Computational Linguistics and Intellectual Technologies:
Proceedings of the International Conference “Dialogue 2021”

Moscow, June 16–19, 2021

Gender and Case in Russian Nouns Denoting Professions and Social Roles

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Abstract

In the present paper, we analyzed a group of Russian nouns denoting professions and social roles. Historically, these nouns were masculine; in modern Russian, they can also be used with feminine agreement, but only nominative forms are regarded as normative (e.g. *etot / eta vrač* ‘this$_{M/F}$ doctor’). We showed that oblique case feminine forms occur naturally using the Web-as-corpus approach and conducted three experimental studies. We discovered that offline rating and online processing of such forms depends on their case. Firstly, this is a unique example of the properties of the form influencing the properties of the lexeme. Secondly, the fact that all oblique forms are regarded as marginal and that locative was found to be significantly worse than other oblique cases points to a deep connection between grammatical gender and inflectional classes and to the crucial role of affix syncretism in morphological processing. This presents a challenge for different approaches in theoretical morphology.

Keywords: grammatical gender; inflectional class; case; agreement; Russian
DOI: 10.28995/2075-7182-2021-20-483-491

Род и падеж у русских существительных, обозначающих профессии и социальные роли

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Аннотация

В этой статье мы анализируем группу существительных русского языка, обозначающих профессии и социальные роли. Исторически эти существительные относились к мужскому роду. В современном русском языке с ними допустимо согласование и по женскому роду, но только формы именительного падежа считаются нормативными (ср. *этот / эта врач*). Используя интернет в качестве источника примеров, мы показали, что носители русского языка используют также формы косвенных падежей и изучили их в трех экспериментальных исследованиях. Мы установили, что обработка предложений, содержащих такие формы с согласованием по женскому роду, — как оценка их приемлемости (оффлайн-обработка), так и скорость, с которой читаются такие предложения (онлайн-обработка) — зависит от падежа этих форм. Во-первых, это можно рассматривать как уникальный случай, когда грамматические категории словоформы влияют на грамматические категории лексемы. Во-вторых, то, что все формы косвенных падежей оцениваются носителями как маргинальные, но при этом формы предложного падежа оказались наиболее проблемными, указывает на глубинную связь между категорией рода и словоизменительными классами (склонениями) и на ключевую роль синкретизма при морфологической обработке. Эти результаты представляют определенные сложности для различных подходов в рамках теоретической морфологии.

Ключевые слова: грамматический род; склонение; падеж; согласование; русский язык

1 Introduction

This paper analyzes a group of Russian nouns denoting professions and social roles. Historically, these nouns were masculine, but in modern Russian, they can also be used with feminine agreement: e.g. *etot / eta vrač* 'this$_{M/F}$ doctor'. These nouns have several interesting features, and we will focus on one of them: a complex relationship between gender and case features.

According to different sources, feminine agreement is grammatical only in the nominative case (e.g. Graudina et al. 1976; Zaliznjak 2002). Zaliznjak (2002) even suggests representing these nouns as two separate lexemes: a masculine noun and a feminine noun with a defective paradigm, rather than one common gender lexeme. However, oblique case forms with feminine agreement are attested. For example, Sitchinava (2011) notes that "according to Internet data, the phrase *etu vrača* 'this$_{F.ACC.SG}$ doctor$_{ACC.SG}$' is relatively frequent in the modern electronic communication", but does not provide any further details.

In this study, we analyzed naturally occurring oblique case forms with masculine and feminine agreement using the Web-as-corpus approach and conducted three experimental processing studies. Our primary goal was to find out whether the status of feminine forms (their prevalence, their perceived grammaticality, their online processing) depends on their case. Foreshadowing the results, the answer was positive. This is interesting as a unique example of the tail wagging the dog (the properties of the form influencing the properties of the lexeme), but may also have wider implications.

Case hierarchies are introduced in many formal and functional linguistic frameworks, and formal theories also draw a principal distinction between structural and inherent cases. Furthermore, cases differ dramatically in terms of their frequency. For individual case affixes, frequency is also an important property; another crucial property is syncretism. Finding out which of these factors affect production and processing of the relevant feminine noun forms is important for understanding the status of case paradigms and case affixes in the mental grammar and for modelling these phenomena in theoretical morphology.

2 Previous studies

Previous studies dedicated to the nouns denoting professions and social roles focused on agreement in the nominative case. Several experimental studies (Panov 1968; Novikov & Priestly 1999) analyzed the choice of masculine and feminine gender in agreeing verbs and adjectives. They found that semantic agreement is more frequent with verbs than with adjectives. Corbett (2006) incorporated these conclusions in his theory of agreement. A group of studies comes from the field of language acquisition because children acquire semantic agreement relatively late (Dizer 2007; Dobrova 2013; Rodina & Westergaard 2012; Rodina 2014; Tseitlin 2009).

Garnham and Yakovlev (2015) compiled a list of 160 nouns; for every noun, they marked whether it has a corresponding feminitive and how stereotypically female or male the denoted profession or social role is[1] (this factor was found to play a role in the studies on other languages). According to the first parameter, the nouns were divided into those having a normative pair (e.g. *učitel' – učitel'nica* 'teacher'), those having a colloquial pair (e.g. *parikmaxer – ?parikmaxerša* 'hairdresser') and unpaired (e.g. *psixolog* 'psychologist'). Garnham and Yakovlev conducted the first online processing experiment measuring sentence-by-sentence reading times.

Slioussar and Generalova (2018) measured word-by-word reading times in their study. They demonstrated that feminine agreement always triggers reading time delays compared to masculine agreement, but the size of this delay depends on gender stereotypes associated with a given profession or social role. No previous studies looked at the processing of oblique case forms.

3 Corpus study

To assess the frequency of masculine and feminine agreement patterns for different case forms, we conducted a corpus study. We could not use the Russian National Corpus (www.ruscorpora.ru) or simi-

[1] This required a separate experiment. Participants were asked, for example: "You see 100 paediatricians. How many of them do you think are female?". The answer could be given using a scale (0%, 10%, 20% etc.).

lar sources because they mainly contain edited texts, and chose Web-as-corpus approach. We selected 43 unpaired nouns from the list by Garnham and Yakovlev (2015): 42 nouns ending in a consonant, like *psixolog* 'psychologist', and the word *sud'ja* 'judge'. We searched for the combinations of a masculine or feminine agreeing pronoun (*moj* 'my', *naš* 'our' and *etot* 'this') and a target noun in all six cases in singular.

We used the Google search engine and analyzed the raw numbers that it provides. We understand the risks involved, for example, duplicate (and multiplicate) hits that recite one actual phrase. However, our primary goal was to find out whether all case forms are attested and to establish very approximate frequency patterns.

For some stereotypically masculine professions like *švejcar* 'doorman' or *mexanik* 'mechanic', no feminine agreement was attested. For 30 of the 43 selected nouns the sum of all search results for feminine forms did not reach 5000 hits, and the sum of all oblique case forms was below 30 (most often, less than 20 hits). Results for the remaining 13 nouns (the number of hits and percentages for every case) are given in Table 1. Table 2 presents the same 13 nouns with masculine agreement for the sake of comparison.

Noun	**Nom**	**Gen**	**Dat**	**Acc**	**Ins**	**Loc**	**Total**
dizajner 'designer'	11350 (96.4%)	274 (2.3%)	30 (0.3%)	32 (0.3%)	86 (0.7%)	2 (<0.1%)	58484
kosmetolog 'cosmetologist'	7210 (89.9%)	122 (1.5%)	212 (2.6%)	219 (2.7%)	260 (3.3%)	0	8023
fotograf 'photographer'	44600 (99.1%)	265 (0.6%)	62 (0.1%)	43 (0.1%)	43 (0.1%)	0	45013
menedžer 'manager'	11070 (87.2%)	350 (2.8%)	383 (3.0%)	261 (2.0%)	631 (5.0%)	2 (<0.1%)	12697
nevrolog 'neurologist'	11880 (94.4%)	469 (3.7%)	132 (1.1%)	63 (0.5%)	38 (0.3%)	0	12582
pedagog 'pedagogue'	15080 (97.1%)	105 (0.7%)	99 (0.6%)	45 (0.3%)	200 (1.3%)	0	15529
pediatr 'pediatrician'	12600 (89.6%)	452 (3.2%)	330 (2.4%)	363 (2.6%)	316 (2.2%)	1 (<0.1%)	14062
professor 'professor'	8110 (92.5%)	347 (4.0%)	69 (0.8%)	79 (0.9%)	158 (1.8%)	1 (<0.1%)	8764
psixolog 'psychologist'	9430 (80,2%)	278 (2,4%)	220 (1,9%)	1567 (13,3%)	257 (2,2%)	0	14852
stomatolog 'dentist'	14202 (96.2%)	416 (2.8%)	119 (0.8%)	20 (0.1%)	6 (0.1%)	0	14763
vrač 'doctor'	597500 (98.5%)	2876 (0.5%)	2895 (0.5%)	2289 (0.4%)	829 (0.1%)	18 (<0.1%)	606407
xirurg 'surgeon'	4952 (96.2%)	154 (3.0%)	21 (0.4%)	10 (0.2%)	13 (0.2%)	0	5150
sudja 'judge'	14430 (40.0%)	7850 (21.8%)	5609 (15.6%)	5396 (15.0%)	2169 (6.0%)	574 (1.6%)	36028

Table 1: Google search results for target nouns with feminine agreement

On the one hand, it is obvious that the share of nominative forms in Table 1 is dramatically larger than in Table 2. Only the noun *sud'ja* 'judge' that belongs to the 2nd declension (according to the *Rus-*

sian Grammar (Shvedova, ed., 1980)) does not show this tendency. This leads to the conclusion that the problem with oblique forms of other nouns is associated with the system of Russian inflectional classes. We will come back to this observation in the discussion section.

Noun	**Nom**	**Gen+Acc**	**Dat**	**Ins**	**Loc**	**Total**
dizajner	1073900	1113600	152470	151470	3641	10395081
'designer'	(43.0%)	(44.6%)	(6.1%)	(6.1%)	(0.2%)	
kosmetolog	151840	84240	67990	28440	1231	333741
'cosmetologist'	(45.5%)	(25.2%)	(20.4%)	(8.5%)	(0.4%)	
fotograf	335400	163720	101600	91540	3317	695577
'photographer'	(48.2%)	(23.5%)	(14.6%)	(13.2%)	(0.5%)	
menedžer	16647000	1976600	4721600	5707700	13714	29066614
'manager'	(57.3%)	(6.8%)	(16.2%)	(19.6%)	(0.1%)	
nevrolog	44380	19800	15198	4158	322	83858
'neurologist'	(52.9%)	(23.6%)	(18.1%)	(5.0%)	(0.4%)	
pedagog	222400	191400	85300	105100	6828	611028
'pedagogue'	(36.4%)	(31.3%)	(14.0%)	(17.2%)	(1.1%)	
pediatr	221460	56640	38071	23490	658	340319
'pediatrician'	(65.1%)	(16.6%)	(11.2%)	(6.9%)	(0.2%)	
professor	280300	124500	24720	24640	3633	457793
'professor'	(61.2%)	(27.2%)	(5.4%)	(5.4%)	(0.8%)	
psixolog	134500	39860	20450	37990	1216	234016
'psychologist'	(57.5%)	(17.0%)	(8.8%)	(16.2%)	(0.5%)	
stomatolog	131050	52460	25390	10635	981	220516
'dentist'	(59.4%)	(23.8%)	(11.5%)	(4.8%)	(0.5%)	
vrač	1308000	750600	416100	158000	66414	2699114
'doctor'	(48.5%)	(27.8%)	(15.4%)	(5.8%)	(2.5%)	
xirurg	116400	63600	44800	18280	4078	247158
'surgeon'	(23.5%)	(12.9%)	(9.1%)	(3.7%)	(0.8%)	
sudja	102300	188669	17250	38700	14548	361467
'judge'	(28.3%)	(52.2%)	(4.8%)	(10.7%)	(4.0%)	

Table 2: Google search results for target nouns with masculine agreement

On the one hand, it is obvious that the share of nominative forms in Table 1 is dramatically larger than in Table 2. Only the noun *sud'ja* 'judge' that belongs to the 2nd declension (according to the *Russian Grammar* (Shvedova, ed., 1980)) does not show this tendency. This leads to the conclusion that the problem with oblique forms of other nouns is associated with the system of Russian inflectional classes. We will come back to this observation in the discussion section.

We can also compare our results to the distribution of cases that Slioussar and Samoilova (2015) calculated for all animate nouns in singular in the syntactically disambiguated subcorpus of the National Russian Corpus: 60.7% nominative forms, 16.6% genitive, 6.2% dative, 8.8% accusative, 6.8% instrumental and 1.0% locative. Nominative is the most frequent, but by far not as frequent as it is in Table 1.

On the other hand, Table 1 shows that feminine agreement is attested in all oblique cases and is not limited to singular examples. Locative forms are underrepresented, but locative case is in general very infrequent with animate nouns. No oblique case appears to be substantially more frequent than the others, so we will turn to experimental studies to explore if there are any differences between them.

4 Experimental study

We conducted three experiments studying how oblique feminine forms are judged offline and processed online.

4.1 Grammaticality judgement experiment

53 native Russian speakers (18 to 55 years old) volunteered to take part in this experiment. They were asked to evaluate sentence grammaticality using the scale from 1 (absolutely ungrammatical) to 5 (perfectly grammatical). The experiment was run on the IbexFarm platform (www.spellout.net).

We selected 15 unpaired nouns that denote stereotypically feminine professions from the list compiled by Garnham and Yakovlev (2015). With each noun, we created five stimulus sentences with five different oblique case forms, as in (1a) or (1b). The nouns were modified by pronouns (*naš* 'our', *etot* 'this' etc.) showing gender agreement. We distributed 75 stimulus sentences across five experimental lists using the Latin square principle, so that every participant sees each noun only once (in one out of five oblique cases). As a result, every list contained 15 stimulus sentences, as well as 30 filler sentences used for distraction.

(1) a. *Ja uznal o svoem diagnoze ot našej vrača.*
I learned about self's diagnosis from our$_{F.GEN.SG}$ doctor$_{GEN.SG}$
'I learned about my diagnosis from our doctor'.

b. *Ja obratilsja s etoj problemoj k našej vraču.*
I appealed with this problem to our$_{F.DAT.SG}$ doctor$_{DAT.SG}$
'I asked our doctor about this problem'.

We found that all oblique forms were judged as equally marginal: genitive received the average rating of 2.0, dative — 2.0, accusative — 1.9, instrumental — 2.0, and locative — 1.8. We used ordinal logistic regression with mixed effects (intercepts) by participant and by item for the statistical analysis, and it did not reveal any significant differences, as expected. These results agree with the corpus data above. However, since oblique feminine forms are infrequent, but most definitely possible, we devised another experiment to zoom in on the potential differences between them.

4.2 Ranging experiment

35 native Russian speakers (19 to 45 years old) volunteered to participate. We selected 30 out of 75 stimulus sentences used in the previous experiment: six sets with six nouns in five oblique cases. Rather than showing participants one sentence from each set, we presented all sentences from one set at once (in a random order) and asked participants to range them from the worst to the best using the 1 to 5 scale. The experiment was run using the PsychoPy software (https://www.psychopy.org).

The data from four participants were discarded because they used only 1s and 5s (all other participants did not always used the whole scale, but at least did not limit themselves to its extremes). After that, we calculated the average ratings: 4.0 for instrumental, 3.4 for accusative, 3.0 for genitive, 2.9 for dative and 1.4 for locative. Using the same statistical methods as in the previous experiment, we found that locative is significantly worse than all other oblique cases (loc vs. acc: β=-4.38, *SE*=0.41, z=-10.69, p<0.01; loc vs. dat: β =-3.34, *SE*=0.30, z=-11.16, p<0.01; loc vs. gen: β=-4.05, *SE*=0.37, z=-11.06, p<0.01; loc vs. ins: β=-3.71, *SE*=0.33, z=-11.22, p<0.01). No other differences were significant. We will come back to these results in the discussion section.

4.3 Self-paced reading experiment

The third experiment was designed to study online processing. 68 native Russian speakers (18 to 55 years old) volunteered to take part in it. We selected 24 unpaired nouns from the list in (Garnham & Yakovlev 2015) and created 48 stimulus sentences like (2a-c) in two experimental conditions: with masculine and with feminine agreement (every noun was used in two sentences). In this experiment, target nouns appeared not only in the oblique cases, but also in nominative. In all sentences, the gender

and case of the target noun were unambiguously signaled by an agreeing adjective and, in some cases, a preposition.

(2) a. *Za stolom sidit molodoj / molodaja bibliotekar' v sinem pidžake.*
at table sits young$_{M.NOM.SG/F.NOM.SG}$ librarian$_{NOM.SG}$ in blue jacket.
'A pretty librarian wearing a blue jacket is sitting at the table'.

b. *Petr uznal ot opytnogo / opytnoj vrača o svoem diagnoze.*
Peter learned from experienced$_{M.GEN.SG/F.GEN.SG}$ doctor$_{GEN.SG}$ about self's diagnosis.
'Peter learned about his diagnosis from an experienced doctor'.

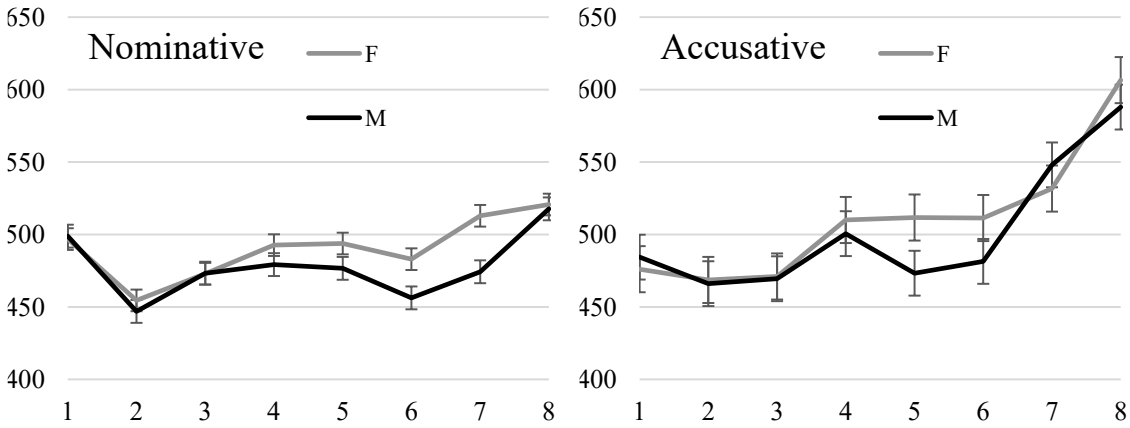
c. *Vanja priglasil populjarnogo / populjarnuju dietologa na večernee šou.*
Vanya invited popular$_{M.ACC.SG/F.ACC.SG}$ dietologist to evening show
'Vanya invited a popular dietologist to the evening show.'

All examples with a particular case had the same syntactic structure. So the target noun was always the fifth word, except for the sentences with accusative case, in which it was the fourth. In all sentences, three words followed the target noun. We created two experimental lists that contained 48 stimulus sentences in one of the two conditions and 108 filler sentences.

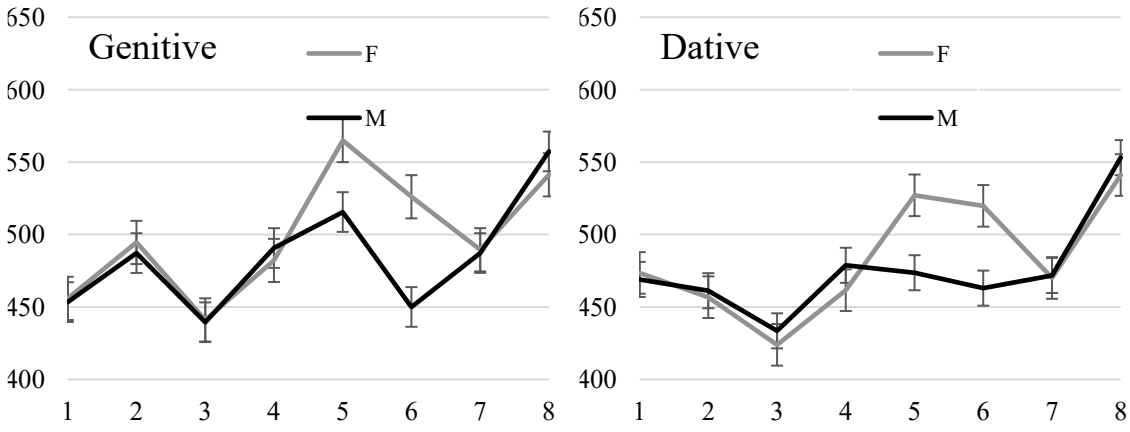
The experiment was run on the IbexFarm platform (www.spellout.net). We used the classic word-by-word self-paced reading methodology. In each trial, a sentence first appeared masked: all letters were replaced by dashes while spaces and punctuation marks remained intact. Participants were asked to press the space bar to reveal a word and re-mask the previous one. As a result, word-by-word reading times could be measured. One third of the sentences were followed by forced choice comprehension questions to ensure that the participants were reading properly.

We analyzed participants' question-answering accuracy and reading times. No participant made more than 3 errors, so no data were discarded based on this parameter. Reading times that exceeded a threshold of 2.5 standard deviations, by region and condition, were excluded (Ratcliff 1993). In total, 3.7% of the data were excluded as outliers.

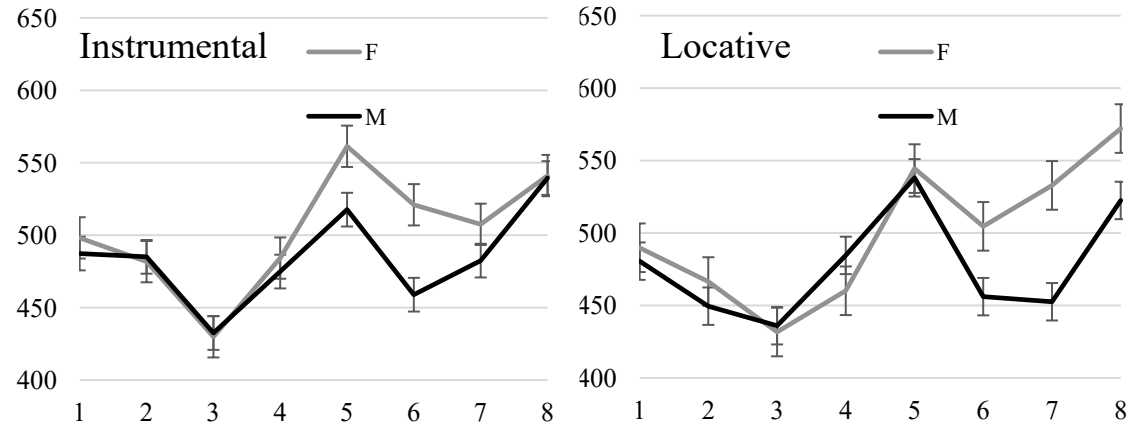
Average reading times per region (word) in different case groups and experimental conditions are presented in Figure 1. Even in the nominative group, feminine agreement takes more time to process than masculine agreement. This was previously observed by Slioussar and Generalova (2018) who also demonstrated that the size of the delay depends on the stereotypes associated with different professions. Processing of sentences with oblique cases has not been studied before.



(a) Sentences with nominative target nouns (b) Sentences with accusative target nouns



(c) Sentences with genitive target nouns (d) Sentences with dative target nouns



(e) Sentences with instrumental target nouns (f) Sentences with locative target nouns

Figure 1: Average word-by-word reading times in different groups (in ms)

For every case group, we compared word-by-word reading times in the two conditions using linear regressions with mixed effects (intercepts) by participant and by item. On the target noun (N region), the differences in the genitive (β=40.08, *SE*=19.04, z=2.02, p=0.04), dative (β=39.15, *SE*=17.91, z=2.19, p=0.03) and instrumental (β=43.33, *SE*=20.78, z=2.09, p=0.04) groups reached significance. On the following word (N+1 region), there were significant differences in every group (nominative: β=26.43, *SE*=12.55, z=2.11, p=0.04; genitive: β=48.02, *SE*=12.33, z=3.90, p<0.01; dative: β=66.22, *SE*=14.84, z=4.46, p<0.01; accusative: β=37.01, *SE*=15.24, z=2.43, p=0.02; instrumental: β=61.01, *SE*=13.80, z=4.42, p<0.01; locative: β=37.80, *SE*=14.57, z=2.59, p=0.01).

In the N+2 region, the difference between the two conditions was significant only in the locative group (β=67.79, *SE*=11.87, z=5.71, p<0.01). The same was true for the N+3 region (β=49.04, *SE*=17.82, z=2.75, p<0.01), which is the last word of the sentence. In other words, the differences in the sentences with two structural cases, nominative and accusative, reach significance later than in the sentences with non-structural cases. In the locative group, the delay associated with feminine agreement develops later than in the other groups and is more sustained.

5 Discussion and conclusions

Let us summarize the results. The corpus study demonstrated that oblique feminine forms are dramatically less frequent than nominative forms, which definitely cannot be explained by general differences in case frequency. At the same time, all case forms are attested. Only locative is underrepresented, but it is in general the least frequent case in animate nouns. The grammaticality judgment study confirmed that oblique feminine forms are perceived as marginal. However, the ranging experiment that zoomed on the differences between oblique cases and the self-paced reading experiment showed that locative case differs from the others. To explain this result, let us first consider why the words like *vrač* 'doctor' have problems with developing into a common gender noun with a full paradigm.

Russian has many common gender nouns (mostly denoting personal qualities, but also professions and social roles, like *kollega* 'colleague' or *sudja* 'judge') that belong to the 2nd declension ending in *-a/ja* in the nominative singular. Apparently, this is possible because this class historically contains both masculine and feminine nouns, although the former are a minority. The 1st declension with a zero affix in the nominative singular has no feminine nouns. Some feminine nouns like *mat'* 'mother' do have a zero affix in the nominative singular, but they belong to the 3rd declension, in which all oblique case affixes in the singular sub-paradigm are different. We argue that this is the reason why the words like *psyxolog* 'psychologist' are easily used with feminine agreement only in the nominative.

This points to a deep connection between the grammatical gender and declension, which is hard to explain in various morphological theories. For example, in the Distributed Morphology framework inflectional class is a feature stored on a syntactic node (e.g. Kramer 2015). As syntactic trees are parsed successively, either gender may be expected to influence declension or vice versa. In non-structural theories, for example, the Optimality Theory, it is easier to explain how various factors including inflectional classes may influence gender assignment (e.g. Rice 2005). Some non-structural analyses can even predict gender assignment variation (e.g. Doleschal 2000). However, these approaches do not offer an explanation why certain factors play a more important role than the others in a particular case in a particular language.

Now let us come back to locative — why does it differ from other oblique cases? This cannot be explained by case frequency: although locative is the least frequent in animate nouns, differences between other cases would also be expected. Locative is low in different case hierarchies, but instrumental is even lower. Apparently, the only possible explanation is affix syncretism: in other oblique cases in singular, affixes of the 1st declension do not coincide with the 2nd and 3rd declension, but the locative affix *-e* is the same in the 1st and 2nd declension. Prima facie, this could seem advantageous because the 2nd declension contains the majority of feminine nouns. But the effect is the opposite because these nouns have a different paradigm. After finishing the ranging experiment, one of our participants noted that locative seemed the worst to her and added a very telling comment in (3).

(3) *Kak budto eto ne vrač, a kakaja-to vrača*.
as if this not doctor$_{\text{NOM.SG(1st declension)}}$ but some$_{\text{F.NOM.SG}}$ doctor$_{\text{NOM.SG (non-existent 2nd declension noun)}}$

The role of affix syncretism in production and processing was discussed in several experimental studies on different languages, including Russian (e.g. Badecker & Kuminiak 2007; Chernova et al. 2020; Hartsuiker et al. 2003; Slioussar 2018). This question is interesting both for the models of production and processing and for theoretical morphology, in which different approaches to syncretism and to the role of concrete morphemes can be found. For example, in Distributive Morphology relying on the principle of Late Insertion, this role is assumed to be very limited. Our results shed new light on these problems. In particular, in all previous studies, syncretism increased the incidence of errors in production and made them less noticeable in comprehension, and we are the first to get the opposite result.

Acknowledgements

The reported study was partially supported by RFBR and GACR, project number 20-512-26004 (Исследование выполнено при частичной финансовой поддержке РФФИ и ЧНФ в рамках научного проекта № 20-512-26004).

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