 (54%)	106 (46%)	144 (63%)	84 (37%)	266 (58%)	190 (42%)
-i	75 (49%)	77 (51%)	117 (77%)	35 (23%)	192 (63%)	112 (37%)
-u	73 (47%)	83 (53%)	83 (56%)	65 (44%)	156 (51%)	148 (49%)

Table 9: Experiment 2: The distribution of answers depending on the final vowel and the grammatical context (all stimuli).

3.2 RESULTS AND DISCUSSION

We analyzed the data using the same approach as in Experiment 1. Since our informants chose their answers from the list, there were no invalid answers requiring exclusion. Table 9 shows their distribution. We wondered whether participants of Experiment 1 produced unusual inflected forms because they could not always come up with the indeclinability option. However, in Experiment 2 inflected forms were chosen even more often, so the problem in Experiment 1 was probably the opposite: at least in some cases, participants resorted to indeclinability because they could not come up with an unusual inflected form. This shows once again how strong the general pressure to decline is. Otherwise, the pattern was similar to Experiment 1, although some effects were less pronounced (potentially, because the task was more mechanical).

Like in Experiment 1, the main effect of the grammatical context was not significant, but the interactions showed that *-i* nouns were more likely to be inflected in locative plural (β = -1.95, SE = 0.32, $p < 0.001$). Like in Experiment 1, nonce nouns with the final *-a* were inflected more often than other nouns (*-e* vs *-a*: β = -2.36, SE = 0.37, $p < 0.01$; *-i* vs *-a*: β = -2.64, SE = 0.41, $p < 0.01$; *-o* vs *-a*: β = -2.35, SE = 0.37, $p < 0.01$; *-u* vs *-a*: β = -2.91, SE = 0.41, $p < 0.01$). Other comparisons did not reach significance. Unlike in Experiment 1, stress patterns did not cause any significant effects, so we do not present a table analogous to Table 4 for space reasons — it can be found in Appendix.

In Table 10, the role of pseudosuffixes is considered. The main effect of pseudosuffixes did not reach significance, like in Experiment 1. Nouns ending in *-o* with pseudosuffixes were more likely to decline only on tendency level (β = 1.30, SE = 0.49, p = 0.09), while in Experiment 1, this effect was significant. Like in Experiment 1, *-stvo* nouns were inflected more often than non-suffixed nouns (β = 2.68, SE = 0.49, $p < 0.01$) and *-ško* nouns (β = 2.48, SE = 0.53, $p < 0.01$). Other comparisons, including those that reached significance in Experiment 1, were not significant.

In Table 11, we turn to the choice between declensions in inflected instrumental singular forms. As before, the pattern is similar to Experiment 1, although the differences are less pronounced. Thus, another unexpected result was successfully replicated in a different experimental design: although there were fewer declension I forms from *-o* and *-e* nouns than from *-i*, *-u* and especially *-a* nouns, participants still chose them in more than half of the cases when they decided to inflect these nouns. Like in Experiment 1, *-o*

Final vowel	Type	Ending in...	Declinable	Indeclinable
-a	pseudosuffix	*-ka*	72 (95%)	4 (5%)
		-ica	66 (87%)	10 (13%)
	no pseudosuffix	*-ža*, *-fa*	128 (84%)	24 (16%)
-o	pseudosuffix	*-stvo*	68 (89%)	8 (11%)
		-ško	44 (58%)	32 (42%)
	no pseudosuffix	*-go*, *-zo*	83 (55%)	69 (45%)
-e	pseudosuffix	*-išče*	53 (70%)	23 (30%)
		-nʹe	50 (66%)	26 (34%)
	no pseudosuffix	*-če*, *-že*	85 (56%)	67 (44%)

Table 10: Experiment 2: The distribution of answers for stimuli with and without pseudosuffixes (stimuli ending in unstressed *-a*, *-o* and *-e*).

Final vowel	Declension I	Declension II
-a	155 (81%)	37 (19%)
-o	61 (52%)	56 (48%)
-e	75 (61%)	47 (39%)
-i	52 (69%)	23 (31%)
-u	50 (68%)	23 (32%)

Table 11: Experiment 1: Answers of different declensions in the instrumental singular contexts (all stimuli).

and *-e* nouns were significantly more likely to have suffixes of the declension II than *-a* nouns (*-o* vs *-a*: β = -1.35, SE = 0.35, $p < 0.01$; *-e* vs *-a*: β = -1.10, SE = 0.35, $p < 0.05$). Other comparisons were not significant. We also analyzed the role of pseudosuffixes in the choice of declensions (a table analogous to Table 7 is provided in Appendix not to overload the text). Pseudosuffixes increased the share of declension II forms for *-o* nouns, like in Experiment 1 (β = 1.24, SE = 0.53, $p < 0.05$), but the difference between *-stvo* and *-ško* nouns did not reach significance.

Finally, in Tables 12 and 13 we looked at the distribution of inflected answers in more detail. For nonce nouns ending in *-a*, there is a prevailing strategy based on a fully productive class of real declinable nouns. Other groups of nouns show clearly that the strategy of root vowel deletion is the most popular one, especially when this vowel coincides with the first vowel of the suffix: e.g. *dazo — daz-oj* (Ins.Sg I decl.), *daz-om* (Ins.Sg II decl.), but also otherwise: e.g. *dazo — daz-ax* (Loc.Pl), *benu — ben-oj*, *ben-om*, *ben-ax*.[7] No existing theoretical model can readily explain this, but we will come back to this generalization in the discussion section. In the plural, we compared this option not only with the strategy of adding a glide, but also with suffix vowel deletion and keeping both vowels without a glide. The last two options were the least popular. This is probably due to a very general rule that we discussed in the introduction: in Russian, stems must end in a consonant (e.g. Unbegaun 1947, Galbreath 2010).

[7]Technically, we cannot decide in this case whether it is a root vowel deletion or a suffix vowel deletion, but given the paradigms of real Russian nouns and very small shares of suffix vowel deletion answers when we can tell them apart, we opted for the former analysis. Of course, what we term the first vowel of the suffix may be a thematic vowel — we do not discuss different approaches in this paper, it is only crucial for us that it does not belong to the stem.

Ins.Sg	*-a*	*-o*	*-e*	*-i*	*-u*
I declension, root vowel deletion	143	54	57	32	32
II declension, root vowel deletion	24	42	34	8	8
I declension, no deletion, with /j/	12	7	18	20	18
II declension, no deletion, with /j/	13	14	13	15	15

Table 12: Experiment 2: the full distribution of inflected singular forms.

Loc.Pl	*-a*	*-o*	*-e*	*-i*	*-u*
root vowel deletion	168	95	88	59	33
no deletion, with /j/	28	44	40	51	35
no deletion, no /j/	7	7	7	2	7
suffix vowel deletion	0	11	9	5	8

Table 13: Experiment 2: the full distribution of inflected plural forms.

4 GENERAL DISCUSSION

4.1 SUMMARIZING EXPERIMENTAL FINDINGS

We conducted two experiments in which participants were asked to use nonce nouns ending in *-a*, *-o*, *-e*, *-i* and *-u* in two grammatical contexts, either producing an appropriate form or selecting it from the list. Most forms from *-a* stimuli were inflected, as expected, although there was a small number of outliers. However, other results were more surprising. Firstly, we received many inflected answers for *-i* and *-u* stimuli. While *-i* forms could be interpreted as nominative plural in plural contexts, otherwise all real Russian nouns ending in *-i* and *-u* are indeclinable. This shows that in general, indeclinability is a strongly dispreferred choice in Russian, despite the fact that certain nouns — those ending in *-i*, *-(j)u*, *-y* and *-è*, as well as loanwords in *-o* and *-e* — never decline.

Secondly, we could foresee two options for stimuli ending in *-o* and *-e*: being inflected like real nouns from the declension IIb or being treated as indeclinable. On the one hand, all declinable neuter nouns end in *-o* and *-e* and constitute about 18% of the nouns in Russian, which is not a small group, especially compared to the 1% of indeclinables. On the other hand, all declinable nouns ending in *-o* and *-e* that appear in modern Russian are derived with a number of suffixes. Non-suffixed nouns do not join this group at least for a couple of centuries, and all nouns ending in *-o* and *-e* that were borrowed since the 19th century are indeclinable. This was noted in some previous studies (Comrie et al. 1996, Muchnik 1971) and supported by our analysis of the data from the Grammatical Dictionary of the Russian Language (Zaliznjak 1987).

In both experiments, *-o* and *-e* stimuli were inflected more often (but usually not significantly so) than *-i* and *-u* stimuli. Some pseudosuffixes, especially *-stv(o)* that corresponds to a highly productive suffix in modern Russian, boosted the number of inflected forms, which was also in line with our predictions and with Dąbrowska (2008) results for Polish. What we could not expect was that more than half of the inflected instrumental singular forms used suffixes of the declension I in both experiments. This tendency was very strong even for stimuli with pseudosuffixes. No similar patterns can be found in real Russian nouns.

Given that the majority of inflected instrumental singular forms from *-i* and *-u* stimuli also belonged to the declension I, we suggest the following tentative explanation for this finding. Since new underived nouns do not enter the declension IIb in Russian and the indeclinability option is marginal, no analogy with real nouns is readily available either for *-i* and *-u* or for *-o* and *-e* stimuli — as opposed to *-a* stimuli, for which very little variation was observed. Therefore, choosing between two fully productive declensions, I and IIa, our participants often opted for the former, probably relying on a very general

principle: if a noun ends in a vowel in nominative singular, it is more suitable for the declension I.

Reliance on such global properties of the system is a novel finding. Let us stress that at the same time, our participants were sensitive to its much more fine-grained properties. For example, in Experiment 1 stimuli with the final stress were less likely to be inflected. This tendency was especially strong for *-e* nouns and was reversed only for *-i* nouns, reflecting the patterns found for real nouns.

It is interesting to compare our results to those obtained in a pilot study by Bailyn & Nevins (2008). They also asked their participants to produce forms from nonce nouns ending in *-a* and *-o*. However, they provided not only nominative singular, but also accusative plural and instrumental plural forms. This made clear that the stimuli were supposed to be declinable and what declension they belonged to, and participants used this information successfully. Thus, Bailyn & Nevins (2008) showed that Russian speakers can use suffixes of the declension IIb with novel stimuli. Our study demonstrates that very often, they go for other options, indeclinability or even the declension I, in the absence of such unambiguous hints.

Trying to explain why some inflectional classes are more productive than the others may be extremely difficult. So far, we cannot offer a convincing explanation for the very low productivity of the declension IIb. However, discussing some properties of the Russian declensions and existing strategies of adapting loanwords in more detail may shed new light on this problem.

4.2 DIFFERENT STRATEGIES OF ADAPTING LOANWORDS

When Russian borrows consonant-final nouns, they invariably become declinable, although initially, some variation may be observed. For example, Murphy (2000) describes *xevi-metal* 'heavy metal (music style)' as indeclinable, while now, this noun is inflected regularly. Only feminine proper names and some rare exceptions like *alma-mater* 'alma mater' do not follow this rule. Most loanwords become masculine nouns of the declension IIa, but some join feminine nouns in the declension III, like *karusel'* 'carousel' borrowed in the 19th century. Variation between these two options is also possible (see Savchuk 2011).

The absolute majority of loanwords ending in *-a* become feminine nouns of the declension I. Loanwords that end in two vowels, like Greek *mania* 'passion, obsession', receive a glide at the end of the stem to make it consonant-final: *manija*. The same strategy is applied to Latin words ending in *-io*, like *natio* 'birth, nation', as well as to French or English nouns ending in *-tion*: *nacija* (note the new *-a* ending, the feminine gender and the declension I paradigm). When borrowing Latin and Greek words that have a vowel and a masculine or neuter nominative singular suffix at the end, like *museum* 'temple devoted to the Muses, collection', Russian removes the inflectional suffix and puts the borrowing into the declension IIa, also adding a stem-final glide: *muzej*. Notably, no borrowings have ever been adapted as neuter nouns ending in a vowel, a glide and an inflection *-o*/*e*. Presumably, this is why generalizing this pattern to nonce words was so difficult in our experiments.

Isačenko (1974) notes that up to the 18th century the strategy of adding a glide and placing the borrowing in the declension I was also commonly applied to the nouns ending in /i/ or /e/, like *armée* ('army', French) – *armija*. After that, the group of indeclinable nouns appeared. However, this strategy can still be traced in the answers with a glide that we received in our experiments and in some words derived from recently borrowed indeclinable nouns, like *šosse* 'highway' – *šossejnyj* 'associated with a highway, designated for it'. To give another example, the brand name Ikea is officially adapted as *Ikea* in Russian (and does not decline as a result), but in colloquial Russian, it became *Ikeja*, a feminine noun of the declension I. Moreover, this strategy remains productive in several other Slavic languages, like Slovenian. Thus, to have a deeper understanding of

Declension	Final vowel	RNC subcorpus	GDRL	FDMRL
IIb	*-o*	18%	1543	336
	-e		4488	1082
III		5%	4002	638

Table 14: Nouns of the declensions IIb and III in the Russian National Corpus (www.ruscorpora.ru), the Grammatical Dictionary of the Russian Language Zaliznjak (1987) and the Frequency Dictionary of Modern Russian Language Lyashevskaya & Sharov (2009).

the question, it would be great to compare Russian to other Slavic languages. A brief comparison of Russian, Czech and BCMS can be found in Thomas (1983).

4.3 SOME PROPERTIES OF RUSSIAN DECLENSIONS

Russian has four inflectional (sub)classes shown in Table 1: I, IIa, IIb and III, as well as a dozen of irregular nouns. The declensions I and IIa are fully productive, while the declensions IIb and III are not. New words added to them are derived with several productive suffixes, mainly with *-stv*(*o*) and *-ost'*. However, it is notable that the declension III also accepts new underived nouns (although this process was more active before the 20th century), while the declension IIb does not. This might be surprising given that the declension IIb is much larger, as Table 14 shows.

The main problem for integrating novel words in the declension IIb might be in the number of nouns without suffixes in both declensions. In the Grammatical Dictionary of the Russian Language, there are 232 of them in the declension III, and only 116 in the declension IIb: 101 ending in *-o* and 15 ending in *-e*.[8] In other words, the declension IIb never actively accepted underived nouns.

We hypothesize that the problem of finding an analogy for novel words ending in *-o* and *-e* might be aggravated by the following. Out of 101 *-o* nouns without suffixes, 76 have stress shift in the plural (e.g. *-licó* 'face' – *-líca*, *-mésto* 'place' – *-mestá*), irregular plural forms, which are otherwise very rare in Russian (e.g. *-peró* 'feather' – *-pérja*), or no plural. Being singularia tantum is expected for abstract nouns like *zlo* 'evil', but not for concrete nouns like *dno* 'bottom' (it used to have an irregular plural *dón'ja*, which is obsolete now). The Grammatical Dictionary of the Russian Language has four non-suffixed *-e* nouns not ending in *-ce* or *-'e*, and three of them also have a stress shift in the plural. Due to lexical conservatism, which is especially strong for recent loanwords, making an analogy with irregular paradigms or paradigms with stress shifts may be particularly difficult.

The problems with the productivity of the declension IIb are evident not only in case of new loanwords. In the overview of the Russian language in the 20th century, Comrie et al. (1996: p.108–111) note that not only all new neuter borrowings are indeclinable, but the share of declinable neuter nouns in general tends to decrease. Some neuter nouns that showed variation in declinability in the 18th and 19th centuries are standardly indeclinable in contemporary Russian Comrie et al. (1996: p.117–120). A large group of toponyms like *Ivanovo* that used to be declinable are almost never inflected now. Russian speakers also have troubles declining words like *èxo* 'echo' Comrie et al. (1996: p.120) and *veče* 'veche', people's assembly (especially in ancient Novgorod)' (according to our own observations). The first example is a loanword, although not a recent one, while the second one was already present in Old Russian.

We can also note that children acquiring Russian often treat neuter nouns as feminine nouns of declension I (e.g. Schwartz & Minkov 2014). This could be explained by the fact

[8]These numbers are approximate: e.g. the noun *-ustje* 'estuary' historically had a suffix (it is related to such words as *-usta* 'lips (archaic)' and *ustnyj* 'oral'), but Russian speakers are hardly aware of it now. We included such cases in our counts, i.e. the number of words that never had a suffix is even smaller.

that unstressed *-a* and *-o* sound the same due to vowel reduction, but this also happens with stress-final nouns. A similar tendency was observed in some Russian dialects (e.g. Matthews 1950) and in heritage speakers of Russian (Polinsky 2006: p.223–224, Nagy & Petrosov 2024). It is notable given that in singular, neuter nouns have the same inflections as masculine nouns of declension IIa in all cases expect for nominative and accusative. This may support the generalization that we formulated above based on the experimental results: if a noun ends in a vowel in nominative singular, declension I patterns are more readily generalized to it.

ABBREVIATIONS

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