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Predicting complex syntactic structure in real time:

Processing of negative sentences in Russian

Nina Kazanina

Running head: PREDICTING COMPLEX STRUCTURE

Author Note

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Abstract

In Russian negative sentences the verb's direct object may appear either in Accusative case which is licensed by the verb (as is common cross-linguistically) or in Genitive case which is licensed by the negation (Russian-specific 'Genitive-of-Negation' phenomenon). Such sentences were used to investigate whether case marking is employed for anticipating syntactic structure, and whether lexical heads other than the verb can be predicted on the basis of a case-marked noun phrase. Experiment 1, a completion task, confirmed that Genitive-of-Negation is part of Russian speakers' active grammatical repertoire. In Experiments 2&3, the Genitive/Accusative case manipulation on the preverbal object led to shorter reading times at the negation and verb in the Genitive vs. Accusative condition. Furthermore, Experiment 3 manipulated linear order of the direct object and the negated verb in order to distinguish whether the abovementioned facilitatory effect was predictive or integrative in nature, and concluded that the parser actively predicts a verb and (otherwise optional) negation on the basis of a preceding genitive-marked object. Similarly to a head-final language, case-marking information on preverbal NPs is used by the parser to enable incremental structure building in a free-word-order language such as Russian.

Keywords: sentence processing, predictive structure building, Genitive-of-Negation, Russian, case-marking, preverbal objects, parsing syntactic dependencies

Introduction

Listeners process sentences as they unfold in time, and the goal of a parsing theory is to identify mechanisms that enable such incremental processing. It has been argued that incremental processing critically involves the parser making predictions about upcoming material on the basis of the already seen input (Kimball, 1975; Crocker, 1994; Schneider, 1999), but ‘the nature of *what* precisely is predicted remains an important empirical and theoretical issue’ (Crocker, 2002, p. 6). The present paper focuses on the nature of predictions formed as a result of morphological case information on preverbal noun phrases (NPs).

There is ample evidence suggesting that the parser makes use of morphological case on nominal arguments to make predictions on the upcoming input, of both lexico-semantic and structural nature. An eyetracking study by Kamide, Scheepers & Altmann (2003) showed that German comprehenders use case marking to predict lexical properties of yet-to-be-seen verb arguments. Participants listened to German sentences equivalent to *The rabbit^{NOM} eats the cabbage^{ACC}* ‘The rabbit eats the cabbage’ or *The rabbit^{ACC} eats the fox^{NOM}* ‘The fox eats the rabbit’ while looking at a display featuring the event participants (a rabbit, a cabbage, a fox). The listeners’ eye movement patterns demonstrated that they could correctly identify the referent for the second NP as soon as they heard the verb, which was possible if and only if they had taken into consideration morphological case of the first NP. A similar outcome has been demonstrated in Finnish by Keiser and Trueswell’s (2004) eyetracking study: listeners fixated on a (discourse-new) post-verbal argument in the visual scene more quickly in scrambled OVS sentences than in canonical SVO sentences, an outcome that required identifying the grammatical role of the preverbal argument on the basis of its case (Partitive case for the object vs. Nominative for the

subject) and using this information to anticipate the discourse status of yet-to-be-heard post-verbal NP.

In verb-final languages prediction on the basis of case marking on nominals arguably takes an even broader scope, as it can include prediction for the verb phrase itself. Prediction of the verb phrase structure is critical in verb-final languages because it makes it possible to link otherwise unattached pre-verbal NPs into a single connected tree. And indeed there is compelling evidence from verb-final structures in Japanese, Korean, German and Basque that the parser makes use of case-marking on a preverbal NP to anticipate upcoming sentence structure, often in advance of the verb (Aoshima, Yoshida, & Phillips, 2009; Bader & Lasser, 1994; Inoue & Fodor, 1995; Kamide, Altmann, & Haywood, 2003; Kim, 1999; Mazuka & Ito, 1995; Miyamoto, 2002; Pablos, 2011). For example, Inoue and Fodor (1995) report that Japanese readers experience a mild surprise at the first verb when they read a sequence like *John-ga Mary-ni ringo-o tabeta inu-o ageta* (John-Nom Mary-Dat apple-Acc ate dog-Acc gave) with the meaning ‘John gave to Mary a dog that ate an apple’. The effect was attributed to the fact that the parser predicts a ditransitive verb on the basis of three initial NPs, hence encountering a (mono-)transitive verb *tabeta* ‘ate’ requires reanalysis. Miyamoto (2002) showed that Japanese readers postulate a clause boundary between two accusative-marked NPs in advance of any information on the following verb(s) in accordance with the so-called ‘Double Accusative constraint’ that disallows two accusative NPs within a single clause (Harada, 1973; Kuroda, 1965). These findings demonstrate that the parser uses case marking on preverbal NPs for anticipating syntactic structure including the verb projection itself, thus enabling incremental parsing of such NPs.

In the current paper I advance the claim that the parser uses case information on pre-verbal NPs for anticipating upcoming sentence structure in a non-head final language, Russian.

In doing so, I focus on a sentence structure in which prediction is mandatory to ensure incremental parsing and incorporation of pre-verbal nominal arguments into the syntactic tree as they appear bottom-up. I argue that the parser can use case-marking to project *multiple* heads if anticipation of a single verb head is insufficient for incorporating preverbal case-marked NPs incrementally. The projection of multiple heads is noteworthy as it is less directly compatible with a simple direct association between the already processed material and yet-to-be seen material, but rather points to a prediction mechanism that aims to attain as fully incremental a structure-building process as possible while ensuring grammatical licensing. My goal is therefore (i) to examine whether case-marking is used as a cue for predicting upcoming lexical and functional heads, i.e. verb and negation respectively, in a free word order language, Russian, and (ii) to distinguish whether predictive mechanisms apply equally depending on how essential they are for incremental parsing. Next I describe a grammatical construction in Russian that features a relation between morphological case on the verb's direct object and negation.

Genitive-of-Negation in Russian

In most Nominative-Accusative languages the verb's direct object bears Accusative case; the case is assigned by the verb and is the same regardless of whether the sentence is affirmative or negative. For example, in English the direct object is Accusative-marked in both *Mary loves him* and *Mary does not love him*. The situation is interestingly different in Russian, in which the direct object's case may differ depending on whether the sentence is affirmative or negative. In affirmative sentences, the direct object is accusative-marked (additionally, the subject is nominative-marked and the indirect object is dative-marked), as exemplified in (1).¹ Negative sentences, however, display more alternatives. First, as shown in (2)a, in a negative sentence the

verbs' direct object may bear accusative case, just as in the affirmative counterpart. Second, and this is a curious property of Russian illustrated in (2)b, the direct object may be genitive-marked (the 'Genitive-of-Negation' phenomenon; Pesetsky 1982). Whereas in (1) and in (2)a the thematic role and the accusative case of the direct object are both licensed by the verb, in (2)b the licensing pattern is 'split': the thematic role is licensed by the verb but its genitive case is licensed by Negation (Bailyn, 1997).

- (1) Ivan cvety Maše podaril.
 Ivan^{NOM} flowers^{ACC} Masha^{DAT} gave
 Ivan gave the flowers to Masha.
- (2) a. Ivan cvety Maše ne podaril.
 Ivan^{NOM} flowers^{ACC} Masha^{DAT} not gave
 b. Ivan cvetov Maše ne podaril. [Genitive-of-Negation]
 Ivan^{NOM} flowers^{GEN} Masha^{DAT} not gave
 Ivan didn't give flowers to Masha.

The Genitive-of-Negation is often described as an optional phenomenon in the sense that the direct object of a negated verb may be either accusative or genitive, as illustrated in (2). [Hereinafter the term 'negated verb' will be used to refer to a combination of Negation and the following verb. In section 'Genitive-of-Negation in Russian' I demonstrate that a negated verb is a combination of two phrasal projections, i.e., a negation phrase NegP headed by the negative marker 'ne' and a verb phrase VP headed by the verb.] It has been noted that the case of the direct object in a negative sentence interacts with its interpretation, i.e., a genitive-marked direct object usually refers to a non-presupposed entity whereas an accusative-marked direct object refers to a presupposed entity (Timberlake, 1975). Thus, (2)b corresponds more closely to *Ivan didn't give Masha any flowers* whereas (2)a corresponds more closely to *Ivan didn't give Masha flowers/the flowers*. For the purposes of this study, the contextual differences between both the Genitive and the Accusative versions can be put aside as all sentences will be presented out of semantic context. The important fact is that both versions are acceptable for Russian speakers, as

can be demonstrated, for example, by examining Russian speakers' productions. For instance, in a subset of 321 sentences that contained a negated transitive verb and a direct object extracted from the homonymy-resolved sub-corpus of the Russian National Corpus, the direct object was genitive-marked in 63% of cases and accusative-marked in 37% of cases.²

From the perspective of incremental parsing, processing a Genitive-of-Negation sentence (2)b involves additional steps compared to the processing of its accusative counterpart (2)a. In (2)a incorporating each preverbal NP incrementally into the parsing tree calls for a procedure similar to what is used in the case of an affirmative sentence (1): of all verbs stored in the lexicon, a subset of verbs is selected that feature a subcategorization frame compatible with all morphological and thematic/semantic properties of the preverbal NP(s), i.e., a ditransitive verb that licenses both the thematic role of the direct object and its accusative case (as well as the dative indirect object). On the other hand, projecting a ditransitive verb in the Genitive-of-Negation sentence (2)b is not sufficient as an affirmative ditransitive verb cannot license a genitive NP. In order to fully license a genitive-marked object in (2)b the parser needs to go beyond projecting a single verb head. Additionally, an (otherwise optional) head that can license a genitive NP such as Negation must be projected. [As discussed below, deciding which additional head to project is not a trivial matter as there are a number of different possible licensors for Genitive case in Russian.] The goal of this paper is to examine whether case-marking on a preverbal NP can indeed trigger prediction of more than one head, with each head licensing some feature of the NP (i.e., case, thematic role) when such is essential for incremental incorporation of the NPs into the syntactic tree. The case of 'forced' prediction will be compared to a case in which a prediction can be made on the basis of available material and contribute to the ease of parsing, but is not critical to ensure incrementality. In two self-paced reading

experiments I will demonstrate that the parser is able to employ a rich anticipatory mechanism that enables projection of a combination of heads (verb and negation) that is geared to enable incremental and grammatically licit incorporation of the bottom-up input into the parsing tree.

Before continuing, it is worth substantiating the claim that the negative particle ‘ne’ is indeed a head that projects a negation phrase NegP (‘sentential negation’, $ne + V \rightarrow [_{NegP} Neg [_{VP} V]]$). An alternative account is that ‘ne’ simply attaches to the verb phrase but does not head its own projection (‘constituent negation’, $ne + V \rightarrow [ne VP]$). ‘Ne’ preceding the verb can indeed represent a case of constituent negation in Russian, but only if the verb is focused or contrasted, e.g. *Maria ne KUPILA yabloki* ^{ACC}(..., *a UKRALA*.) [lit: Maria not BUY apples, but STOLE.] ‘Maria did not BUY apples (... she STOLE them.)’ (Neidle, 1988; de Freitas, 2004). Thus, in the absence of an intonational focus, verbal negation is of sentential type. Furthermore, the direct object of the negated verb cannot bear Genitive case in the case of constituent negation, i.e., *Maria ne KUPILA yablok* ^{GEN}(..., *a UKRALA*) is illicit. Therefore, in Genitive-of-negation sentences such as 2(b) negation must be sentential, i.e. ‘ne’ is a head that projects its own phrasal projection NegP.

The stimuli used in the present study were similar to (2), except that they were bi-clausal sentences as shown in (3). [The sentences in (3) are simplified versions of real experimental sentences which also contained modifiers such as adjectives and prepositional phrases, see *Materials* for Experiment 1.] The critical part is an embedded clause that contains a negated ditransitive verb (e.g., *darit* ‘give’) together with its direct object (*podarki* ‘gifts’) and its indirect object (*molodoženy* ‘the newly weds’). The Accusative and Genitive conditions differ only by the case of the direct object, i.e. *podarki* ^{ACC} vs. *podarkov* ^{GEN} respectively. If in (3)b the genitive NP2 can trigger the parser to actively project the negation (in addition to the verb) in an

anticipatory manner, one should find facilitation in the processing of the negation and the verb in (3)b as compared to (3)a. This should lead to faster reading times at the negation *ne* ‘not’ or at the following verb in the Genitive condition relative to the Accusative condition. (A spill-over effect, especially into the following region, is common in self-paced reading experiments, especially in cases similar to the present one in which the critical region *ne* ‘not’ is a short and frequent closed-class word.) This will be tested in Experiments 2 and 3 which employ a self-paced reading technique.

(3) a. *Accusative condition*: NP^{NOM} MainV [NP^{ACC} NP^{DAT} Neg EmbV]

Roditeli	dogovorilis’	podarki	molodoženam	ne	darit’.
parents ^{NOM}	agreed	gifts ^{ACC}	newly-weds ^{DAT}	not	to-give

b. *Genitive(-of-negation) condition*: NP^{NOM} MainV [NP^{GEN} NP^{DAT} Neg EmbV]

Roditeli	dogovorilis’	podarkov	molodoženam	ne	darit’.
parents ^{NOM}	agreed	gifts ^{GEN}	newlyweds ^{DAT}	not	to-give

The parents agreed not to give gifts to the newlyweds.

Experiment 1 was a paper-and-pencil sentence fragment completion task which used truncated versions of (3) to examine ways in which Russian speakers can license a preverbal genitive-marked NP in the experimental sentences. The logic of this sentence completion study was as follows: if Russian speakers recognize that the genitive-marked NP is licensed by Negation, then sentence completions should include the negation marker *ne* when the genitive NP is present in the fragment. The reason why this needed to be confirmed is because, generally speaking, there are a number of different possible licensors for Genitive case in Russian. In addition to Negation, such licensors are (i) monotransitive verbs that assign Genitive case to their direct object, e.g. *izbegat’ spleten*^{GEN} ‘avoid rumours’ (hereinafter ‘quirky’ verbs); (ii) prepositions that assign Genitive case to their complement, e.g., *bez knigi*^{GEN} ‘without the book’;

(iii) head nouns within possessor NPs, i.e. the possessum NP (*chemodan* ‘suitcase’) licenses Genitive case on the possessor noun (*devochki* ‘girl.gen’) as in *chemodan devochki^{GEN}* (literally: suitcase of-girl) ‘the girl’s suitcase’; (iv) adverbs or comparative phrases or numerals, e.g. *mnogo knig^{GEN}* ‘many books’ or *bol’she knig^{GEN}* ‘more books’; (v) numerals, e.g. *sem’ knig^{GEN}* ‘seven books’.³ Because there are multiple possible licensors for the Genitive case in Russian, the process of identifying a licensor for the genitive NP during incremental processing of (3) requires considering a variety of factors, including word order, frequency and other preverbal material. For example, word order can rule out some licensors such as prepositions that necessarily precede their genitive-marked argument, whereas the presence of an indirect object rules out a quirky verb as these are monotransitive. The completion task provided a quantitative assessment for these hypotheses and revealed which licensors are considered for the genitive NP in (3)b.

Experiment 1: Completion task

Participants. Twenty-eight Russian-speaking volunteers (age 18-35) gave informed consent to participate in the study. All participants were students who were at or had graduated from a university, had normal or corrected vision and reported no history of language disorders. They were tested on the premises of Moscow State University or St Petersburg State University.

Materials. Materials for the completion task in Experiment 1 were based on 24 sets of experimental sentences used in the self-paced task in Experiment 2 (see Appendix B) that followed the same sentence structure as shown in (3). For the completion task the sentences such as (3) were truncated after the second or the third NP, yielding two accusative and two genitive conditions listed in Table 1. Across all sets the critical second NP was an inanimate plural noun

in order to avoid ambiguity between Genitive and Accusative forms found in other Russian nouns (see fn. 2).⁴ Participants had to provide a natural completion for each sentence fragment (they were instructed to skip any fragments that they considered ungrammatical). If Russian speakers can resort to Genitive-of-Negation in order to license a genitive NP, continuations containing a negated embedded verb in both Genitive conditions should be expected. The rate of such completions was predicted to be lower in the Gen-only condition than in the Gen+Dat condition, as the former also allows a completion with a monotransitive quirky verb that takes the genitive NP as a direct object. The two accusative conditions were used for estimating a ‘baseline’ rate of negative completions in a case where either an affirmative or a negative continuation is available.

Each participant filled out a paper questionnaire with 20 sentences to complete, i.e., 8 experimental sentences (two items for each of four conditions in Table 1) interspersed with 12 filler sentences.

TABLE 1 ABOUT HERE

Results

Two hundred and twenty three completions from 28 participants were obtained (one completion was missing). Except for 6 unacceptable completions (usually lacking an embedded verb, *Illicit*), the continuations were well-formed and fell into one of three categories (Table 1; see also Appendix A for examples). First, there were completions with an affirmative verb taking the second NP as a direct object and, if present, NP^{DAT} as an indirect object (*Affirmative*, e.g. Acc+Dat fragment *Komandir^{NOM} prikazal podrobnye^{ACC} donesenija^{ACC} glavnomu^{DAT} štabu^{DAT}...* completed as *...peredavat’ s maksimal’noj skorost’ju*. ‘The commander^{NOM} ordered detailed^{ACC} reports^{ACC} (to) central^{DAT} headquarters^{DAT} ... to-transmit with maximal speed.’). These

affirmative completions were restricted to conditions in which the second NP was accusative-marked, and did not occur at all in the Gen-only or Gen+Dat conditions confirming that an affirmative (di-)transitive verb cannot assign genitive case to its object. Second, there were completions with a negated verb taking the second NP as a direct object and, if present, NP^{DAT} as an indirect object (*Negative*, e.g. Acc condition: *Glavnyj^{NOM} redaktor^{NOM} prikazal konfidencial'nye^{ACC} podrobnosti^{ACC} ... ne razglašat'* 'Chief^{NOM} editor^{NOM} ordered confidential^{ACC} details^{ACC} ... not to-disseminate'). This option was found in all four conditions, albeit at different rates. In particular, there were more completions with a negated verb in the two Genitive conditions than the two Accusative conditions ($\chi^2(1)=63.9$, $p < .001$); the same asymmetry held when the Gen-only condition was compared to the Acc-only condition, and when the Gen+Dat condition was compared to the Acc+Dat condition ($\chi^2(1)=24.3$, $p < .001$ and $\chi^2(1)=42.5$, $p < .001$ respectively). In particular, in the Gen+Dat condition negative completions were used overwhelmingly more than other elements (91% of all trials), suggesting that a sequence NP^{GEN} NP^{DAT} most clearly prompted a negated verb.

Third, in the Gen-only and Gen+Dat conditions, there were completions in which NP^{GEN} was licensed by a licensor other than a negated verb, namely, a quirky verb, an adverb or a numeral (*Other Genitive licensor*, e.g. *Komandir^{NOM} staralsja opasnyx^{GEN} zon^{GEN} kosmičeskim^{DAT} turistam^{DAT} ... pokazyvati kak možno bol'she* 'Commander^{NOM} tried dangerous^{GEN} zones^{GEN} to space^{DAT} tourists^{DAT} ... to-show as possible more' corresponding to 'The commander attempted to show as many dangerous zones to space tourists as possible'.)

Discussion

The findings from Experiment 1 clearly demonstrate ‘optionality’ of the Genitive-of-Negation, i.e., that the direct object of a negated verb can be either accusative- or genitive-marked. Negated verbs were used with a genitive direct object (91% and 70% of responses to the Gen+Dat and Gen-only conditions respectively) and with an accusative direct object (30% and 23% of responses in Acc+Dat and Acc-only conditions respectively), thus confirming an earlier corpus-based observation.

The pattern found in the accusative conditions suggests that when both negative and affirmative continuations are available, a negative completion is chosen in roughly a quarter of cases (Acc+Dat condition – 30%, Acc-only condition – 23%). Critically, the proportion of negative continuations was much higher in the genitive conditions. The increase is expected in light of the Genitive-of-Negation whereby a genitive object can be licensed by Negation and suggests that Russian speakers are aware of this grammatical phenomenon. Even in the Gen-only condition, completions with a negated verb constituted a clear majority (70%), although continuations containing another possible licenser of the genitive case were also common (29%, of which more than half – 9/16 – contained a quirky verb). In the Gen+Dat condition, the presence of an additional NP^{DAT} excluded the possibility of a quirky verb which raised the proportion of the Genitive-of-Negation structure to 91%. Only 4/55 responses in the Gen+Dat condition featured an alternative licenser for the genitive NP, an adverb, suggesting that this alternative is grammatical but dispreferred compared to the Genitive-of-Negation.

In summary, the results of the completion task confirm that Genitive-of-Negation is part of Russian speakers’ grammatical repertoire. Furthermore, they demonstrate that a preverbal sequence $NP^{GEN} NP^{DAT}$ prompts Negation and a ditransitive verb, i.e., in (3)b Negation is a

highly favoured case licensor for the Genitive NP. Building on these findings from Experiment 1, in Experiment 2 I examine how Genitive-of-Negation sentences are processed in real-time. As explained in the section ‘Genitive-of-Negation in Russian’ such examination will elucidate whether the parser can predict multiple heads on the basis of case-marking on a preverbal NP when such prediction is essential for ensuring incrementality of structure building.

Experiment 2

Participants. Forty-four native Russian speakers (age 18-35) were recruited in St. Petersburg, Russia. All participants were students who were at or had graduated from a university, had normal or corrected vision and reported no history of language disorders. They gave informed consent and received monetary compensation for their participation. Participants were tested on the premises of St. Petersburg State University.

Materials. A sample set of materials from the online task is shown in Figure 1. As the example shows, both object NPs consist of an adjective and a noun agreeing in case, number and gender, as required in Russian. The main verb uniquely subcategorized for a clausal argument or could take a clausal or a nominal argument but with the former being strongly more probable; hence, a clause boundary could be postulated upon encountering the critical accusative or genitive NP. The function of two prepositional phrases PP1 and PP2 is to separate that NP from the negated verb and to make the experimental sentences pragmatically felicitous. A full list of experimental materials is provided in Appendix B.

In order to ensure that the experimental sentences were grammatically acceptable I administered a grammaticality judgement questionnaire to an independent group of 12 Russian

speakers. Each questionnaire contained 12 Accusative and 12 Genitive conditions, interspersed with 6 grammatically licit control items chosen from among filler sentences and 6 grammatically illicit controls also chosen from the same filler set but manipulated to introduce ungrammaticality (by changing case marking on one of the nominal arguments). Two versions of the questionnaire were created that covered all 24 sets of experimental conditions. The participants were asked to rate how grammatical each sentence was on a 1 (clearly ungrammatical) – to – 5 (perfectly grammatical) scale. The mean ratings (sd) for the four conditions were: Accusative – 3.8(1.2), Genitive – 3.9 (1.1), licit control - 4.4 (1.1), illicit control – 1.3 (1.0). A one-way ANOVA showed a significant effect of condition ($F(1,3) = 119.6$, $p < .001$). Pairwise comparisons (Bonferroni-corrected) demonstrated that the ratings for the Accusative and Genitive conditions were significantly different from the illicit (both p 's $< .001$) and licit (both p 's $< .05$) controls, but not significantly different from each other ($p = 1.0$). Given a rather high ranking for the Accusative and Genitive conditions, the results confirm that the experimental conditions are grammatically acceptable and comparable for Russian speakers.

Procedure. Participants were randomly assigned to one of two presentation lists resulting from distributing 24 sets of stimuli using a Latin-square design so that each participant only saw one condition from each set. Each list also contained 48 filler sentences that were similar to the test sentences in length and complexity, yielding a total of 72 sentences. The order of sentences within the list was randomized for each participant. Stimulus presentation was controlled by the *Linger* software (version 2.80, Doug Rohde, MIT) run on a laptop with a Windows operating system. Each trial started with a lead-in sentence (e.g., *It was decided to keep the wedding small.*) that established a broad situational context and appeared at once. It was followed by a

critical sentence presented in a non-cumulative word-by-word moving window paradigm (Just, Carpenter, & Woolley, 1982), using the font Courier New Cyrillic 20. All words in the sentence, including punctuation marks and spaces between words, initially appeared on the screen masked by dashes. As the participant pressed the spacebar, a new word appeared on the screen, whereupon the previous word was re-masked. Participants were instructed to read sentences at a natural pace. They also had to answer a yes/no comprehension question after each sentence (feedback was provided). The experiment consisted of a short practice session followed by a 20-25 minute long main session.

Analysis. One item was excluded due to a coding error. All sentences for which the comprehension question was answered incorrectly were excluded from the RT analyses. Reading times below 150 ms and above 2000 ms were also excluded (corresponding to 0.6% of data points).

Reading times were analyzed by region with each region corresponding to a single word, except the final region in the sentence which was an average of one or more words. Statistical analyses of RTs were performed by fitting a linear mixed-effects model. The *lmer* function from the *lme4* package in R was employed (version 2.15.2; CRAN project; The R Foundation for Statistical Computing, 2012). Mixed-effects models take raw unaveraged data as input and incorporate both random effects of participants and items within a single analysis. For every region a model was constructed that included participants and items as random factors, and Case of direct object (Accusative vs. Genitive) as a fixed factor. Following Baayen (2008), in order to minimize collinearity between variables, the factor Case was transformed into a numerical variable and centered to have a mean of 0 and a range of 1. For each model a maximal random-effect structure justified by the design was used (Barr, Levy, Scheepers, & Tily, 2013) whereby

random intercepts and slopes were included for every fixed effect. If the maximal model did not converge, the effect structure was simplified step-wise until convergence was obtained using the recommendations in Barr et al. (2013). In the Results section I report a coefficient, standard error and t -value for the best-fitting linear model in each region. A coefficient was judged to be significant at $\alpha = 0.05$ given the absolute value of t -value of 2 or above (Baayen, 2008), and marginally significant given the absolute t -value of at least 1.8 (in light of a typical number of 800+ degrees of freedom in the experiment that corresponded to $p < 0.07$).

For the analyses of error rates a generalized linear mixed effects model with a binomial link function was used. P -values are based on the Z -score.

Results

Accuracy. The comprehension question accuracy rates were 88.3% (standard deviation: 32.2) in the Accusative condition and 89.0% (31.3) in the Genitive condition.

FIGURE 1 ABOUT HERE

RTs. Mean RTs for each condition are plotted in Figure 1. The results of the statistical analyses are summarized in Table 2. Below, I provide details on regions in which a (marginally) significant effect of Case of direct object was found. Starting with the negated embedded verb, mean reading times in the region 11 corresponding to Negation were the same for the two conditions (ACC-condition – 375 ms, GEN-condition - 374 ms). Critically, at the following verb (region 12) the reading times were significantly longer in the Accusative condition (456 ms) than in the Genitive condition (421 ms). In the following region 13 a similar effect was marginally significant (region PP2^a: ACC-condition – 420 ms, GEN-condition - 404 ms).

At the beginning of the sentence, a significant effect of Case in region 1 was found that was unexpected in light of identical lexical material across conditions, and therefore likely spurious. The noun in the critical NP (region 5) was read significantly faster in the Accusative condition (ACC-condition – 513 ms, GEN-condition - 546 ms). This effect could in part be due to minor differences in the length of the noun (in a subset of items the Genitive suffix on the noun was one letter longer than the Accusative suffix). The outcome of an additional analysis that included the noun length (in letters) as a covariate demonstrates that when the noun length is taken into account the effect of Case on reading times in region 5 is no longer significant (coefficient = 24.7, $t(890)=1.5$). In the following region 6 (a dative adjective) there was a marginally significant trend for longer RTs in the Accusative vs. Genitive condition (583 vs. 545 ms respectively).

TABLE 2 ABOUT HERE

Discussion

The main finding of Experiment 2 is a significant facilitatory effect at the negated embedded verb in the Genitive condition relative to the Accusative condition. I take this effect as a sign of the parser's anticipation of a negated verb on the basis of a previously identified genitive object (in combination with a dative object). As mentioned in the introduction, this process is rather notable as it points to anticipatory projection of multiple heads, i.e., the verb that licenses the object's thematic role and Negation that licenses its genitive case. Furthermore, as Negation is not the only conceivable licenser for genitive case, projecting it requires ruling out other candidate licensors by assessing their permissibility in the given configuration, i.e., prepositions, nouns within possessor NPs, quirky verbs and numerals.

Before continuing with the discussion of the processing mechanism and the nature of the facilitatory effect at the negated verb in the Genitive condition, I discuss significant effects found earlier in the sentence, namely in regions 5 and 6. As suggested by additional RT analysis that included the region length in letters as a covariate, at least in part differences in reading times at the critical NP (region 5) could be attributed to differences in the length of Accusative vs. Genitive case suffixes. Alternatively, a trend for longer RTs at the Genitive noun could be a reflection of increased difficulty in incorporating a Genitive NP as compared to the Accusative NP into the previously built structure, i.e. effort needed to project a genitive case licenser, Negation. In region 6, the Dative adjective was lexically identical in the two conditions, yet the reading times were marginally longer in the Accusative condition. Tentatively I suggest that the slowdown reflects reanalysis of the preceding accusative NP, i.e., the accusative NP is initially taken for the main verb's direct object and is only subsequently reanalyzed as the embedded object. This is plausible because more than half the time the verbs could take an (accusative) NP as complement despite this being a statistically dispreferred alternative. I will revisit this issue in the discussion of Experiment 3.

Let us now return to the facilitatory effect in the Genitive condition which I have interpreted as reflecting the prediction for the negated verb on the basis of case-marking on the preverbal object in order to ensure incremental processing of that object (and other preverbal material) and discuss its nature in more detail. First, it may be noted that alternative explanations for the effect may be proposed: (i) the effect may reflect the parser's anticipation of the negated verb based, for example, on probabilistic contingencies with no regard to considerations of incrementality, or (ii) the effect may not be anticipatory at all and reflect a facilitated combination of two elements encountered bottom up. These two alternatives closely resemble

the notions of prediction and integration as they are formulated in the literature on lexical access. In this literature it is well accepted that words that are supported by the preceding context require less processing effort, which could mean that “readers are using context to generate expectancies for that upcoming item (prediction view) or [...] forced by the word itself to devote more or fewer resources to integrating the word into the existing sentence representation (integration view)” (Kutas, de Long & Smith, 2011). Applying these notions to the present case, the parser may find it easier to combine the negated verb once it has been encountered bottom-up with a preceding genitive-marked object than with an accusative-marked object due to a higher probability of the direct object of a negated verb bearing a genitive case (integration view). Alternatively, a genitive NP (and the following preverbal material) may lead the parser towards predicting a negated verb more strongly than an accusative NP (prediction view). Indeed, as mentioned in the introduction, a negated verb is accompanied by a genitive-marked direct object more often than by an accusative-marked one, a pattern that holds in either order. [Specific counts are as follows: the direct object is Genitive-marked in 67% of cases when the object is pre-verbal, and in 60% of case when it is post-verbal. The counts are based on the corpus query described in fn.2.]

Importantly, in the context of sentence parsing, the notion of prediction traditionally goes beyond the formulation above. Early theories that incorporated prediction into parsing algorithms above all were driven by considerations of incrementality and connectedness of the structure built by the parser (e.g. Kimball 1975; Stabler 1994). Rather than being limited to an enhanced expectation for an item on the basis of the input seen so far (i.e. prediction being akin to an anticipated integration, as apparent in the Kutas et al.’s quote above), prediction also plays a critical role in enabling incremental processing of the sentence when incrementality could not be

attained without top-down structural anticipation. This aspect of prediction, i.e., its role in supporting incremental parsing, that resolutely distinguishes it from integration or prediction as formulated in the lexical access literature, is the focus of Experiment 3.

Thus additional experimentation is needed to assert that the facilitatory effect in Experiment 2 emerged due to a genuine prediction driven by considerations of incrementality. Experiment 3 aimed to replicate the facilitatory effect in the Genitive condition found in Experiment 2 and put to test the competing hypotheses regarding its nature. In addition to the conditions used in Experiment 2 ('Object-first conditions'), Experiment 3 also included another pair of conditions in which negation marker *ne* and the ditransitive verb preceded the Accusative- or Genitive-marked direct object ('Negation-first conditions'). Table 3 illustrates a full sample set of conditions from Experiment 3. Negation-first conditions were obtained by swapping the position of the direct object and the negated verb in the Object-first condition, which is possible due to free word order in Russian. If the facilitatory effect at the negated verb following a genitive-marked vs accusative-marked object in Experiment 2 was purely due to a relative ease of integration of Negated verb with a Genitive object (as compared to an Accusative object), one should expect such facilitation be also present in Negation-first condition. Indeed, given that integration as a process of combining two items from the bottom-up input, the effort of combining them should be equivalent for both orders. That is, in the Negation-first condition, the Genitive object should be read more quickly than the Accusative object following the negated verb. [An implicit assumption is that integration effects should be observable at either item, i.e., at the negated verb or NP. See General Discussion for more details.] Similarly, if the facilitatory effect in Experiment 2 reflected the parser's anticipation of a negated verb on the basis of its higher probability following a genitive vs. accusative direct object, we should also

find facilitation in the Negation-first condition in Experiment 3 as it enables a stronger prediction for genitive vs. accusative direct object following a negated verb. On the other hand, if the facilitatory effect in Experiment 2 was due to a prediction of the Negation and verb driven by the need to incrementally incorporate the preverbal arguments into the parsing tree, it should be absent or strongly reduced in the Negation-first condition (in which prediction is not required to process the sentence incrementally) as compared to the Object-first condition in Experiment 3.

Experiment 3

Participants. Forty Russian speakers aged 18-35 were recruited in St. Petersburg, Russia. Inclusion criteria and testing location were the same as in Experiment 2.

TABLE 3 ABOUT HERE

Materials. A sample set of materials from the online task is shown in Table 3. The Object-first and Negation-first conditions differed only in the linear order of the critical (genitive or accusative) direct object NP and the negated verb. Hence, the experiment followed a 2×2 design with factors Linear Order (Object-first vs. Negation-first) and Case of direct object (Acc vs. Gen). Experiment 3 contained 40 sets of experimental conditions (24 from Experiment 2 with some modifications and 16 new sets of sentences; see Appendix C for a full set of experimental materials). Participants were randomly assigned to one of four presentation list resulting from distributing 40 sets of stimuli using a Latin-square design. In addition to 40 experimental sentences each list also contained 78 filler sentences that were similar to the test sentences in length and complexity. The order of sentences within the list was randomized for each participant. The rest of the procedure was identical to Experiment 2.

Analysis. Data from one participant were not included due to a technical error and two items were excluded due to low response accuracy (below 70%). RTs below 150 ms or above 2000 ms (.3% of the datapoints) and sentences that were responded to incorrectly were excluded from the RT analysis.

A linear mixed effects model was constructed for every region corresponding to a single word, and included the fixed effects of Linear Order, Case of direct object and their interaction, and random effects of participants and items. Regions were defined in terms of lexical content rather than sentential position; accordingly, some regions occupied different sentential positions in the Object-first vs Negation-first conditions (see Table 3). As in Experiment 2, for each model a maximal random-effect structure justified by the design was used (Barr, Levy, Scheepers, & Tily, 2013) whereby random intercepts and slopes were included for every fixed effect.

Whenever planned pairwise comparisons were performed following interactions, the analysis was carried out on the subset of data corresponding to the relevant pair of conditions. The rest of the analysis procedure was the same as in Experiment 2.

Results

Accuracy. The comprehension question accuracy rate was 91.43% (st. dev.: 28.1). The rates for individual conditions were: Object-first/Accusative – 91.5% (27.9), Object-first/Genitive – 92.8% (26.0), Negation-first/Accusative – 90.5% (29.4), Negation-first/Genitive – 90.8% (29.0).

FIGURE 2 ABOUT HERE

RTs. Mean reading times for all four conditions in Experiment 3 are shown in Figure 2. The results of the statistical analyses are summarized in Table 4.

TABLE 4 ABOUT HERE

Below I discuss regions in which a significant effect of Case of direct object, Linear Order or their interaction was found. Of special interest is the negated embedded verb. While there were no significant effects or interactions at the negation, at the embedded verb the effect of Linear Order and the interaction Linear Order $\times$ Case were significant. The effect of Linear Order was due to longer RTs at the embedded verb in the Object-first conditions and could be due to differences in its sentential position (5th word in the Negation-first and 12th in the Object-first conditions). The Linear Order $\times$ Case interaction reflects that the verb was read significantly more quickly when the direct object was Genitive-marked in the Object-first conditions (Gen: 372 ms, Acc: 398 ms), but not in the Negation-first conditions (Gen: 374 ms, Acc: 356 ms). This was supported by the outcomes of pairwise comparisons, i.e. an effect of Case was significant in the Object-first conditions ($\beta = -28.7$, $t(686) = -2.03$) but not in the Negation-first conditions ($\beta = 21.9$, $t(686) = 1.5$).

The effect of Linear Order was significant at the critical direct object (CritNP_Noun and CritNP_Adj) and at the adjective from the dative NP (DatNP_Adj). These effects are expected and due either to the fact that the sentential position of the region differed across Negation-first and Object-first conditions (as true for the critical NP), or because preceding regions contained lexical material that differed across Negation-first and Object-first conditions (as true for the DatNP_Adj). [As in Experiment 2 an additional analysis for CritNP_Noun region was run due to some differences in the length of Genitive vs. Accusative nouns. The effect of noun length was non-significant ($\beta = 3.4$, $t(1373) < 1$) and other effects were very similar to those in Table 4.] The interaction Linear Order $\times$ Case was significant at the dative noun and (marginally) significant

the following two regions (PP1^a & PP1^b). When the interaction was resolved via pairwise comparisons, no differences were found in the Negation-first conditions (DativeNoun: $\beta = 15.8$, $t(685) = 1.1$; PP1^a: $\beta = 16.1$, $t(686) = 1.6$; PP1^b: $\beta = 9.6$, $t(687) = 0.8$). This is expected as the two Negation-first conditions were identical to each other until after PP1. In the Object-first conditions, a significant effect of Case was found at the dative noun and at PP1^b reflecting slower RTs following an Accusative object (DativeNoun: $\beta = -28.5$, $t(686) = -2.4$; PP1^a: $\beta = -10.1$, $t(688) = -0.9$; PP1^b: $\beta = -24.2$, $t(689) = -2.6$). A similar effect was marginally significant in Experiment 2. I believe that this effect reflects reanalysis of the preceding critical NP in the Accusative condition and return to this finding in the Discussion.

Discussion

The Object-first condition from Experiment 3 replicated the main findings of Experiment 2, i.e., the processing of a negated verb takes less effort when it is preceded by a genitive-marked as compared to an accusative-marked direct object. However, in the Negation-first condition no differences in reading times were found at the genitive- vs. accusative-marked object that followed a negated verb. The results are incompatible with a purely integration-based account of the facilitatory effect in the Object-first condition: if the effect were due to a relative ease of combining a negated verb with a genitive-marked as compared to accusative-marked object after they become available bottom-up, it should have been observed in both orders, contrary to what has been found. A simple predictive process that anticipates a head on the basis of already encountered material is unlikely to be sufficient either: a negated (di-)transitive verb is accompanied by a genitive-marked direct object more often than by an accusative-marked object regardless of whether the object is pre-verbal or post-verbal and hence a similar effect should be

expected in the Negation-first vs. Object-first conditions, contrary to the findings. As further elaborated in the General Discussion, the results from Experiments 2 & 3 argue for the parser's use of morphological case marking on pre-verbal NPs to predict the upcoming sentence structure in order to maintain incremental structure building.

One point worth mentioning before the General Discussion concerns a significant Linear Order $\times$ Case interaction at the dative noun and the following two regions (PP1^a & PP1^b) which emerged due to slower reading times with an Accusative- vs. Genitive-marked direct object, but only in the Object-first conditions. When a similar, albeit only marginally significant, effect was observed in Experiment 2 I suggested a tentative account whereby the parser initially treats the accusative NP as the verb's direct object which results in reanalysis and longer RTs a few regions downstream. This explanation may also account for the significant effects found at the dative noun and the following region in Experiment 3. Although the main verb was always strongly biased towards taking a clausal argument, 38% (15/40) of items contained a verb that could also take an (accusative) NP argument [for the remaining 25/40 items the verb could only take a clausal argument]. Hence the effect in question could be due to a reanalysis from the NP-complement frame to a clausal complement in the Accusative Object-first condition. Note that the fact that only accusative but not genitive-marked NPs were temporarily considered as the verb's direct object by the parser points to its early use of case information, and accords with an observation that morphological case provides critical guidance to the parser that is necessary for linking nominal arguments to their grammatical roles (Bornkessel & Schlesewsky, 2006).

General Discussion

The results from Experiment 2 and from the Object-first conditions in Experiment 3 clearly demonstrate that the processing of a negated embedded verb in Russian was facilitated by a preceding genitive-marked direct object as compared to an accusative-marked direct object. Conceivably this result can be interpreted as either stemming from the parser's prediction of a negated verb on the basis of a previously identified Genitive-marked direct object, or from facilitated integration of the negated verb with a direct object when the latter bears a genitive as compared to accusative case. I argue that the outcome from the Negation-first condition, in which the order of the negated verb and the direct object was swapped, points to the prediction-based alternative. In the Negation-first condition, similar reading times were found for the accusative-marked and genitive-marked objects that followed a negated verb, which suggests that ease of integration of the negated verb and the direct object is not measurably different for accusative- vs. genitive-marked objects (even though probabilistically, the direct object that follows a negated verb is genitive marked in 67% of cases, and accusative-marked in 33% of cases). This suggests that the facilitatory effect at the negated verb in the Object-first condition is due to the parser's ability to anticipate Negation and Verb heads on the basis of case marking on a genitive-marked direct object. Furthermore, as argued in the Discussion for Experiments 2 and 3, this predictive process cannot be reduced to a higher expectancy of the negated verb on the basis of higher co-occurrence of it with Genitive direct object. Instead, a critical component driving the parser's prediction of multiple heads is the need to ensure incremental parsing of the sentence.

Predicting Negation and Verb heads following the genitive NP in the Object-first condition is far from straightforward and requires ruling out a range of other possible licensors

for the genitive case and revising the prediction in light of the bottom-up material (in particular, a quirky verb or a comparative adverb, see the Introduction), yet it is critical for ensuring that the preverbal object is incrementally incorporated into a connected parsing tree rather than left hanging. This latter consideration explains why the prediction-based facilitation was found only in the Object-first condition, even though there is a more straightforward prediction from a negated verb to a genitive-marked direct object in the Negation-first condition. Indeed, in the Negation-first condition predicting the Genitive direct object following a negated verb that is transitive should to be a simpler process: it requires predicting a single N(oun) head, as opposed to two heads in the Object-first condition, there is no need to revise the initial prediction for a direct object, etc. Yet, despite it requiring more effort than in the Negation-first condition, the parser formulates a more active prediction in the Object-first condition in order to incrementally parse the preverbal material.

The findings from Experiments 2 and 3 extend the claim that case information on a preverbal NP is actively used for predictive structure building, i.e., for projecting an upcoming verb, proposed for head-final languages (Kamide et al., 2003; Miyamoto, 2002; Yamashita, 1997). I demonstrate that the parser makes predictions based on case marking in languages with free word order in which grammatically and/or probabilistically verbs are not restricted to positions to the right of their arguments. A novel finding from the present study is that prediction based on case-marking may lead to projection of multiple heads if a single head is insufficient to ensure a licit incremental incorporation of a preverbal NP into the parsing tree. In addition to the verb, the prediction of Negation, an otherwise optional head, is made in order to accommodate

the Genitive-marked object into the tree structure and license both its thematic role (by the verb) and its case (by Negation).

It is important to consider a potential criticism of the logic behind Experiment 3 whereby the presence of a facilitatory effect in the Object-first vs. its absence in the Negation-first condition is attributed to the fact that it is measured at the negated verb vs. noun phrase respectively. Could it be that the processing is similar in both cases (i.e. there is facilitation in the case where the negated verb is accompanied by a genitive object) but the effect is observed more prominently at the verb vs. object, e.g. due to their grammatical category differences? Although this possibility cannot be fully ruled out in the current study, the concern is at least partly alleviated if other studies are brought into consideration. In particular, ample research has shown that reading times for post-verbal NPs can reflect relative difficulty of integrating that NP with the preceding verb, e.g., reading times at the post-verbal NP vary as a result of manipulating its semantic plausibility as the verb's complement (e.g. *[T]he woman edited/sailed the magazine*, Pickering & Traxler, 1998). Hence unless proven otherwise, it is reasonable to assume that facilitated integration of the genitive object and the negated verb should be observable irrespective of whether the critical region is the verb or the NP. The absence of any effect in the Negation-first condition suggests therefore that the facilitation found in the Object-first condition was not solely due to integration.

The facilitatory effect at the negated embedded verb in the Genitive condition is rather noteworthy. It would not be surprising if Genitive-of-Negation sentences were overall more costly for the parser than their accusative counterparts. Indeed, the direct object in the Accusative condition is licensed similarly to that in an affirmative sentence, i.e., its case and its thematic role are both licensed by the verb. Hence, the Accusative condition can be parsed via a standard

parsing procedure applied in the case of affirmative sentences. On the contrary, identification of the Genitive-of-Negation structure requires additional effort regardless of whether the parser is lexicalized or grammar-based (see the section *Implications for parsing theories*). An important finding therefore is that, once identified, the Genitive-of-Negation structure entails no additional processing costs for the parser; on the contrary, it yields a facilitatory effect at the negation and the verb. The results are ambiguous as to how costly initial identification of the Genitive-of-Negation structure is: there was a trend for slower reading times at the Genitive vs Accusative object in Experiment 2, but not in the corresponding Object-first conditions in Experiment 3. However, the present findings unambiguously demonstrate facilitation later in the sentence (shorter reading times at the negated verb following the Genitive object). Overall, this serves as further evidence for the claim that a predictive mechanism is an integral part of sentence comprehension (Chen, Gibson, & Wolf, 2005; Crocker, 1994; Lau, Stroud, Plesch, & Phillips, 2006; Staub & Clifton, 2006; Yoshida, Walsh Dickey & Sturt, 2013; Yoshida, 2006). Furthermore, this highlights similarity between the Genitive-of-Negation dependencies and other syntactic dependencies [e.g., wh-dependencies (Stowe, 1986; Sussman & Sedivy, 2003; Traxler & Pickering, 1996) and backwards anaphora (van Gompel & Liversegde, 2003; Kazanina et al., 2007)] in that in all cases the parser uses the first element of the dependency to actively anticipate its remainder. Critically, the dependency completion is anticipated in accordance with grammatical restrictions on the dependency. Such a mechanism constrains the space of possible sentence continuations to those that secure a licit dependency completion: in a wh-dependency, the upcoming structure needs to contain a gap for a previously-seen wh-filler, in backwards anaphora - an antecedent for a cataphoric pronoun, in Genitive-of-Negation - a negated verb to license a preverbal genitive-marked NP.

A final point before discussing the implications of the findings for parsing theories is that whereas the results demonstrate that the parser anticipates negation as a licenser for the genitive NP, they are not conclusive as to whether alternative licensors are considered in parallel. Recall that, in the offline sentence fragment completion task (Experiment 1) alternative licensors for the genitive NP (in particular, adverbs) were offered, albeit infrequently. This, together with an active prediction of a negated verb in the online task, indicates that in the current stimulus set the combination of grammatical, word-order and frequency considerations disfavors most alternative licensors. Yet, I remain agnostic whether, during online processing of the experimental sentences, the few remaining possibilities (in particular, numerals or adverbs) are fully disregarded or whether they are considered in parallel with the Genitive-of-Negation structure.

Implications for parsing theories

As mentioned earlier, the results from Experiments 2 and 3 are notable as they point to anticipatory projection of multiple heads, i.e. the verb and negation. Thus they argue against strongly bottom-up approaches to structure building such as head-driven parsing models (Abney 1989, Pritchett 1992, Mulders 2003) by demonstrating that the verb and negation heads are projected ahead of bottom-up input on the basis of preverbal arguments. Most previous research demonstrated prediction of a verbal head in head-final languages in which such prediction could potentially be viewed as a last-resort response to a ubiquitous necessity to deal with preverbal arguments, as unattached NPs would regularly result in a significant working memory load. The current demonstration that verb heads can be predicted in Russian, a non-head final language, is notable and suggests a wider role for predictive structure building algorithms (see also Pablos, 2006 for Spanish, Omaki et al. 2015 for English wh-dependencies). In particular, the standard

left-corner parsing algorithm (Abney & Johnson, 1991; Resnick, 1992; Stabler, 1994, among others) in combination with lexicalized grammar can be used to explain the results. The left-corner strategy has a top-down predictive component that operates as follows: once the first constituent of a phrase is recognized in the bottom-up input, the prediction of a subsequent constituent can be triggered on the basis of a syntactic rule. For example, once a NP is formed bottom-up (e.g. *The boy...*) the rule $S \rightarrow NP + VP$ is invoked of which the NP is the left hand-side constituent (i.e. ‘left corner’), which in turn triggers projection of a VP ahead of bottom-up input. In the Accusative condition, upon encountering the accusative and dative NPs in the bottom-up input, the parser predicts a ditransitive verb using $VP \rightarrow V + NP^{ACC} + NP^{DAT}$ rule (recall that in Russian word order is flexible and hence $NP^{ACC} + NP^{DAT}$ can appear before the verb and serve as a left corner) and incorporates the preverbal NPs into a connected structure. Negation is not actively predicted in the Accusative condition on the basis of this rule and must be added into the parsing tree on the basis of bottom-up input. In the Genitive condition, when NP^{GEN} is encountered it can trigger prediction of a quirky verb (on the basis of $VP \rightarrow V + NP^{GEN}$ rule), another nominal ($NP \rightarrow N + NP^{GEN}$), adverb ($AdvP \rightarrow Adv + NP^{GEN}$) or negative phrase with a transitive or intransitive verb $NegP \rightarrow Neg + V + NP^{GEN}$ or $NegP \rightarrow Neg + V + NP^{GEN} + NP^{DAT}$ using a left-corner strategy (NP^{GEN} is a valid left corner in all these cases as the nominal arguments can precede the head). The appearance of the NP^{DAT} in the bottom-up input invalidates all alternatives except for the latter. Note that in the case above postulating a lexicalized Genitive-of-Negation rule $NegP \rightarrow Neg + V + NP^{GEN} (+ NP^{DAT})$ is critical for rendering NP^{GEN} into a left corner that can trigger projection of Negation and Verb.

As an alternative to the account above that assumed a lexicalized rule $NegP \rightarrow Neg + V + NP^{GEN} (+ NP^{DAT})$, the Genitive-of-Negation may be encoded as a combination of structural

rules in a grammar-based parser. In this case there is a rule $\text{NegP} \rightarrow \text{Neg} + \text{VP}$ and a rule whereby the structural Accusative case on the verb's direct object changes to Genitive. In addition, the parser should be aware of the split licensing pattern whereby Case and thematic role (on NP^{GEN}) are not assigned by the same head. These considerations on what a parser should be able to achieve will hopefully trigger further research from grammar-based parsing theorists.

In conclusion, the findings demonstrate that in Russian, a free-word-order language, morphological case information is used by the parser for predictive structure building when it is available in the input ahead of information about the heads. Such an anticipatory mechanism allows projection of multiple lexical heads when a single head is insufficient for incremental incorporation of the bottom-up material into the parsing tree.

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Appendix A. Examples of most frequent completion types for individual conditions from the completion task. Respondents' continuations are in italics; the licenser of the genitive object is underlined.

Condition	Respondent's completion [completion type]
Acc+Dat: NPNOM Main-verb NPACC NP ^{DAT} ... Direkcija zavoda prikazala otvetnye trebovanija ^{ACC} protivopoložnoj storone ^{DAT} ... The factory management ordained reciprocal conditions ^{ACC} to the opponents ^{DAT}	... <u>oformit'</u> v pis'mennom vide. [Affirmative] <u>to.draw</u> in writing. ... <u>ne vydavat'</u> . [Negative] <u>not to.issue</u> .
Acc-only: NPNOM Main-verb NPACC ... Opytnye poljarniki staralis' razvernutyje otčety ^{ACC} ... Experienced polar explorers tried extensive reports ^{ACC} ...	... <u>xranit'</u> v osobo nadežnyx mestax. [Affirm.] <u>to.keep</u> in especially secure places. ... <u>ne pisat'</u> . [Negative] <u>not to.write</u>
Gen+Dat: NPNOM Main-verb NP ^{GEN} NP ^{DAT} ... Administracija gostinicy prikazala dorožix kon'jakov ^{GEN} priglašennym gostjam ^{DAT} ... The hotel administration ordained expensive brandy ^{GEN} for the invited guests ^{DAT}	... <u>ne nalivat'</u> . [Negative] <u>not to.pour</u> ... <u>davat' kak možno bol'se</u> [Other Gen licenser, comparative adverb] <u>to.give as possibly more</u> (<u>'to give as much as possible of brandy'</u>)
Gen-only: NPNOM Main-verb NP ^{GEN} ... Gid postaralsja dolgix perexodov ^{GEN} ... Guide attempted long crossings ^{GEN} ...	... <u>ne ustraivat'</u> . [Negative] <u>not to.arrange</u> ... <u>izbežat'</u> . [Other Gen licenser] <u>to.avoid</u>
Nachal'nik oxrany prikazal vremennyx propuskov ^{GEN} ... Director of security ordained temporary passes ^{GEN}	... <u>vydavat' kak možno men'se</u> [Other Gen licenser, comparative adverb] <u>to.issue as possibly fewer</u> (<u>'to issue as few as possible (of passes)'</u>)

Appendix B. Experimental sentences from Experiment 2. A fully spelled out conditions are provided for the first set. In sets 2-24 the Accusative/Genitive direct object and the negated embedded verbs are highlighted in bold.

For every item the lead-in sentence presented all at once (indicated by curly brackets { }) is followed by the critical sentence presented word-by-word.

[Fillers in Experiment 2 were fillers 1-48 for Experiment 3, see Appendix C.]

1. {Аэропорт принимал чужие рейсы из-за непогоды в Москве.}
Accusative condition
 Многие летчики старались **длинные сообщения** наземным диспетчерам до подлёта к аэропорту **не передавать** из-за загруженности эфира.
Genitive condition
 Многие летчики старались **длинных сообщений** наземным диспетчерам до подлёта к аэропорту **не передавать** из-за загруженности эфира.
2. {В клинике можно было провести любые анализы.} Молодой врач постарался **дополнительные обследования/дополнительных обследований** пожилому пациенту на этот раз **не назначать** ради ускорения процесса лечения основного заболевания.
3. {Присутствие гостей сказывалось на настроении детей.} Чуткая учительница старалась **трудные вопросы/трудных вопросов** разволнованным ученикам на открытом уроке **не задавать** ввиду явного смятения детей.
4. {Экскурсий было запланировано очень много.} Понятливый гид постарался **долгие переходы/долгих переходов** утомлённым экскурсантам во второй половине дня **не навязывать** ради сохранения полной численности группы.
5. {Первые сутки космического полета проходили спокойно.} Командир корабля старался **опасные зоны/опасных зон** космическим туристам в ходе полета **не показывать** из-за возможных рискованных действий новичков.
6. {Днём почему-то возникали сильные радиопомехи.} Опытные полярники старались **развернутые отчеты/развернутых отчетов** Большой земле в дневное время **не посылать** из-за ненадежности связи.
7. {Банкет проходил в конференц-зале гостиницы.} Администрация гостиницы приказала **дорогие коньяки/дорогих коньяков** приглашенным гостям во время банкета **не предлагать** ввиду ограниченного бюджета.
8. {Последствия происшествия были весьма неприятными.} Главный редактор приказал **конфиденциальные подробности/конфиденциальных подробностей** взволнованным слушателям в прямом эфире **не сообщать** до обнародования официальной версии прокуратуры.
9. {Засаду устроили высоко в горах.} Командир отряда приказал **подробные донесения/подробных донесений** главному штабу в первое время **не посылать** ради сохранения тайны их местоположения.
10. {Приближались новогодние праздники.} Заведующий ателье приказал **внеплановые заказы/внеплановых заказов** ведущим мастерам до конца года **не давать** ввиду их перегруженного графика.
11. {Музей приобрел на аукционе несколько картин знаменитого художника.} Директор музея приказал **новые поступления/новых поступлений** любопытным посетителям в первые месяцы **не показывать** до прохождения картинами экспертизы и реставрации.
12. {Прибыль предприятия катастрофически сократилась.} Финансовый директор приказал **дополнительные надбавки/дополнительных надбавок** главному маркетологу за последний месяц **не выплачивать** из-за снижения объемов продаж и доходов.
13. {На фирме провели кадровые перестановки.} Новоиспеченный начальник приказал **временные пропуска/временных пропусков** посторонним посетителям до соответствующего разрешения **не оформлять** из-за отсутствия письменных заявок начальников отделов.
14. {Срок ультиматума подходил к концу.} Дирекция завода приказала **ответные требования/ответных требований** противоположной стороне до окончания конфронтации **не предъявлять** из-за возможных осложнений ситуации.
15. {Приближалось время летних экзаменов.} Администрация колледжа постановила **дисциплинарные нарушения/дисциплинарных нарушений** нерадивым студентам до конца сессии **не прощать** из-за участившихся жалоб преподавателей.
16. {Приближался день 75-летнего юбилея маститого режиссёра.} Гильдия кино постановила **торжественные церемонии/торжественных церемоний** знаменитому юбиляру на этот раз **не навязывать** ради его собственного спокойствия.
17. {Возле здания банка царил переполох и дежурила милиция.} Собрание правления постановило **накопленные дивиденды/накопленных дивидендов** рассерженным вкладчикам в весеннем квартале **не выплачивать** из-за ухудшения ситуации на фондовом рынке.

18. {Нужных материалов на складе не было.} Конструкторское бюро постановило **новые заказы/новых заказов** испытательному участку до конца квартала **не давать** из-за перегруженности снабженцев.
19. {Хотя конвейер был наконец запущен, оставались проблемы.} Озабоченные инженеры договорились **опытные образцы/опытных образцов** большому начальству до конца недели **не предъявлять** из-за обнаруженных накануне недоделок.
20. {Свадьбу решили отмечать по-скромному, в семейном кругу.} Родители заранее договорились **громоздкие подарки/громоздких подарков** будущим молодоженам на день свадьбы **не дарить** из-за отсутствия места в их квартире.
21. {Многодневный конкурс подходил к концу.} Организаторы состязаний договорились **новые задания/новых заданий** счастливым победителям в заключительный день **не давать** ради сохранения их энтузиазма на будущее.
22. {Ситуация становилась всё более напряженной.} Акционеры компании договорились **дополнительные условия/дополнительных условий** финансовым представителям в текущем году **не ставить** из-за возможных осложнений.
23. {Дневное представление затягивалось.} Утомленный клоун решил **воздушные шарiki/воздушных шариков** расшалившимся ребятишкам из первых рядов **не раздавать** до самого конца праздника.
24. {Дело оказалось достаточно щекотливым.} Прозорливый детектив решил **детальные факты/детальных фактов** назойливому клиенту до завершения расследования **не докладывать** во избежание неприятностей.

Appendix C. Experimental and filler sentences from Experiment 3. For every item the lead-in sentence was presented all at once (indicated by curly brackets { }) and was followed by the critical sentence presented word-by-word.

A fully spelled out conditions are given for the first set. For sets 2-40 the Object-first condition (Accusative/Genitive) is provided; the Negation-first condition can be obtained by swapping the Accusative/Genitive direct object and the negated embedded verbs which are highlighted in bold.

1. {Подошел срок обязательной диспансеризации.}

Object-first, Accusative: Школьный врач приказал **обязательные прививки** четверым ученикам из второго класса **не делать** ввиду их ослабленности.

Object-first, Genitive: Школьный врач приказал **обязательных прививок** четверым ученикам из второго класса **не делать** ввиду их ослабленности.

Negation-first, Accusative: Школьный врач приказал **не делать** четверым ученикам из второго класса **обязательные прививки** ввиду их ослабленности.

Negation-first, Genitive: Школьный врач приказал **не делать** четверым ученикам из второго класса **обязательных прививок** ввиду их ослабленности.

2. {В студии царил неразбериха.} Некоторые ребята намеревались **удачные рисунки/удачных рисунков** своему руководителю из художественной студии **не возвращать** из-за боязни потерять их.
3. {Работники гостиницы друг с другом не ладили.} Администратор гостиницы приказал **нужные документы/нужных документов** молодому сотруднику из коммерческого отдела **не передавать** из-за личной неприязни.
4. {Ралли «Париж-Даккар» подходило к концу.} Австралийская команда старалась **запасные детали/запасных деталей** техническим службам при таможенных структурах **не оставлять** ввиду невозможности вернуться за ними.
5. {Из кабинета химии пропали взрывоопасные реактивы.} Учительница химии старалась **неприятные подробности/неприятных подробностей** возмущенным мамам из родительского комитета **не рассказывать** ввиду возможного выговора.
6. {Кризис повлиял на отношения между партнерами в бизнесе.} Менеджер проекта распорядился **новые разработки/новых разработок** ненадежным поставщикам из мелких фирм **не предлагать** ввиду их неустойчивого положения.
7. {Положение с развитием бизнеса в Поволжье ухудшалось.} Самарский предприниматель старался **неприятные новости/неприятных новостей** потенциальным поставщикам из зарубежных фирм **не рассказывать** из боязни потерять выгодных партнеров.
8. {В детский сад привезли много новых игрушек.} Заведующая детсадом велела **глиняные игрушки/глиняных игрушек** маленьким детям из ясельной группы **не давать** из-за их ломкости.
9. {Сборы юниорской команды только что начались.} Опытный тренер старался **резкие замечания/резких замечаний** молодым спортсменам из волейбольной команды **не делать** из соображений тактичности.
10. {Любовный роман развивался стремительно.} Умная девушка старалась **старые тайны/старых тайн** богатому поклоннику из влиятельных кругов **не раскрывать** ради сохранения отношений.
11. {Проект раздвижного моста принимал весьма интересные формы.} Талантливый инженер намеревался **свои разработки/своих разработок** другим инженерам из конструкторского бюро **не передавать** ввиду возможного патента.
12. {Психологические тренинги выматывали всех участников.} Приглашенный психолог старался **длительные тренинги/длительных тренингов** усталым педагогам из детского дома **не предлагать** из-за их постоянной занятости.
13. {Подходил конец финансового года.} Главный бухгалтер распорядился **итоговые ведомости/итоговых ведомостей** неопытным практикантам из планового отдела **не давать** во избежание путаницы.
14. {Перед приближением холодов люди бросились чинить зимнюю обувь.} Предприимчивый сапожник старался **выгодные заказы/выгодных заказов** другим работникам в своей мастерской **не отдавать** из желания подзаработать.
15. {Скандалы вокруг спортивных чиновников возникали постоянно.} Именитые хоккеисты договорились **призовые деньги/призовых денег** жуликоватым чиновникам из хоккейной федерации **не доверять** во избежание афер.

16. {Шли съемки программы о театрах Москвы.} Молодой журналист старался **нелицеприятные вопросы/нелицеприятных вопросов** знаменитому режиссеру из Малого театра **не задавать** ввиду обидчивости мэтра.
17. {Ситуация была сложной.} Многие летчики старались **длинные сообщения/длинных сообщений** дежурным диспетчерам из наземной службы **не передавать** из-за загруженности эфира.
18. {В клинике можно было провести любые анализы.} Молодой врач постарался **дополнительные обследования/дополнительных обследований** пожилому пациенту из ортопедического отделения **не назначать** ради ускорения выписки.
19. {Присутствие наблюдателей на открытом уроке смущало учеников.} Чуткая учительница старалась **трудные вопросы/трудных вопросов** разволновавшимся ученикам на открытом уроке **не задавать** ввиду их явного смятения.
20. {Экскурсионная программа была очень насыщенной.} Понятливый гид постарался **пешие экскурсии/пеших экскурсий** пожилым туристам из Западной Европы **не навязывать** ввиду их возраста.
21. {Иностранцев туристов на корабле было мало.} Экипаж корабля старался **свои услуги/своих услуг** богатым туристам из Южной Кореи **не навязывать** дабы не показаться назойливыми.
22. {Днём почему-то возникали сильные радиопомехи.} Опытные полярники старались **развернутые отчеты/развернутых отчетов** Большой земле в дневное время **не посылать** из-за ненадежности связи.
23. {Банкет проходил на теплоходе.} Озабоченные организаторы приказали **дорогие напитки/дорогих напитков** многочисленным гостям на нижней палубе **не предлагать** ввиду ограниченности бюджета.
24. {Происшествие было очень неприятным.} Следственная группа потребовала **криминальные подробности/криминальных подробностей** возмущенным зрителям в телевизионной студии **не сообщать** до появления официальной версии.
25. {Засаду устроили высоко в горах.} Полевой командир приказал **подробные радиোগраммы/подробных радиোগрам** главному штабу во время операции **не посылать** ради сохранения тайны местоположения отряда.
26. {Приближались новогодние праздники.} Заведующий ателье приказал **внеплановые заказы/внеплановых заказов** ведущим мастерам из швейного цеха **не давать** ввиду их перегруженности.
27. {Коллекция музея пополнилась несколькими иконами 16-го века.} Директор музея приказал **новые поступления/новых поступлений** любопытным посетителям из художественной школы **не показывать** до окончания реставрационных работ.
28. {Прибыль предприятия катастрофически сократилась.} Финансовый директор приказал **ежемесячные бонусы/ежемесячных бонусов** главному маркетологу из отдела продаж **не выплачивать** из-за снижения доходов.
29. {В отделе безопасности провели кадровые перестановки.} Новоиспеченный начальник приказал **одноразовые пропуска/одноразовых пропусков** посторонним посетителям до конца месяца **не оформлять** без его личного распоряжения.
30. {За решением работники завода обратились в профсоюз.} Профсоюзная организация постановила **новые требования/новых требований** до начала квартала заводской администрации **не предъявлять** из-за возможного осложнения ситуации.
31. {Поведение студентов во время летней практики перешло за пределы дозволенного.} Строгий ректор приказал **дисциплинарные нарушения/дисциплинарных нарушений** распутившимся студентам в геологической группе **не прощать** из-за участвовавших жалоб преподавателей.
32. {Приближался 85-летний юбилей большого мастера сцены.} Театральный бомонд предпочел **торжественные мероприятия/торжественных мероприятий** пожилому юбиляру со слабым здоровьем **не навязывать** ввиду его самочувствия.
33. {Возле банка собралась разгневанная толпа.} Крупные акционеры предложили **накопленные дивиденды/накопленных дивидендов** мелким вкладчикам по валютным счетам **не выплачивать** ввиду сложной финансовой ситуации.
34. {Срок сдачи проекта приближался.} Конструкторское бюро потребовало **новые задания/новых заданий** испытательному участку до конца квартала **не давать** из-за перегруженности инженеров.
35. {Проблемы с конвейером не прекращались.} Озабоченные инженеры договорились **опытные образцы/опытных образцов** большому начальству на областной выставке **не предъявлять** из-за обнаруженных накануне недоделок.
36. {Свадьбу решили отмечать в семейном кругу.} Рациональные родители договорились **громоздкие подарки/громоздких подарков** будущим молодоженам на их свадьбу **не дарить** из-за отсутствия у детей собственной квартиры.
37. {Многодневный конкурс подходил к концу.} Организаторы конкурса договорились **сложные задания/сложных заданий** изнеможенным финалистам в заключительный день **не давать** ради сохранения атмосферы праздника.

38. {Ситуация становилась всё более напряженной.} Акционеры компании постановили **денежные премии/денежных премий** региональным менеджерам по итогам года **не выплачивать** из-за финансовых осложнений.
39. {Дело оказалось достаточно щекотливым.} Опытный детектив намеревался **мелкие подробности/мелких подробностей** назойливому клиенту до конца расследования **не докладывать** во избежание дальнейших расспросов.
40. {Стюарды не успевали обслуживать пассажиров.} Старшая стюардесса распорядилась **детские комплекты/детских комплектов** юным пассажирам в экономическом салоне **не раздавать** ради экономии времени

Fillers.

1. {План по расчистке подвального помещения был принят.} Сотрудники решили громоздкие предметы выносить из помещений в последнюю очередь.
2. {Жара изнуряла путешественников.} Ребята решили устроить недолгий привал для отдыха и переодевания прямо на тропе ввиду приближающейся грозы.
3. {На улице отставной генерал показывал свои военные награды.} Узнав об этом, мальчишки попытались оставшуюся уборку переложить на младших сестренку и убежать во двор до прихода родителей.
4. {Ремонтные работы намного отставали от графика.} Директор магазина приказал своим сотрудникам выйти на работу по благоустройству прилегающей территории в выходной день ввиду приближающегося открытия магазина.
5. {В отношениях между игроками шахматного клуба царило напряжение.} Молодые ребята опасались вступить в конфликт с опытными игроками из-за возможного длительного отлучения от клуба.
6. {Футбольный матч постепенно превращался в битву.} Судья предпочел обоим футболистам предъявить красные карточки для пресечения в дальнейшем жесткой игры с обеих сторон.
7. {Удовлетворение клиентов было основной задачей работников гостиницы.} Администратор гостиницы пообещал ресторанное меню на время изменить в соответствии со вкусами приезжающей группы туристов.
8. {Начальство требовало результата.} Руководитель научно-исследовательской лаборатории пообещал опытные образцы изделий представить на экспертизу к концу месяца.
9. {Приближались новогодние праздники.} Почтальон предпочитал в начале смены разносить почтовые переводы и заказную корреспонденцию по всему участку для ускорения и облегчения остальной работы.
10. {Заказ на ремонт квартиры был оформлен.} Модный дизайнер предложил использовать современную цветовую гамму в оформлении небольшой квартиры для оптимизации пространства.
11. {Составлялась цирковая программа на следующий сезон.} Дрессировщик предложил режиссеру переставить композиционные акценты в программе для более эффектной подачи номера со слонами в представлении.
12. {Старая аппаратура выходила из строя.} Мастер предложил клиентам старые детали в телевизоре заменять по очереди для четкой локализации неисправности.
13. {Появлялись новые методы работы с трудными детьми.} Молодой тренер предложил дирекции дельфинария разнообразные развивающие занятия с детьми проводить на воде с дельфинами.
14. {Студенты в группе интеллектом не блистали.} Преподаватель предложил некоторые вопросы из пройденного материала оставить для проработки дома ввиду ограниченного времени занятия.
15. {Настал день первой примерки.} Портниха предложила девушке свадебное платье немного укоротить в соответствии с тенденциями современной моды.
16. {Сделка сулила хорошую прибыль.} Продавец пообещал скидку на радиоаппаратуру покупателю увеличить вдвое при условии приобретения комплекта специализированной мебели.
17. {После осушения болот экология местности претерпела значительные изменения.} Птицы предпочли покинуть старые гнезда после изменения ландшафта.
18. {Ситуация развивалась весьма непредсказуемо.} Рабочие попросили молодых инженеров уменьшить габариты прибора из-за трудностей с монтажом стенда.
19. {Новобранцы отличались отсутствием опыта и физической подготовки.} Командир решил пешие переходы делать как можно короче из-за очень низкой температуры воздуха.
20. {К середине второго тайма команда Испании выигрывала с перевесом в два мяча.} Испанские футболисты старались почаще давать пас на левый край своему лучшему бомбардиру в надежде на еще один гол.
21. {Исследования проходили с большим успехом.} Ученые смогли по завершению решающего эксперимента внести важные изменения в теоретическую часть.
22. {Старый распорядок концерта перестал устраивать и певицу, и публику.} Менеджер певицы решил в этот раз самые популярные песни поставить в начало концертной программы.

23. {Посетители ресторана не могли выбрать подходящий сорт вина к мясу.} Метрдотель посоветовал гостям заказать сухое красное вино из недавно доставленной французской коллекции.
24. {Положение дел становилось все более запутанным.} Компаньоны решили новые акции приобретать только после консультаций с лучшими специалистами брокерского дома.
25. {В палате роддома не утихали разговоры.} Молодые мамочки даже не пытались в свободное время между кормлениями заняться собой, и только рассказывали друг другу о своих переживаниях.
26. {Система электронной маркировки простаивала.} Продавцы магазина не хотели внедрять новый способ оплаты товаров без соответствующих изменений в системе учета.
27. {В новом подразделении работа длилась с раннего утра до позднего вечера.} Молодые сотрудники банка не хотели откладывать освоение новой системы по обслуживанию клиентов, несмотря на увеличившийся объем текущей работы.
28. {Верстальщики издательства в конце месяца дежурили по ночам.} Редакторы модного журнала не хотели исключать для себя возможности внесения изменений в готовый макет буквально до последнего дня перед сдачей его в печать.
29. {Возле турагенства стихийно собирались группы на разные маршруты.} Усталый экскурсовод даже не старался познакомиться с группой туристов до начала экскурсии и просто ждал недалеко от автобуса.
30. {Телезрителям показалось, что за ревом трибун комментарий просто не слышен.} На самом деле, спортивный комментатор не мог поверить в случившееся и удрученно замолчал перед микрофоном.
31. {Зрительный зал и сцена превратились в единое целое.} Остроумные ребята не старались понравиться ни жюри, ни зрителям, а просто с удовольствием отдавались любимой игре.
32. {Страсти в студии накалялись.} Телеведущая совершенно не хотела останавливать вспыхнувшую дискуссию и только пыталась удерживать гостей передачи в рамках заявленной темы.
33. {Уговоры не принесли никаких результатов.} Уставшие сотрудники технического отдела не хотели вносить никаких изменений в текст рекламации до тех пор, пока поправки не будут утверждены на заседании комиссии.
34. {Работа над проектом была в самом разгаре.} Модный дизайнер не отказывался обсуждать свои идеи с заказчиками проекта, поскольку был искренне убежден в правильности своих решений.
35. {Факты говорили сами за себя.} Директор школы даже не пытался заставить ребят изменить свою позицию в конфликте с учителем.
36. {Расчеты и планы рушились на глазах.} Спортсмены и механики долго не могли ничего сделать с машиной и уже потеряли надежду выйти на старт соревнований.
37. {Все волнения остались позади.} Счастливые выпускники гуляли всю ночь и разошлись по домам только к середине следующего дня.
38. {График строительства выдерживался неукоснительно.} Строители закончили монтаж электросети и приступили к отделочным работам уже к началу лета.
39. {Родители выполнили свое обещание.} Детишки увидели самые разнообразные аттракционы на главной аллее парка и сразу пришли в неопишуемый восторг.
40. {Заказ наконец-то был получен.} Художник и его подмастерья долго и кропотливо забеливали огромный холст для монументальной картины.
41. {До полного окончания работ было еще далеко.} Реставраторы трудились над восстановлением дворцового комплекса уже десятый год и любили свое детище всей душой.
42. {Громко прозвенел звонок.} Девушка нечаянно оступилась на пороге комнаты и выронила из рук большую стопку тетрадей.
43. {Победителям выставки вручали награды.} Цветовод с гордостью показывал посетителям свой новый сорт розы и очень подробно описывал все этапы селекционной работы.
44. {Свободных мест в аудитории не осталось.} Студенты с большим интересом слушали лекцию нового преподавателя и записывали ее почти дословно.
45. {Хозяевам овчарки дали правильную рекомендацию.} Кинолог упорно работал с молодой собакой и вскоре добился прекрасных результатов.
46. {Каждый ребенок в школе был одарен каким-либо талантом.} Младшие школьники особенно любили уроки рисования и труда и искренне гордились своими поделками и рисунками.
47. {В пятницу приезжих было особенно много.} Администратор гостиницы весь день был занят расселением туристов и отложил все остальные дела на конец смены.
48. {Наплыв посетителей ожидался большой.} Буфетчица приготовила все закуски и десерт еще с вечера и оставила на утро только салат из морепродуктов.
49. {В поликлинике разгорался громкий скандал.} Семейный врач не предложил юной матери госпитализировать больного ребенка с высокой температурой в ближайшую больницу из-за отсутствия отопления.

50. {В новогоднюю ночь участились ложные звонки на пульт пожарной охраны.} Диспетчер пожарной охраны отменила выезд пожарников на вызов после нескольких повторных звонков нетрезвого мужчины.
51. {Клиент добивался выполнения контракта.} Работник склада предложил неуступчивому клиенту привезти имеющиеся в наличии специальные коробки для перевозки стекла при первой необходимости.
52. {С приходом зимы нехватка персонала возросла.} Заведующий отделением предложил своим подчиненным в зимнее время перейти на посменный график работ ради экономии времени.
53. {Европейский конкурс балета начался с торжественного открытия.} Прошлогодний победитель с гордостью описал свои впечатления от представленных в этом году танцев и пожелал конкурсантам успеха.
54. {Землетрясение было страшным.} Многие жители Гаити хотели уехать из полностью разрушенной страны на некоторое время из-за страха новых подземных толчков.
55. {В школе кипела внеклассная работа.} Энергичные старшеклассники не отказались от своей мечты устроить интеллектуальный марафон среди детей из младших классов.
56. {Перемены к худшему не заставили себя ждать.} Малым предпринимателям оставалось только надеяться на чудо ввиду резкого сокращения заказов.
57. {В новогоднюю ночь такси были нарасхват.} Диспетчерская служба приняла заказ и предложила клиенту подтвердить его за два часа до вызова, ввиду большого количества заявок.
58. {Родители обратились за помощью к психологу.} Школьный психолог посоветовал родителям ребенка не заострять внимания на происшествии из-за возможности дальнейших проблем у мальчика.
59. {Проблемы с отоплением возникали постоянно.} Возмущенные отсутствием отопления жители обратились за помощью в городские службы коммунального хозяйства из-за бездействия районных коммунальщиков.
60. {В институте языкознания готовили проект реформы языка.} Очередную конференцию по проекту реформы было предложено провести в середине лета ввиду множества совещаний в первой половине года.
61. {В конкурсах органистов появляются новые имена.} Талантливый юноша хотел принять участие в конкурсе органистов из большой любви к средневековой классической музыке.
62. {В Европе снегопады не прекращались целую неделю.} Многие туристы не могли улететь домой после новогодних отпусков, ввиду затруднений с полетами практически всех авиакомпаний.
63. {Сильные холода продолжались весь январь.} Коммунальные службы просили жителей не оставлять открытыми окна и двери в подъездах из необходимости сохранения тепла.
64. {Администрация завода решила автоматизировать технологический процесс.} Опытные программисты посоветовали заказчикам предусмотреть все рабочие моменты заранее, так как любые дополнения сильно увеличивают сроки сдачи программы.
65. {Конкурс имени Паганини проводился в Генуе, родном городе великого скрипача.} Знаменитые скрипачи из разных стран мира предложили проводить конкурс имени Паганини и в других странах с целью популяризации скрипичной музыки.
66. {Приближался новогодний конкурс художественного творчества.} Учитель рисования предложил детям сделать рисунки на темы природы из-за их постоянной привлекательности для детей.
67. {Тарифов на услуги опять возросли.} Подмосковные жители потребовали от правительства сохранения льгот на транспорте из-за резкого удорожания тарифов.
68. {Хоккейная команда плохо стартовала в чемпионате страны.} После третьего подряд проигранного матча болельщики предложили устроить встречу с командой, чтобы разобраться в создавшемся положении.
69. {Многие сотрудники уезжали в отпуск.} Ответственный кадровик заметил изменения в графике работы некоторых сотрудников из научного отдела и предупредил их об этом.
70. {В 2011 году на показах мод появилось множество новинок.} Знаменитые модельеры предлагали потребителям новые силуэты одежды на ближайшие годы, ввиду значительных изменений в технологии производства тканей.
71. {Социальные службы активно работали с работодателями.} Работники службы занятости целенаправленно работали с обратившимися к ним людьми и помогали им в конкретных ситуациях общения с потенциальными работодателями.
72. {Диспетчеры аэропортов устроили однодневную предупредительную забастовку.} Некоторые руководители не рассматривали забастовку диспетчеров всерьез, так как были уверены, что найдут им быструю замену.
73. {Заказанные гостиничные номера не соответствовали цене путевок.} Представители турфирмы в Египте уговаривали туристов не раздувать из случившегося скандальный эпизод и переселили группу в более комфортабельную гостиницу.
74. {2009 год был объявлен годом Н.В. Гоголя.} Творческая интеллигенция с интересом смотрела новые постановки и интерпретации пьес Гоголя ввиду продолжавшегося юбилейного года писателя.

- 75. {Конкурс технического творчества школьников обещал быть интересным.} Известные космонавты решили принять участие в конкурсной комиссии технического творчества школьников ввиду того, что в детских работах много фантазии и полета.
- 76. {В секции появился новый тренер.} Молодой тренер не делал своим воспитанникам никаких скидок на тренировках, так как на городской баскетбольный турнир должны были собраться очень сильные команды
- 77. {Творческий потенциал группы разработчиков проекта заметно уменьшился.} Любые предложения сотрудников других отделов также решили рассматривать сразу из-за недостатка новых идей в ходе проектирования.
- 78. {Доходы страховой компании сильно упали с началом кризиса.} Страховщики не предлагали никаких скидок опытным водителям по новым полисам из-за значительного уменьшения потока клиентов.

Footnotes

¹ Russian has a free word order. By default the order in affirmative ditransitive sentences is ‘Subject^{NOM} – Verb – Direct Object^{ACC} – Indirect Object^{DAT}’; in negative sentences there is an additional Negation that immediately precedes the verb. The present study focuses on a scrambled word order with verb objects preceding the verb: ‘Subject^{NOM} – Direct Object^{ACC} – Indirect Object^{DAT} – (Neg -) Verb’. The reader is referred to Sekerina (1997, 2003) and Slioussar (2011) for a review on processing of scrambled word orders in Russian.

² The counts are based on the first 200 documents yielded by the search for the negative particle ‘ne’ directly followed by a verb. This corresponded to 704 individual sentences each containing a negated verb which were further screened for whether the sentence also contained a direct object (343 sentences did). Only instances for which the case of the object NP could be determined unambiguously were included, which led to the exclusion of 22 sentences with singular or plural animate objects for which their genitive and accusative forms are identical, e.g. *volka* ‘wolf.Masc.Sg.Gen/Acc’ or *koshek* ‘cat.Fem.Pl.Gen/Acc’.

³ Of all these licensors, the most frequent ones are, in the order of decreasing frequency: nouns (54.4% of all cases), prepositions (26.4%), numerals (9.1%) and negation (4.3%), followed by adverbs (2.9%) and quirky verbs (2.1%). The counts are based on approximately 1220 sentences with a genitive NP extracted from the Russian National Corpus (www.ruscorpora.ru). Only the first genitive NP in each sentence was counted. These numbers make it clear that, generally, a genitive-marked NP by itself does not guarantee the presence of negation in the sentence.

⁴ A further consideration that was taken into account is that the genitive form of plural nouns coincides with their partitive form (if such form is available), e.g., *Ivan ne kupil cvetov*^{GEN} ‘Ivan didn’t buy flowers.’ vs *Ivan kupil cvetov*^{PART} ‘Ivan bought some-flowers’. However, partitive nouns almost never appear preverbally (due to the necessity to follow an existential closure which is normally introduced by the verb; Fischer, 2004). Hence, in the experimental sentences NP^{GEN} is unlikely to be mistaken for a partitive noun.

Table 1

Results of the completion task (Experiment 1).

Condition	Description	Completion type			
		Affirmative verb	Negative verb	Other Gen licensor	Illicit
Acc+Dat	NP ^{NOM} MainVerb NP ^{ACC} NP ^{DAT} ...	64% (36/56)	30% (17/56)	-	5% (3/56)
Acc-only	NP ^{NOM} MainVerb NP ^{ACC} ...	75% (42/56)	23% (13/56)	-	2% (1/56)
Gen+Dat	NP ^{NOM} MainVerb NP ^{GEN} NP ^{DAT} ...	0%	91% (50/55)	7% (4/55)	2% (1/55)
Gen-only	NP ^{NOM} MainVerb NP ^{GEN} ...	0%	70% (39/56)	29% (16/56)	2% (1/56)

Table 2

Results of statistical analysis for mean reading times in each region, Experiment 2. Parameters for the best fitting model (coefficient, standard error and t -value) are given for each region. Superscripts a/b/c in the region's name indicate the 1st/2nd/3rd word in the relevant region, e.g. MainSubj^a and MainSubj^b refer to the adjective *prudent* and the noun *parents* of the main subject NP respectively (see Figure 1). All models included random intercepts and slopes for the fixed factor Case by participants and items, i.e. $rt \sim \text{Case} + (1 + \text{Case} \mid \text{subj}) + (1 + \text{Case} \mid \text{item})$. An asterisk indicates that the effect is significant using the $|t| > 2$ criterion, and '^' indicates that the effect is marginally significant using the $|t| > 1.8$ criterion.

Note that the effect of Case in region 5 was non-significant once the variation in letter length was taken into account (see text).

Region #	Region name		Coeff	SE	df	t-value
1	MainSubj ^a	(Intercept)	569.7	29.1	880	19.6
		Case	-32.0	16.7	880	-1.9^
2	MainSubj ^b	(Intercept)	440.8	20.3	889	21.7
		Case	-6.3	11.7	889	-0.5
3	MainVerb	(Intercept)	466.9	25.4	892	18.4
		Case	1.6	13.9	892	0.1
4	CritNP_Adj	(Intercept)	512.5	32.6	887	15.7
		Case	-17.7	16.2	887	-1.1
5	CritNP_Noun	(Intercept)	527.4	25.9	890	20.4
		Case	33.0	15.9	890	2.1* [#]
6	DatNP_Adj	(Intercept)	564.7	35.6	884	15.8
		Case	-36.7	20.4	884	-1.8^
7	DatNP_Noun	(Intercept)	516.9	20.6	889	25.1
		Case	-5.6	13.5	889	-0.4
8	PP1 ^a	(Intercept)	431.7	12.9	895	33.5
		Case	-5.1	10.1	895	-0.5
9	PP1 ^b	(Intercept)	436.8	18.4	896	23.8
		Case	-17.5	12.9	896	-1.4
10	PP1 ^c	(Intercept)	415.1	15.8	895	26.3
		Case	-11.8	10.1	895	-1.2
11	Negation	(Intercept)	373.7	10.8	896	34.5
		Case	-1.3	8.1	896	-0.2
12	EmbVerb	(Intercept)	435.5	19.0	895	22.9
		Case	-32.4	16.3	895	-2.0*
13	PP2 ^a	(Intercept)	410.7	11.9	893	34.5
		Case	-15.4	9.3	893	-1.7
14	PP2 ^b	(Intercept)	436.6	18.2	894	24.0
		Case	-9.7	11.6	894	-0.8
15	PP2 ^c	(Intercept)	533.8	20.7	2311	25.8
		Case	-1.8	11.9	2311	-0.2

Table 3

A sample set of experimental conditions from Experiment 3.

Object- first, Accusative/Genitive

<u>Učitel'nica₁ ximii₂</u>	<u>staralas'₃</u>	<u>nepriyatnye^{ACC₄} podrobnosti^{ACC₅} / nepriyatnyx^{GEN₄} podrobnoste^{iGEN₅}</u>
main-subject	main-verb	critical-NP ^{ACC/GEN}
teacher of-chemistry	tried	unpleasant ^{ACC} details ^{ACC} / unpleasant ^{GEN} details ^{GEN}

<u>vozmuščennym^{DAT₆} mamam^{DAT₇}</u>	<u>iz₈ roditel'skogo₉ komiteta₁₀</u>	<u>ne₁₁</u>	<u>rasskazyvat'₁₂</u>	<u>vvidu₁₃ ...</u>
dative-NP	PP1	NEG	emb-verb	PP2
to indignant mothers	from parent committee	not	tell	due to ...

Negation-first, Accusative/Genitive

<u>Učitel'nica₁ ximii₂</u>	<u>staralas'₃</u>	<u>ne₄</u>	<u>rasskazyvat'₅</u>	<u>vozmuščennym^{DAT₆} mamam^{DAT₇}</u>
main-subject	main-verb	NEG	emb-verb	dative-NP
teacher of-chemistry	tried	not	tell	to indignant mothers

<u>iz₈ roditel'skogo₉ komiteta₁₀</u>	<u>nepriyatnye^{ACC₁₁} podrobnosti^{ACC₁₂} / nepriyatnyx^{GEN₁₁} podrobnoste^{iGEN₁₂}</u>	<u>vvidu₁₃...</u>
PP1	critical NP ^{ACC/GEN}	PP2
from parent committee	unpleasant ^{ACC} details ^{ACC} / unpleasant ^{GEN} details ^{GEN}	due to...

English equivalent: 'The chemistry teacher tried to not tell unpleasant details to the indignant mothers from the parent committee due to ...'

Table 4

Results of statistical analysis for mean reading times in each region, Experiment 3. Regions are listed in the order in which they appear in the Object-first condition. ‘#’ indicates that the region’s sentential position differed across the Negation-first and Object-first conditions. Parameters for the best fitting model (coefficient, standard error, degrees of freedom and *t*-value) are given for each region. The Effect structure column indicates the maximal convergent model for each region, i.e. x: (Linear order * Case | subj) + (Linear order | item), y: (Linear order * Case | subj) + (Linear order + Case | item), z: (Linear order * Case | subj) + (Linear order * Case | item). An asterisk indicates that the effect is significant using the $|t| > 2$ criterion, and ‘^’ indicates that the effect is marginally significant using the $|t| > 1.8$ criterion.

Region	Effect	Coeff	SE	df	t	Effect structure
MainSubj ^a	(Intercept)	503.8	21.8	1371	23.1	y
	Linear order	-10.8	12.4	1371	-0.9	
	Case	0.9	14.6	1371	0.1	
	Linear order × Case	7.4	23.4	1371	0.3	
MainSubj ^b	(Intercept)	390.1	17.1	1373	22.9	z
	Linear order	5.1	9.7	1373	0.5	
	Case	-9.4	8.9	1373	-1.1	
	Linear order x Case	-17.3	19.4	1373	-0.9	
MainVerb	(Intercept)	382.2	17.2	1374	22.2	z
	Linear order	11.0	9.0	1374	1.2	
	Case	-6.3	9.7	1374	-0.6	
	Linear order x Case	-18.6	16.9	1374	-1.1	
#CritNP_Adj	(Intercept)	396.6	17.9	1371	22.1	y
	Linear order	31.4	12.5	1371	2.5*	
	Case	-1.5	9.2	1371	-0.2	
	Linear order x Case	-11.9	17.7	1371	-0.7	
#CritNP_Noun	(Intercept)	428.5	19.4	1375	22.1	z
	Linear order	60.7	11.2	1375	5.4*	
	Case	-4.9	10.3	1375	-0.5	
	Linear order x Case	-0.3	19.9	1375	0.0	
DatNP_Adj	(Intercept)	415.2	17.1	1373	24.3	z
	Linear order	43.7	11.4	1373	3.8*	
	Case	6.1	11.7	1373	0.5	
	Linear order x Case	0.8	23.4	1373	0.0	
DatNP_Noun	(Intercept)	423.4	17.2	1371	24.6	z
	Linear order	13.3	8.7	1371	1.5	
	Case	-5.9	10.2	1371	-0.6	
	Linear order x Case	-44.9	19.1	1371	-2.4*	

PREDICTING COMPLEX STRUCTURE

PP1 ^a	(Intercept)	390.5	12.6	1374	31.1	y
	Linear order	-8.0	7.6	1374	-1.1	
	Case	3.1	8.3	1374	0.4	
	Linear order x Case	-26.4	13.7	1374	-1.9 [^]	
PP1 ^b	(Intercept)	386.5	15.0	1376	25.8	y
	Linear order	-16.9	10.0	1376	-1.7	
	Case	-7.5	7.7	1376	-1.0	
	Linear order x Case	-33.8	16.0	1376	-2.1 [*]	
PP1 ^c	(Intercept)	371.6	14.5	1375	25.6	y
	Linear order	-3.2	7.7	1375	-0.4	
	Case	-4.5	6.0	1375	-0.8	
	Linear order x Case	-10.4	11.9	1375	-0.9	
#Negation	(Intercept)	356.8	12.3	1374	28.9	z
	Linear order	-13.1	7.1	1374	-1.9 [^]	
	Case	-0.3	7.7	1374	0.0	
	Linear order x Case	-19.9	12.3	1374	-1.6	
#EmbVerb	(Intercept)	375.5	15.8	1370	23.8	x
	Linear order	21.4	11.3	1370	1.9 [^]	
	Case	-4.3	8.9	1370	-0.5	
	Linear order x Case	-49.3	19.1	1370	-2.6 [*]	
PP2 ^a	(Intercept)	368.3	12.3	1373	29.8	y
	Linear order	0.3	5.8	1373	0.1	
	Case	-3.3	5.2	1373	-0.6	
	Linear order x Case	-4.8	10.5	1373	-0.5	
PP2 ^b	(Intercept)	378.5	14.6	1373	26.0	z
	Linear order	-4.0	6.8	1373	-0.6	
	Case	-6.7	7.3	1373	-0.9	
	Linear order x Case	-22.4	12.3	1373	-1.8 [^]	
PP2 ^c	(Intercept)	526.5	26.6	2102	19.8	z
	Linear order	8.9	12.7	2102	0.7	
	Case	10.2	10.0	2102	1.0	
	Linear order x Case	-26.1	20.2	2102	-1.3

The prudent parents have agreed to not give bulky items to the newly-weds on their wedding day due to lack of space in their flat.

Figure 1. Mean reading times in milliseconds for the Accusative (solid line) and Genitive (dashed line) conditions, Experiment 2. A sample set comprising an Accusative and a Genitive condition is shown below the graph. Region numbers on the x-axis are shown by subscripts in the sample sentence. Error bars indicate standard error of the mean. The box indicates the position of the direct object. Regions in which there was a significant difference in mean reading times between conditions ($p > .05$) are marked by an asterisk.

Figure 2. Mean reading times (standard error) by condition by region, Experiment 3. The Object-first condition is plotted at the top and the Negation-first condition is plotted at the bottom. Superscripts a/b/c in the region's name indicate the 1st/2nd/3rd word in the relevant region, e.g. MainSubj^a and MainSubj^b refer to the nouns *teacher* and *(of-)chemistry* of the main subject NP respectively (see Table 3). Error bars indicate standard error of the mean. In each graph, the negated verb and the critical accusative or genitive direct object are indicated by the box. Asterisks indicate regions in which there was a significant difference in mean reading times between conditions in pairwise comparisons ($p > .05$).