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Producing Case Errors in Russian*

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1 Introduction

Numerous experimental studies have been devoted to so-called attraction errors in subject–verb agreement, as in (1a). Across languages, attraction errors were shown to arise more often in production and to cause smaller effects in comprehension than errors without attraction, as in (1b) (e.g. Badecker & Kuminiak 2007; Bock & Miller 1991; Clifton et al. 1999; Dillon et al. 2013; Eberhard et al. 2005; Franck et al. 2002, 2006; Hartsuiker et al. 2003; Lorimor et al. 2008; Pearlmutter et al. 1999; Solomon & Pearlmutter 2004; Staub 2009, 2010; Tanner et al. 2014; Vigliocco et al. 1995, 1996; Wagers et al. 2009).

(1) a. *The key to the cabinets were rusty.
b. *The key to the cabinet were rusty.

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Most experiments looked at number agreement, but gender agreement has also been analyzed. Many characteristics of attraction errors have been studied, so we will focus on the two that are most relevant for the present paper. Firstly, it was noted that only plural attractors cause a significant effect. Agreement errors with singular attractors, as in (2), were shown to be almost as infrequent and as easy to detect as errors without attraction. To explain this asymmetry, the singular feature is usually argued to be unmarked in some sense and thus to be unable to interfere with agreement (e.g. Eberhard et al. 2005; Franck et al. 2002; Vigliocco et al. 1995).

(2) *The keys to the cabinet was rusty.

Secondly, previous studies of languages where nouns are marked for case found that attraction was much stronger when the form of the plural attractor coincided with nominative plural, like in the German example (3a) as opposed to (3b) (Hartsuiker et al. 2003). We will further call such forms morphologically ambiguous or syncretic.

(3) a.	die	Stellungnahme	gegen	die		Demonstrationen
	the	position	against	the$_{ACC(=NOM).PL}$		demonstrations
b.	die	Stellungnahme	zu	den		Demonstrationen
	the	position	on	the$_{DAT(\neq NOM).PL}$		demonstrations

In this paper, we also study how morphological ambiguity triggers errors in production, but, unlike previous experimental studies, we analyze case. We highlight some similarities and differences between our data and existing findings on number and gender. The former let us reveal some general properties of morphological ambiguity processing, while the latter may be associated with the fact that case differs from phi-features. Case errors we are interested in have been noted in naturally occurring conversations and texts (Rusakova 2009) and have been studied experimentally in comprehension (Slioussar and Cherepovskaia 2014, 2015). We summarize the findings in the next section.

2 Previous studies of case errors analyzed in the present paper

In Russian, some adjective and participle forms are ambiguous between different cases: genitive, dative, instrumental and locative for singular feminine forms, and genitive and locative for plural forms, which are the same in all three genders. Rusakova (2009) who studied naturally occurring errors in Russian noted a number of examples like (4a–e) with case errors on nouns after such syncretic forms.

(4) a. * v predposlednej igry
in second-to-last$_{F.LOC(=GEN/DAT/INS).SG}$ game$_{F.GEN.SG}$
'in the second to last game'

b. * komitet po nauke i vyššej
committee for science$_{F.DAT.SG}$ and higher$_{F.DAT(=GEN/INS/LOC).SG}$
školy
school$_{F.GEN.SG}$
'the committee for science and higher education'

c. * obitateli pjatoj kvartire[1]
residents fifth$_{F.GEN(=DAT/INS/LOC).SG}$ apartment$_{F.DAT/LOC.SG}$
'the residents of the fifth apartment'

d. * more udovol'stvija ot tex točnyx
sea pleasure$_{GEN.SG}$ from those$_{GEN(=LOC).PL}$ precise$_{GEN(=LOC).PL}$
roditel'skix otvetax
parental$_{GEN(=LOC).PL}$ answer$_{LOC.PL}$
'a lot of pleasure from the parents' precise answers'

e. * na voennyx sborov
during military$_{PREP.PL(=GEN.PL)}$ assembly$_{GEN.PL}$
'during the military assembly'

Unfortunately, Rusakova recorded only a dozen of such errors so her materials do not let us investigate how different factors influence their frequency, in particular, the distribution of different cases and the similarities and differences with other errors following syncretic forms.

[1] Dative singular coincides with locative singular for feminine nouns, so it is impossible to tell which case was erroneously used in this example.

So we decided to study them experimentally, starting with three reading experiments (Slioussar and Cherepovskaia 2014, 2015).[2]

In all three experiments, we looked at plural syncretic forms, as in (4d–e). The first and second experiments used the self-paced reading method (allowing to measure word-by-word reading times). The third one involved a speeded grammaticality judgment task: sentences were presented word by word (every word for 500 ms), and participants were asked whether they contain a grammatical error.[3]

In the first experiment, we compared reading times for correct sentences like (5a) and sentences with case errors like (5b) and (5c). We will further call the former ambiguity-related errors and the latter control errors. We looked at prepositions taking locative DPs, as in (5a–c), genitive DPs and dative DPs (these were used as a control case because dative plural adjective forms are not syncretic).

(5) a. Listja na pešexodnyx dorožkax radujut zolotistym
leaves on pedestrian$_{LOC.PL}$ paths$_{LOC.PL}$ gladden golden$_{INS.SG}$
cvetom.
color$_{INS.SG}$
'Leaves on the pedestrian paths gladden (us) with their golden color.'

b. * Listja na pešexodnyx dorožek…
leaves on pedestrian$_{LOC(=GEN).PL}$ path$_{GEN.PL}$

c. * Listja na pešexodnyx dorožkam…
leaves on pedestrian$_{LOC(\neq DAT).PL}$ path$_{DAT.PL}$

Ambiguity-related errors caused a significantly smaller slow-down than control errors in the sentences where both genitive and locative were required. Thus, in this respect they were similar to attraction errors in number and gender subject-verb agreement. In the sentences where dative case was required, there was no difference between errors in genitive and in locative (this showed that the difference we found was

[2] We started with comprehension experiments because developing a method for triggering such errors in production took some time, and the first results are reported only in the present paper.

[3] If adult native speakers are allowed to take their time, they can find almost every grammatical error, so this method allows differentiating between errors that are more and less difficult to spot.

not caused by independent factors, e.g. by the properties of case forms such as their frequency).

In the second and third experiment, we investigated how the effect we found depends on the distance between the adjective or participle and the noun. We compared sentences like (5a–c) ('short' conditions) to sentences like (6a–c) ('long' conditions) with three words between the syncretic form and the noun. Notably, the structural distance is the same in all conditions, only the linear distance changes, and attraction effects in subject-verb agreement were demonstrated to depend only on the structural distance.

(6) a. Listja na iduščix vdol' krutogo berega
leaves on going$_{LOC.PL}$ along steep$_{GEN.SG}$ bank$_{GEN.SG}$
dorožkax radujut zolotistym cvetom.
path$_{LOC.PL}$ gladden golden$_{INS.SG}$ color$_{INS.SG}$
'Leaves on the paths going along the steep (river) bank gladden (us) with their golden color.'

b. * Listja na iduščix vdol' krutogo berega
leaves on going$_{LOC(=GEN).PL}$ along steep$_{GEN.SG}$ bank$_{GEN.SG}$
dorožek…
path$_{GEN.PL}$

c. * Listja na iduščix vdol' krutogo berega
leaves on going$_{LOC(\neq DAT).PL}$ along steep$_{GEN.SG}$ bank$_{GEN.SG}$
dorožkam…
path$_{DAT.PL}$

The same difference between ambiguity-related and control errors was observed in the short and long conditions, so the picture is again similar to subject-predicate agreement attraction. Comparing the results of self-paced reading (measuring online reactions to violations) and speeded grammaticality judgment (measuring offline effects), we found that online effects were more pronounced in the short conditions, while offline effects — in the long conditions. Apparently, the number of errors not noticed by the readers increases in the long conditions, so the differences in grammaticality judgments are inflated, while the differences in reading times are smoothed over.

Speeded grammaticality judgment also allowed for a direct comparison between sentences with prepositions taking genitive and

locative, and no differences between them were found (i.e. the effect was the same in both cases). A direct comparison of reading times was impossible because the relevant sentences contain different lexical items. The goal of our next experiments reported in the present paper was to study ambiguity-related case errors in production.

3 Experiment 1

3.1 Method

The goal of Experiment 1 was to find out whether case errors after morphologically ambiguous adjective and participle forms could be elicited experimentally and, in case of the positive answer, to analyze their distribution. We started with plural forms because the pattern of syncretism is simpler than in case of feminine singular forms and because plural forms were analyzed in comprehension experiments.

25 native speakers of Russian (14 female), aged 18–52, took part in the experiment. The materials included 40 sentences in four conditions, exemplified in (7a–d).

(7) a. Short genitive condition:
Kak izvestno, položitel'nye otzyvy ot
as known positive comments from
postojannyx klientov uveličivajut prodaži
regular$_{GEN(=LOC).PL}$ clients$_{GEN.PL}$ increase sales
'As is well known, positive feedback from regular clients increases sales.'

b. Long genitive condition:
Demonstracii protiv vyzvavšix vseobščee
demonstrations against provoking$_{GEN(=LOC).PL}$ unanimous
burnoe negodovanie arestov prodolžalis' dolgo.
violent indignation arrests$_{GEN.PL}$ continued for-a-long-time
Demonstrations against the arrests that provoked an unanimous violent indignation went on for a long time.'

c. Short locative condition:
Proverennye neskol'ko raz ispravlenija v novyx
checked several times corrections in new$_{LOC(=GEN).PL}$
učebnikax soderžat ošibku.
textbooks$_{LOC.PL}$ contain mistake
'Corrections in the new textbooks that have been checked severl times contain a mistake.'

d. Long locative condition:
Legendy ob izmenjajuščix svoj vnešnij oblik
legends about changing$_{LOC(=GEN).PL}$ their external appearance
demonax vstrečajutsja povsjudu.
demons$_{LOC.PL}$ occur everywhere
'Legends about demons changing their visual appearance can be found everywhere.'

In all target sentences, the subject was modified by a PP. In two conditions (7a–b), the preposition took a genitive DP, in two other conditions (7c–d), a locative DP. These DPs always contained a plural adjective or participle, which was morphologically ambiguous.

Like in the previous reading experiments, we included 'short' and 'long' conditions. In the short conditions (7a,c), the noun immediately followed the adjective or participle. In the long conditions (7b,d), there were three words in between (a DP in accusative or instrumental singular depending on the ambiguous adjective or participle). The predicate always contained two words. In total, all target sentences were nine words long: in the short conditions, there were three words before the subject noun (a participial construction, a parenthetical expression, etc.).

There are several methods to elicit number and gender errors in subject-predicate agreement, which have been tested in numerous production experiments since Bock and Miller 1991. However, no previous experimental studies analyzed case errors we were interested in. We tried many versions of the experimental design, providing participants with parts of sentences that they were asked to continue or to combine to get a complete sentence, presenting materials visually or aurally (see Stetsenko 2015 for more details). If the task was too easy, participants made very few errors. If the task was too difficult, participants slowed down, started thinking over their responses and made many memory-based errors, but virtually no grammatical errors.

Finally, we opted for the following design. We presented the first part of target sentences aurally (8a) and asked participants to finish them using the words on the computer screen: a noun and a two-word predicate (8b–c). To do so, participants had to inflect the noun and the verb in the predicate.

(8) a. Demonstracii protiv vyzvavšix vseobščee
demonstrations against provoking$_{GEN(=LOC).PL}$ unanimous
burnoe negodovanie…
violent indignation
b. aresty
arrests$_{NOM.PL}$
c. prodolžat'sja dolgo
continue$_{INF}$ for-a-long-time

In addition to 40 target sentences, we had 80 filler sentences. Participants were also asked to finish them inflecting provided nouns and verbs. However, there were no syncretic adjective or participle forms and nouns never had to appear in genitive or locative plural (other combinations of number and case were used). Half of the fillers resembled long experimental conditions and the other half — short conditions.

The experiment was run on a Macintosh computer using PsyScope software (Cohen et al. 1993). In every trial, participants saw a fixation point on the computer screen and heard the beginning of a sentence. Then they saw a noun and a predicate (one above the other) and pronounced a complete sentence. After that, the experimenter pressed a key, and the next trial started after a short interstimulus interval. Stimuli and fillers were presented in a pseudo-random order (with the constraint that no more than two target items occur consecutively). Before the experiment, there was a short practice session. All participants' responses were tape-recorded.

3.2 Results and discussion

All responses were transcribed and assigned into one of the following categories: (a) correct sentence; (b) repetition error (when some words that were provided were changed or omitted); (c) case error on the noun; (d) other grammatical errors (for example, one participant made a number agreement attraction error on the verb in a filler sentence). In

target sentences, case errors were the only grammatical errors, so we will further focus on them.

In total, there were 43 case errors, and in all cases, a genitive plural form was used where locative plural was required. There were three errors in the short locative condition (1.2% from all responses) and 40 errors in the long locative condition (16.0% from all responses). The proportion of errors by condition was analyzed using a 2 x 2 repeated-measures ANOVA (IBM SPSS software) with case and length as factors. Both factors were shown to be significant (for case, $F1(1,24) = 30.07$, $p < 0.01$, $F2(1,19) = 11.88$, $p < 0.01$; for length, $F1(1,24) = 34.37$, $p < 0.01$, $F2(1,19) = 12.82$, $p < 0.01$).

Let us discuss these results. Firstly, only ambiguity-related case errors were recorded, which shows that syncretism of the participle or adjective indeed increases the frequency of case errors on nouns. Secondly, there were more errors in the long sentences. This shows that these errors are not a surface phenomenon stemming from adjacency between the syncretic form and the noun.

Thirdly, the results were not parallel to our previous findings in comprehension. In comprehension, all ambiguity-related errors behaved in the same way, while in production, we found genitive errors where locative was required, but not vice versa. Of course, this does not mean that the latter type of errors does not exist (Rusakova (2009) even recorded a naturally occurring example in (4d)), but definitely points to a significant difference in frequency. We postpone further discussion until we have more data from Experiment 2 with singular syncretic forms.

Interestingly, here the picture does not coincide to what we find in case of subject-predicate agreement attraction. The absolute majority of number attraction errors are in plural, which, as we noted in the introduction, is usually explained by plural markedness[4] (e.g. Eberhard et al. 2005, Franck et al. 2002, Vigliocco et al. 1995). Applying the notion of markedness to case is less straightforward, but whatever case

[4] In semantics there is an ongoing debate whether singular or plural is the default (e.g Sauerland et al. 2005; Farkas and de Swart 2010), but it is largely ignored in psycholinguistics. Without going into details, let us note that singular is used in impersonal sentences and is morphologically unmarked in a number of languages.

hierarchy we take (e.g. Baerman et al. 2005; Bobaljik 2002; Caha 2013), genitive will be above locative.[5]

4 Experiment 2: a pilot study

4.1 Method

The goal of Experiment 2 was to elicit case errors on nouns modified by feminine singular syncretic adjective and participle forms. So far, we collected data from 20 native speakers of Russian (14 female), aged 18–34, but plan to record more participants.

The materials included 40 sentences in four conditions, exemplified in (9a–d). Experiment 1 demonstrated that the error rate is much higher when the syncretic form and the noun are separated by several words, so in this experiment, there was a two word long DP in accusative singular between them in all target sentences. Otherwise, we used the same method as in Experiment 1. We also had 80 fillers that resembled target sentences, but required different number and case on the noun that participants were supposed to modify.

(9) a. Genitive condition:
Miting protiv vyzvavšej vseobščee
meeting against provoking$_{\text{GEN(=DAT/INS/LOC).SG}}$ unanimous
negodovanie iniciativy prodolžalsja dolgo.
indignation initiative$_{\text{GEN.SG}}$ continued for-a-long-time
'The meeting against the initiative that provoked an unanimous indignation went on for a long time.'

b. Dative condition:
Poxod po porazivšej turističeskuju
hike across amazing$_{\text{DAT(=GEN/INS/LOC).SG}}$ touristic
gruppu doline byl zaxvatyvajuščim.
group valley$_{\text{DAT.SG}}$ was captivating
'The hike across the valley that amazed the tourist group was captivating.'

[5] An anonymous reviewer noted that it might be infelicitous to discuss Russian Genitive as a whole because its different uses have very different syntactic properties. However, our materials were rather homogenous in this respect.

c. Instrumental condition:
Služet s ispolnjajuščej ljuboe želanie
plot with fulfilling$_{INS(=GEN/DAT/LOC).SG}$ every wish
ryboj často vstrečaetsja.
fish$_{INS.SG}$ often occurs
'The plot with a fish that fulfills every wish occurs frequently.'

d. Locative condition:
Urožaj v pereživšej zasušlivoe leto
harvest in surviving$_{LOC(=GEN/DAT/INS).SG}$ droughty summer
strane okazalsja mizernym.
country$_{INS.SG}$ turned-out paltry
'The harvest in the country that survived a droughty summer turned out to be paltry.'

4.2 Results and discussion

All responses were transcribed and assigned into the same categories as in Experiment 1: (a) correct sentence; (b) repetition error (when some words that were provided were changed or omitted); (c) case error on the noun; (d) other grammatical errors. The incidence of various errors was higher than in Experiment 1, potentially due to the fact that there were no short conditions. The distribution of case errors across conditions is shown in Table 1.

Case required / case used	Genitive	Dative	Instrumental	Locative	Total
Genitive	—	25 (12.5%)	17 (8.5%)	18 (9.0%)	60
Dative or locative	8 (4.0%)	—	6 (3.0%)	—	14
Instrumental	2 (1.0%)	1 (0.5%)	—	1 (0.5%)	4
Accusative	1 (0.5%)	6 (3.0%)	4 (2.0%)	2 (1.0%)	13

Table 1. The distribution of case errors in different conditions

It was impossible to distinguish between dative and locative errors because not only feminine adjectives, but also feminine nouns have the same form in these cases in singular. Thus, we observed all possible types of ambiguity-related errors and also accusative singular errors, which could be triggered by accusative singular DPs depending on

syncretic adjectives and participles.[6] We did not perform any statistical tests because more participants need to be recorded to make the data sample large enough. However, it can already be noted that, unlike in Experiment 1, participants made not only genitive errors. But genitive errors were by far the most frequent.

5 General discussion

In this paper, we present the results of one experiment and one pilot study analyzing the production of case errors in Russian. Experimental research on such errors focused only on comprehension so far. In total, experiments show that the morphological ambiguity of the adjective or participle modifying a noun increases the number of case errors on this noun in production and influences processing of case errors in comprehension (ambiguity-related errors are missed more often and, if noticed, are less disruptive for reading).

The effect of morphological ambiguity is similar to what can be observed during subject-predicate agreement attraction. However, case errors differ from number and gender agreement errors in an important way. Genitive is higher than locative, dative and instrumental in all proposed case hierarchies, and genitive errors are the most frequent. In case of number and gender, we find more errors with marked features (plural and feminine).

Let us discuss our findings in the context of existing approaches to agreement attraction. Two major approaches can be identified in the literature. According to the first approach, which we will further call representational (e.g. Brehm & Bock 2013; Eberhard et al. 2005; Franck et al. 2002; Nicol et al. 1997; Staub 2009, 2010), agreement attraction takes place because the mental representation of the number feature of the subject NP is faulty or ambiguous. Some authors assume that the number feature can "percolate" from the embedded NP to the subject NP, which normally receives its features from its head. The others, relying primarily on the Marking and Morphing model suggested by Eberhard et al. (2005), argue that the number value of the subject NP is a continuum, i.e. it can be more or less plural. The more plural is the subject NP, the higher is the possibility of choosing a plural verb. This plurality depends

[6] Similar naturally occurring errors have been observed by Rusakova (2009).

on such properties of the subject NP as a whole and its head as collectivity, distributivity, etc.

The second approach (e.g. Badecker & Kuminiak 2007; Dillon et al. 2013; Lewis & Vasishth 2005; Solomon & Pearlmutter 2004; Wagers et al. 2009) claims that the number feature on the subject NP is always represented unambiguously and correctly, and attraction errors arise when the subject NP is accessed to determine the number on the agreeing verb because several nouns are simultaneously active. The authors adopting this approach usually assume that the agreement controller is found via cue-based retrieval (Lewis & Vasishth 2005): we query the memory with a set of cues (e.g. "number: plural", "case: nominative", etc.) and select an element that matches the maximum number of cues. This process is not error-free, and a wrong element can sometimes be retrieved.

As Wagers et al. (2009) note, two scenarios are possible both in production and in comprehension. On the one hand, cue-based retrieval may be initiated whenever we reach an agreeing verb form. On the other hand, we may predict the number of the verb relying on the subject NP and initiate the retrieval only when our expectations are violated (in comprehension, this would be the case in ungrammatical sentences, in production, this would be possible if a wrong verb form can sometimes be spuriously generated).

The retrieval approach is better suited to account for the fact that in case marking languages, significant attraction effects are observed only when the form of the attractor coincides with nominative plural. In the representational approach, it is unclear why this syncretism should influence the ambiguous representation of the number feature on the attractor or its ability to percolate.

The fact that morphological ambiguity of adjectives and participles influences the incidence of case errors and reaction to them in comprehension in a similar way can be taken as indication that we also deal with retrieval errors here. When we reach the noun, we must determine which case is necessary in production or check whether the case we see is correct in comprehension. Notably, from the syntactic point of view, we should not look at adjectives and participles to do so, which shows that the retrieval process is noisier than we could assume based on subject-verb agreement attraction data. Another new observation is that case behaves differently from phi-features: in the

latter case, the most marked features are easier to retrieve. Maybe, the reason is that case hierarchy does not rely on feature markedness.

Our data also let us make a small contribution to the discussion of ambiguity processing. For many decades, locally and globally ambiguous sentences have served as a testing ground for parsing models (Clifton & Staub 2008; Frazier & Fodor 1978; Frazier & Rayner 1982; McDonald 1994; Swets et al. 2008; van Gompel et al. 2001, 2005, among many others). The sources of ambiguity could be different, but in many cases it was created by morphologically ambiguous forms, as in the classical example in (10).

(10) The horse raced past the barn fell.

Notably, all previous studies looking at morphologically ambiguous forms from this perspective analysed constructions where at least locally, two interpretations are possible (for example, (10) remains ambiguous until the reader reaches the verb *fell*). The goal was to determine which interpretation is chosen in different constructions depending on various factors, how ambiguity resolution proceeds, how reanalysis is implemented, if it is necessary, etc.

In the sentences used in our study, the ambiguity should be resolved immediately because the preposition preceding the syncretic adjective or participle requires a certain case. Nevertheless, we demonstrated that alternative feature sets are available at the stage when cue-based retrieval is initiated at the noun. We believe that they get reactivated rather than remain active. Various studies show that, even if two interpretations are possible from the syntactic point of view, the resolution is very fast if one of them is strongly supported by other factors. In our case, no alternative interpretations are possible in principle.

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