L1 and L2 Processing and Comprehension of Russian Locally Ambiguous Participial Relative Clause Sentences

by

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Statement of Originality

I, DARZHINOVA, Liubov, hereby declare that I am the sole author of the thesis and the material presented in this thesis is my original work except those indicated in the acknowledgement. I further declare that I have followed the University's policies and regulations on Academic Honesty, Copyright and Plagiarism in writing the thesis and no material in this thesis has been submitted for a degree in this or other universities.

Abstract

Syntactic ambiguity occurs when more than one reading is available within one sentence, eventually resulting in one interpretation (local ambiguity) or multiple interpretations (global ambiguity). To get a clearer picture of how syntactic ambiguity is resolved across languages, the present study utilized a participial relative clause with three noun phrase attachment sites in Russian, a construction that was not employed previously, to study processes that occur while reading syntactically ambiguous sentences.

The study examined the attachment preferences of monolingual Russian speakers and English-speaking learners of Russian during processing and comprehension of locally ambiguous participial relative clause sentences with three potential NP attachment sites in Russian (Experiment 1) and whether disambiguation by pragmatic congruence leads to modification of these attachment preferences (Experiment 2). The study also tested whether the two-factor model by Gibson et al. (1996) can predict these attachment preferences. Participants of each experiment read six experimental sentences per each condition and 60 fillers by pressing the space bar in the self-paced reading fashion. They were also asked to respond to questions by choosing one of the three noun phrase options. If the read sentence seemed ungrammatical or unacceptable in Russian, they pressed the button specified as ungrammatical.

The generalized linear mixed-effects modeling of the collected data revealed that in processing, native Russian speakers show high attachment preference, whereas English-speaking learners of Russian demonstrate both low and high attachment preferences. During comprehension, native speakers do not exhibit any preference, whereas learners show only low attachment preference. The analyses also revealed processing facilitation for syntactically unpreferred attachment conditions in native speakers in Experiment 2, suggesting modulation of attachment preference through pragmatic congruence. Pragmatic

congruence did not level out the ungrammaticality rate across conditions in the same group, implying no effect of pragmatic congruence on comprehension. No conclusive remarks could be offered about processing in learners of Russian due to incomparable L2 proficiency level among participants of the experiments. At the same time, there were additional grammaticality benefits for syntactically preferred high attachment and low attachment conditions. As a result, based on findings from first and second language processing and comprehension in Russian, the study supports that one factor, Predicate Proximity, in the Recency Preference and Predicate Proximity model (Gibson et al., 1996) is operative in native Russian speakers, and the factor of Recency Preference is dominant in English-speaking learners of Russian. The study stresses the importance of the facilitating role of congruence of an input with reader's general knowledge. In conclusion, some limitations, suggestions, and the potential avenue to be accounted for in future research are discussed.

Keywords: sentence processing, syntactic ambiguity, ambiguity resolution, attachment preference, pragmatic congruence.

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Table of Contents

List of Abbreviations

ACC	accusative
ANOVA	analysis of variance
C1	advanced
C2	fluent
CI	confidence interval
CP	complementizer phrase
df	degrees of freedom
FEM	feminine
GEN	genitive
GLMM	generalized linear mixed effects model(ing)
HA	high attachment
L1	first language
L2	second language
L3	third language
LA	low attachment
MA	middle attachment
MASC	masculine
ms	millisecond(s)
N	neuter
NOM	nominative
NP(s)	noun phrase(s)
NP_1	the (higher) first noun phrase
NP_2	the (middle / lower) second noun phrase

NP_3	the (lower) third noun phrase
p	measure of the probability that an observed difference could have occurred just by random chance (probability value)
PASS	passive
PFV	perfective
PL	plural
PP	prepositional phrase
PRC	participial relative clause
PREP	prepositional
PST	past
PTCP	participial phrase
R(1)	(first) reading region
RC	relative clause
RespAcc	accuracy of response
RT	reaction time / reading time
s	second(s)
SD	standard deviation
SE	standard error
SG	singular
t	the size of the difference relative to the variation in sample data (t-value)
TP	tense phrase
UJ	ungrammaticality judgment
VP	verb phrase
WM	working memory

List of Figures

List of Tables

Chapter 1: Introduction

1.1. Introduction

When processing written stimuli, readers may face the so-called local (temporary) syntactic (structural) ambiguity. It is the type of ambiguity that appears at one point during written language processing and is resolved in its course. There is another type of structural ambiguity called global (permanent) ambiguity, which is never resolved at the linguistic level: the structure has more than one possible interpretation. For example, in the sentences (1) and (2), the ambiguity is settled at the reflexive pronoun. The pronoun "himself" is understood to be *the king* because it is the only noun that matches in gender with the pronoun. By the same token, the reflexive pronoun "herself" is understood to be *the daughter*. In other words, the ambiguities in these sentences are local (temporary), because they are resolved once the reader reaches the reflexive pronoun.

(1) The daughter of the king who punched himself feels embarrassed.

(2) The daughter of the king who punched herself feels embarrassed.

In contrast, the sentence (3) exemplifies a global (permanent) ambiguity, i.e., that cannot be resolved within the processing, since the masculine reflective pronoun "himself" agrees in gender with both the NP_1 "the son" and the NP_2 "the king."

(3) The son of the king who punched himself feels embarrassed.

In psycholinguistics, multiple attempts have been taken to understand how readers process sentences with ambiguities. In particular, there is a debate with regard to the time course of integration of the incoming information and the way a syntactic ambiguity is resolved. One of the prominent accounts, the Garden Path theory (Frazier & Fodor, 1978), stipulates that at first a single syntactical structure is regarded for a sentence, whereas non-structural information, e.g., semantics, frequency, discourse contexts, do not impact the

process of creating a syntactical structure.

When the constructed structure does not lead to a grammatical and / or plausible sentence interpretation, the parser initiates the second stage of processing called re-analysis. Previously discarded non-structural information comes into play and corrects the initially made interpretation. Since this stage is reached only when the initial interpretation is considered erroneous, the combination of misanalysis detection and posterior re-analysis lead to processing difficulty reflected in reading slowdown. Given its serial but also modular view on processing, the Garden Path theory is referred to as a two-stage and syntax-first model.

In the two-stage models, the parser initially constructs a sole syntactical structure by relying on one of the two principles, Late Closure or Minimal Attachment. According to the former principle, incoming lexical items tend to be associated with the phrase or clause currently being processed (or lower NP) rather than with structures farther back in the sentence (Frazier, 1979). From a syntactic point of view, the parser postpones closure of a current constituent to attach a new material locally than attaching it to a higher node (non-locally), because the former process is easier (less costly) for the memory system in terms of computation than the latter. In view of the Minimal Attachment (Early Closure) principle, the parser attaches each incoming unit to the phrase structure being constructed to have as less additional nodes as possible (Ferreira & Clifton, 1986; Frazier & Rayner, 1982). It is a principle that "minimizes node-to-terminal node ratio and maximizes flat structures" (Bever et al., 1998). That is, the parser selects such a structure that is syntactically plausible and does not introduce any further non-terminal nodes. In other words, the parser adhering to the Minimal Attachment principle associates the incoming lexical items with a clause farther back (higher) in the sentence, not the now processed structure, and thus favors a simple structure in terms of its syntactic complexity.

The Construal hypothesis (Frazier & Clifton, 1997; Frazier & Clifton, 1996) is a

heavily revised version of the Garden Path theory and states that the parser makes the delineation between syntactic constructions. The first type is the primary phrase that features the verb and its arguments, whereas the second type is the non-primary phrase, such as relative clause and adjunct predicates, which are optional constructions that can be omitted (Frazier & Clifton, 1997). Just as the Garden Path theory, the Construal hypothesis suggests that primary phrases are processed strictly depending on either the Late Closure principle or the Minimal Attachment principle. At odds with its predecessor, the Construal proposes that in case with non-primary phrases, multiple structures are easily constructed in parallel at the first stage of parsing, so that the NP_1 "the son" and the NP_2 "the king" each can modify of the relative clause in (3). At the second stage, the parser pursues to determine the modifier using non-structural considerations, that is, semantic and pragmatic information (Frazier & Clifton, 1996). It is worth noting that even when the task does not necessitate the parser to establish the ultimate interpretation, consulting non-structural sources still goes on. If that is the case, the parser works in the superficial manner, just enough to pinpoint a potentially inappropriate interpretation and is not committed to fully resolve a syntactic ambiguity (Swets et al., 2008).

Alternative to the two-stage models, constraint-based or parallel accounts (see MacDonald & Seidenberg, 2006, for constraint satisfaction approach; McRae et al., 1998, for competition integration; MacDonald et al., 1994, for lexicalist constraint-based model) postulate that both structural and non-structural information are simultaneously activated by the parser during processing. Different sources or "constraints", such as syntactic information, word meaning, prior knowledge, and context, are utilized to resolve an ambiguity with little to no delay in accessing them. Relying on the constraints, the parser computes several potential analyses at once. Processing becomes relatively easy if one analysis is preferred over the paralleled analyses, whereas having several analyses at disposal increases the processing difficulty.

In essence, both types of models point out that contextual information is utilized to resolve a syntactic ambiguity. However, they differ in their claims about the time course of the context integration: it has an early onset in constraint-based accounts and late in the two-stage accounts. Both model types have led to the creation of an account combining features of each type, the Unrestricted Race model (van Gompel et al., 2005; van Gompel et al., 2001). According to this model, one of the potential analyses may become more favorable than the other owing to relevant syntactic and / or non-syntactic information available before exposure to the input being processed. The analysis that is completed first "wins the race" and makes the parser drop the alternative analyses. When no plausible analysis is reached, the parser re-analyses the input. On the one hand, the model is of syntax-first nature because no semantics is activated in the initial analysis, for the exception of information about a part of speech of the unit in process. On the other hand, it is parallel since several likely analyses are available and partake in the "speed race" so that only one of them is eventually adopted.

According to van Gompel et al. (2001), there is another fundamental variation within the models. On the one hand, there are fixed-choice or deterministic models, according to which the language processor adopts the same initial analysis for a certain sentence type every time. For example, based on the Garden Path theory, the parser is invariably driven in its analyses by one structural principle (e.g., Minimal Attachment or Late Closure). On the other hand, variable-choice or non-deterministic models predict that although there might be some general principle that guides parsing, the parser may not follow the same analysis every time, e.g., the low and high attachment analyses in syntactically ambiguous sentences with two potential NP attachment sites are conducted approximately half the time each. One example of a variable-choice but also a one-stage model is the Unrestricted Race model, which predicts that the parser may eventually take the initially non-preferred analysis, being led by individual preferences as well as syntactic and non-syntactic information. In fact, the

Construal hypothesis acts as a fixed-choice model while parsing the primary phrase attachment ambiguities, whereas it can also be a variable-choice model in processing the non-primary phrase attachment ambiguities. To test all the reviewed models empirically, a growing body of sentence processing research has been investigating the resolution of various types of attachment ambiguity, to be discussed in the literature review.

1.2. Thesis structure

This thesis is organized as follows. Chapter 1 introduces the topic of attachment ambiguity more squarely in the larger picture of the syntactic ambiguity resolution literature by discussing the main debate pertinent to this topic.

Chapter 2 lays out the theoretical and conceptual groundwork for the study. The first section discusses what the existing models generally argue with the relative clause attachment as a testing ground and reviews the most classic principles advanced in the framework. The second section presents the overview of heuristic processing that advances pragmatic congruence, one of the major factors in the present study. The subsequent sections focus on influence of the first language on second language processing of syntactically ambiguous sentences, syntactic ambiguity in Russian and participial relative clause sentences in Russian, that are assumed in this study. Chapter 3 rationalizes the study, presents the research questions, hypotheses, and basic research design, as well as summarizes the structure of the dissertation.

Chapter 4 reports on Experiment 1 that investigated how first and second language Russian speakers process and comprehend Russian participial relative clause sentences that are disambiguated with only agreement cues. Chapter 5 provides the details of Experiment 2 that investigated how first and second language Russian speakers process and comprehend

Russian participial relative clause sentences that are disambiguated with pragmatic cues. Chapter 6 discusses the results of each experiment and affords their possible interpretations, puts forth limitations, implications, and ideas for future investigations.

Chapter 2: Literature Review

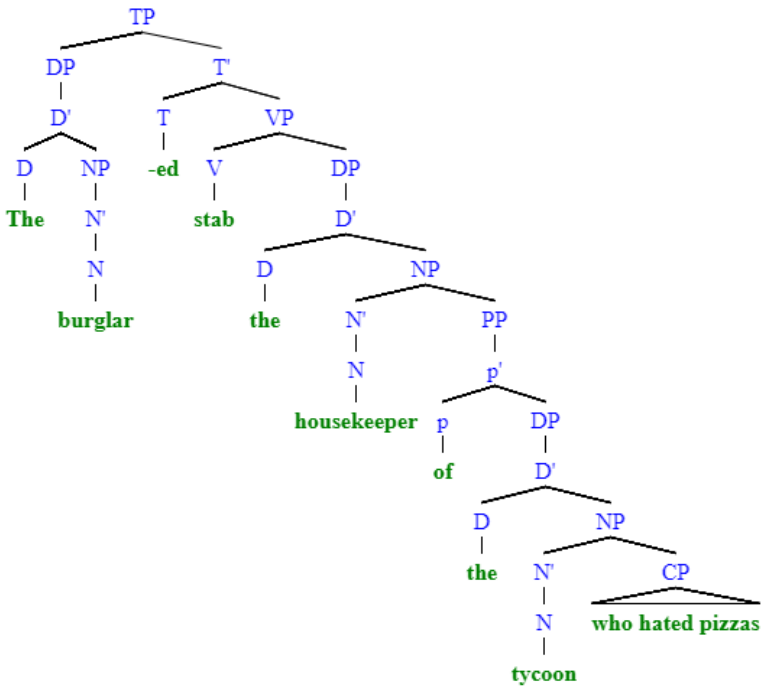
2.1. Cross-linguistic preferences in attachment ambiguity resolution

The syntactic ambiguity in relative clause attachment ambiguity lies in that the relative clause can be attached to either of the noun phrases (NPs). For example, while processing the sentence (4), the parser is likely to attach the first noun phrase (NP_1) "the housekeeper" to the relative clause. The other interpretation may be resultant from the relative clause being attached to the NP_2 "the tycoon".

(4) The burglar stabbed the housekeeper of the tycoon who hated pizzas.

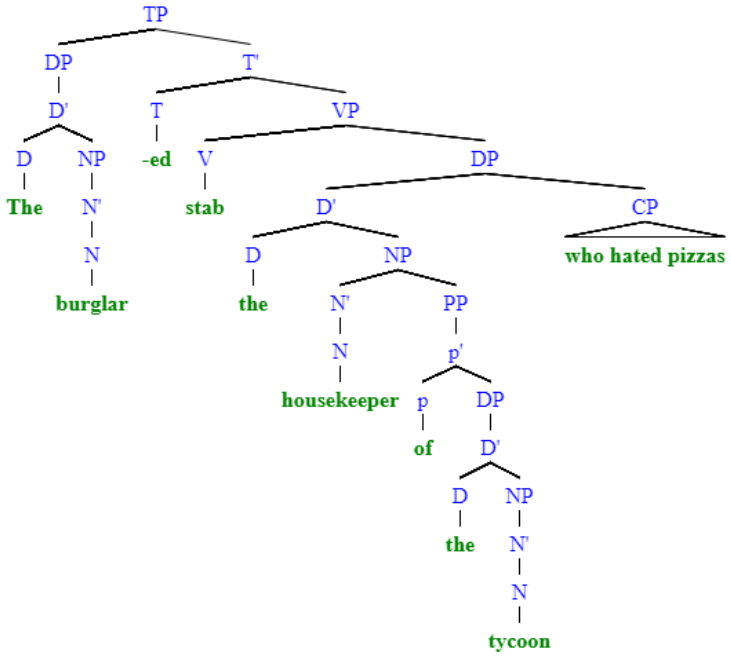
Following the Late Closure principle, the parser arrives at the low attachment interpretation of a syntactically ambiguous sentence (4a), so that the sentence is interpreted as it was *the tycoon* who hated pizzas.

(4a)



The application of the Minimal Attachment principle to the sentence directs to adopt a conjoined NP interpretation, as in (4b), "the housekeeper of the tycoon" hating pizzas.

(4b)



There are marked preferences across languages in attaching a relative clause high or low. Fernando Cuetos and Don Mitchell (1988) conducted the first study to observe the difference in processing preference between Spanish and English. In their study, a paper-based questionnaire was administered to check whether local connections, that is, low attachment guided by the Late Closure principle, as shown for English, is applied to processing the sentences of interest with two potential hosts in Spanish. It was found that Spanish speakers prefer non-local relative clause attachment. The authors also tested whether English speakers indeed prefer low attachment, as shown in earlier studies, when reading the same sentences but that are literal translation into English. Results showed that English speakers tend to have the last NP rather than the first modifying a relative clause, confirming

previous research. Tendencies of Spanish and English speakers were reflected in the higher mean number of off-line responses corresponding to each of the attachment options.

A second experiment was conducted with the same sentences but in English and introducing a new clause that resolves the relative clause attachment ambiguity via pragmatic information or gender agreement. The mean viewing time of the control sentences having only one plausible attachment site, i.e., predisposing to attach low, was longer than of the experimental sentences having two potential attachment sites. Given that the experimental condition did not rule out the high attachment interpretation and the control condition did, this finding confirmed that Spanish speakers prefer to close the first clause early to attach the incoming relative clause to the earlier NP than the latter. The subsequent experiments using the self-paced reading paradigm pursued the same goal but introduced the new control conditions: the Spanish "y" ("and" in English) instead of "de" (of) in Experiment 3 and "el criado" ([male] servant) instead of "la criada" ([female] servant) in Experiment 4. These experiments provided further evidence in favor of the high attachment preference in Spanish and added that parsing decisions are made during sentence reading, because Spanish speakers spent more time processing unambiguous (the low attachment condition) sentences than ambiguous sentences. These results were achieved even the control and experimental conditions were comparable in length (Experiment 3) as well as both length and number (Experiment 4) of potential hosts.

Concluding their discussion, the authors urged future research to be conducted on languages other than English, so that the relevant findings can become usable as "a basis for a more general account of syntactic processing in humans." The study also sparked the debate, mainly in the 1980s and 1990s, over how speakers of different languages process a syntactic ambiguity. It was found that apart from English (Fernández, 2003; Cuetos & Mitchell, 1988), the trend to attach low is documented for Arabic (Quinn et al., 2000), Basque (Gutierrez-

Ziardegi et al., 2004), Norwegian, Romanian, and Swedish (Ehrlich et al., 1999), inter alia. Other than Spanish (Carreiras & Clifton, 1999; Cuetos & Mitchell, 1988), among the high-attaching languages were named Afrikaans (Mitchell et al., 2000), Croatian (Lovrić, 2003), Dutch (Desmet et al., 2002), French (Pynte & Colonna, 2001), Greek (Papadopoulou & Clahsen, 2003), Persian (Shabani, 2018), Russian (Sekerina, 2003), inter alia. However, there is little to no consensus on this matter as well, as some studies showed that Spanish (Gibson et al., 1999; Gibson et al., 1996) and Russian (Sekerina, 2019) belong to the group of low-attaching languages.

The model of Recency Preference and Predicate Proximity (Gibson et al., 1996) proposed that both low and high attachment preferences are resultant from certain factors influencing the cross-linguistic variation. Recency Preference implies that the processor attaches the inbound relative clause to the most recent NP. Predicate Proximity suggests the processor attaches the inbound relative clause to the NP that is hierarchically closest to the head of a verb phrase (VP). Each factor's strength fluctuates across languages, so those that allow the subject argument to be situated afar from the sentence's predicate may be more indicative of a relatively strong Predicate Proximity factor. In contrast, those languages not permitting this appearance may be bound to have a relatively strong Recency Preference factor. For example, the English parser would have the tendency to attach a clause to the latest NP of a nominal group being dominated by Recency Preference factor. This tendency may be intertwined with a relatively weak Predicate Proximity strength.

Using the self-paced reading task, Edward Gibson and colleagues analyzed the ungrammaticality judgments and the reading times (RTs) for the Spanish sentences like (5) in native speakers. The attachment predisposition to high, middle, and low attachments was controlled by agreeing the number of one of the preceding NPs with the verb in the relative clause, so that for instance, the middle-attaching version looked like (6). Experiment 1 tested

whether only one factor is behind the preference in Spanish attachment ambiguity resolution. The participants were asked to press the space to read each sentence in a word-by-word fashion. Every other time the last word of a sentence was reached, and the space was pressed, the participants were requested to paraphrase that sentence. They were also given the instruction to press the button specified "NO" at any point of reading, whenever they deemed that sentence unacceptable in Spanish. It was found that the low-attaching version was judged as ungrammatical less often than the middle- or high-attaching versions, whereas the high-attaching version was judged as ungrammatical less often than the middle-attaching version. The disambiguating region, that is, the auxiliary verb "fue" (be), in the low-attaching version was processed faster than in any other version, while the high-attaching version was processed faster than the middle-attaching version. Both results hint at robust preference to attach a relative clause low and easier processing of the high-attaching version than the middle-attaching version.

(5) The lamp near the picture of the villa which was damaged by fire.

(6) The lamps near the picture of the villas which was damaged by fire.

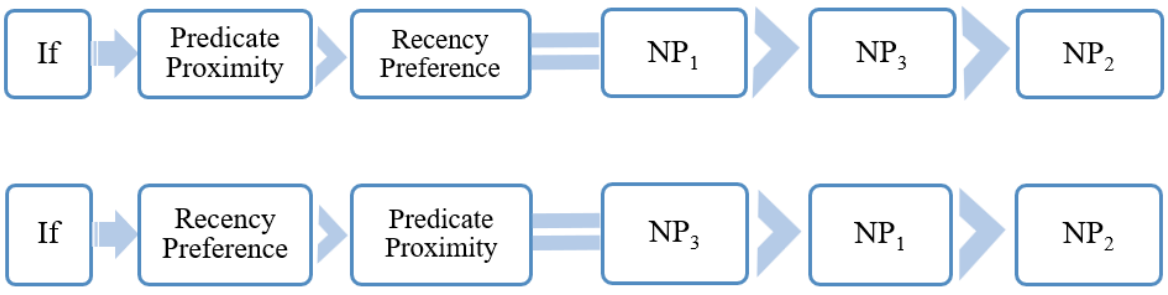
To further test whether English prefers high attachment, the authors conducted Experiment 2 with English constructions that were similar to those in Spanish from Experiment 1. The low-attaching version was judged as ungrammatical less often than the middle-attaching or high-attaching versions, but the difference in ungrammaticality between the latter two conditions did not reach significance. The disambiguating region in the low-attaching version was processed faster than in any other version, while the high-attaching version was processed faster than the middle-attaching version. Even though ungrammaticality judgment data did not show any clear pattern, the reading time data showed the low-attaching version was processed faster than both high and middle-attaching versions, suggesting more difficulty to attach a relative clause middle than to the low and middle-

attaching site. However, the difference between the high and middle-attaching versions was marginally significant. In both experiments, middle attachments were the hardest to process, indicating that both Recency Preference factor (governing the low attachment preference) and Predicate Proximity factor (governing the high attachment preference) are operative in relative clause attachment ambiguities in English and Spanish.

Assuming only high attachment governed by Predicate Proximity factor is preferred, the most preferred attachment site would be the first noun phrase (NP_1) "lamp", followed by the NP_2 "picture" and the NP_3 "villa". Thus, when both Predicate Proximity and Recency Preference factors interact in resolving the ambiguity with attaching a relative clause to a NP, one would expect the preference orderings in attachment ambiguity outlined in Figure 1.

Figure 1

The visualization of possible interactions between Predicate Proximity and Recency Preference factors in a three-site attachment ambiguity resolution



It is apparent that Late Closure and Recency Preference overlap in their general prediction, but they crucially differ in one aspect. Late Closure guides the parser to pick only one attachment site over others, whereas Recency Preference lines up the potential attachment sites in order and interacts with different factors to establish the ultimate

attachment preference (Pearlmutter & Gibson, 2001).

The two-factor model was confirmed to predict attachment preferences in German (Walter & Hemforth, 1998) and Dutch (Wijnen, 1998). Given that English and Spanish, German and Dutch are all head-initial languages, a study on the material of a head-final language, the complements of which precede the head of a phrase, was further conducted to test whether the Recency Preference and Predicate Proximity model (Gibson et al., 1996) is applicable across languages. Miyamoto et al. (1999) conducted the phrase-by-phrase self-paced non-cumulative reading experiment on the material of Japanese relative clause sentences with a three-site context with native Japanese speakers. For example, the sentence (7) prompted them by plausibility to attach a relative clause to the NP_3.

(7) *Eda-ga* *oreteiru* *shigemi-no* *yoko-no* *hito-no*
branch-NOM broken bush (NP_3) beside person (NP_2)
ushiro-no *jitensha-wa* *kireide* *ooki-katta.*
Behind bicycle-TOP (NP_1) pretty big-was.
"The bicycle behind the person beside *the bush* that has a broken branch was pretty and big."

Results showed that sentence comprehension was more accurate in the low attachment, e.g., predisposind to attach to "bush" in (7), than in the middle ("person") and high attachment ("bicycle") sentence versions. It was also found that the low attachment version was read faster than the high or middle attachment versions, with no significant difference between the latter two. These results show that Japanese relative clause attachment preferences lead to the U-shaped preference ordering $NP_3 > NP_1 > NP_2$ and, therefore, are predicted by the Recency Preference and Predicate Proximity model. For example, the

Japanese parser primarily prefers to attach a relative clause to the NP_3 that initiates the three-site context when processing the sentence (7), and then to the NP_1, i.e., the last NP in the complex nominal group in the linear structure. The preference to attach middle, that is, to the NP_2 has no factor's force behind it, and becomes the least preferred attachment site among the three attachment versions.

Continuing the discussion on cross-linguistic differences in attachment ambiguity resolution, studies have been relying on other psycholinguistic techniques, testing materials, and accounting for individual differences of language speakers. For example, Hemforth et al. (2000; 1998) attempted to explain different attachment preferences across languages by putting forth the hypothesis of Anaphoric Binding. According to the hypothesis, the preference for Early or Late Closure is the result of competition between syntactic and anaphoric processes. Syntactic processes predispose the parser to attach a relaive clause to the most recent NP, whereas anaphoric processes prompt to attach the clause to a discourse-emphasized antecedent that is often the first NP. The activation of anaphoric processes, i.e., "binding" a relative pronoun to its antecedent, depends on the way a given language attaches the relative clause with the relative pronoun to the main clause. In one array of languages, including English, relative pronouns (e.g., *who* and *which*) do not need to be coindexed with antecedents and can often be switched to a generalized complementizer "that" or even removed. That explains why English has a low activation of anaphoric processes that occur while initiating a relative clause, which result in the likelihood of following the Late Closure principle. In another array of languages, including German, the relative pronoun agrees with the antecedent in number, case and gender and cannot be removed, which increases the significance of anaphoric processes.

In pursuit of evidence favoring robustness of the low attachment preference across different types of syntactically ambiguous sentences in English, van Gompel et al. (2005)

conducted the three experiments using eye-tracking while reading. The experiments included sentences with global attachment ambiguities of a relative clause to a NP (8) and with global attachment ambiguities of an adverbial to a verb phrase (9). The relative clause sentences were also locally ambiguous featuring high- (8a) and low-attaching (8b) conditions and unambiguous (8c). The authors were particularly interested in whether native English speakers process globally ambiguous sentences (8) easier than temporally ambiguous like (8a) and (8b) and unambiguous sentences, such as (8c).

(8) The collar of the jacket that was sewn skillfully looks stylish.

(8a) Pam thought that the shirt of the tailor that was sewn skillfully looked stylish.

(8b) Pam thought that the designer of the jacket that was sewn skillfully looked stylish.

(8c) Kate certainly thought that the jacket sewn skillfully looked stylish.

(9) The gardener examined the seedlings he planted into the fertile soil yesterday afternoon, the groundskeeper is certain.

In Experiment 1, participants were told to read sentences carefully for understanding and at their own pace. The comprehension question, e.g., “Was the groundskeeper unsure?” after (9), was appearing after the last sentence region was presented. It was found that the comprehension question error rate was higher for globally ambiguous sentences than for those disambiguated to the low or high attachment. However, the authors disregarded comprehension results as the questions did not require readers to resolve the syntactic ambiguity. Reading times were shorter for globally ambiguous sentences (8) than low attachment (8a) and high attachment (8b) sentences. It was concluded that globally ambiguous relative clauses are easier to process than high- or low-attaching sentences because in the latter sentences, the resolution of ambiguity is prolonged relative to the primary point of ambiguity.

Experiment 2 compared the predictive powers of the constraint-based and Unrestricted

Race models. No difference was found in comprehension question error rates between the sentences. Reading times at the post-disambiguating region (the rest of the relative clause after the disambiguating verb) were shorter for the ambiguous condition than for high-attaching or low-attaching sentences and similar to the unambiguous sentences. Thus, globally ambiguous sentences are easier to process than temporarily ambiguous and not more difficult than unambiguous sentences. Thus, the results were in favor of the Unrestricted Race model suggesting that re-analysis is expected in the disambiguated conditions, not in the ambiguous condition.

Experiment 3 was conducted to check whether the same result was obtained even when there is a different type of ambiguity, that is, attachment to VPs, not to NPs and a different type of disambiguation, that is, by an adverbial, which is incompatible with a verb's tense by temporal features. The findings of Experiment 3 were similar to those in Experiment 2 and showed that globally ambiguous sentences with adverbial attachment to a verb phrase are less effortful to process than any temporarily ambiguous sentence. This experiment showed that processing difficulty starts earlier when the ambiguity resolution is not consistent with low attachment in the high-attaching sentences than when it is inconsistent with high attachment in the low-attaching sentences. The study suggests that detection of the previous syntactic misanalysis and the following re-analysis reflect processing difficulty in syntactic disambiguation.

Further, Payne et al. (2014) utilized a self-paced reading task to see the effects of age, working memory (WM), and reading experience on attachment ambiguity resolution of English globally ambiguous relative clause sentences such as (10) and temporarily ambiguous relative clause sentences such as (11).

(10) The sister of the heiress who bankrupted herself established risky business.

(11) The sister of the heir who bankrupted himself established risky business.

The authors found that the higher the WM memory span is, the more likely the processor prefers NP_2 attachment for globally ambiguous sentences. Those with lower WM spans demonstrate an explicit bias towards NP_1 attachment. Reading times in the ambiguous condition are more inflated in older adults showing a higher span of WM than those older adults showing a lower span of WM. The study concluded that high-span elderly individuals are sensitive to global ambiguity by reading reflexive pronouns longer than young and middle-aged groups.

To summarize, parsing preferences in resolution of relative clause attachment ambiguity are determined by linguistic factors, e.g., the way the relative pronoun agrees with its antecedent (Anaphoric Binding hypothesis), or the distance between the subject argument and the sentence's predicate (Recency Preference and Predicate Proximity model). Individual differences of language speakers and structure types can modulate these parsing preferences. This means that language speakers rely not only on syntactic rules and algorithms (syntactic route) but also their linguistic experience and contextual cues (non-syntactic route). Can the non-syntactic route be sufficient in itself in order to lead to plausible sentence representations? This question is discussed in the following section.

2.2. Heuristic and algorithmic mechanisms of written language processing

As opposed to "syntax-first" proposals, language processing is claimed to work through "heuristic first, algorithmic second" mechanisms (Dwivedi, 2013). According to Good-Enough Processing theory (Ferreira & Patson, 2007; Ferreira et al., 2002), a heuristic, or "a rule of thumb" plays the leading part in language processing and it is effective in meaning extraction. Pertinent to language processing, the concept of heuristic is placed into a much richer perspective of cognitive processing, e.g., heuristics are also used to solve problems in

mathematics and science education (Sharps et al., 2008).

There are different heuristics that are subconsciously used in written language processing. For example, the heuristic of plausibility refers to the case when the conceptual processor leads the parser to merge lexical units into a sentence so as to obtain its plausible interpretation, often without the need to parse that sentence through the "algorithmic" route. For example, after running a fast and sketchy scan of the incoming material, such as "dog-bone-gnaw", the parser arrives at the sentence interpretation "The dog gnaws a bone" through word recognition and without resorting to syntactic constraints. However, Good-Enough Processing theory is also based on earlier findings suggesting that interpretation may not always reflect the actual content of a sentence and can remain incorrect even after re-analysis (cf. Ferreira et al., 2002). For instance, the parser can misunderstand the sentence (12) as if it was the snake who bit the man. In this context, the heuristic processing overrides the algorithmic (syntactic) processing, and therefore, ignores available grammatical information and relies on world knowledge instead.

(12) The snake was bitten by the man.

Even though Good-Enough Processing theory has no lead on the exact preference that language speakers stick to when there is an attachment ambiguity, it claims that relevant decisions are reached only when they are required. One such case is when there is a comprehension question that pushes language speakers to determine the NP modifying the relative clause in a syntactically ambiguous sentence. In this scenario, the parser is prompted to process that sentence more deeply through the algorithmic route. The top-down "heuristic" route is preferred over the bottom-up "algorithmic" route since the former necessitates less cognitive effort and facilitates faster reading than the latter. In this context, Good-Enough Processing account resembles the Minimal Attachment principle (Ferreira & Clifton, 1986; Frazier & Rayner, 1982) putting forward the idea that the parser prefers the simplest syntactic

structure to be constructed (cf. Ferreira et al., 2009).

In the revised version of Good-Enough Processing theory (Karimi & Ferreira, 2016), both heuristic and algorithmic mechanisms are claimed to remain at "a state of equilibrium" during processing. This equilibrium ceases to exist once the parser gets pinged to perform deeper processing through the algorithmic route, for example, when the task at hand changes from reading adrift to reading for comprehension. For example, when the reflexive pronoun "herself" is reached while processing the sentence (13), language speakers are likely to disregard an attachment ambiguity by assuming the NP_1 "the daughter" and the NP_2 "the queen" as a merged (single) entity and lead to the interpretation of that it was the daughter who punched herself. However, once there is an objective to identify who of the two "punched herself", or, in syntactic terms, which NP modifies the relative clause, the conceptual processor would tumble down the merged entity "the daughter of the queen" and conduct parsing through the algorithmic route.

(13) The daughter of the queen who punched herself feels embarrassed.

The other heuristic has to do with whether the language under consideration allows specific constructions or not. For instance, Grillo and Costa (2014) brought to the attention that the availability of Pseudo Relatives can explain the variability in parsing strategies across languages. Pseudo relatives are identical to the relative clauses in the string view but lack resemblance in their parse views (Grillo, 2012). When parsing the sentence (14) in the way that it features a relative clause, the CP "running" can identify either the daughter or the queen who was running. In the pseudo relative parse, the NP_1 "the daughter" and the NP_2 "the queen" are merged into a single entity "the daughter of the queen", so the pseudo relative "running" refers to "the daughter" only.

(14) Jay saw the daughter of the queen running.

Therefore, pseudo relatives, or "small" clauses, are less difficult to parse than restrictive

relative clauses (relative clauses that present information for a complete identification of the noun), owing to the structural simplicity and absence of alternative interpretations. That is why, the parser of speakers of languages with availability of pseudo relatives conducts a pseudo relative parse. Speakers, languages of which allow this construction, would prefer to disambiguate relative clause attachment ambiguity following the pseudo relative parse, or in terms of the Construal hypothesis (e.g., Frazier & Clifton, 1997), adhere to the Minimal Attachment principle rather than the Late Closure.

Being a carrier of semantic information, animacy is another heuristic suppliying readers with substantial cues for sentence comprehension. For example, Gennari and MacDonald (2008) conducted a three-fold study to check what is parsing like with regard to object-extracted relative clauses. The study used the web sentence completion and self-paced reading tasks to introduce subject-extracted relative clause sentences like (15) and object-extracted relative clause sentences like (16).

(15) The journalist that bullied the congresswoman confessed the fault.

(16) The journalist that the congresswoman bullied confessed the fault.

The study found that active object-extracted relative clauses with animate heads are harder than active object-extracted relative clauses with inanimate heads. The study demonstrated that animate nouns tend to be interpreted as agents or experiencers, whereas inanimate nouns are likely to be perceived as the theme-object of an action. Noun animacy modulates sentence interpretations at the stages of processing, especially in the understanding of syntactically ambiguous relative clause sentences. The authors also concluded that subject-extracted relative clause structures with animate NPs are less difficult than object-extracted relative clause structures with animate NPs, because subjects are often animate, and objects are often inanimate.

Baudiffier et al. (2011) conducted self-paced and eye-tracking experiments to examine

the effect animacy on the processing of subject-extracted and object-extracted relative clause sentences similar to the sentences in (15) and (16) respectively, as well as object-extracted relative clause with stylistic inversion such as in (17) in unambiguous relative clause sentences in French.

(17) The treasure that can find the neighbor has a lock.

The self-paced experiment showed a higher rate of comprehension for sentences with object-extracted relative clauses with an animate subject and an inanimate object than for other condition configurations. Analyses of the mean reading time data at the relative clause region showed that object-extracted relative clauses with stylistic inversion are processed longer than object-extracted and subject-extracted relative clauses in sentences with animate object, with the latter being processed the fastest. In the eye-tracking experiment, analyses of the overall reading time data demonstrated that subject-extracted relative clauses are processed faster than object-extracted and object-extracted relative clauses with stylistic inversion in sentences with animate object. Processing difficulty with object-extracted and object-extracted relative clauses with stylistic inversion does not extend initial fixations but increases regressions instead, and the preference to assign the function of the subject to an animate NP suggests that animacy cues are utilized at the initial point of parsing and interpretation, but there is no interaction between them and syntactic constraints.

Levy et al. (2013) recorded self-paced reading of Russian sentences such as (18a) and (18b) in a non-cumulative word-by-word moving-window. Experiment 1 manipulated the flexibility of Russian word order to test how the relative clause types, whether they are object-extracted or subject-extracted, affect syntactic processing of a sentence. It was found that nominative relative clause NPs in object-extracted sentences (18a) are processed faster when relative clause stands before verb than when it is after verb (18b). The verb region is processed faster in the subject-extracted default and object-extracted scrambled sentence

conditions than the subject-extracted scrambled and object-extracted default. These results are in line with the memory-based accounts (e.g., Gibson, 1998, for the Dependency Locality Theory), which suggest significant difficulty in the non-local conditions and that the retrieval at the relative clause verb is the focal point in establishing processing difficulty. Nevertheless, the second result is backed by surprisal theories (e.g., Levy, 2008) in that there is a little probability for a subject-extracted to start with an object NP, and a high probability for an object-extracted to start with a subject NP.

(18a) *Dikt-ator* *kotor-yy* *dissident-a* *voz-nenavid-e-l* *posle*
Dictator who-NOM dissident-ACC came_to_hate after
ne-davn-ikh *sobyti-y*, *proiznes* *rech* *na* *so-br-a-ni-i*
recent events, pronounced speech at meeting.
"The dictator, who came to hate the dissident after the recent events, made a speech at the meeting."

(18b) *Dikt-ator* *kotor-yy* *voz-nenavid-e-l* *dissident-a* *posle*
Dictator who-NOM came_to_hate dissident-ACC after
ne-davn-ikh *sobyti-y*, *proiznes* *rech* *na* *so-br-a-ni-i*
recent events, pronounced speech at meeting.
"The dictator, who came to hate the dissident after the recent events, made a speech at the meeting."

Experiment 2 was conducted to locate the exact region of processing difficulty and extended the previous experiment findings by adding that the relative clause verb alone induces comprehension difficulty expressed in RT inflation, whereas the presence of a NP at

the beginning of a relative clause, where it is unanticipated, prompts an immediate processing difficulty too. Overall, the study suggested that when reader's expectations are unmet, there is a slowdown in reading, therefore, constructing an infrequent structure is more complex than constructing a more frequent one.

Lowder and Gordon (2014) conducted the two eye-tracking experiments to examine how different animacy configurations of objects and subjects in syntactically complex sentences can affect processing and accuracy of comprehension. Experiment 1 revealed that regression path duration is longer in the object-extracted-animate (19) sentences than in object-extracted-inanimate (20) and the subject-extracted sentences (21). However, overall reading times for the subject-extracted sentences are longer than for object-extracted-inanimate sentences. These results suggest that object-extracted sentences are easier to read when its object is inanimate, and subject is animate.

(19) The senator that the journalist criticized accused the governor of…

(20) The article that the journalist criticized accused the governor of…

(21) The senator that criticized the journalist accused the governor of…

In Experiment 2, both animacy and semantic connectedness of object and subject were brought to the forefront to pinpoint differences in comprehension of syntactically complex sentences. It was found that comprehension accuracy is lower for object-extracted-animate than for object-extracted-inanimate sentences, whereas the former sentences are processed longer when there is no direct semantic connectedness between their object and subject as in (22) than sentences as (23) where such connectedness exists.

(22) The waitress that the senator criticized received more publicity than anyone expected.

(23) The mayor that the senator criticized received more publicity than anyone expected.

So, to form a meaningful connection among the nouns, readers depend on object animacy if there are no semantic relations between the nouns. Readers experience difficulty remembering which of the nouns need to receive what thematic roles when both the object and the subject are animate. Both experiments suggest that object animacy and the extent of its semantic connection with subject have a robust effect on comprehension of ORC sentences.

The length of an attached material (Webman-Shafran & Fodor, 2016) and the position of a modifying constituent (Kim & Christianson, 2017) also influence on how much time it takes to process the material and what parsing preferences are used. For example, Hemforth et al. (2015) examined off-line attachment preferences when the position of a complex nominal group changes from object to subject and whether a relatively long relative clause leads to high attachment. The authors introduced sentences with a short relative clause (e.g., who stank) and a long relative clause (e.g., who very frequently stank) in German, English, Spanish, and French. In the example of English, two sentence variants, such as (24a) and (24b) were in subject (subject/topic position in Spanish), whereas the other two, e.g., (25a) and (25b) were in object position.

(24a) The companion of the basketball player who stumbles didn't say anything to reporters.

(24b) The companion of the basketball player who allegedly often stumbles didn't say anything to reporters.

(25a) The tenant greeted the grandfather of the caretaker who stank.

(25b) The tenant greeted the grandfather of the caretaker who very frequently stank.

It was found that the low attachment interpretation generally occurs more than the high attachment. At the same time, syntactically ambiguous sentences with long relative clauses lead to more high attachment than low attachment interpretations. In Spanish and German,

high attachment interpretations appear more often when relative clauses are in object position than in non-object position. Overall, German and French speakers favor high attachment interpretations more than Spanish and English speakers. The study concluded that differences between attachment preferences are merely attributed to specific properties of languages, and therefore, researchers may need to focus on similarities across languages instead.

In sum, research indicates that internal characteristics of the incoming material, such as noun animacy, the length of a relative clause, and the position of a modifying constituent can directly influence the choice of a parsing path employed for sentence processing. The information about animacy is used right since the beginning of parsing, but independently from syntactic information (Baudiffier et al., 2011). Animate nouns are taken as agents or experiencers, and inanimate nouns are often assumed to be the theme-object of an action. Because of this, active ORCs with animate heads are more difficult to process than the same clauses with inanimate heads (Gennari & MacDonald, 2008). In the event of both object and subject are animate, the parser cannot easily attribute the appropriate thematic roles to these nouns (Lowder & Gordon, 2014). Because of that, readers are suggested to be inclined to make expectations about the incoming material, and if those expectations are not met, say, in reading uncommon structures, e.g., active ORCs with animate heads, longer processing time (more difficulty) would be shown than in parsing common structures, such as active ORCs with inanimate heads (Levy et al., 2013). It is suggested that syntactically ambiguous sentences featuring a long relative clause are likely to be resolved through the high attachment interpretation than the low attachment interpretation (Hemforth et al., 2015). This observation underpins the premise that long relative clauses tend to be marked with the prosodic boundary (e.g., Fodor, 2002, for the Balanced Sister hypothesis).

The review of the literature also makes it evident that parsing preferences can vary across languages, with one array of languages showing tendency to attach low, and the other

array tending to attach high. Keeping this in mind, is it so that L1 preference to attach low (high) will transfer to low attachment (high attachment) interpretation of sentences in L2? The next section deals with the question of whether there is such transfer, if yes, to what extent it occurs, and how this transfer impacts the time course of processing and further comprehension.

2.3. L1 influence on processing syntactically ambiguous sentences

Language transfer has long been considered with regard to its facilitating or inhibiting effects on reading in the target language. For example, while reading in L2, language learners with typologically close L1 and L2 can rely on cognates, unlike those learners whose languages are less or not related. Cognates are the semantic concepts that share orthographic forms in both languages and contribute to the surface-level transfer between the languages (Ringbom, 1992). The availability of cognates often leads to positive transfer, which is the improvement in the target language learning owing to the facilitating effect of the cross-linguistic contact (Ramírez et al., 2013).

Not only language transfer helps learners in L2 reading but can disrupt it and induce difficulties in the process and result in misapprehensions. This phenomenon is often referred to as negative transfer or linguistic interference. According to Ortega (2013), not only differences between the languages, but rather misleading similarities can induce reading difficulties. One of the striking examples is given in Schröter and Schroeder (2016): the German word “Angel” means “fish-rod” in English, and not “angel” as it could seem at first. So, the words that share orthographic forms in several languages though differ in meaning are known as interlingual homographs or “false cognates.”

Both negative and positive transfers concern not only semantics, but also other

dimensions of the L2 system, such as syntax. Grabe (2001) highlighted that the differences in word order, construction of relative clauses, complex noun phrase structures, and some other variations between L1 and L2 at the syntactic level can have an influence on how language learners read the target language materials, especially at the beginning stage of L2 learning. Ringbom (1992) admitted that language transfer in L2 reading is overt as it entails an explicit transfer of different forms of L1, such as lexical elements, phonological and morphological forms, grammatical patterns and reading strategies. It stands to reason that positive transfer takes place in related languages (e.g., German and Dutch) when the material being processed carries at least some cross-linguistic resemblance to the L1 knowledge. This argument also implies that positive transfer has little to no chance to occur in distant languages, such as German and Japanese.

Benson (2002) considered language transfer as a conscious and an unconscious process. When there is a gap in the L2 knowledge, language learners can consciously resort to transfer in an attempt to eradicate that gap. For instance, when there is a certain structure that exists in L2 but is absent from the L1 grammatical representation, language learners can try to map, that is, transfer the L1 structure with analogous semantic content but that is built with a different morphosyntax (Romano, 2021). Otherwise, transfer may arise unconsciously, because the knowledge is not established in the learner's L2 system or is yet to be fully automatized. So, difficulties and errors in L2 reading have to be explained in developmental terms, and not only by language transfer per se. The amount of transfer is suggested to decline with an increasing L2 proficiency but may never surmount at higher levels of reading complexity.

There is a range of views or theoretical underpinnings on language transfer that would particularly apply to the construct of reading. One view is that there is a complete transition, that is, the full transfer of aspects of L1 grammar with its abstract and functional categories at

the beginning stage of L2 acquisition. With the advancement of the target language, some properties of this language can no longer be lodged within the fully transferred L1 system, and the grammar starts to receive structural rearrangements (Schwartz & Sprouse, 1996, for the Full Transfer/Full Access Hypothesis). A slightly different view proposes that at the initial state of L2 acquisition language learners have both lexical and functional categories transferred from their L1. The only exception are the feature values of the functional categories, that is, morphological information. For example, the strength of inflection is set at null and becomes "valueless" and "inert" at the start of L2 acquisition and before language learners get familiarized how agreement manifests itself in their L2 (Eubank, 1996, for the Valueless Feature hypothesis). From another perspective, the scope of transfer at the beginning of L2 acquisition is restricted to lexical, and not functional categories (Vainikka & Young-Scholten, 1996, for the Minimal Trees hypothesis).

It is evident that language transfer is one of the most influential variables in reading on the target language, but there is no consensus on what exact L1 knowledge does not get transferred to L2 and what does and to what extent. Due to the discrepancy in views on the phenomenon, it is not so obvious whether L2 reading is a function of L2 proficiency or age of L2 acquisition, or a complex case of within-subject variability. To figure this out, psycholinguistic research tends to concentrate on negative rather than positive transfer since it is mainly the former that leads to difficulties in reading. In this context, Dekydtspotter et al. (2006), by analogy with Phillips (1996), conjectured that because of the lack of experience with L2, routines for lexical access in L2 learners are "underlearned" and, therefore, impede automaticity and productivity of processing. To illustrate this claim, the authors reflected on how the French sentence "Il n'y a pas assez de chambres" may be processed by English-speaking learners of French. While it is intended by its producer to mean "There are not sufficient separate sub-units of this building designed for human occupancy", these L2

learners might be (temporarily) distorted by the interpretation “There is not sufficient space”, which is not applicable to the sentence context. This (interim) misrepresentation is due to the linguistic interference from L1 English, which has English lexical entry “room” as either “chambre” or “place” in French. These learners of French might probably be unable to arrive at the intended meaning immediately, and, therefore, have a processing slowdown, or might not arrive at it at all due to the L1 interference leading to the improper interpretation that would never occur to a native French speaker.

To test the claims like above, studies of the putative transfer of particular aspects from one language to another within one linguistic domain are conducted in the form of psycholinguistic experiments. They rely on off-line or on-line methods, and sometimes both, because of the demarcation made between the process and the product of reading. In accordance with Talebi (2013), the former is expressed by the strategies that the reader employs to handle interaction with a written input and alleviate any potential difficulty of its understanding. On-line methods, such as self-paced reading and eye-tracking, can be used to get insights into the process of reading by recording the participant’s processing in real-time. It is recognized that the more time is spent between button presses during self-paced reading, the more processing complexity readers have (Keating & Jegerski, 2015). The analogous reasoning is applied to interpretation of eye-tracking data: elongated eye fixations on certain parts of input and a relatively high number of regressions indicate processing difficulty in those parts among readers. In turn, the product of reading is the result of the reader’s interaction with that input, and which is reflected in its interpretation. The product of reading is captured by reading comprehension tests, untimed grammaticality judgment tasks and questionnaires.

For example, Dowens et al. (2010) explored how English-speaking late learners of Spanish with extensive exposure to L2 and high proficiency read simple declarative sentences

with L2 morphosyntactic features available in their L1 (number agreement) and not (gender agreement). These features were manipulated by placing them at different sentence positions: gender disagreement-beginning (26a); number disagreement-beginning (26b); gender disagreement-middle (26c); number disagreement-middle (26d). The sentences were given in the grammaticality judgment task with recording of event-related brain potentials, during which one of the two buttons had to be pressed to indicate judgment about grammaticality of each sentence.

(26a) *La* *suelo* *está* *plano* *y* *bien* *acabado.*
The-FEM.SG floor-MASC.SG is flat-MASC.SG and well finished.
"The floor is flat and well finished."

(26b) *Los* *suelo* *está* *plano* *y* *bien* *acabado.*
The-MASC.PL floor-MASC.SG is flat-MASC.SG and well finished.
"The floor is flat and well finished."

(26c) *El* *suelo* *está* *plana* *y* *bien* *acabado.*
The-MASC.SG floor-MASC.SG is flat-FEM.SG and well finished.
"The floor is flat and well finished."

(26d) *El* *suelo* *está* *planos* *y* *bien* *acabado.*
The-MASC.SG floor-MASC.SG is flat-MASC.PL and well finished.
"The floor is flat and well finished."

The study found that there are largely no differences in event-related potentials of late

bilinguals and their native counterparts. Nevertheless, in the first position of manipulations (the beginning of sentences), some differences were detected between gender and number processing, with the latter being processed faster than the former. This result is justified by that grammatical number in L2 Spanish is likely to be acquired better than grammatical gender, because the latter is missing in L1 English. Late learners have more mistakes in grammaticality judgments of sentences with gender violation than in those with number violation. Concerning the second position of manipulations (the mid-sentence position), the delineated differences between the native and high proficiency groups are far more distinct than in those sentences with the first position of manipulations. The authors attributed such difference to higher cognitive load and, therefore, more WM cost in processing sentences with the second position of manipulations than those sentences with the first position of manipulations. As a result, the authors concluded that native-like processing of both codified and uncodified grammatical features (number and gender, respectively) among late learners is achievable at high levels of proficiency. The study also stresses the importance of WM limitations that are due to the lasting L1 transfer effects.

Because of the structural differences between simple declarative sentences and complex sentences, one can expect transfer to be manifested differently in both the process and the product of reading. In this regard, the complexity of syntactically ambiguous sentences provides a prolific testing ground to further understand the cross-language effects on syntactic processing and whether language learners resort to a parsing strategy of their L1 to interpret an input in L2 or L*n*. For instance, Rothman (2010), in one of the off-line experiments, instituted an untimed simple choice matching task to L1 English with L2 Spanish and L1 Spanish with L2 English learners of Brazilian Portuguese and groups with Brazilian Portuguese/Spanish/English as controls. The testing material involved ambiguous relative clause sentences, such as (27a) and unambiguous relative clause sentences with

coerced high/low attachment, such as (27b) and (27c). Each sentence was followed by a comprehension question (e.g., “Who is said to be intelligent?”) and answer options (e.g., the wife of that man; that man; not sure).

(27a) Yesterday, I saw on the street the father of my husband who after the divorce treated me poorly.

(27b) I need to speak with the wife of that man who is known for her intelligence.

(27c) Maria wants to go out with the son of that woman who is known for her good looks.

There were significant differences between the groups of Spanish control, L1 English with L2 Spanish, L1 Spanish with L2 English and the groups of English control and Brazilian Portuguese control. The former three groups preferred to interpret sentences in favor of high attachment, while the latter two groups demonstrated low attachment preference. The study, therefore, suggested that preference to attach a relative clause high is a result of transfer from Spanish, regardless of whether it was learned as L1 or L2. Being a typologically close language, Spanish, not English, is used for comprehension of Brazilian Portuguese sentences with the two-site context (ambiguous or not).

Kim (2010) instituted a questionnaire to Korean-speaking learners of English to investigate what attachment preference they favor in interpretation of syntactically ambiguous relative clause sentences. The researcher manipulated the two factors, relative pronoun extraction site (object-extracted vs. subject-extracted) and referential load (first- or-second person pronouns vs. full names and definite description). Following the Dependency Locality Theory (Gibson, 1998), subject-extracted relative clauses were considered as processed faster and requiring less storage than object-extracted relative clauses. Relative clauses that feature a first- or second-person pronoun (e.g., you) were taken as easier to process than relative clauses with a full NP (e.g., the producer) or definite description

(Warren & Gibson, 2002, for the Givenness Hierarchy). The two factors were crossed to develop the following four types of stimuli: subject-extracted sentences with heavy (28a) and light (28b) referential loads, and object-extracted sentences with heavy (28c) and light (28d) referential loads.

(28a) The agent of the star who met the producer at the party was poor.

(28b) The agent of the star who met you at the party was poor.

(28c) The agent of the star who the producer met at the party was poor.

(28d) The agent of the star who you met at the party was poor.

It was found that the manipulation of factors in the testing material did not lead to significant results, but there was a trend toward significance between the cloze test scores and mean attachment preference ($p < .10$). The author explained this outcome as that Korean-speaking learners of English with a relatively low L2 proficiency, that is, with the cloze test score below average, tend to attach a relative clause low. It was also confirmed that Korean-speaking learners of English were found to prefer attaching a relative clause to the higher noun phrase 70% of the time in interpretation of syntactically ambiguous sentences. Built on previous evidence for high attachment preference in Korean as L1 (e.g., Lee & Kweon, 2004), the author concluded that it is the transfer from Korean that has an influence on L2 sentence interpretation in English. The author attributed this result to the strength of Recency Preference effect (Gibson et al., 1996), suggested to be carrying an equal power in different languages, rather than transfer from L1. The study suggested that language transfer can happen not only between typologically similar languages but also the languages with a different head-directionality, like in the case with Korean and English.

Hopp (2006) conducted experiments involving online processing with English- and Dutch-speaking learners of German (near-native and advanced levels) to check for differences between L1 and L2 processing of garden-path subject-extracted and object-

extracted sentences disambiguated by either verbal agreement (29) or case (30). In (29), the noun “die Baronin” (the baroness) and the verb “hat” (has) receive the same number marking, that is, are in singular form, so that the sentence is supposed to be interpreted as it was the baroness who invited, not the bankers (“die Bankiers”). In (30), since the noun “der Physiker” (the physicist) is in the nominative form and the noun “den Chemiker” (the chemist) is in the accusative form, the sentence has to be understood as it was the physicist who greeted the chemist, and not vice versa.

(29) *Sie sagt, dass die Baronin am Freitag die Bankiers*
She says that the baroness-SG on Friday the bankers-PL
eingeladen hat.
invited has-SG.
“She says that the baroness has invited the bankers on Friday.”

(30) *Er denkt, dass der Physiker am Freitag*
He thinks that the-NOM physicist on Friday
den Chemiker gegrüsst hat.
the-ACC chemist greeted has.
“He thinks that the physicist has greeted the chemist on Friday.”

Hopp administered Experiment 1 in the form of the self-paced segment-by-segment reading task in a non-cumulative moving window paradigm. There was a comprehension sentence after each experimental sentence that required judgement (Yes/No) about whether this sentence reflects the meaning of the previously encountered experimental sentence. As a result, native German processing of object-extracted sentences disambiguated by verbal

agreement was significantly more difficult (longer reading times) than processing of the analoguous sentences disambiguated by case. It was also found that L2 learners have more difficulty with sentences disambiguated via verbal agreement than via case. This suggests that their ability to utilize case cue for adequate sentence representations is stronger than verbal agreement cue. Comparisons of native German speakers with near-native speakers showed that the latter can process some segments of sentences disambiguated by case (NP1; Adverbial) and disambiguated by verbal agreement (Finite verb) in a native-like manner.

Experiment 2 was conducted in the form of the speeded grammaticality judgment task to test whether differences between processing sentences disambiguated via case and verbal agreement can alter under time pressure. The task featured sentences similar to those from Experiment 1, but they were disambiguated by case marking and case violation, e.g., marked with nominative twice (*der-der*) and marked with accusative twice (*den-den*). The rest of sentences were in either subject-object order or object-subject order with violations of verbal agreement. Participants read sentences in a word-by-word fashion, and upon the last word of the sentence, they were asked to make a time-constrained grammaticality judgment (Yes/No) by pressing one of the colored buttons. In both native speakers and near-native learners, the reading times were longer, and comprehension was worse for object-extracted sentences than subject-extracted sentences. Language learners with advanced level judged the object-extracted sentences as grammatical less often than subject-extracted sentences. Near-native speakers were sensitive to ungrammatical case marking in the same way as native speakers. In all groups, sentences with violations of case marking were judged better than sentences with violations of verbal agreement. Unlike in Experiment 1, comprehension accuracy was higher for sentences with violations of verbal agreement than for those with violations of case. There were no differences observed between the English- and Dutch-speaking learners of German in manifesting attachment preferences corresponding to L1. However, differences

were detected between the Dutch- and English-speaking near-native learners and advanced learners in that the former groups demonstrate more native re-analysis patterns than the latter groups do. Based on these findings, the study concluded that there is a facilitating influence of proficiency on L2 performance. Parsing routines and patterns of re-analysis of near-native speakers of German processing L2 materials are similar to the ones the native speakers demonstrate.

In another self-paced reading study, Rah and Adone (2010) examined the processes that underlie L2 processing in German learners of English with intermediate and advanced levels of proficiency and compared them with native processing. The authors employed the self-paced reading of garden-path sentences with transitive reading (31) along with ambiguous sentences with an open transitive interpretation till the last word of the cue region (32), as well as unambiguous sentences (33). The cue region was the third chunk (e.g., almost every day) before the disambiguating region in the sentences and was expected to either facilitate or hinder processing.

(31) The brown sparrow noticed on an upper branch pecked at an insect.

(32) The brown sparrow noticed almost every day pecked at an insect.

(33) The brown sparrow seen by the hungry cat pecked at an insect.

It was found that the advanced German learners of English (advanced group) experience difficulties with reduced relative clauses but are expectedly faster and more accurate in retrieving from misanalyses than the intermediate group. L2 learners exhibit mostly correct responses to the grammaticality judgment task for sentences as (31) and notably (33). The accuracy for sentences as (32) is significantly lower than for sentences as (33) in three groups. Both L2 groups read the embedded irregular verb and the cue region of the unambiguous condition longer than other regions, because they are pushed to build a reduced relative clause at these regions. This result may be justified by that their L1 does not

have reduced relative clauses. The study concluded that German-speaking learners of English exhibit processing strategies that are similar to those of native English speakers, but still lack the automaticity of processing, which gradually improves with increasing L2 proficiency.

In the eye-tracking experiment, Dussias and Sagarra (2007) explored the influence of the L2 environment immersion on processing of locally ambiguous relative clause sentences disambiguated via morphological gender toward high attachment (34a) and low attachment (34b). The researchers recruited L1 Spanish – L2 English and native Spanish speakers and divided them into three groups. The first group included those who had resided in an English-speaking environment for a long period (bilinguals with "extensive L2 exposure"). The second group comprised those who had lived in that environment for a short period (bilinguals with "limited L2 exposure"). The third group involved native Spanish speakers who had no knowledge of other languages.

(34a) *El policía arrestó a la hermana del criado*
The police arrested the sister of servant-MASC
que estaba enferma desde hacía tiempo.
who had-been ill-FEM for a-while.
"The police arrested the sister of the (male) servant who had been ill (feminine) for a while."

(34b) *El policía arrestó al hermano de la niñera*
The police arrested the brother of the babysitter-FEM
que estaba enferma desde hacía tiempo.
who had-been ill-FEM for a-while.
"The police arrested the brother of the (female) babysitter who had been ill

(feminine) for a while."

It was found that comprehension in L1 Spanish was more accurate in native speakers than in the extensive L2 English exposure group and the limited L2 English exposure group (96%, 93%, and 91%, respectively). In both the native speaker group and the limited L2 exposure group, the total reading time for sentences disambiguated toward low attachment was significantly longer than for sentences disambiguated toward high attachment. This finding validates earlier evidence (e.g., Carreiras & Clifton, 1999) suggesting high attachment preference in Spanish for syntactically ambiguous sentences with a two-site context. For the extensive L2 exposure group, the result was the opposite, implying that while extensively exposed to L2, language speakers can adjust their parsing preference to the one that their target language has, i.e., low attachment in this case.

Witzel et al. (2012) conducted an eye-tracking study to explore the parsing strategies of native English speakers and Chinese-speaking advanced learners of English while reading English sentences with local ambiguities of relative clause attachment disambiguated toward high attachment as (35a) and low attachment (35b), adverb attachment ambiguity with high (36a) and low (36b) attachment conditions, and NP versus sentence coordination with unambiguous (37a) and temporarily ambiguous (37b) conditions.

(35a) The sister of the heir who bankrupted herself established risky business.

(35b) The sister of the heir who bankrupted himself established risky business.

(36a) Robert will meet the friend he phoned tomorrow, but he doesn't want to.

(36b) Robert will meet the friend he phoned yesterday, but he doesn't want to.

(37a) The nurse examined the mother, and the child played quietly in the corner.

(37b) The nurse examined the mother and the child played quietly in the corner.

The reflexive pronouns in the disambiguating region of relative clause sentences (e.g., himself/herself) were balanced, whereas adverb phrases were concordant by past and future

tenses (e.g., last month/next month). After each sentence, there was a Yes/No comprehension question. In processing of the sentences with adverb attachment ambiguity prompting to attach low (36a) or high (36b), both groups demonstrated significant preference to attach low, which is in line with L1 Chinese preference to attach modifiers of a verb phrase. While interpreting the sentences with a relative clause attachment ambiguity, the group of Chinese-speaking advanced learners of English preferred high attachment (35a), and the group of native speakers exhibited low attachment preference (35b). These results, however, were not bound to be decisively explained by the high attachment preference transfer from L1 Chinese to L2 English, because previous research could not resolutely establish how attachment ambiguity in L1 Chinese is resolved. Some studies suggested that native Chinese speakers prefer to attach high (Cai, 2007), whereas others argued that they favor to attach low (Kwon et al., 2019; Shen, 2006). Nevertheless, the study contended that it is the interference of L1 Chinese that results in the high attachment preference in L2 English.

In an on-line study, Bidaoui et al. (2016) examined attachment preferences of native Arabic speakers (the native speaker group) and English-speaking learners of Arabic (the learner group), and whether there is any transfer of L1 English preference to L2 Arabic. The study involved the attachment preference task and the self-paced reading task of locally ambiguous relative clause sentences with a two-site context disambiguated by verb meaning. Results of the off-line task showed that both native speakers and language learners demonstrate high attachment preference. In the self-paced reading, comprehension accuracy was significantly higher in the native speaker group than in the learner group. In the region following the disambiguating verb, the high attachment condition was read faster than the low attachment condition in both groups. Despite these results, the effect of interaction between attachment and group was significant in the learner group and not significant in the native speaker group. These on-line findings suggest that attachment preferences of English-

speaking learners of Arabic remain towards high attachment, which was also shown in the off-line task. Native Arabic speakers, however, do not demonstrate a clear-cut high attachment preference in the on-line task as they do in the off-line task. The results of this study offer support to only one factor, Predicate Proximity, of the two-factor model (Gibson et al., 1996) and suggest that the factor is so robust to override the Recency Preference in languages (e.g., Arabic) that permit its head verb to be situated afar from its arguments. At the same time, the study provides the evidence for the lack of L1 transfer and the ability of L2 learners to adjust their parsing preferences toward native-like, even though the latter are not robust in the on-line processing.

More recently, Uludağ (2020) investigated the effect of L1 on parsing strategies in interpretation of globally ambiguous relative clause sentences in L2. By using the paper-based comprehension task, the author conducted an experiment to check how Turkish-speaking learners of English disambiguate sentences such as (38) in both Turkish and English and contrasted the results with attachment preferences of native English speakers.

(38) The furniture of the room that had bright colors amazed the guests.

It was found that native English speakers attach relative clauses to NP_2, whereas Turkish-speaking learners of English, when shown similar sentences in Turkish, have a robust predisposition to attach a relative clause to NP_1 following their L1 parsing strategy. Turkish-speaking learners of English do not show preference to attach the relative clause to either of NPs in English. In an eye-tracking experiment, Turkish-speaking learners of English are guided by L1 parsing strategy (i.e., high attachment) when processing syntactically ambiguous relative clause sentences in English, suggesting L1 transfer. This finding contradicts an earlier study (Dinçtopal-Deniz, 2010) that suggested there is no interference when Turkish-speaking learners of English process syntactically ambiguous structures in English.

The reviewed studies collectively suggest that with increasing L2 proficiency, the parsing mechanisms of L2 learners can closely resemble the ones that the native speakers of a given language demonstrate (Bidaoui et al., 2016; Rah & Adone, 2010; Hopp, 2006). When language learners are still under way to the proficient use of their target language, they can show indistinct pattern of their parsing preference (Uludağ, 2020, for an off-line evidence). The degree of current exposure to the target language also affects L2 processing since those learners with relatively more amount of such exposure can develop native-like parsing routine and level of comprehension (Dussias & Sagarra, 2007). It is also evident that the absence of some constructions in L1 may result in relevant difficulties among learners when they process these structures in L2 (Rah & Adone, 2010). L2 learners can be guided by their native language parsing routines, e.g., preference to attach the Turkish relative clause to the head NP may predispose Turkish-speaking learners of English to do the same with analogous structures in English (Uludağ, 2020, but Dinçtopal-Deniz, 2010, for discordant evidence).

Having conducted the review, it is relatively clear what interpretation route may be adopted when native speakers of high/low-attaching languages read materials in L2 that is regarded as low/high-attaching. But it is yet to be established to what extent L2 learners rely on L1 during L2 reading, and whether they demonstrate reading patterns incompatible with either language. There is a lack of understanding about how these patterns manifest themselves in processing (the process of reading) and comprehension (the product of reading). As suggested in Slabakova and Mayo (2015), it is imperative to study specific linguistic properties on the material of language combinations, other than already examined, with the goal to identify how and when transfer manifests itself, and whether it does. The present study responded to this call by exploring correlations between the attachment preferences of native speakers of Russian and English-speaking learners of Russian, whose L1 attachment preference is supposedly in contrast with L2. The pair of English as L1 and

Russian as L2, to the best of the author's knowledge, has not been investigated in prior research. The choice of this linguistic pair is also driven by the premise that once the two languages at test share same parsing preferences, it is tricky to verify whether learners are affected by their native language or the target language. Thus, while Russian is putatively a high-attaching language, having the L2 group with low-attaching English provided a benchmark to measure the potential transfer from English to Russian and specifically establish whether the low attachment preference is pervious to transfer from English to Russian or not. In a broad sense, psycholinguistics and language pedagogy can benefit from this study by further understanding of the general mechanism of the positive (or negative) transfer of L1 knowledge pertinent to the process and the product of L2 reading. The investigation can potentially lead psycholinguistic research towards finding the most inclusive theory that accounts best for all languages and structures.

2.4. Syntactic ambiguity in Russian

The issue of syntactic ambiguity on the material of Russian has been investigated on the basis of native sentence processing across the two linguistic domains. The first is relative clause attachment ambiguity that has been instantiated in locally ambiguous sentences with the two-site context (e.g., Sekerina, 2003) and with the three-site context (e.g., Dragoy, 2006), as well as globally ambiguous sentences with the two-site context (e.g., Anisimov, 2013). The second domain is participial relative clause attachment ambiguity that has been presented in both locally and globally ambiguous sentences with the two-site context (e.g., Chernova & Chernigovskaya, 2015). Of these two, the resolution of relative clause attachment ambiguity with the two-site context has gained the most attention among the researchers. To see the differences between the two apparently similar constructions, let us review both relative

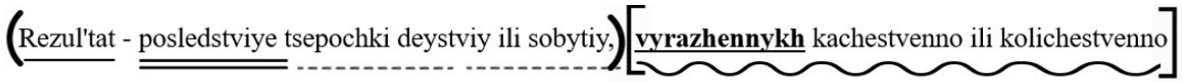
clauses and participial relative clauses in Russian.

Participial relative clauses are similar to relative clauses as syntactic structures in that both of them are complementizer phrases (CPs). In English, the equivalent to participial relative clauses is reduced relative clauses, which are considered as a subtype of relative clauses (DeCapua, 2017). However, in Russian, relative clauses are not considered as tantamount to participial relative clauses. First, Volkova (2017) emphasizes that unlike relative clauses, participial relative clauses in Russian do not have a head of a CP, such as *kotoryy* (“which/who”), *kakoy* (“which/that”), *chey* (“whose”), *chto* (“that”), *gde* (“where”), *kuda* (“where-to”), *otkuda* (“where-from”), *kogda* (“when”), and *kto* (“who”). Second, participial relative clauses do not have their own time reference and do not introduce subjects. Third, even though both constructions can be synonymous, there are some instances when it is impossible to replace a relative clause with a participial relative clause. For example, when the predicate of a participial relative clause is in the future tense or in the form of the conditional (subjunctive) mood, or when the former has CP “which” in any case, except for NOM and ACC without preposition. The other difference between these constructions in Russian is that participial relative clauses are regularly used in literary writing style, whereas relative clauses are stylistically neutral. Fifth, participial relative clauses are more concise than relative clauses in Russian and can be introduced before or after the noun phrase they modify, whereas relative clauses can only be placed after the modified noun phrase. So, even though participial relative clauses are often synonymic to relative clauses in meaning, both are considered separate constructions due to the formal differences specified above.

Khorokhordina (2017) differentiates the two types by conducting their syntactic linear analyses. In participial relative clause complex sentence as (39) the information presented by the main clause and the participial relative clause is ranked by importance. The information

delivered by the main clause and the relative clause of the relative clause compound sentence as (40) is rather of the same communicative importance – both predicates put the information they transmit in the foreground. In other words, the relative clause "which are expressed qualitatively or quantitatively" holds the information that is of the same load as the preceding main clause in the form of a short participle "(are) expressed." The relative clause transforms into the second independent clause due to featuring the relative pronoun "which." In turn, this relative pronoun is expressed as the subject of the second independent clause, whereas the predicate "(are) expressed" is conveyed as the short participle, and that is what makes the sentence compound. In contrast, the participial relative clause "expressed qualitatively or quantitatively" is an embedded one as it is semantically relegated to the background by becoming sort of clarifying or secondary information, and the predicate "(the) consequence", which is expressed in the form of a noun in the main clause, becomes the sole primary message of the complex sentence.

(39)



Result – consequence$_{\text{N.SG.NOM.}}$ *chain*$_{\text{N.SG.GEN}}$ *actions*$_{\text{PL.GEN}}$ *or events*$_{\text{PL.GEN}}$, *express*$_{\text{PTCP(FULL).PFV.PL.GEN}}$ …
"Result is the consequence of a chain of actions or events expressed qualitatively or quantitatively"

(40)

Result – consequence$_{\text{N.SG.NOM.}}$ *chain*$_{\text{N.SG.GEN}}$ *actions*$_{\text{PL.GEN}}$ *or events*$_{\text{PL.GEN}}$, *which express*$_{\text{PTCP(SHORT).PFV.PL.NOM}}$ …
"Result is the consequence of a chain of actions or events, which are expressed qualitatively or quantitatively"

Given the considerations above, processing a participial relative clause sentence is

likely to be different from that of a relative clause sentence. In participial relative clause sentences, due to no CP "blocking" the way between the main and participial relative clauses, thus more closely attached NPs to the modifying participial relative clause, processing might be easier than of the relative clause sentences. Indeed, relative clause sentences might bring slightly heavier processing load than in participial relative clause sentences due to the presence of the head of a CP.

However, there are several possible but contrary scenarios with regard to comprehension of participial relative clause sentences in contrast with relative clause sentences. On the one hand, because there is no complementizer in a participial relative clause sentence, the recency effect may become so strong and make disambiguation easier than in relative clause sentences because of the incoming participial clause being attached directly to the $NP_{2/3}$. This scenario is backed by previous research (e.g., Keenan & Kintsch, 1973) suggesting that the complexity of syntactic structure increases the difficulty of reading, which leads to leaving some part of the earlier processed stimuli behind at the stage of interpretation. At the same time, the predicate proximity effect would also become more activated on account of the absence of the head of a CP, so that the incoming participial clause is attached more closely to the NP_1 than in a relative clause sentence. On the other hand, readers may be able to recall the entire nominal group owing to the absence of complementizer and then encounter comprehension difficulty due to having more NP options to decide on for disambiguation. In turn, due to heavy processing load, comprehension of relative clause sentence might be affected by partial loss of information about the nominal group and, therefore, present fewer NP options to choose from to resolve an attachment ambiguity.

One of the earliest attempts to examine the issue of attachment ambiguity resolution in Russian was made on the example of globally ambiguous relative clause sentences with two

potential NP attachment sites. Thus, Sekerina (2003) conducted several experiments to test whether the low attachment of the relative clause to the complex NP is applicable to Russian. Experiment 1 introduced the globally ambiguous relative clause sentences (41) and the same sentences but that feature a lexical preposition (42) in the off-line rating acceptability questionnaire. There were also partial paraphrases of each sentence in order manipulate them in such a way so that participants were forced to adopt a high (e.g., "My sister's friend went abroad") or low-attaching (e.g., "My sister went abroad") interpretation.

(41) *Nikolay* *khorosh-o* *zna-l* *syn-a* *polk-ov-nik-a* *kotor-yy*
Nikolay-NOM well knew son-ACC colonel-GEN who-NOM
po-gib *v* *avto-mobil'-n-oy* *katastroph-e.*
was-killed in car accident.
"Nikolay knew well the son whose father, the colonel, was killed in a car accident. / Nikolay knew well the colonel's son who was killed in a car accident."

(42) *Illyustr-atsi-i* *k* *ras-skaz-am* *kotor-yye* *by-l-i* *pri-sl-an-y*
Illustrations-NOM to stories-DAT which were sent
na *konkurs,* *is-poln-en-y* *master-sk-i.*
to contest are-performed professionally.
"The illustrated stories which were sent to the contest are performed professionally. / The stories which were sent to the contest have illustrations performed professionally."

Participants were requested to rate each sentence according to the following scale: 0 = "No such meaning exists for the sentence"; 1 = "The meaning does not come to mind easily,

but you agree that it is possible"; 2 = "The meaning comes to mind second but not immediately, after reading the sentence"; 3 = "The meaning immediately comes to mind, right after reading the sentence." As a result, it was found that the high attachment interpretation received higher ratings than the low attachment intepretation (2.53 and 1.51, respectively). The on-line task (Experiment 2) was instituted to test whether the same result can be achieved when participants read the same sentences under time limitations. The researcher generated the set of comprehension questions reflecting a query about one of the sentence interpretations. As a part of the procedure, the participants were invited to answer "yes" or "no" to each question in order to indicate whether the given sentence interpretation is appropriate or not. It was found that Russian speakers have a higher percentage of "yes" answers to post-reading questions reflecting the high-attaching interpretation of a sentence than those reflecting the low attachment sentence interpretation (81.77% and 18.16%, respectively). In both experiments, high attachment is shown to be more preferable than low attachment in native speakers of Russian.

Dragoy (2006) tested whether those native speakers of Russian with high capacity of WM tend to attach a relative clause low or do not show any preference, owing to the activation of both first and last noun phrases. The recruited participants were native speakers (20-25 years old) who were graduate and postgraduate university students at the time of experiment. The material involved Russian relative clause sentences with a three-site context, which were controlled for the length of the clause. It was suggested earlier (Fedorova & Yanovich, 2004) that long clauses such as (43a) push to adhere to the Minimal Attachment principle, and short clauses such as (43b) predispose to follow the Late Closure principle.

(43a) It is difficult to understand the logic of organization of speech, which is damaged.

(43b) It is difficult to understand the logic of organization of speech, which is damaged in many patients with lesions of the left hemisphere.

To estimate their WM capacity, the researcher used the WM test (Daneman & Carpenter, 1980) adapted for Russian. Each participant was invited to read a series of sentences that featured between two to five sentences each. Upon completion of one series presentation, participants had to repeat the last words of the sentences. Participants received five points for each completely and correctly repeated series. The participants were divided into groups with the low, medium, and high WM capacity. The sum of the points less than or equal to 30 was interpreted as the low WM capacity. Those who achieved less or equal to 45 points were regarded as having the medium working capacity. The participants who scored 50 points or more at the test were considered as having the high WM capacity.

Each participant was instructed to read aloud experimental sentences each appearing on the computer screen. To move to the next sentence, they had to press the specified button and were forwarded to read a paraphrase of that sentence with three interpretations (e.g., logic, organization, speech). They were asked to choose one of the options, say it out loud and simultaneously press the corresponding key. As a result, in the group with low WM capacity, high attachment interpretation was the most preferable, followed by low attachment and middle attachment. In the group with the high WM capacity, the order of preference was reversed: low attachment interpretation prevailed over high attachment interpretation. This result contradicts the belief that Russian prefers high attachment. In the group with medium WM capacity, the preference pattern reflects no significant differences between the high and low attachment interpretations, with significantly less preference for the middle attachment interpretation. Lending support to the two-factor model (Gibson et al. 1996), the findings suggest the simultaneous activation of the Predicate Proximity and Recency Preference factors, which, however, have different strengths in groups with different levels of WM capacity.

Yudina (2006) investigated whether the high attachment preference of Russian is maintained in language production. The participants had to complete sentences with either "which$_{MASC}$" or "which$_{FEM}$" after exposure to one of the contexts. The neutral context, such as (44) predisposed to attach the relative clause high and low by providing information without revealing NP_1 and NP_2 to be encountered in the unfinished sentence. The context predisposing to attach high, such as (45) introduced NP_2 prompting participants to favor for NP_1 attachment because NP_2 is already known. The context, such as (46) introduced multiple elements, including NP_2, to trigger the participants to attach low.

(44) *Vchera na nashey ulitse sluchilos' potryassheye vsekh*
Yesterday on our street happened shocked everyone
uzhasnoye accident. Prestupnik zastrelil slugu
terrible event. Criminal shot servantMASC/FEM
aktrisy,…
actressFEM,…
"Yesterday the terrible event (that) shocked everyone happened on our street. The criminal shot the servant of the actress,..."

(45) *Eta aktrisa vsegda davala priyut narushitelyam zakona,*
This actress always gave shelter violators law,
poka-ne sluchilos' neschast'ye. Prestupnik zastrelil slugu
until struck disaster. Criminal shot servantMASC/FEM
aktrisy,…
actressFEM,…
"This actress has always given shelter to violators of the law, until the disaster

struck. The criminal shot the servant of the actress,...”

(46) *Sredi aktris etogo gorodka bylo prinyato davat’*
Among actresses this town it-was customary to-give
priyut narushitelyam zakona, poka-ne sluchilos’ neschast’ye.
shelter violators law, until struck disaster.
Prestupnik zastrelil slugu aktrisy,...
Criminal shot servantMASC/FEM aktrisyFEM,…

“Among the actresses of this town, it was customary to give shelter to violators of the law until the disaster struck. The criminal shot the servant of the actress,…”

The highest preference for high attachment was displayed in the sentences predisposing to attach high, followed by sentences with neutral context and then low attachment predisposition (91.3%, 62.5%, and 60.6%, respectively). It was suggested that native Russian speakers prefer to attach the relative clause to the NP that is a situationally marked referent, i.e., there is an emphasis on this NP participant in the discourse situation. The study suggested robust predominance of high attachment in Russian. The author advised to control for both the gender and context effects, because preference of any closure type is prompted not only by the context, but also the gender of nouns in NPs, the semantics of the main verb and the lexical composition of the contexts.

Chernova and Chernigovskaya (2015) employed the self-paced reading (Experiment 1) and eye-tracking (Experiment 2) paradigms. Their material contained Russian globally ambiguous participial relative clause sentences with two possible NP attachment sites such as (47) and locally ambiguous sentences of the same type, disambiguated by case like (48) and (49). Experiment 1 showed that sentences with low attachment predisposition are misread as

high attachment more than high-attaching sentences as low-attaching, suggesting that high attachment effects are stronger than that of case marking, that is, case morphology on the participle. Globally ambiguous sentences are read as high attachment more frequently than low attachment (67.3% and 32.7%, respectively), and the sentences in the low-attaching version are comprehended worse than those in the high-attaching version. It was also found that ambiguous sentences with the low attachment interpretation are processed faster than those with the high attachment interpretation. This result is unexpected given that the high attachment condition is supposed to be read faster as it is the preferred option. The authors interpreted this reading time result as the result of influence from the Late Closure principle (Frazier & Fodor, 1978): since the agreement between a noun and a participle is not local, the high attachments demand more WM resources and are longer to process than the low attachments.

In Experiment 2, the authors examined the effects of attachment preferences on processing participial relative clause sentence by using the eye-tracking method. They found that the number of regressions to or from the participle-region is higher for low-attaching and globally ambiguous sentences than to or from the high-attaching sentences. Rereading of the NP_1 region occurs twice more than of the NP_2 region. This matched comprehension results showing that the global ambiguity is resolved more towards high attachment than low attachment. In sum, the study provides evidence for strong high attachment preference in native Russian speakers: even though high-attaching sentences necessitate more time to process than other conditions, they are preferred over other conditions at the stage of comprehension.

(47) *Svide-tel'*	*u-pomya-nu-l*	*na-par-nik-a*
Witness-NOM-MASC-SG	mention-PFV-PST-SG	workmate-MASC-SG-ACC

vod-i-tel-ya *vchera*

driver-MASC-SG-GEN yesterday

vid-evsh-ego *eto o-grabl-eni-ye.*

see-PTCP-ACC/GEN-SG-PASS-PFV this robbery.

"The witness mentioned the workmate of the driver yesterday having seen this robbery."

(48) *Svide-tel'* *u-pomya-nu-l* *o*

Witness-NOM-MASC-SG mention-PFV-PST-SG about

na-par-nik-e *vod-i-tel-ya* *vchera*

workmate-MASC-SG-PREP driver-MASC-SG-GEN yesterday

vid-evsh-ego *eto o-grabl-eni-ye.*

see-PTCP-ACC/GEN-SG-PASS-PFV this robbery.

"The witness mentioned about the workmate of the driver yesterday having seen this robbery."

(49) *Svide-tel'* *u-pomya-nu-l* *o*

Witness-NOM-MASC-SG mention-PFV-PST-SG about

na-par-nik-e *vod-i-tel-ya* *vchera*

workmate-MASC-SG-PREP driver-MASC-SG-GEN yesterday

vid-evsh-em *eto o-grabl-eni-ye.*

see-PTCP-PREP-SG-PASS-PFV this robbery.

"The witness mentioned about the workmate of the driver yesterday having seen this robbery."

Chernova and Prokopenya (2016) administered a story-continuation task as (50) to native speakers of Russian to check whether the resolution of syntactic ambiguity is influenced by contextual expectations and the ambiguity is resolved via the head of the nominal group. The participants were asked to fill in blanks with whatever comes to their mind first. It was found that the majority of the participants responded in a way that does not resolve the ambiguity and maintain it by producing third person pronouns (e.g., *ona* "she"). Other participants put the NP_1 or their synonyms in the blank, whereas the NP_2 or its periphrases were the least common responses. The authors concluded that even though most participants did not resolve an ambiguity by filling in the blank with the pronoun "she", variations of the NP_1 filling in the blank were the second most predominant. This combination of findings was taken as an indication of high attachment preference in Russian. The authors also suggested that readers tend to avoid resolving an ambiguity as they are driven by the so-called egocentric approach (Kibrik, 2011). This approach represents the case when one maintains tacit assumption that other's mental processes or WM are aligned with theirs, so that there is no need to specify who the referent is, e.g., *the servant*$_{FEM}$ or *the countess*$_{FEM}$.

(50) *Ya* *vstret-i-l-(a)* *sluzh-ank-u*

I meet-PFV-PST-MASC(FEM)-SG servant-ACC-FEM-SG

graf-in-i *na* *ulits-e.*

countess-GEN-FEM-SG on street.

"I met the servant of the countess on the street."

Mnogo *let* _____ *zhil-a* *ryad-om.*

Many year-PL _____ live-PFV-PST-SG-FEM nearby.

"For many years ____ had been living nearby."

Based on this overview, there is a predominance of research determining how native speakers of Russian assign the function of a modifying constituent of a relative clause to a NP. Relative clause sentences with two and three NP attachment sites and participial relative clause sentences with two NP attachment sites in Russian have been employed so far. There is no data from processing and comprehension of locally ambiguous participial relative clause sentences with three NP attachment sites in Russian. Therefore, the proposed study assumes the task to explore the general parsing strategy applicable to processing such sentences in Russian. Given the lack of consensus in the literature about language transfer, it is also imperative to establish whether implementation of the function assignment is transferred from one's L1 to Russian as L2. It is intriguing whether learners of Russian with advanced L2 proficiency can attain the target language parsing strategy, or they stick to one used in their L1.

Chapter 3: The present study

Based the review of literature, there is a prevalence of data on processing of garden-path sentences and relative clause sentences. Besides, the Recency Preference and Predicate Proximity model (Gibson et al., 1996) has been tested for English and Spanish, the languages using the Latin script. Both head-initial, they also share words originating from Latin and, therefore, same cognates, so the extent of transferability of literacy skills between these languages is very large. The two-factor model was also found to predict attachment preferences in Japanese, a non-alphabetic and head-final language, on the material of relative clause constructions with three head nouns (Miyamoto et al., 1999). It is admissible that the strategies found to be involved in interpretation of one type of sentences with syntactic ambiguity in Spanish, English and Japanese are not similar to the strategies used for interpretation of other type of sentences with syntactic ambiguity and in other languages. In these circumstances, it is necessary to put other languages at test to further enrich the psycholinguistic understanding of how human processor works with language, particularly with syntactic ambiguity.

Given the above, investigations with other constructions are required because each construction has its grammatical uniqueness and can bring (completely) different outcomes and enrich our knowledge about language processing with more exhaustive descriptions. Indeed, as Konieczny and Hemforth (2000) stated, the preference for the type of closure may depend on the type of the structure itself and, that is why, studies of different structure types are encouraged. Further efforts have to be afoot to test whether there are effects of both proposed factors, i.e., Recency Preference and Predicate Proximity, in unrelated to English by orthography but also head-initial languages, such as Russian. The peculiarities of inflection of Russian participles, e.g., gender, number, and case agreement with the corresponding NP, come handy as a new testing ground.

Moreover, it is important to gather supplementary evidence based on data from the comprehension of different structures (Hopp, 2014) to tackle the question of whether language speakers choose the parsing strategy consistent with their target language or adopt their L1 parsing strategy. Therefore, bringing languages contrasting in their parsing strategies as a research ground can shed more light on the putative transfer of L1 parsing strategies into L2 sentence processing and comprehension. That being said, Russian and English make up a felicitous combination to examine L2 processing of Russian participial relative clause sentences. Such an investigation also addresses broader questions that are theoretically important to second language processing research, both about the effects of L1 on L2 ultimate attainment. Does asymmetry of parsing preferences between L1 and L2 result in L1 interference, which constrains L2 ultimate attainment on parsing? Are language learners sensitive to morphological information during L2 processing in the same way as the native speakers of the language? To the best of the author's knowledge, the study reported in this dissertation is the only one that explicitly probes the potential transfer of L1 attachment preference to L2 reading in native English speakers with advanced Russian. Therefore, the study addresses the continuing debate on whether L2 proficiency at a level comparable to the level of the native speakers (advanced and near-native) could lead to suppression of L1 transfer, leaving room for the use of L2 processing strategy in the native-like manner (e.g., Dussias & Sagarra, 2007), or to inability to surmount linguistic interference, giving away the attainability of their L2 processing strategy (e.g., Su, 2001).

The study is divided into the two experiments. Each experiment puts emphasis on one source of information, that is, syntactic (disambiguation by agreement) and pragmatic (disambiguation by world knowledge) cues. The study examines which of the cues has a temporal priority, or earlier availability, in resolution of attachment ambiguity in participial relative clause sentences with a three-site context. Assume sentence processing is

implemented in a two-stage manner, at the first stage, the parser would commit to obtaining a single syntactic structure through activating morphological and syntactic information about each incoming lexical unit. The factor of Recency Preference takes the lead, whereas the strength of the Predicate Proximity factor at that stage depends on whether the language entitles a relatively long distance from the head of a predicate (verb) to its arguments (e.g., subject and object) and the higher the penalty for attaching to a non-predicate site (Gibson et al., 1996). Because Russian allows such a provision, the strength of Predicate Proximity will outweigh the strength of Recency Preference, and the parser would adhere to the Minimal Attachment principle (Ferreira & Clifton, 1986; Frazier & Rayner, 1982). Thus, it would seek to construct as less additional nodes as possible.

However, the modified constituent would not be subject to true Predicate Proximity effect, and therefore, will not rigidly attach to its modifier because the resolution of attachment ambiguity is a function of a variety of factors (Gibson et al., 1996; Carreiras & Clifton, 1993). The sentence-internal pragmatic information, which fails to correspond with the first NP modifying a participial relative clause, would serve as a counteracting factor and might outweigh this high attachment preference. As a result, one of the syntactically unpreferred attachment options, that is, low or middle attachment, could be favored once the corresponding NP (the NP_3 / the NP_2) is pragmatically congruent with the participle.

If there is a second stage of processing, the parser will seek verification for grammaticality and plausibility from a conceptual processor. If obtained it, the participial relative clause will be attached to a node that is higher in syntactic hierarchy, else a node that is dictated by pragmatic information. Because the two-stage accounts suggest that re-analysis occurs only when the constructed syntactic structure is in conflict with non-structural information accessed during the second stage, the parser would likely not commit to re-analysis. If detected the conflict of an input, particularly, inconsistency of participial relative

clause attachment to any NP with non-structural information, the parser will, first, conduct a syntactic revision and, second, once again reconcile the newly obtained structure with available non-structural information.

3.1. Aims and objectives

The present study aimed to determine attachment preferences of native Russian speakers and English-speaking learners of Russian in processing and comprehension of locally ambiguous participial relative clause sentences with three potential NP attachment sites. It also tested whether the model of Recency Preference and Predicate Proximity, as proposed by earlier experimental studies of L1 Japanese speakers, L1 Spanish, and L1 English (Miyamoto et al., 1999; Gibson et al., 1999; Gibson et al., 1996), can account for the data from native Russian speakers and English-speaking learners of Russian. In particular, the study tested whether both factors with their varying power are accountable for attachment preferences, namely the factor of Recency Preference facilitating low attachment, i.e., to NP_3 (LA) and the factor of Predicate Proximity facilitating high attachment, i.e., to NP_1 (HA).

The study also examined whether L1 and L2 speakers of Russian prioritize pragmatic cues (congruence with real-world knowledge) over morphological cues (agreement) during sentence processing and comprehension. The study attempted to expand the two-factor model by positing that pragmatic congruence of a NP with the participle overrides attachment preferences in processing and comprehension of locally ambiguous participial relative clause sentences with three potential NP attachment sites.

3.2. Research questions

Research question 1: Do native Russian speakers demonstrate a stronger attachment preference to the first NP (NP_1) than the third (NP_3) and the second (NP_2) in processing and comprehension of locally ambiguous participial relative clause sentences with three potential NP attachment sites in Russian?

Research question 2: Do English-speaking learners of Russian demonstrate a stronger attachment preference to NP_3 than NP_1 and NP_2 in processing and comprehension of locally ambiguous participial relative clause sentences with three potential NP attachment sites in Russian?

Research question 3: Does pragmatic congruence of NPs modulate attachment preference in native Russian speakers in processing and comprehension of Russian locally ambiguous participial relative clause sentences with three potential NP attachment sites?

Research question 4: Does pragmatic congruence of NPs modulate attachment preference in English-speaking learners of Russian in processing and comprehension of Russian locally ambiguous participial relative clause sentences with three potential NP attachment sites?

3.3. Hypotheses

Hypothesis 1a: Native Russian speakers process the disambiguating region of locally ambiguous participial relative clause sentences with three potential NP attachment sites in the high attachment condition faster than those in the low or middle attachment conditions.

Hypothesis 1b: Native Russian speakers judge locally ambiguous participial relative clause sentences with three potential NP attachment sites in the high attachment condition as ungrammatical less often than those in the low or middle attachment conditions.

Hypothesis 2a: English-speaking learners of Russian process the disambiguating region of locally ambiguous participial relative clause sentences with three potential NP attachment sites in the low attachment condition faster than those in the high or middle attachment conditions.

Hypothesis 2b: English-speaking learners of Russian judge locally ambiguous participial relative clause sentences with three potential NP attachment sites in the low attachment condition as ungrammatical less often than those in the high or middle attachment conditions.

Hypothesis 3a: In native Russian speakers, the decrease in reading times at the disambiguating region of locally ambiguous participial relative clause sentences with three potential NP attachment sites in the middle attachment condition is greater than the decrease in reading times at the disambiguating region of the respective sentences in the high attachment condition and the low attachment condition.

Hypothesis 3b: In native Russian speakers, the decrease in ungrammaticality judgment rate of locally ambiguous participial relative clause sentences with three potential NP attachment sites in the middle attachment condition is greater than the decrease ungrammaticality judgment rate of the respective sentences in the high attachment condition and the low attachment condition.

Hypothesis 4a: In English-speaking learners of Russian, the decrease in reading times at the disambiguating region of locally ambiguous participial relative clause sentences with three potential NP attachment sites in the middle attachment condition is greater than the decrease in reading times at the disambiguating region of the respective sentences in the low attachment condition and the high attachment condition.

Hypothesis 4b: In English-speaking learners of Russian, the decrease in ungrammaticality judgment rate of locally ambiguous participial relative clause sentences

with three potential NP attachment sites in the middle attachment condition is greater than the decrease ungrammaticality judgment rate of the respective sentences in the low attachment condition and the high attachment condition.

Chapter 4: Experiment 1

This experiment addressed the first and second research questions, which are pertinent to the question of whether a two-factor, i.e., the model of Recency Preference and Predicate Proximity (Gibson et al., 1996) accounts for the attachment preferences in L1 and L2 Russian participial relative clause attachment ambiguities. The subsequent predictions were made before conducting this experiment:

If monolingual Russian speakers prefer HA, they will demonstrate a strong tendency to attach the participial relative clause to the head NP of a complex nominal group because of the strong influence of predicate proximity factor. They will also attach it to the latest NP due to some impact of recency preference factor. This trend was anticipated to be expressed in short reading times at the participle (disambiguating region) in sentences, in which NP_1 agrees with the participle in number (the NP_1 condition). At the same time, reading times at the disambiguating region were expected to be shorter in sentences in the NP_3 condition than in the NP_2 condition. As of cumulative ungrammaticality judgments, the sentences in the NP_1 condition were supposed to be judged as ungrammatical significantly less often than those in the NP_3 condition and the NP_2 condition, respectively. Overall, the attachment preference ordering NP_1, NP_3, NP_2 was expected. This result would validate previous research (e.g., Sekerina, 2003), suggesting that Russian speakers tend to resolve attachment ambiguities high.

If English-speaking advanced learners of Russian prefer LA, they will demonstrate a strong tendency to attach the participial relative clause to the latest NP of a complex nominal group because of the strong influence of recency preference factor. They will also attach it to the head NP due to some impact of predicate proximity factor. This trend was anticipated to be expressed in short reading times at the disambiguating region in sentences in the NP_3 condition. At the same time, reading times at the disambiguating region were expected to be

shorter in sentences in the NP_1 condition than in the NP_2 condition. As of cumulative ungrammaticality judgments, the sentences in the NP_3 condition were supposed to be judged as ungrammatical significantly less often than those in the NP_1 condition and the NP_2 condition, respectively. Overall, the attachment preference ordering NP_3, NP_1, NP_2 was expected. This result would validate previous research (e.g., Fernández, 2003), suggesting that English speakers tend to resolve attachment ambiguities low.

4.1. Material and design

Comprehension difficulty of L1 and L2 speakers of Russian was explored by utilizing participial relative clause sentences with three potential NP attachment sites, based on the template: Subject and verb*NP_1*NP_2*NP_3*Participial relative clause. The stimulus material consisted of the sentences predisposing to favor low attachment on account of the participle agreeing in number with NP_1 only (the NP_1 condition) as (51a), the sentences predisposing to favor high attachment due to the participle agreeing in number with NP_2 only (the NP_2 condition) as (51b), and the sentences predisposing to favor middle attachment due to the participle agreeing in number with NP_3 only (the NP_3 condition) as (51c).

(51a) *Istts-y* *potrebov-a-l-i* *ispoln-en-iya*
Plaintiff-NOM-MASC-PL demand-PFV-PST-PL execution-GEN-N-SG
resh-en-iy *del,*
judgment-GEN-N-PL case-GEN-N-PL
zatyan-u-vsh-ego-sya *iz-za* *pandem-i-i.*
have-delay-PTCP-PST-PFV-SG-PASS due to pandemic.
"The plaintiffs demanded the execution of the judgments of the cases (the judgments' execution of the cases) having delayed due to the pandemic."

(51b) *Istts-y* *potrebov-a-l-i* *ispoln-en-iy*

Plaintiff-NOM-MASC-PL demand-PFV-PST-PL execution-GEN-N-PL

resh-en-iya *del,*

judgment-GEN-N-SG case-GEN-N-PL

zatyan-u-vsh-ego-sya *iz-za* *pandem-i-i.*

have-delay-PTCP-PST-PFV-SG-PASS due to pandemic.

"The plaintiffs demanded the executions of the judgment of the cases (the judgment' executions of the cases) having delayed due to the pandemic."

(51c) *Istts-y* *potrebov-a-l-i* *ispoln-en-iy*

Plaintiff-NOM-MASC-PL demand-PFV-PST-PL execution-GEN-N-PL

resh-en-iy *del-a,*

judgment-GEN-N-PL case-GEN-N-SG

zatyan-u-vsh-ego-sya *iz-za* *pandem-i-i.*

have-delay-PTCP-PST-PFV-SG-PASS due to pandemic.

"The plaintiffs demanded the executions of the judgments of the case (the judgments' executions of the case) having delayed due to the pandemic."

The grammatical and semantic factors were controlled for when creating the material. As for the grammatical factors, the number of the participle in the participial relative clause corresponded with the number of only one of the preceding NPs, so that each item was represented by low attachment, middle attachment, and high attachment versions. Even though the participial relative clause could in principle attach to any of the three NPs at the onset of processing, just one reading was grammatical when the singular participle *zatyanuvshegosya*

("delayed$_{SG}$") was read as only one of the NP sites was in singular form. All the nouns of NPs agreed with the participle in the participial relative clause in neuter gender, e.g., *ispolnenie* ("execution"), *resheniye* ("judgment"), and *delo* ("case"). All participles were in passive voice, past tense, and perfective form (i.e., a form equivalent to the past participle in English).

As for the semantic factors, the likelihood of each sentence interpretation was pragmatically similar. For instance, any of the three NPs *ispolnenie* ("execution"), *resheniye* ("judgment"), or *delo* ("case") were semantically compatible with "delayed due to the pandemic". Animacy of antecedents was controlled for, and all the NPs were inanimate, e.g., *ispolnenie* ("execution"), *resheniye* ("judgment"), and *delo* ("case").

With the aim to introduce the main clause of a participial relative clause sentence and set the discourse situation, the first (R1) region was composed of a subject and verb. The subject was always in animate and plural form to be co-indexed and have a syntactic relation with the verb in plural form. Neither word in R1 had such grammatical marking that would form co-index or agreement relation with words of the subsequent regions. The R2, R3, R4 (each introducing an antecedent, only one of which was being modified by a participial relative clause via agreement cue) and the participial relative clause were thematically consistent with the main clause but did not have morphological relations, e.g., agreement by case and animacy with the R1. The participial relative clause was semantically relegated to the background by introducing clarifying information, whereas the main clause was the primary message of a complex sentence and could omit a participial relative clause.

The discourses in experimental sentences were inspired by corpora of textual materials in Russian that are freely available on the Internet, e.g., official documents, news articles, and excerpts from books. To ensure that L2 learners understand the lexical items that make up the experimental sentences, they were cross-checked with the word list from one of the most popular dictionaries among learners of Russian "The Russian Learners' Dictionary 10,000

Russian Words in Frequency Order" (Brown, 2013). According to the complier, L2 learners who have the knowledge of all or most of the 10000 words present in the dictionary may be considered as near native in Russian. Given the author's opinion and the predominance of positive reviews of the dictionary from English-speaking learners of Russian (e.g., Amazon, 2021), the lexemes (words) of the experimental sentences were cross-checked with this dictionary as it reflects the vocabulary of a fluent or proficient Russian learner.

The experimental design was adapted from Gibson et al. (1996), and Experiment 1 consisted of 18 sentences in the NP_3 condition as (51c), 18 sentences in the NP_1 condition as (51a), and 18 sentences in the NP_2 condition as (51b). In addition, the experiment incorporated 60 filler sentences as distractors to ensure that participants do not become accustomed to the experimental sentences (Rah & Adone, 2010) and test the knowledge about morphological marking. The set of fillers included 30 grammatical globally ambiguous relative clause sentence with two potential NP attachment sites (52) and 30 ungrammatical relative clause sentences with two NP attachment sites (53), which were ungrammatical because neither of NPs agreed in gender with the relative pronoun and the verb. The fillers were roughly of the same length and complexity as the experimental sentences, i.e., contained 8 words and had a complex nominal group each. The data of only those native speakers and L2 learners, who were able to detect incorrect grammatical marking in sentences as (53) with at least 70% accuracy of detection, was used for analyses.

(52) *Zhyuri dis-kval-ifits-ir-ova-l-o soper-nik-a*

Jury disqualified rival-GEN.MASC.SG

atlet-a, *kotor-yy gotov-i-l-sya k sorevn-ova-ni-yam.*

athlete-GEN.MASC.SG who was-preparing for competition.

"The jury disqualified the rival of the athlete who was preparing for the

competition."

(53) *Vod-i-tel'* *lish-i-l-sya* *dvig-a-tel-ya* *avto-mobil-ya,*
Driver lost engine-GEN.MASC.SG car-GEN.MASC.SG,
kotor-o-ye *by-l-o* *ne-is-prav-n-o.*
which-N.SG was-N.SG defective.
"The driver lost the engine of the car, which was defective."

Also, four practice sentences were created. As a result, a set of 118 sentences was produced. The experimental sentences were counterbalanced across the three lists (Table 1) so that each list contained the three types of experimental sentences and 60 filler sentences.

Table 1

Counterbalancing the material for Experiment 1

List 1		List 2		List 3	
Sentences in the NP_1 condition as (51a)	$n = 6$	Sentences in the NP_1 condition as (51a)	$n = 6$	Sentences in the NP_1 condition as (51a)	$n = 6$
Sentences in the NP_2 condition as (51b)	$n = 6$	Sentences in the NP_2 condition as (51b)	$n = 6$	Sentences in the NP_2 condition as (51b)	$n = 6$
Sentences in the NP_3 condition as (51c)	$n = 6$	Sentences in the NP_3 condition as (51c)	$n = 6$	Sentences in the NP_3 condition as (51c)	$n = 6$

Grammatical globally ambiguous relative clause sentence with two potential NP attachment sites as (52)	*n* = 30	Grammatical globally ambiguous relative clause sentence with two potential NP attachment sites as (52)	*n* = 30	Grammatical globally ambiguous relative clause sentence with two potential NP attachment sites as (52)	*n* = 30
Ungrammatical relative clause sentence with two NP attachment sites as (53)	*n* = 30	Ungrammatical relative clause sentence with two NP attachment sites as (53)	*n* = 30	Ungrammatical relative clause sentence with two NP attachment sites as (53)	*n* = 30

The study gathered both on-line and off-line measures, so that the design of the experiment was 2 (between: language) x 3 (within: attachment predisposition) factorial design with region-by-region reading times (RT) and responses to comprehension questions in the form of a NP or ungrammaticality judgment (UJ) as dependent variables.

For analyses and the stimuli presentation, each experimental item was broken into seven regions:

Region 1 (R1):	R2:	R3:	R4:	R5 (critical):	R6:	R7:
Subject and verb	NP_1	NP_2	NP_3	Disambiguation	Remainder	Final word
Isttsy potrebovali	*ispolneniy*	*resheniy*	*dela*	*zatyanuvshegosya*	*iz-za*	*pandemii.*

"The plaintiffs demanded the execution of the judgments of the case (the judgments' execution of the case) having delayed due to the pandemic."

All regions (except for R1) constituted of one word per region each, so the data for them were collected in a phrase-by-phrase (region-by-region) manner, and the word-by-word segmentation was used for R1. The rationale here was that segmentation by region for R1 could bring in processing difficulty reflected in increased reading time due to grouping of words and the disparity between each phrase's length in a sentence (Gilboy & Sopena, 1996). Word-by-word presentation of a reading region consisting of multiple words was safer to use because it can be readily switched to the region-by-region mode through adding up the reading times across words, however, once the phrase-by-phrase presentation is opted for, it is no longer possible to split the received data into word-by-word reading times (Jegerski, 2013).

To ensure naturalness and plausibility of the material, a norming study was carried out before the actual experiment. The group of ten native speakers of Russian was invited via phone communication to evaluate the sentences. For convenience, the norming study itself was coordinated via digital communication channels, such as e-mail or mobile messengers. Each rater was provided with the list of sentences in a document file and requested to rate their plausibility and naturalness by putting either plus (+) or minus (–) symbol next to each sentence to indicate whether that sentence sounds plausible and natural or implausible and unnatural, respectively.

As a result, five out of 58 sentences produced for the experimental set and 14 out of 60 syntactically ambiguous grammatical sentences as filler sentences were marked as unnatural and implausible by most raters and therefore were replaced or modified and then again underwent another round of the norming procedure.

4.2. Participants

As language proficiency was intended for participant selection, this measurement was taken

as a controlled variable. Following the sampling method of Gibson et al. (1996), monolingual speakers of Russian (the L1 group) and English-speaking learners of Russian (the L2 group) were recruited. Sample size was estimated based on sample sizes of previous experiments (Gibson et al., 1996), i.e., 26 required participants per group. The use of the same sample size as an earlier study is justified because it is adopted as a model in the current study (Lakens, 2022). The material of the experiment is similar to the materials in Gibson et al. (1996) in that the relative clause is a plausible modifier for any of the three preceding NPs. However, the participial relative clause was not initiated by a pronoun, and the head noun was not immediately preceded by the second and third nouns. Also, on account of the absence of the head of a CP in a participial relative clause sentence, the effect of Predicate Proximity was expected to become so strong and make disambiguation easier than in relative clause sentences due to the incoming participial clause attached more closely to the head noun.

Given the potential drop-out of participants (Hoerger, 2010), two extra participants per group were needed, totaling 28 participants per group to recruit. To ensure that all recruited participants will contribute their data to subsequent analyses, after the experimental session, each participant's data was checked in terms of comprehension accuracy of filler sentences. During data collection, it was established that more than two participants would dropout from each group. Eventually, to get to the estimated sample size (n = 26), the experiment received the total of 35 monolingual speakers of Russian because nine of them showed less than 70% comprehension accuracy of filler sentences each. As of the L2 group, 34 participants were recruited to participate in the experiment. After taking the Russian placement test, seven of them dropped out due to low proficiency in Russian. 27 participants proceeded to take part in the experiment, and one data file was later withdrawn due to low comprehension accuracy of filler sentences (16.67%).

The biographic information of the participants was confirmed verbally with the

investigator. It was found that the L1 group consisted of permanent residents of Russia who have no or little knowledge of languages, including regional languages, other than Russian (e.g., Oirat-Kalmyk, Buryat, Tatar, etc.). The L2 group involved English-speaking learners of Russian from the student's population of the Centre for the Russian Language and Culture at the Faculty of Pre-university Training and Education of Foreign Citizens, Faculty of Engineering and Technology, the Faculty of Management and Law at Kalmyk State University (Elista, Russia). The remaining L2 participant was recruited from the student's population of one of the universities in St. Petersburg, Russia. All L2 group participants had everyday exposure to Russian, while English was reported as their tool for communication with family members and friends dwelling outside Russia. It is also noted that the L2 group was subjected to Russian as a part of their formal instruction, i.e., taking a Russian course at the Center or pursuing their major at one of the faculties. Apart from their formal learning, they were exposed to the target language outside classroom.

Both the convenience sampling and snowball sampling techniques were followed because they were the most feasible approaches to reach the necessary representatives of the population. To ensure that all participants were naïve about the purpose of the experiment, no one with training in linguistics was involved. No participant was notified of the intended purpose of the experiment.

All participants had normal or corrected-to-normal vision and reported no reading difficulties. After the experimental session, one participant (ID #21) informed the investigator about undergoing an issue to recall a few sentences to answer subsequently appearing comprehension questions. The participant linked this issue with her recent general anaesthetic surgery, although several weeks passed since the surgery before participation. After checking the participant's data, no outliers, insufficient comprehension accuracy of filler sentences or other irregularities were found, so the data was kept for further analyses.

4.3. Methods and tools

The self-paced reading task of a non-cumulative fashion was developed in the customized PsychoPy script (Peirce et al., 2019). It obtained on-line indications of processing difficulty (Witzel et al., 2012) expressed in reading times. It allowed participants to process a given segment, i.e., a word or chunk of words, one at a time; and that is what represents natural reading (Schuster et al., 2016).

The task incorporated comprehension questions to elicit off-line data about ungrammaticality judgment or a NP. The purpose of having the comprehension questions was to check whether the participants paid attention to gender and number morphology. It could happen that they did not see that only one of the NPs is compatible with the participle. In that case, there could be no difference in reading times in the critical regions. Also, having responses to comprehension questions from participants gave information about their attachment preferences in addition to reading times.

The web-based version of the Russian placement test was given to the L2 group to ensure each participant holds an advanced or fluent proficiency in the target language to contribute to the study (Keating & Jegerski, 2015). In particular, the test checked the capability of potential participants of the L2 learner group to detect grammatical markings and any errors in such marking and, therefore, able to have a correct sentence representation.

They were invited to take the test on their device, or the provided laptop presented via Google Forms and were not restricted in time. The test consisted of 50 sentences featuring cloze-questions with multiple choice below that tested lexico-semantic and morphological knowledge in Russian (Appendix A). Each item weighed two points, and the maximum score of this test was 100. Test-takers with at least thirty-three correct answers (66% accuracy) were eligible for participation in the experiment. Those who successfully reached the threshold were deemed as advanced or proficient speakers of Russian. These levels

correspond with C1 or C2 certification levels, accordingly, based on the scale of the Test of Russian as a Foreign Language, or TORFL.

C1 certified level corresponds to the advanced level of Russian proficiency (up to 12,000 lexical units) in all areas of communication including research. Those language learners with C1 certified level can be enrolled into undergraduate and graduate programs and can conduct professional activities in a Russian-speaking work environment. C2 certified level corresponds to the fluent level of Russian proficiency (up to 20,000 lexical units) and the ability to produce a spontaneous speech close to the level of a native speaker. Those with C2 certified level can be enrolled into master's degree / specialist programs and major in philology, attain candidacy in philological sciences / pedagogical sciences ("Methods of teaching Russian as a foreign language"). Both candidacy types provide with the right to legally teach and conduct research activities in the field of the Russian language (Russia's Ministry of Education and Science, 2014). Since the Russian state testing system is included in the Association of Language Testers in Europe, levels of proficiency in Russian as a foreign language have been harmonized with the scale used in the Common European Framework of Reference for Languages. For example, C1 certification level of TORFL may be viewed as an analogue to English Certificate in Advanced English, whereas C2 certification level may be viewed comparable to English Certificate of Proficiency in English (MSLU Testing Center for Foreign Citizens, 2022). Based on this, since L2 learners with one of such levels confirmed can be regarded advanced or proficient users of Russian, and, therefore, are able to read and comprehend the experimental stimuli at a level close or comparable to the level of native speakers. The test's accuracy cut-off at 66% accuracy is chosen as it corresponds to the minimum percentage required for passing each subtest in the TORFL. As a result, the L2 learners scored between 68% and 100%, with the average of 88.96%. The lowest result was received by the participant whose data was removed from the

subsequent analyses due to low comprehension of filler sentences.

The web-based version of Edinburgh Handedness Inventory (Oldfield, 1971) was administered to each participant for objective testing of their handedness before the actual experiment.

4.4. Procedure

The experiment obtained ethical approval by the Human Research Ethics Committee of The Education University of Hong Kong. All potential participants gave informed consent prior to the procedure. Experiment 1 was conducted through the investigator's laptop with the 15.6-inch display. Each participant saw the welcome screen with instructions, followed by four practice sentences and then the set containing experimental (n=18) and filler (n=60) sentences in a randomized fashion. All instructions were given in Russian to both groups.

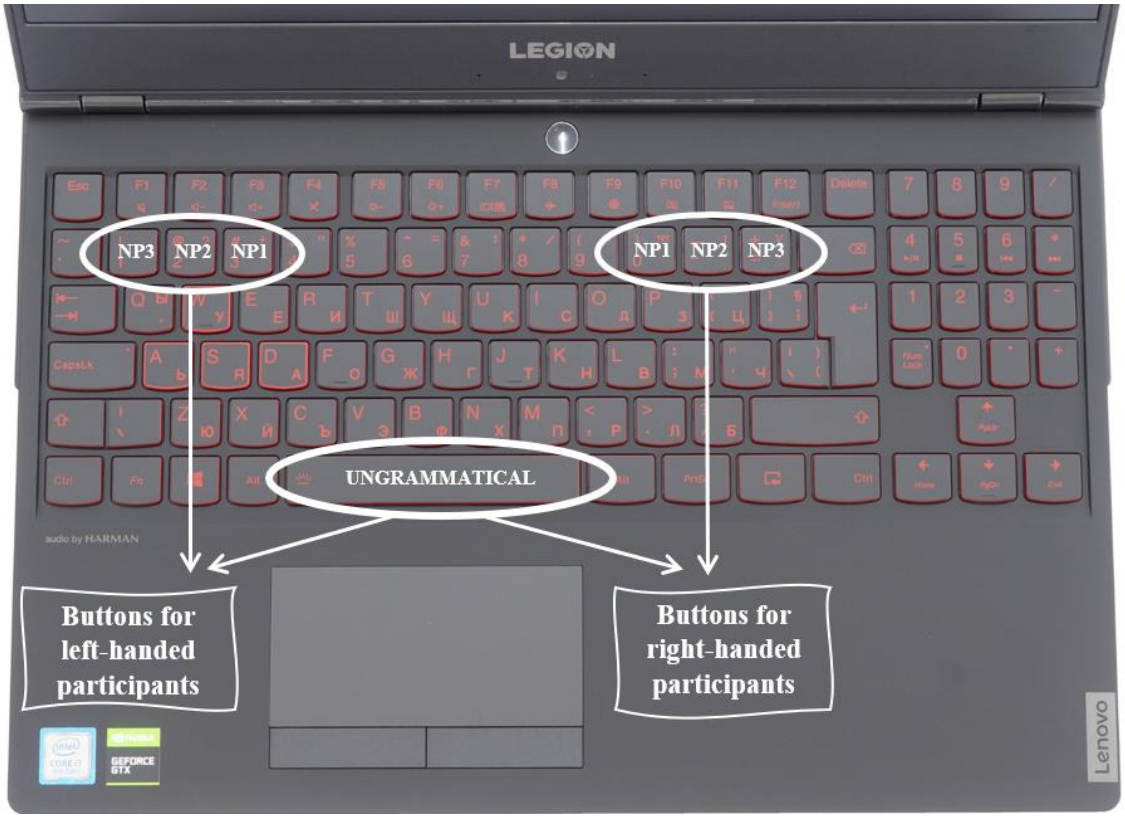
At the beginning of each trial, a white asterisk was visible in the center of the black screen. When participants pressed the space bar, the first region of the item was displayed. When the space bar was pressed for a second time, the first region disappeared, and the second region appeared in place. Each subsequent press of the space bar disclosed the next region and removed the prior region. The program recorded the time between all the space bar presses.

Pressing the space bar on the last region of each item triggered the item to be superseded by the new screen with one corresponding comprehension question, e.g., "What was delayed due to the pandemic?". To respond to the question, unrestricted in time, participants had to select the antecedent by one of the buttons marked "NP_1", e.g., "execution", or "NP_2", e.g., "judgment", or "NP_3", e.g., "case". When the read sentence seemed ungrammatical or unacceptable in Russian, they had to press the button marked

"ungrammatical / unacceptable." The space bar was chosen due to its convenience of use with the thumb. The two transparent keyboard protective skin covers were used to highlight the buttons securely. The buttons meant for the use by right-handed participants were marked with green stickers (dark blue stickers for left-handed) and sealed with transparent tape accordingly. Through script configurations, based on each participant's handedness, the specific buttons (Figure 2) were activated during the experiment. After button-pressing, participants were automatically moved to the next item. The average duration of experimental session was 23 minutes 15 seconds.

Figure 2

The keyboard buttons activated through the script configurations during the experiment



4.4.1. Precautionary measures in the light of COVID-19 pandemic

Prior to the experiment, each participant sanitized their hands with alcohol disinfectant, was requested to wear the provided surgical mask and given disposable gloves to wear during the experiment. Equipped with protection, each participant was seated at a required distance of ~1.5 m from the researcher and interacted with the laptop only to do the experimental task. After each participant, desk and laptop were disinfected with antibacterial wipes to be ready for the next experimental session.

It was critical for the investigator to be present at the data collection sites for participant recruitment and subsequent monitoring to control for undesirable experiment behavior, such as interaction with third parties, use of personal devices during sessions, taking long pauses while reading. Another reason for holding on-site sessions was the need to monitor and clear any arising technical issues.

The employment of a computerized version of the experimental design made it possible to reduce close interactions with participants in the light of COVID-19 pandemic. The chosen method and tools were appropriate for both eliciting the required data to address the research questions and make data collection relatively safe for both participants and the investigator.

4.5. Predictions

It was hypothesized that the reading time and ungrammaticality judgment percentage data for the sentences, such as (51a), (51b), and (51c), could reveal whether the two-factor model (Gibson et al., 1996), that is both predicate proximity and recency preference factors with varying power, are responsible for attachment preferences to resolve ambiguities in locally ambiguous participial relative clause sentences with three potential NP attachment sites. If the model accounts for the data from native Russian speakers and L2 learners of Russian, the

results were expected to look as follows:

1) In the L1 group, the reading times of the disambiguating region are shorter for the sentences in the NP_1 condition (51a) than in the NP_2 condition (51b) and the NP_3 condition (51c), respectively. Sentences in the NP_1 condition are judged as ungrammatical less often than those in the NP_3 condition and in the NP_2 condition, respectively.

2) In the L2 group, the reading times of the disambiguating region are shorter for the sentences in the NP_3 condition (51c) than in the NP_2 condition (51b) and the NP_1 condition (51a), respectively. Sentences in the NP_3 condition are judged as ungrammatical less often than those in the NP_1 condition and in the NP_2 condition, respectively.

4.6. Data analyses

Following Gibson et al. (1996), the reading times and the ungrammaticality judgements were analyzed. Effects were expected to be found where the attachment of the participle (e.g., *zatyanuvshegosya*) is disambiguated, i.e., disambiguation by number agreement. The ungrammaticality judgments about sentences were also analyzed, because they could help to establish final attachment preferences of each group.

4.6.1. Analyses of reading time data

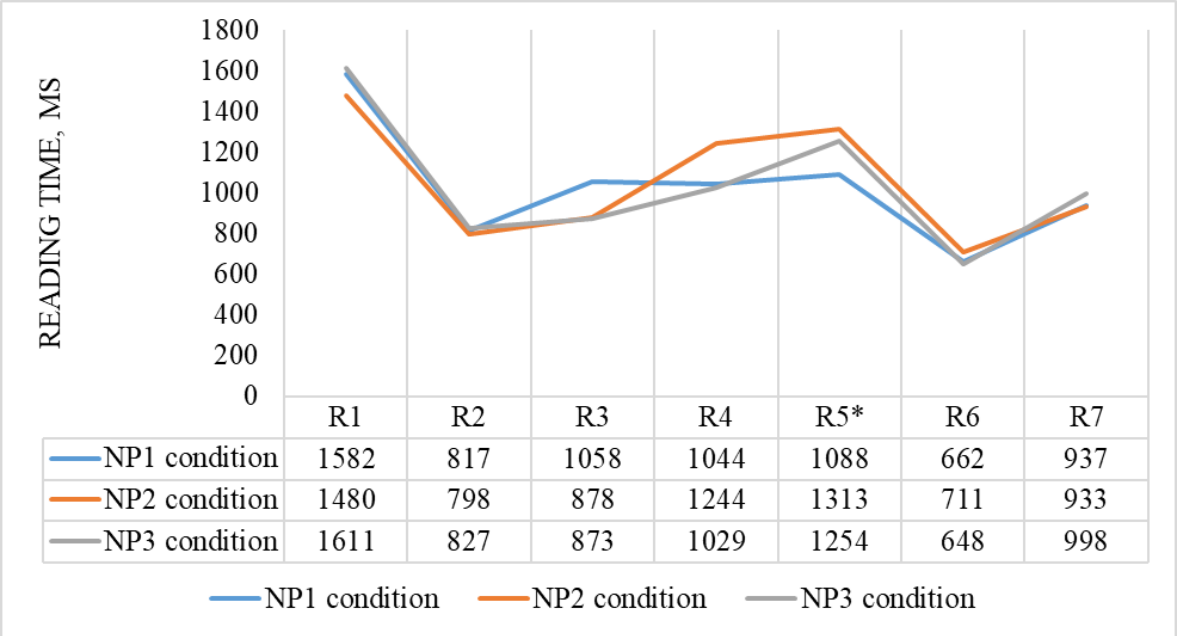
The reading time in each region was recorded during the self-paced reading of the participants for subsequent analyses.

The means of the region-by-region reading times computed from the remaining data (with outliers) in each experimental condition for the L1 group are displayed in Figure 3. Numerically, the disambiguating (critical) region was processed faster in sentences in the NP_1

condition than in the NP_2 condition and in the NP_3 condition. The intermediary result was obtained in the NP_3 condition.

Figure 3

The region-by-region RTs for experimental sentences per condition of Experiment 1: the L1 group (disambiguating region is marked with an asterisk)

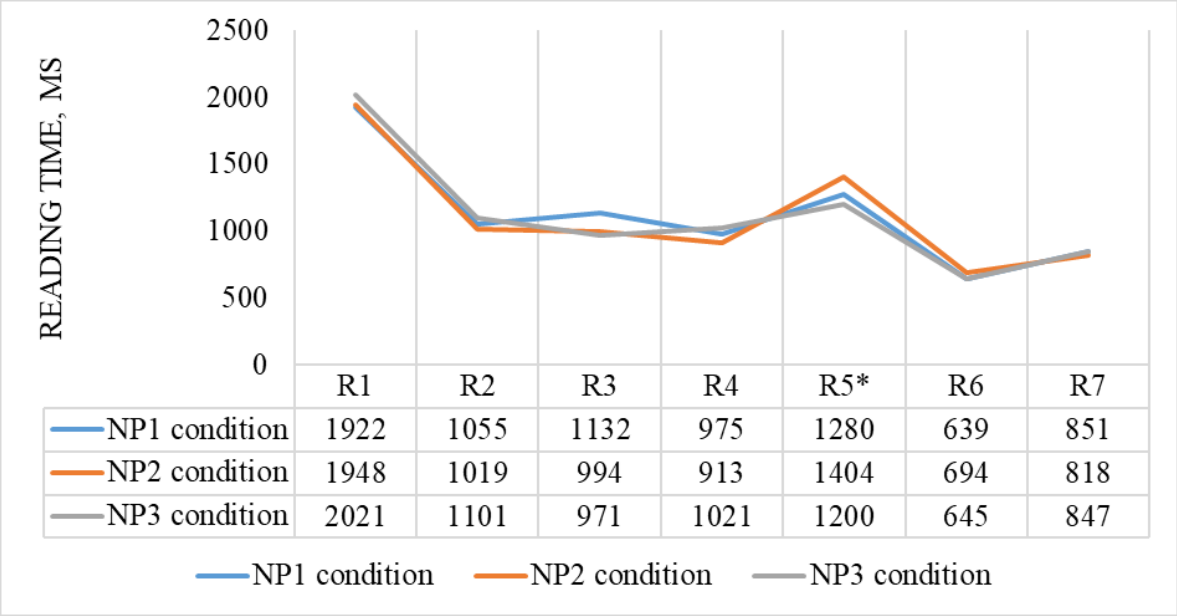


	R1	R2	R3	R4	R5*	R6	R7
NP1 condition	1582	817	1058	1044	1088	662	937
NP2 condition	1480	798	878	1244	1313	711	933
NP3 condition	1611	827	873	1029	1254	648	998

As of the L2 group (Figure 4), the critical region was processed numerically faster in sentences in the NP_3 condition than in the NP_1 condition and in the NP_2 condition. The intermediary result was obtained in the NP_1 condition.

Figure 4

The region-by-region RTs for experimental sentences per condition of Experiment 1: the L2 group (disambiguating region is marked with an asterisk)



	R1	R2	R3	R4	R5*	R6	R7
NP1 condition	1922	1055	1132	975	1280	639	851
NP2 condition	1948	1019	994	913	1404	694	818
NP3 condition	2021	1101	971	1021	1200	645	847

The reading times at the critical, i.e., disambiguating region were sent to generalized linear mixed effects modeling (GLMM) in IBM SPSS Statistics 27. The choice of this statistical approach is supported by its ability to account for non-normality of the dependent variable by adding a probability distribution. This modeling has also been shown to be the most suitable for working with raw reading times (original metric) as a dependent variable without the need for their transformation (Lo & Andrews, 2015). In addition, GLMM can manage the cross-level interactions that are typical of a nested design (Lin, 2010).

Pertinent to this experiment, separate words forming reading regions were displayed to participants one after the other, so the regions remained nested within items, whereas items were nested within participants. This handling allowed us for a single analysis of data across counterbalanced stimuli and different participants. Owing to a fine-grained level of analysis

of reading times, GLMM accounts for individual variability within group participants, and can bring more accurate results than traditional statistical approaches. In contrast to the repeated measures ANOVA, the independent samples t-test, or Mann-Whitney U test, GLMM considers the mixed effects from multiple sources of random variations as it works with data in long format, hence, does not average data from all participants into a single data point per participant (wide format). Unlike mixed linear models, GLMM can analyze non-normally distributed data.

Since reading times are latency data, they cannot be negative, and have no upper limit, therefore may go towards infinity, as well as there is variation above than below the mean (de Angeli et al., 2021), the reading times at the critical region were modeled with the gamma distribution. There is no consensus on what the correct way is to select the model (Gries, 2021); it is best to opt for the maximal model that encompasses all potential predictors and as many random effects as possible, so that the model can potentially provide generalizable results (Barr et al., 2012).

The GLMM was used to estimate the effect of attachment predisposition by number agreement on reading times at the disambiguating region. The model was used separately for each group with attachment predisposition as a fixed effect, which had three levels: NP_1 (AttachmentPredisp1), NP_2 (AttachmentPredisp2), NP_3 (AttachmentPredisp3). To adjust for individual variation among sentences and participants, the model indicated Item, Participant, and their interaction term (Item * Participant) as random effects. Thus, the model adjusted for the individual reading times nested under items, and items nested under participants.

Unlike in Gibson et al. (1996), reading times at the disambiguating region of the experimental sentences judged as ungrammatical were not excluded from analyses, because they could serve as an indirect measure of the participant's real-time cognitive processes related to the attachment preference.

4.6.1.1. Results of the L1 group

There were 18 observations per participant (n=26), i.e., 468 observations for the reading time data at the disambiguating region in total. Reading times that were 2.5 SD below or above the mean from the group mean per each region and per each experimental condition were considered outliers. The cut-off of 2.5 SD is often selected in psycholinguistic experiments with healthy adults to guarantee that uncommonly slow or fast reading time resulting from distractions or accidental button pressing do not distort the data (Reifegerste & Felser, 2017). Previous studies involving sentences with ambiguity (e.g., Teubner-Rhodes et al., 2016; Narumi & Yokokawa, 2013; Carreiras et al., 2010) also preferred this cut-off. These outliers were identified through using the z-score approach, in which standardized values of region-by-region reading times are computed as variables. In particular, the values of actual variables, not the z-scores of those variables, were removed at both negative (-2.5 SD) and positive (2.5 SD) ends.

The procedure eliminated 27 data points in the disambiguating region, or 2.88% of all the reading time data, 30 data points (3.21%) in the SubjectVerb region (i.e., R1) and the NP_1 region each, 28 data points (2.99%) in the NP_2 region, the Remainder region, and the FinalWord region each, and 25 data points (2.67%) in the NP_3 region. As a result, 457 observations were analyzed (97.65% of the collected data) after cleaning, and the SD of the cleaned data of the disambiguating region changed to 0.643 from 0.789 of all the data.

In the disambiguating region, the main effect of attachment predisposition was significant, $F(2,454) = 7.853$, $p < .001$. Table 2 summarizes the results of random-intercept GLMM for reading times at the disambiguating region with attachment predisposition by number agreement as a fixed effect in the L1 group. There were significant differences in the reading times at the disambiguating region between the NP_1 condition and the NP_2 condition

($p < .001$), and between the NP_1 condition and the NP_3 condition ($p = .004$). The reading times at the disambiguating region were significantly shorter in the NP_1 condition than in the NP_2 condition. They were also significantly shorter in the NP_1 condition than in the NP_3 condition.

Table 2

Fixed coefficients of the GLMM fitted to the RT data at the disambiguating region from Experiment 1: the L1 group

Predictor	β	SE	t	p	%CI
Intercept	.003	.0708	.037	.970	[-.136, .142]
AttachmentPredisp1	0	.	.	.	.
AttachmentPredisp2	.174	.0463	3.767	.000	[.083, .265]
AttachmentPredisp3	.134	.0457	2.935	.004	[.044, .224]

Pairwise comparisons for the main effect of attachment predisposition by number agreement on reading times at the disambiguating region in the L1 group (Table 3) revealed significant differences between the NP_1 condition and the NP_2 condition ($p < .001$), the NP_1 condition and the NP_3 condition ($p = .004$), and no difference between the NP_2 condition and the NP_3 condition ($p = .387$). The reading times at the disambiguating region were significantly longer in the NP_2 condition than in the NP_1 condition, as well as in the NP_3 condition than in the NP_1 condition. No significant difference was found in the reading times at the disambiguating region between the NP_2 condition and the NP_3 condition.

Table 3

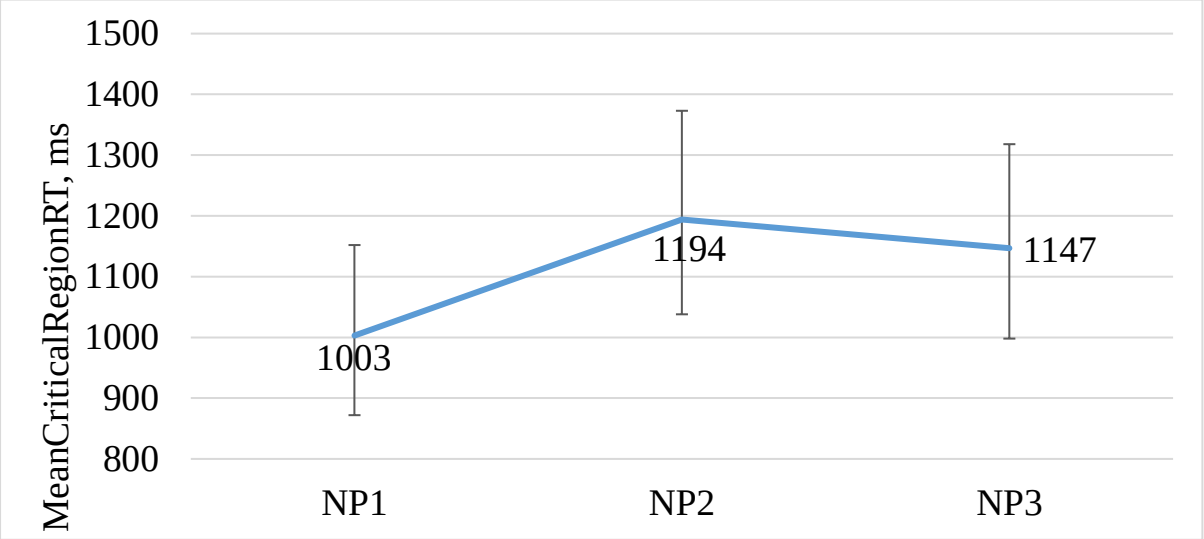
Pairwise contrasts of the GLMM fitted to the RT data at the disambiguating region from Experiment 1: the L1 group

Contrast	Estimate	SE	t	df	p	%CI
NP_2-NP_1	.191	.053	3.637	454	.000	[.088, .294]
NP_3-NP_1	.144	.050	2.877	454	.004	[.046, .242]
NP_2-NP_3	.047	.054	.866	454	.387	[-.060, .153]

As shown in Figure 5, the reading times at the disambiguating region were shorter in the NP_1 condition than in the NP_2 condition and the NP_3 condition.

Figure 5

The RTs at the disambiguating region for experimental sentences per condition of Experiment 1: the L1 group



4.6.1.2. Results of the L2 group

Analogous to the L1 group, there were 18 observations per participant (n=26). After cleaning up data beyond ± 2.5 SD, 452 observations for the reading time data at the disambiguating region were analyzed (96.58% of the collected data). The SD of the cleaned data of the disambiguating region changed to 1.064 from 0.820 of all the data.

In the disambiguating region, the main effect of attachment predisposition was significant, $F(2,424) = 5.183$, $p = .006$. Table 4 presents the results of random-intercept GLMM for reading time at the disambiguating region with attachment predisposition by number agreement as a fixed effect in the L2 group. There was a significant difference in the reading times at the disambiguating region between the NP_2 condition and the NP_3 condition ($p = .001$), and no significant difference between the NP_1 condition and the NP_3 condition ($p = .092$). The reading times at the disambiguating region were significantly shorter in the NP_3 condition than in the NP_2 condition.

Table 4

Fixed coefficients of the GLMM fitted to the RT data at the disambiguating region from Experiment 1: the L2 group

Predictor	Coefficient	SE	t	p	%CI
Intercept	.027	.0954	.286	.777	[-.168, .222]
AttachmentPredisp1	.085	.0503	1.690	.092	[-.014, .184]
AttachmentPredisp2	.161	.0501	3.218	.001	[.063, .260]
AttachmentPredisp3	0	.	.	.	.

Pairwise comparisons for the effect of attachment predisposition by number agreement on reading times at the disambiguating region (Table 5) revealed a significant difference between the NP_2 condition and the NP_3 condition (p = .002). There were no significant differences between the NP_1 condition and the NP_3 condition (p = .096), and the NP_1 condition and the NP_2 condition (p = .133). The reading times at the disambiguating region were significantly longer in the NP_2 condition than in the NP_3 condition.

Table 5

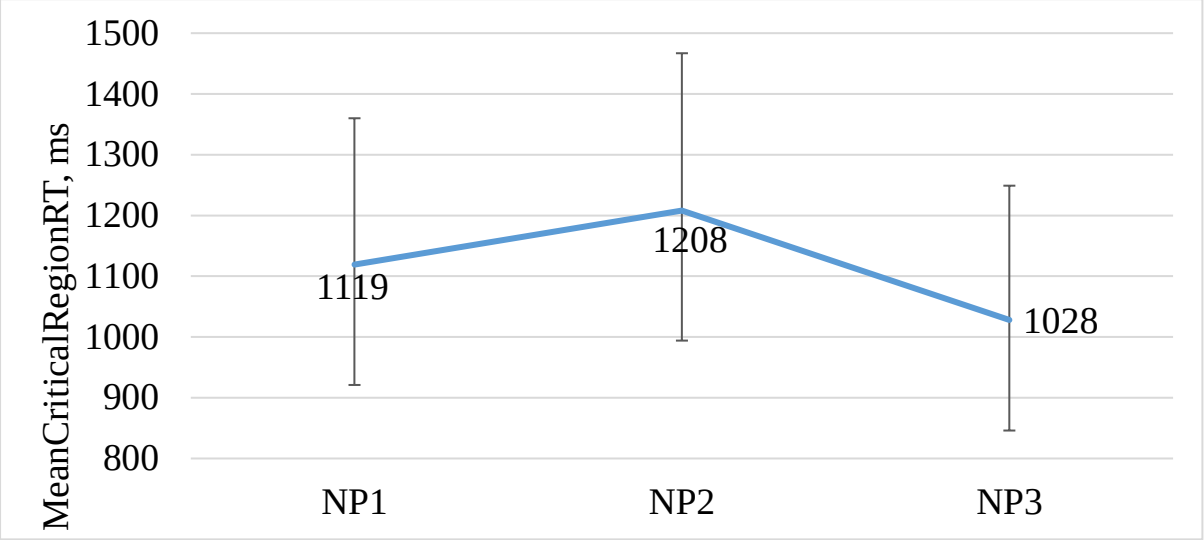
Pairwise contrasts of the GLMM fitted to the RT data at the disambiguating region from Experiment 1: the L2 group

Contrast	Estimate	SE	t	df	p	%CI
NP_2-NP_3	.180	.058	3.081	445	.002	[.065, .295]
NP_1-NP_3	.091	.055	1.669	440	.096	[-.016, .199]
NP_2-NP_1	.089	.059	1.507	438	.133	[-.027, .205]

As shown in Figure 6, the reading times at the disambiguating region were longer in the NP_2 condition than in the NP_3 condition.

Figure 6

The RTs at the disambiguating region for experimental sentences per condition of Experiment 1: the L2 group



4.6.2. Analyses of responses to comprehension questions

Throughout the self-paced reading procedure, the experimental log file collected from participants their selection of an appropriate NP to respond to comprehension questions corresponding to each sentence via a forced choice procedure: NP_1 as the first option, NP_2 as the second option, and NP_3 as the third option. In the same window, participants could hit the specified button to judge that sentence as ungrammatical and, thus, do not choose any NP.

Once participants chose a NP, it was considered as their grammaticality judgment, whereas as they pressed ungrammatical button, this did not invoke an option to choose a NP, because the sentence was judged as ungrammatical. Since for each sentence participants could respond to a comprehension question either by choosing a NP or pressing "ungrammatical", relevant analyses were conducted for each of the ways.

4.6.2.1. Ungrammaticality judgments

For analyses of the ungrammaticality judgements, responses were coded as 1 for those "ungrammatical" button presses and 0 for other responses, i.e., no press on the "ungrammatical" button. For analyses of responses with selection of a NP, correct choices of a NP were coded as 1 and incorrect choices, including the fourth option of judging a sentence ungrammatical, as 0. The means and SDs of ungrammaticality judgments computed from the collected data in each experimental condition for the L1 group and the L2 group are displayed in Table 6.

Table 6

Means and SDs of UJs for each condition and group of Experiment 1

Condition	L1 group		L2 group	
	M	*SD*	*M*	*SD*
NP_1	.24	.427	.22	.419
NP_2	.32	.468	.36	.481
NP_3	.24	.427	.17	.374

The ungrammaticality judgment data for each sentence of each group were then sent to the GLMM. The goal of this analysis was to investigate the effects of attachment predisposition by number agreement on ungrammaticality judgments for experimental sentences.

As in RT analyses, the model was fitted separately for each group with attachment predisposition by number agreement as a fixed effect, which had three levels: NP1

(AttachmentPredisp1), NP2 (AttachmentPredisp2), NP3 (AttachmentPredisp3). Individual variation among sentences and participants was adjusted by indicating Item, Participant, and their interaction term (Item * Participant) as random effects. Thus, the model adjusted for the individual reading times nested under items, and items nested under participants.

Because there were either ungrammatical or grammatical judgements about sentences, they were modeled with the binary logistic distribution, which is considered a special case of the binomial logistic regression. So, for this analysis, the dependent variable had the two categories: 1 (ungrammatical) and 0 (grammatical).

4.6.2.1.1. Results of the L1 group

There were 18 observations per participant, i.e., 468 observations for the ungrammaticality judgments corresponding to each experimental sentence. In ungrammaticality judgments for the experimental sentences, the main effect of attachment predisposition by number agreement was not statistically significant, $F(2,465) = 2.041$, $p = .131$, therefore the model was not significantly different from the null model.

Table 7 shows the results of random-intercept GLMM for the ungrammaticality judgments about experimental sentences with attachment predisposition by number agreement as a fixed effect in the L1 group. There were no significant differences in ungrammaticality judgments between the NP_1 condition and the NP_2 condition ($p = .085$), and the NP_1 condition and the NP_3 condition ($p = 1.000$).

Table 7

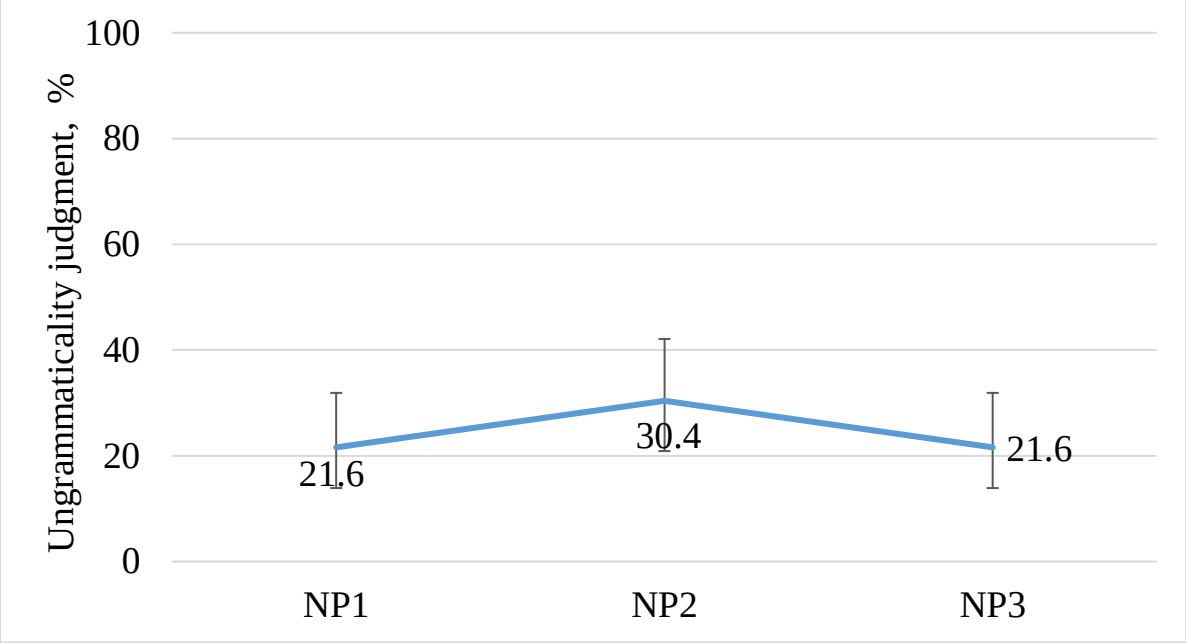
Fixed coefficients of the GLMM fitted to the UJ data from Experiment 1: the L1 group

Predictor	β	SE	t	p	%CI
Intercept	-1.290	.2657	-4.855	.000	[-1.822, -.759]
AttachmentPredisp1	0	.	.	.	.
AttachmentPredisp2	.463	.2687	1.724	.085	[-.065, .992]
AttachmentPredisp3	-0.000	.2801	.000	1.000	[-.550, -.550]

As shown in Figure 7, the NP_1 condition and the NP_3 condition had the same ungrammaticality judgment rate.

Figure 7

The UJs about experimental sentences per condition of Experiment 1: the L1 group



4.6.2.1.2. Results of the L2 group

There were 18 observations per participant, that is, 468 observations for the ungrammaticality judgments corresponding to each experimental sentence. In ungrammaticality judgments for the experimental sentences, the main effect of attachment predisposition was significant, $F(2,465) = 8.503$, $p < .001$.

Table 8 shows the results of random-intercept GLMM for the ungrammaticality judgments about experimental sentences with attachment predisposition by number agreement as a fixed effect in the L2 group. There was a significant difference between the NP_1 condition and the NP_2 condition ($p = .007$), and no difference between the NP_1 condition and the NP_3 condition ($p = .184$). The NP_2 condition was judged as ungrammatical significantly more often than the NP_1 condition.

Table 8

Fixed coefficients of the GLMM fitted to the UJ data from Experiment 1: the L2 group

Predictor	β	SE	t	p	%CI
Intercept	1.383	.2709	-5.106	.000	[-1.927, -.839]
AttachmentPredisp1	0	.	.	.	.
AttachmentPredisp2	.726	.2671	2.720	.007	[.202, 1.251]
AttachmentPredisp3	-.397	.2990	-1.329	.184	[-.985, .190]

Pairwise comparisons for the effect of attachment predisposition by number agreement on ungrammaticality judgments in the L2 group revealed significant differences between the NP_2 condition and the NP_3 condition ($p < .001$), and between the NP_1 condition and the NP_2

condition (p = .007), as outlined in Table 9. The NP_2 condition was judged as ungrammatical significantly more often than the NP_1 condition and the NP_3 condition.

Table 9

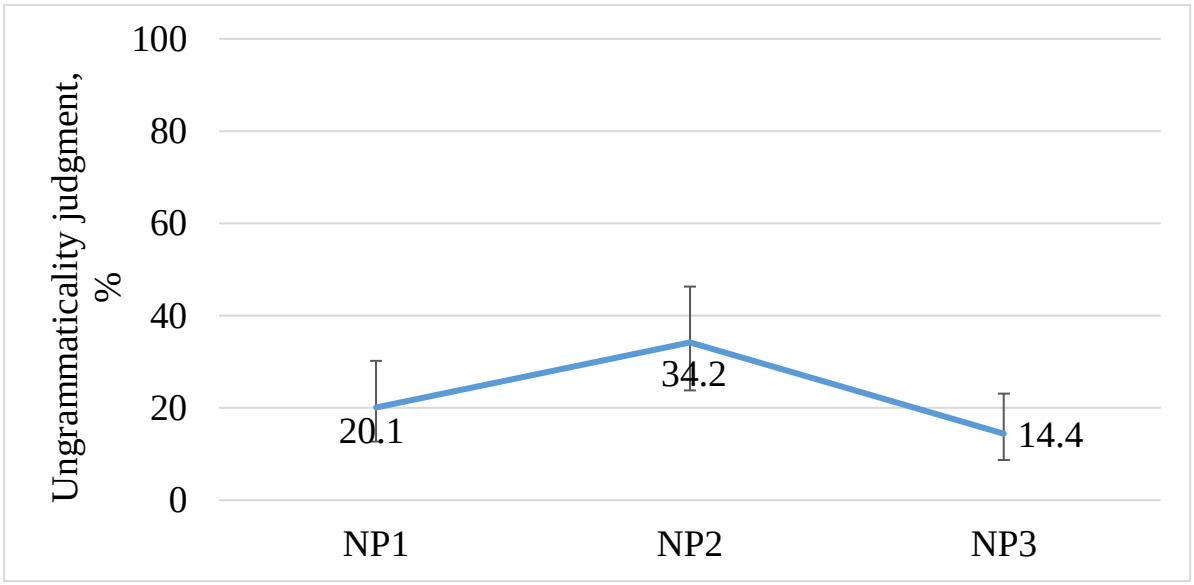
Pairwise contrasts of the GLMM fitted to the UJ data from Experiment 1: the L2 group

Contrast	Estimate	SE	t	df	p	%CI
NP_2-NP_3	.197	.052	3.830	465	.000	[.096, .298]
NP_2-NP_1	.141	.052	2.697	465	.007	[.038, .244]
NP_1-NP_3	.056	.043	1.318	465	.188	[-.028, .140]

As seen in Figure 8, the highest ungrammaticality rate was received for the NP_2 condition.

Figure 8

The UJs about experimental sentences per condition of Experiment 1: the L2 group



4.6.2.2. NP selection responses and comprehension accuracy

To examine participants' answers to questions corresponding to the experimental sentences, the frequencies of responses were calculated for each condition and group.

Numerically, as shown in Table 10, in the L1 group, the number of the NP_1 responses (46.79% of the responses) was higher than of the other available options to answer questions corresponding to sentences in the NP_1 condition. In the NP_2 condition, the number of ungrammaticality presses (32.05% of the responses) was higher than of the other available options. In the NP_3 condition, the number of the NP_1 responses (33.33% of the responses) was higher than of the other available options.

Table 10

Frequencies of NP selection responses and ungrammaticality presses for each condition of Experiment 1: the L1 group

Condition	NP_1 response (%)	NP_2 response (%)	NP_3 response (%)	Ungrammatical response (%)
NP_1	73 (46.79)	36 (23.08)	10 (6.41)	37 (23.72)
NP_2	48 (30.77)	40 (25.64)	18 (11.54)	50 (32.05)
NP_3	52 (33.33)	35 (22.44)	32 (20.51)	37 (23.72)

As of the L2 group (Table 11), in the NP_1 condition, the number of the NP_1 responses (47.44% of the responses) was numerically higher than of the other available options, whereas the number of the NP_2 responses (37.18%) was higher than of the other options in the NP_2 condition. The number of the NP_3 responses (41.03%) was higher than of the other available response options in the NP_3 condition.

Table 11

Frequencies of NP selection responses and ungrammaticality presses for each condition of Experiment 1: the L2 group

Condition	NP_1 response (%)	NP_2 response (%)	NP_3 response (%)	Ungrammatical response (%)
NP_1	74 (47.44)	30 (19.23)	17 (10.90)	35 (22.44)
NP_2	23 (14.74)	58 (37.18)	19 (12.18)	56 (35.90)
NP_3	34 (21.79)	32 (20.51)	64 (41.03)	26 (16.67)

To check further how participants responded to comprehension questions per each experimental condition, the means and SDs of their responses were computed from the collected data (Table 12).

Table 12

Means and SDs of responses for each condition and group of Experiment 1

Condition	L1 group		L2 group	
	M	*SD*	*M*	*SD*
NP_1	.47	.501	.47	.501
NP_2	.26	.438	.37	.485
NP_3	.21	.405	.41	.493

The GLMM was then used to investigate the effect of attachment predisposition by number agreement on responses. As in previous analyses, the model was fitted separately for

each group with attachment predisposition as a fixed effect, which had three levels: NP_1 (AttachmentPredisp1), NP_2 (AttachmentPredisp2), NP_3 (AttachmentPredisp3). Individual variation among sentences and participants was adjusted by indicating Item, Participant, and their interaction term (Item * Participant) as random effects. Since response choices were either selected or not selected, they were modeled with the binary logistic distribution. For this analysis, the dependent variable had the two categories of response choices: 1 (selected) and 0 (not selected).

4.6.2.2.1. Results of the L1 group

There were 18 observations per participant, i.e., 468 observations for responses corresponding to each experimental sentence. In the comprehension question response, the main effect of attachment predisposition was significant, $F(2,465) = 14.091$, $p < .001$.

Table 13 summarizes the results of random-intercept GLMM for the comprehension question response with attachment predisposition by number agreement as a fixed effect in the L1 group. There were significant differences in responses between the NP_1 condition and the NP_2 condition ($p < .001$), and between the NP_1 condition and the NP_3 condition ($p < .001$). The number of response choices was significantly lower for the NP_2 condition than the NP_1 condition, whereas it was also significantly lower for the NP_3 condition than the NP_1 condition.

Table 13

Fixed coefficients of the GLMM fitted to the RespChoice data from Experiment 1: the L1 group

Predictor	β	SE	t	p	%CI
Intercept	-.133	.2191	-.608	.547	[-.575, .308]
AttachmentPredisp1	0	.	.	.	.
AttachmentPredisp2	-.989	.2499	-3.958	.000	[-1.480, -.498]
AttachmentPredisp3	-1.274	.2613	-4.874	.000	[-1.787, -.760]

Pairwise comparisons for the main effect of attachment predisposition by number agreement on the responses to comprehension questions in the L1 group revealed significant differences between the NP_1 condition and the NP_2 condition ($p < .001$) and the NP_1 condition and the NP_3 condition ($p < .001$), and no difference between the NP_2 condition and the NP_3 condition ($p = .302$), as outlined in Table 14. As a result, the number of responses was higher for the NP_1 condition than the NP_2 condition and the NP_3 condition.

Table 14

Pairwise contrasts of the GLMM fitted to the RespChoice data from Experiment 1: the L1 group

Contrast	Estimate	SE	t	df	p	%CI
NP_2-NP_3	.049	.047	1.033	465	.302	[-.044, .142]
NP_1-NP_2	.221	.055	4.057	465	.000	[.114, .328]

NP_1-NP_3	.270	.054	5.034	465	.000	[.165, .375]

Table 15 presents the estimated means of random-intercept GLMM for the responses to comprehension questions with attachment predisposition by number agreement as a fixed effect in the L2 group.

Table 15

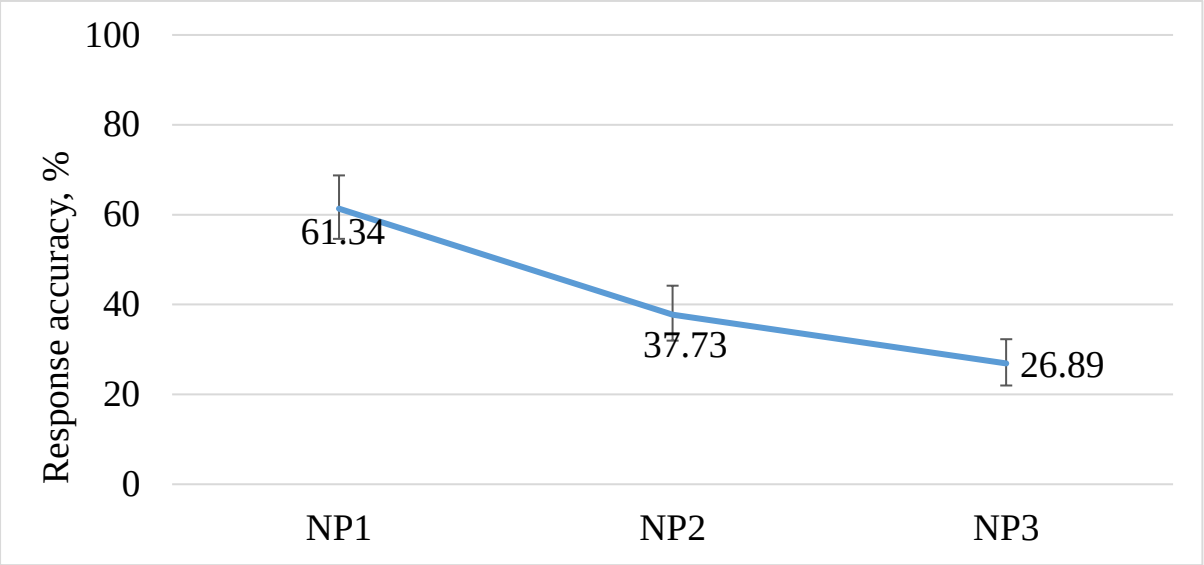
The estimated means of fixed effects in the GLMM for the RespChoice data from Experiment 1 (sum score): the L1 group

Fixed effect	Estimate	SE	95% Wald confidence interval	
			Lower	Upper
AttachmentPredisp1	.467	.055	.360	.576
AttachmentPredisp2	.246	.044	.168	.343
AttachmentPredisp3	.197	.039	.130	.287

In order to know the comprehension accuracy of participants per condition, the percentages of their response selections were normed out of the percentages of the ungrammatical button presses. For example, the comprehension accuracy for the NP_1 condition was received based on this calculation: .4679 / (1 - .2372) = .6134. The accuracies for the NP_2 condition and the NP_3 condition equaled to .3773 and .2689, respectively. As observed in Figure 9, the comprehension accuracy was higher for the NP_1 condition than the NP_2 condition and the NP_3 condition.

Figure 9

The RespAcc for experimental sentences per condition of Experiment 1: the L1 group



4.6.2.2.2. Results of the L2 group

There were 18 observations per participant, i.e., 468 observations for responses corresponding to each experimental sentence. In the comprehension question response, the main effect of attachment predisposition was significant, $F(2,465) = 13.936$, $p < .001$.

Table 16 summarizes the results of random-intercept GLMM for the comprehension question response with attachment predisposition by number agreement as a fixed effect in the L2 group. There was a significant difference in responses between the NP_1 condition and the NP_3 condition ($p < .001$), and no difference between the NP_1 condition and the NP_2 condition ($p = .882$). The number of response choices was significantly higher for the NP_3 condition than the NP_1 condition.

Table 16

Fixed coefficients of the GLMM fitted to the RespChoice data from Experiment 1: the L2 group

Predictor	β	SE	t	p	%CI
Intercept	.467	.2130	2.194	.033	[.039, .895]
AttachmentPredisp1	0	.	.	.	.
AttachmentPredisp2	-.035	.2368	-.148	.882	[-.500, .430]
AttachmentPredisp3	1.343	.2837	4.734	.000	[.786, 1.901]

Pairwise comparisons for the main effect of attachment predisposition by number agreement on the responses to comprehension questions in the L2 group revealed significant differences between the NP_2 condition and the NP_3 condition ($p < .001$), the NP_1 condition and the NP_3 condition ($p < .001$), and no difference between the NP_1 condition and the NP_2 condition ($p = .882$), as outlined in Table 17. As a result, the number of response choices was higher for the NP_3 condition than the NP_2 condition and the NP_1 condition.

Table 17

Pairwise contrasts of the GLMM fitted to the RespAcc data from Experiment 1: the L2 group

Contrast	Estimate	SE	t	df	p	%CI
NP_3-NP_2	.253	.051	4.969	465	.000	[.153, .353]
NP_3-NP_1	.245	.051	4.828	465	.000	[.145, .344]
NP_1-NP_2	.008	.056	.148	465	.882	[-.102, .119]

Table 18 presents the estimated means of random-intercept GLMM for the responses to comprehension questions with attachment predisposition by number agreement as a fixed effect in the L2 group.

Table 18

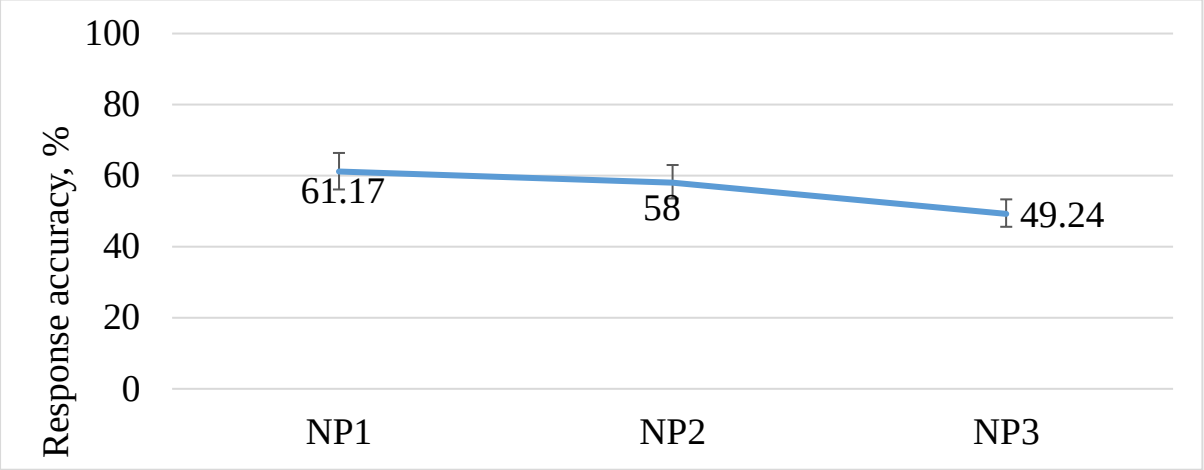
The estimated means of fixed effects in the GLMM for the RespChoice data from Experiment 1 (sum score): the L2 group

Fixed effect	Estimate	SE	95% Wald confidence interval	
			Lower	Upper
AttachmentPredisp3	.859	.032	.784	.912
AttachmentPredisp2	.606	.051	.501	.703
AttachmentPredisp1	.615	.050	.510	.710

Further, the percentages of response selections were normed out of the percentages of the ungrammatical button presses. As a result, the comprehension accuracy for the NP_1 condition, the NP_2 condition and the NP_3 condition equaled to .6117, .5800, and .4924, respectively. As shown in Figure 10, the comprehension accuracy in the NP_1 condition was the highest among the conditions.

Figure 10

The RespAcc for experimental sentences per condition of Experiment 1: the L2 group



4.7. Summary of findings

In the L1 group, the reading times at the disambiguating region in the NP_1 condition were shorter than in the NP_2 condition ($p < .001$), whereas they were shorter in the NP_1 condition than in the NP_3 condition ($p < .01$). There were no significant results in the rates of ungrammaticality judgment. The number of NP selection responses was higher in the NP_1 condition than in the NP_2 condition ($p < .001$) and the NP_3 condition ($p < .001$).

In the L2 group, the reading times at the disambiguating region in the NP_3 condition were shorter than in the NP_2 condition ($p < .01$). There were no significant differences between the NP_1 condition and the NP_3 condition and between the NP_1 condition and the NP_2 condition. The rate of ungrammaticality judgment was higher in the NP_2 condition than in the NP_1 condition ($p < .01$), and it was also higher in the NP2 condition than in the NP_3 condition ($p < .001$). The number of NP selection responses was higher in the NP_3 condition than in the NP_1 condition ($p < .001$), and it was also higher in the NP_3 condition than in the NP_2 condition ($p < .001$).

Chapter 5: Experiment 2

Experiment 2 addressed the third and fourth research questions of whether pragmatic congruence of a NP with the participle in a participial relative clause overrides attachment preferences in resolution of attachment ambiguities in Russian participial relative clause sentences.

Previous research (e.g., Levy et al., 2013) suggested that readers always obtain context-based expectations about the processed stimuli. Once such expectations are met, there is a reduction in processing costs or their increase when expectations are failed. Following this reasoning, if speakers of Russian, regardless of whether it is their L1 or L2, rely on their world knowledge by deciding on pragmatic congruence more than their general parsing strategy, the reading times of the disambiguating region would be shorter for the sentences in which NP is pragmatically congruent with the participle.

5.1. Material and design

The experimental design was adopted from Gibson et al. (1996). Comprehension difficulty of L1 and L2 speakers of Russian was explored by utilizing participial relative clause sentences with three potential NP attachment sites, one of which is pragmatically congruent with the subsequent participle.

To make the participle in the participial relative clause pragmatically congruent with only one of the preceding NPs, each item was represented by low attachment, middle attachment, and high attachment versions, depending on which NP is congruent with the participle in a participial relative clause. Even though the participial relative clause could attach to any of the three NPs at the onset of processing, just one reading was acceptable while the participle was read, because only one of the NP sites was pragmatically congruent

with it. Therefore, it was intended that the current material neutralizes any possible effect of parsing preferences by bringing the pragmatic factor, biasing readers to attach high, middle, or low purely based on the use of world knowledge. However, this expectation was not fulfilled based on the ungrammaticality judgment results of the L2 group: the effects of pragmatic congruence and syntactic attachment preference stacked on each other to result in additional grammaticality benefits for syntactically preferred attachment versions, i.e., the NP_1 condition and the NP_3 condition.

The example (54b) shows that middle attachment is preferred when the participle *vynesennogo [v sude]* ("delivered [in court]") in the participial relative clause is reached, because NP_2 is the only pragmatically congruent attachment site. The extraneous variables, such as number, tense, and form of the participle, as well as gender and animacy of antecedents were controlled in the same way as in Experiment 1. The lexical composition of the experimental sentences was cross-checked with the same dictionary used in creating sentences for Experiment 1.

Analogous to Experiment 1, the number of sentences was as follows: 18 sentences in the NP_1 condition as (54a), 18 sentences in the NP_2 condition as (54b), and 18 sentences in the NP_3 condition as (54c) interspersed by 60 filler sentences as (52) and (53). In addition, four practice sentences were created, totaling the sentence set to 118 sentences.

(54a) *Ist-ets* *bo-ya-l-sya* *pere-smotr-a*
Plaintiff-NOM-MASC-SG fear-PFV-PST-SG review-GEN-N-SG
pri-govor-a *sud-a,*
judgment-GEN-N-SG court-GEN-N-SG
initsi-ir-ova-n-no-go *yego* *zhen-oy.*
initiate-PTCP-PST-PFV-SG-PASS (by) his wife.

"The plaintiff feared the review of the judgment of the court (the judgment's review of the court) initiated by his wife."

(54b) *Ist-ets* *bo-ya-l-sya* *pere-smotr-a*
Plaintiff-NOM-MASC-SG fear-PFV-PST-SG review-GEN-N-SG
pri-govor-a *sud-a,*
judgment-GEN-N-SG court-GEN-N-SG
vy-nes-enn-ogo *vo* *vtor-nik.*
deliver-PTCP-PST-PFV-SG-PASS on Tuesday.
"The plaintiff feared the review of the judgment of the court (the judgment's review of the court) delivered on Tuesday."

(54c) *Ist-ets* *bo-ya-l-sya* *pere-smotr-a*
Plaintiff-NOM-MASC-SG fear-PFV-PST-SG review-GEN-N-SG
pri-govor-a *sud-a,*
judgment-GEN-N-SG court-GEN-N-SG
iz-uch-i-vsh-ego *prichin-y* *avari-i.*
examine-PTCP-PST-PFV-SG-PASS cause-PL (of) accident.
"The plaintiff feared the review of the judgment of the court (the judgment's review of the court) examining the cause of the accident."

The experimental sentences were counterbalanced across the three lists (Table 19) so that each list contained the three types of experimental sentences plus 60 filler sentences. Before carrying out the actual experiment, the sentences went through a norming study. The group of ten native speakers of Russian (other than those found for Experiment 1) was invited

via phone communication to evaluate the sentences. The norming study itself was coordinated via digital communication channels, such as mobile messengers or e-mail. Each rater was informed about the need to validate whether only one of the NPs is pragmatically congruent with the participial relative clause in each sentence. They were then provided with the list of sentences in a document file and requested to rate the plausibility and naturalness of the pragmatic congruence of one of the NPs with the participial relative clause. The rating was conducted by putting either plus (+) or minus (–) symbol next to each sentence to indicate whether that sentence meets or does not meet the criterion, respectively. As a result, three out of 58 sentences produced for the experimental set were marked by most raters as meeting the criterion. As the filler sentences were the same as in Experiment 1, they did not undergo a norming study.

Table 19

Counterbalancing the material for Experiment 2

List 1		List 2		List 3	
Sentences in the NP_1 condition as (54a)	$n = 6$	Sentences in the NP_1 condition as (54a)	$n = 6$	Sentences in the NP_1 condition as (54a)	$n = 6$
Sentences in the NP_2 condition as (54b)	$n = 6$	Sentences in the NP_2 condition as (54b)	$n = 6$	Sentences in the NP_2 condition as (54b)	$n = 6$
Sentences in the NP_3 condition as	$n = 6$	Sentences in the NP_3 condition as	$n = 6$	Sentences in the NP_3 condition as	$n = 6$

(54c)		(54c)		(54c)	
Grammatical globally ambiguous relative clause sentence with two potential NP attachment sites as (52)	*n* = 30	Grammatical globally ambiguous relative clause sentence with two potential NP attachment sites as (52)	*n* = 30	Grammatical globally ambiguous relative clause sentence with two potential NP attachment sites as (52)	*n* = 30
Ungrammatical relative clause sentence with two NP attachment sites as (53)	*n* = 30	Ungrammatical relative clause sentence with two NP attachment sites as (53)	*n* = 30	Ungrammatical relative clause sentence with two NP attachment sites as (53)	*n* = 30

In sum, the design of this experiment was 2 (between: language) x 2 (between: experiment) x 3 (within: attachment predisposition) factorial design with region-by-region RTs and responses to comprehension questions in the form of a NP or UJ as dependent variables. For analyses and the stimuli presentation, each item was broken into seven regions (as in Experiment 1):

R1:	R2:	R3:	R4:	R5 (critical):	R6:	R7:
Subject and verb	NP_1	NP_2	NP_3	Disambiguation	Remainder	Final word
Istets boyalsya	*peresmotra*	*prigovora*	*suda*	*vynesennogo*	*vo*	*vtornik.*

"The plaintiff feared the review of the judgment of the court (the judgment's review of the court) delivered on Tuesday."

5.2. Methods and tools

Same as in Experiment 1, the following three methods and tools were utilized:

1. The self-paced reading task of a non-cumulative fashion was developed in the customized PsychoPy script (Peirce et al., 2019) to obtain on-line indications of processing difficulty in reading times. Comprehension questions were incorporated after each sentence in the self-paced reading task to elicit off-line data about ungrammaticality judgment or a NP.

2. The web-based version of the Russian placement test, the same as in Experiment 1, was given to L2 participants to ensure each participant holds a C1 or C2 proficiency in the target language to contribute to the study (Keating & Jegerski, 2015).

3. The web-based version of Edinburgh Handedness Inventory (Oldfield, 1971) was administered to both groups for objective testing of their handedness.

5.3. Participants

Same as in Experiment 1, language proficiency was intended for participant selection, so that this measurement was taken as a controlled variable. Following the same sampling method and size, the L1 group consisted of monolingual Russian speakers who were Russia's residents and had everyday exposure to L1 Russian, and no or little L2 knowledge, including regional languages (e.g., Oirat-Kalmyk, Buryat, Tatar, etc.). 29 Russian monolinguals participated in the experiment. Two participants were excluded due to their comprehension accuracy of filler sentences being lower than 70% (0% and 6.67% respectively), leaving 27 data files for analyses.

In the L2 group, all recruited participants (n=27) proceeded with the experiment after taking the Russian placement test. One participant's data file was later removed due to low comprehension accuracy of filler sentences (36.67%), leaving 26 data files for analyses.

Participants of this group were recruited from the general population of residents of St. Petersburg, Russia who were native in English and fluent in Russian.

The biographic information of all the participants was confirmed verbally with the investigator. At the time of experiment, they were working as professionals in the following areas of specialization: medical services, pharmaceuticals, entrepreneurship, transportation services. All L2 participants had everyday exposure to Russian, while English was reported to be the tool for their communication with family members and friends dwelling outside of Russia.

All participants had normal or corrected-to-normal vision and reported no reading difficulties. To guarantee that all participants were naïve to the purpose of the experiment, no one with a background in linguistics was involved. No participant was notified of the intended purpose of the experiment.

5.4. Procedure

The experiment obtained ethical approval by the Human Research Ethics Committee of The Education University of Hong Kong. All potential participants gave informed consent prior to the procedure. Experiment 2 was conducted through the investigator's laptop. Each participant saw the welcome screen with instructions, followed by four practice sentences and the set containing experimental (n=18) and filler (n=60) sentences in a randomized fashion. All instructions were given in Russian to both groups.

At the beginning of each trial, the white asterisk was visible in the center of the black screen. When participant pressed the space bar, the first region of the item was displayed. When pressed the space bar for a second time, the first region disappeared, and the second region was shown in place. Each subsequent press of the space bar disclosed the next region

and removed the prior region. The program recorded the time between all the space bar presses.

Pressing the space bar on the last region of each item triggered the item to be superseded by the new screen with one corresponding comprehension question, e.g., “What was delivered on Tuesday?”. To respond to the question, unrestricted in time, participants had to select the antecedent by one of the buttons marked “NP_1”, e.g., “review”, or “NP_2”, e.g., “judgment”, or “NP_3”, e.g., “court”. When the read sentence seemed ungrammatical / unacceptable in Russian, they had to press the button marked “ungrammatical / unacceptable.” The space bar was chosen due to its convenience of use with the thumb. The two transparent keyboard protective skin covers were used to highlight the buttons securely. The buttons meant for the use by right-handed participants were marked with green stickers (dark blue stickers for left-handed) and sealed with transparent tape accordingly. Through script configurations, based on each participant’s handedness, the specific buttons (Figure 2) were activated during the experiment. After button-pressing, participants were automatically moved to the next item.

The average duration of experimental session was 21 minutes 23 seconds.

5.4.1. Precautionary measures in the light of COVID-19

Same as in Experiment 1.

5.5. Predictions

The reading times at the disambiguating region and ungrammaticality judgment data for the sentences such as (51a), (51b), and (51c) from Experiment 1 and (54a), (54b), and (54c) from this experiment were considered. In both groups, the decrease in reading times at the

disambiguating region and in ungrammaticality judgments about sentences in the NP_2 condition from Experiment 2 (54b) is significantly greater than the decrease in reading times at the disambiguating region and in ungrammaticality judgments about sentences in the NP_1 condition (51a) and the NP_3 condition (51c) from Experiment 1.

It was important to have all the conditions from both experiments representing all possible attachment conditions for a three-site context in order to find out how exactly pragmatic congruence affects the reading times at the disambiguating region and ungrammaticality judgments about sentences.

5.6. Data analyses

The reading times and responses to comprehension questions were taken from both experiments for analyses. Effects were projected to be found in the reading times at the disambiguating region in sentences from Experiment 1 and Experiment 2 and the corresponding grammaticality judgments.

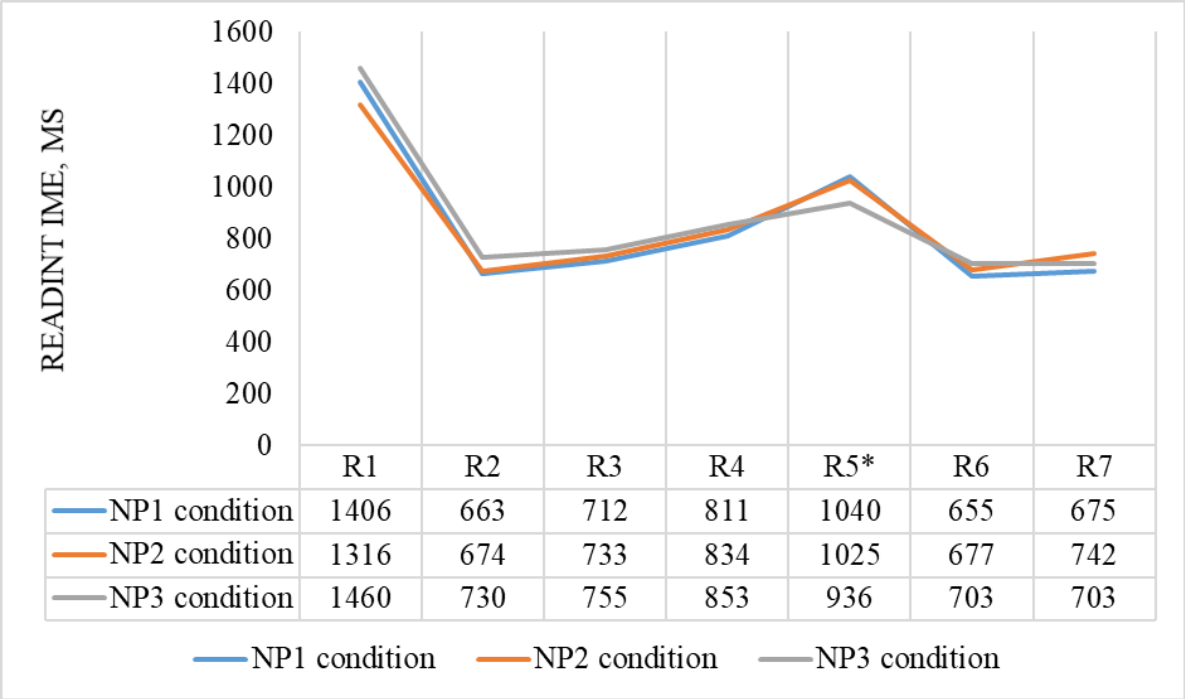
5.6.1. Analyses of the reading time data

The reading times for each region were recorded during the self-paced reading. Analogous to Experiment 1, the cut-off of ±2.5 SDs from the group mean per each region and per each experimental condition was selected for elimination of outliers. In the L1 group, this measure eliminated 19 data points in the disambiguating region, or 3.19% of the collected data, eight data points (1.65%) in the SubjectVerb region and the NP_1 region each, one data point (0.21%) in the NP_2 region, ten data points (2.06%) in the NP_3 region and the Remainder region each, six data points (1.23%) in the FinalWord region, and five data points (1.03%) in overall reading times. The means of the region-by-region reading times computed from the

remaining data in each experimental condition for the L1 group are presented in Figure 11.

Figure 11

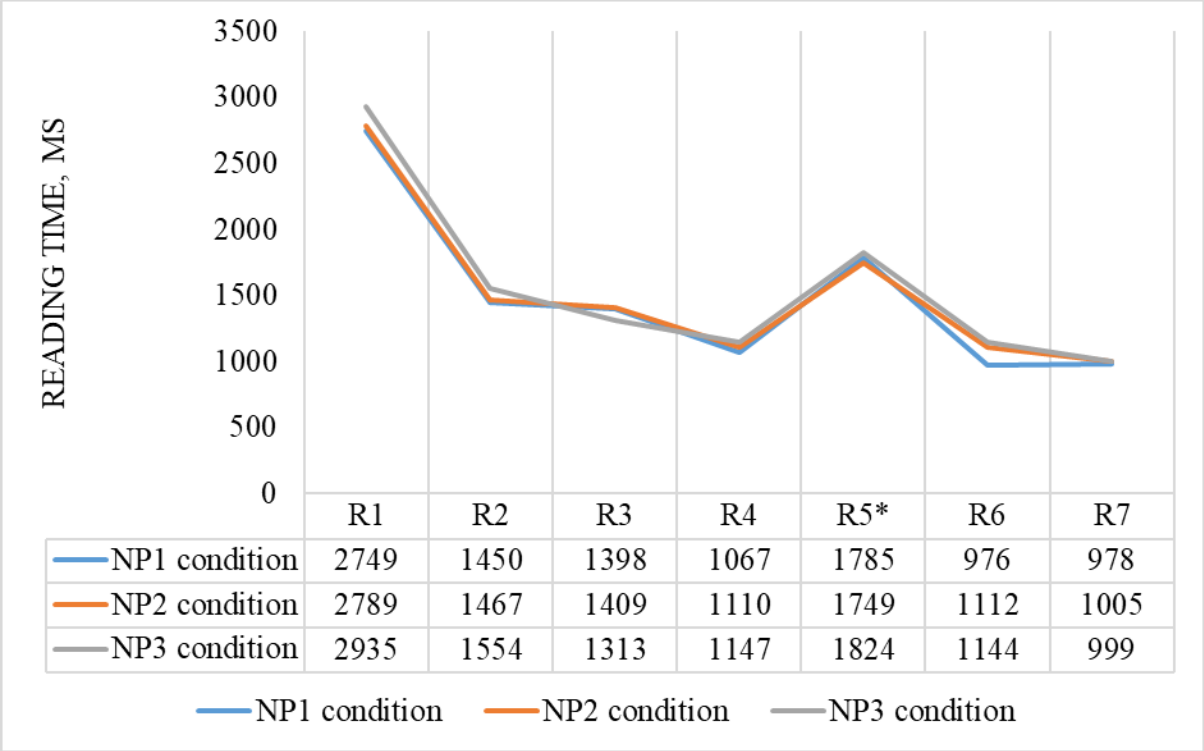
The region-by-region RTs for experimental sentences per condition of Experiment 2 in the L1 group (disambiguating region is marked with an asterisk)



In the L2 group, the measure eliminated 28 data points (5.98%) in the disambiguating region, 31 data points (6.62%) in the SubjectVerb region, 34 data points (7.26%) in the NP_1 region each, 30 data points (6.41%) in the NP_2 region, 29 data points (6.2%) in the NP_3 region and the Remainder region each, 35 data points (7.48%) in the FinalWord region, and 25 data points (5.34%) in overall reading times. The means of the region-by-region reading times computed from the remaining data in each experimental condition for the L2 group are presented in Figure 12.

Figure 12

The region-by-region RTs for experimental sentences per condition of Experiment 2 in the L2 group (disambiguating region is marked with an asterisk)



	R1	R2	R3	R4	R5*	R6	R7
NP1 condition	2749	1450	1398	1067	1785	976	978
NP2 condition	2789	1467	1409	1110	1749	1112	1005
NP3 condition	2935	1554	1313	1147	1824	1144	999

As the reading time data at the disambiguating region from Experiment 1 and Experiment 2 were the dependent variables of interest, they were sent to GLMM to compare the effects of attachment predisposition, its types, and interaction of these effects on the reading times. The model was used separately for each group with attachment predisposition, which had three levels: NP_1 (AttachmentPredisp1), NP_2 (AttachmentPredisp2), NP_3 (AttachmentPredisp3), experiment with two levels: attachment predisposition by number agreement (Experiment1) and attachment predisposition by pragmatic congruence (Experiment2), and their interaction term (Experiment * AttachmentPredisp) as fixed effects. To adjust for individual variation among sentences and participants, the model indicated Item, Participant, and their interaction term (Item * Participant) as random effects. Thus, the

model adjusted for the individual reading times nested under items, and items nested under participants.

5.6.1.1. Results of the L1 group

The reading times at the disambiguating region for each experimental sentence were taken from both experiments. There were 452 observations from Experiment 1 (468 observations before data cleaning) and 467 observations from Experiment 2 (486 observations before data cleaning), i.e., 919 observations in total. The SD of the cleaned data of the disambiguating region from Experiment 2 changed to 0.764 from 0.813 of all the data. 96.58% of the region data from Experiment 1 and 96.09% of the region data from Experiment 2 were included in the analyses.

The GLMM for the data set of the L1 group showed that the effects of attachment predisposition ($p = .034$), experiment ($p < .001$), and their interaction ($p = .005$) significantly affected the reading times at the disambiguating region (Table 20).

Table 20

Main effects and interactions of the GLMM derived from the RT data at disambiguating region from Experiment 1 and Experiment 2: the L1 group

Effect	F	df1	df2	p
AttachmentPredisp	3.383	2	913	.034
Experiment	30.876	1	913	.000
Experiment * AttachmentPredisp	5.238	2	913	.005

Table 21 summarizes the results of random-intercept GLMM for reading times at the disambiguating region. There was a significant difference between the NP_1 condition and the NP_2 condition (p = .001), indicating that the reading times at the disambiguating region in the NP_2 condition were longer than in the NP_1 condition. There was also a significant difference between the NP_1 condition and the NP_3 condition (p = .011), indicating that the reading times at the disambiguating region in the NP_3 condition were longer than in the NP_1 condition. Significant differences were greater in the NP_2 condition in Experiment 2 than in the NP_1 condition in Experiment 1 (p = .018) and in the NP_3 condition in Experiment 2 than in the NP_1 condition in Experiment 1 (p = .002).

Table 21

Fixed coefficients of the GLMM fitted to the RT data at the disambiguating region of the L1 group for experiment, attachment predisposition and their interaction

Predictor	β	SE	t	p	%CI
Intercept	.075	.0593	1.262	.207	[-.042, .191]
AttachmentPredisp=1	0	.	.	.	.
AttachmentPredisp=2	.184	.0541	3.398	.001	[.078, .290]
AttachmentPredisp=3	.135	.0534	2.534	.011	[.030, .240]
Experiment=1	0	.	.	.	.
Experiment=2	-.068	.0570	-1.198	.231	[-.180, .044]
[Experiment=1]*[Attachment Predisp=3]	0	.	.	.	.
[Experiment=2]*[Attachment Predisp=3]	-.232	.0751	-3.089	.002	[-.379, -.085]

[Experiment=1]*[Attachment Predisp=2]	0	.	.	.	.
[Experiment=2]*[Attachment Predisp=2]	-.180	.0758	-2.377	.018	[-.329, -.031]
[Experiment=1]*[Attachment Predisp=1]	0	.	.	.	.
[Experiment=2]*[Attachment Predisp=1]	0	.	.	.	.

Pairwise comparisons for the main significant effects of experiment and attachment predisposition in the L1 group (Table 22) revealed significant differences between the experiments in the NP_2 condition ($p < .001$) and in the NP_3 condition ($p < .001$), indicating that the reading times at the disambiguating region in each of these conditions were longer in Experiment 1 than Experiment 2.

Table 22

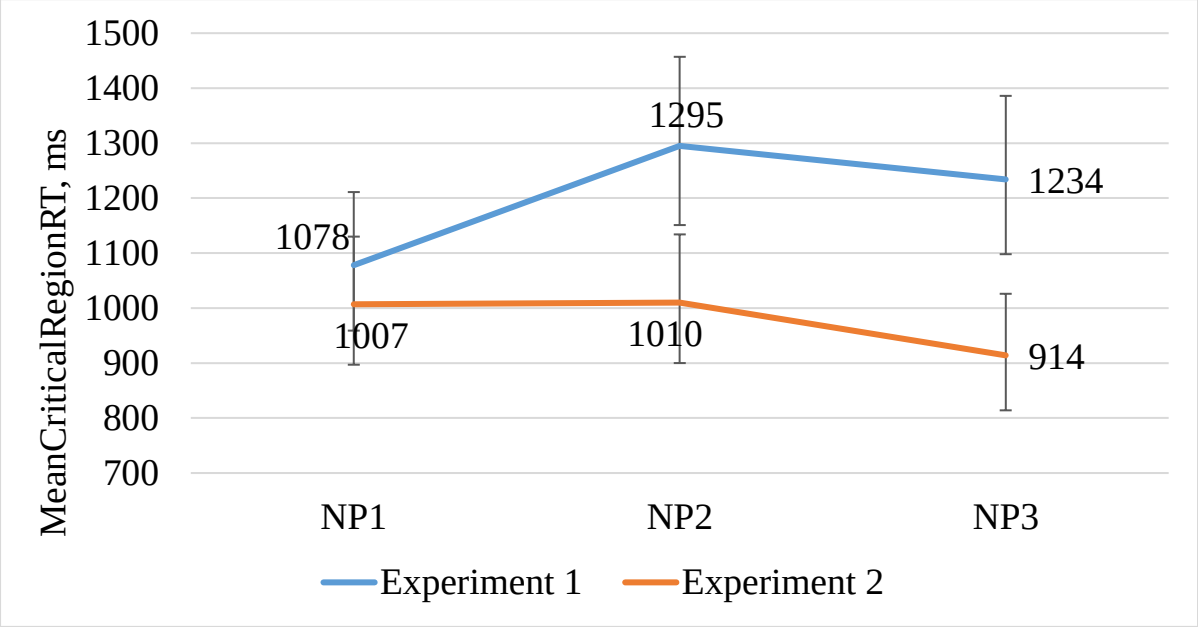
Pairwise contrasts of the GLMM fitted to the RT data at the disambiguating region from Experiment 1 and Experiment 2: the L1 group

Attachment Predisp	Contrast	Estimate	SE	t	df	p	%CI
1	Exp1-Exp2	.071	.060	1.195	913	.233	[-.046, .188]
2	Exp1-Exp2	.285	.069	4.154	913	.000	[.150, .419]
3	Exp1-Exp2	.320	.063	5.054	913	.000	[-.444, -.196]

Figure 13 demonstrates the group's actual means of the reading times at the disambiguating region per condition and experiment.

Figure 13

The RTs at the disambiguating region for experimental sentences per condition and experiment: the L1 group



5.6.1.2. Results of the L2 group

The reading times at the disambiguating region for each experimental sentence were taken from both experiments. After data cleaning of five observations from Experiment 1, and 23 observations from Experiment 2, 98.93% and 95.09% of the collected data were analyzed respectively. There were 463 observations from Experiment 1 (468 observations before data cleaning) and 445 observations from Experiment 2 (468 observations before data cleaning), i.e., 908 observations in total. The SD of the cleaned data of the disambiguating region from Experiment 2 changed to 1.116 from 1.594 of all the data. 98.93% of the region data from Experiment 1 and 95.09% of the region data from Experiment 2 were included in the analyses.

Table 23 shows the GLMM for the data set of the L2 group showed that the effect of experiment significantly affected the reading times at the disambiguating region ($p < .001$)

Table 23

Main effects and interactions of the GLMM derived from the RT data at the disambiguating region from Experiment 1 and Experiment 2: the L2 group

Effect	F	df1	df2	p
AttachmentPredisp	.501	2	902	.606
Experiment	50.919	1	902	.000
Experiment * AttachmentPredisp	1.404	2	902	.246

Table 24 summarizes the results of random-intercept GLMM for reading times at the disambiguating region. There was a significantly large facilitation in Experiment 1 ($p < .001$), indicating that the reading times at the disambiguating region were lower in Experiment 1 than in Experiment 2.

Table 24

Fixed coefficients of the GLMM fitted to the RT data at the disambiguating region of the L2 group for experiment, attachment predisposition, and their interaction

Predictor	β	SE	t	p	%CI
Intercept	.512	.0934	5.479	.000	[.328, .695]
AttachmentPredisp=1	-.024	.0624	-.381	.703	[-.146, .099]

AttachmentPredisp=2	-.030	.0625	-.483	.630	[-.153, .092]
AttachmentPredisp=3	0	.	.	.	.
Experiment=1	-.335	.0620	-5.401	.000	[-.456, -.213]
Experiment=2	0	.	.	.	.
[Experiment=1]*[Attachment Predisp=1]	.077	.0876	.878	.380	[-.095, .249]
[Experiment=2]*[Attachment Predisp=1]	0	.	.	.	.
[Experiment=1]*[Attachment Predisp=2]	.146	.0874	1.675	.094	[-.025, .318]
[Experiment=2]*[Attachment Predisp=2]	0	.	.	.	.
[Experiment=1]*[Attachment Predisp=3]	0	.	.	.	.
[Experiment=2]*[Attachment Predisp=3]	0	.	.	.	.

Pairwise comparisons for the main significant effect of experiment on reading times at the disambiguating region in the L2 group (Table 25) revealed significant differences between the experiments in the NP_1 condition ($p < .001$), in the NP_2 condition ($p = .004$), and in the NP_3 condition ($p < .001$), indicating that the reading times at the disambiguating region in each of these conditions were longer in Experiment 2 than Experiment 1.

Table 25

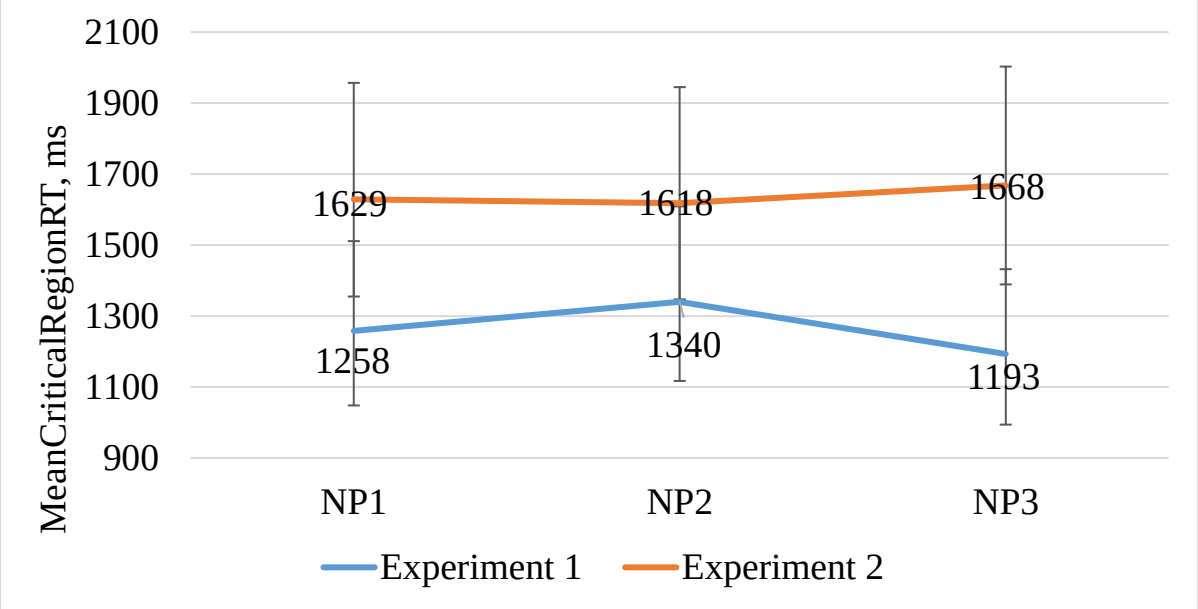
Pairwise contrasts of the GLMM fitted to the RT data at the disambiguating region from Experiment 1 and Experiment 2: the L2 group

Attachment Predisp	Contrast	Estimate	SE	t	df	p	%CI
1	Exp2-Exp1	.370	.096	3.842	902	.000	[.181, .559]
2	Exp2-Exp1	.278	.096	2.899	902	.004	[.090, .466]
3	Exp2-Exp1	.475	.098	4.833	902	.000	[.282, .667]

Figure 14 demonstrates that the group's actual means of the reading times at the disambiguating region were longer in Experiment 2 than in Experiment 1.

Figure 14

The RTs at the disambiguating region for experimental sentences per condition and experiment: the L2 group



5.6.2. Analyses of responses to comprehension questions

As in Experiment 1, there were the two analyses of responses to comprehension questions. The classification of responses was as follows: ungrammaticality judgements were either 1 (pressed the "ungrammatical" button) or 0 (did not press the "ungrammatical" button). In responses with NP selection, correct choices were 1 and incorrect were 0.

5.6.2.1. Ungrammaticality judgments

The means and SDs of ungrammaticality judgments computed from the collected data in each experimental condition for the L1 group and the L2 group are displayed in Table 26.

Table 26

Means and SDs of UJs for each condition and group of Experiment 2

Condition	L1 group		L2 group	
	M	*SD*	*M*	*SD*
NP_1	.12	.33	.08	.27
NP_2	.22	.42	.23	.42
NP_3	.10	.30	.08	.27

The ungrammaticality judgment data for each sentence of each group were taken for analyses in the GLMM to investigate the effects of attachment predisposition, its types, and interaction of these effects on ungrammaticality judgments about experimental sentences. As in previous analyses, the model was fitted separately for each group with attachment

predisposition, had three levels: NP_1 (AttachmentPredisp1), NP_2 (AttachmentPredisp2), NP_3 (AttachmentPredisp3), experiment with two levels: attachment predisposition by number agreement (Experiment1) and attachment predisposition by pragmatic congruence (Experiment2), and their interaction term (Experiment * AttachmentPredisp) as fixed effects. Individual variation among sentences and participants was adjusted by indicating Item, Participant, and their interaction term (Item * Participant) as random effects. Because there were either ungrammatical or grammatical judgements about sentences, they were modeled with the binary logistic distribution. So, for this analysis, the dependent variable had the two categories: 1 (ungrammatical) and 0 (grammatical).

5.6.2.1.1. Results of the L1 group

The ungrammaticality judgments for each experimental sentence were taken from both experiments. There were 468 observations from Experiment 1 and 486 observations from Experiment 2, i.e., 954 observations in total. In ungrammaticality judgments for the experimental sentences, the GLMM for the data set of the L1 group showed significant effects of attachment predisposition, $F(2,948) = 7.650$, $p < .001$ and experiment, $F(1,948) = 10.048$, $p = .002$, and no significant effect of their interaction term, $F(2,948) = 0.910$, $p = .403$ (Table 27).

Table 27

Main effects and interactions of the GLMM derived from the UJ data from Experiment 1 and Experiment 2: the L1 group

Effect	F	df1	df2	p
AttachmentPredisp	7.650	2	948	.001
Experiment	10.048	1	948	.002
Experiment * AttachmentPredisp	.910	2	948	.403

Table 28 summarizes the results of random-intercept GLMM for the ungrammaticality judgment data. There was a significantly large facilitation in Experiment 2 (p = .046), indicating that sentences in Experiment 2 were judged as ungrammatical less often than sentences in Experiment 1.

Table 28

Fixed coefficients of the GLMM fitted to the UJ data of the L1 group for attachment predisposition, experiment, and their interaction

Predictor	β	SE	t	p	%CI
Intercept	-1.395	.2824	-4.941	.000	[-1.956, -.835]
AttachmentPredisp=3	.008	.2831	.028	.977	[-.547, .564]
AttachmentPredisp=2	.481	.2721	1.769	.077	[-.053, 1.015]
AttachmentPredisp=1	0	.	.	.	.
Experiment=2	-.676	.3387	-1.996	.046	[-1.341, -.011]

Experiment=1	0	.	.	.	.
[Experiment=2]*[Attachment Predisp=3]	-.274	.4652	-.589	.556	[-1.187, .639]
[Experiment=1]*[Attachment Predisp=3]	0	.	.	.	.
[Experiment=2]*[Attachment Predisp=2]	.306	.4201	.728	.467	[-.519, 1.130]
[Experiment=1]*[Attachment Predisp=2]	0	.	.	.	.
[Experiment=2]*[Attachment Predisp=1]	0	.	.	.	.
[Experiment=1]*[Attachment Predisp=1]	0	.	.	.	.

Pairwise comparisons for the main significant effects of experiment and attachment predisposition on ungrammaticality judgments in the L1 group (Table 29) revealed significant differences between the experiments in the NP_1 condition (p = .050) and in the NP_3 condition (p = .011), indicating the ungrammaticality judgments about each of these conditions were made more often in Experiment 1 than Experiment 2.

Table 29

Pairwise contrasts of the GLMM fitted to the UJ data from Experiment 1 and Experiment 2: the L1 group

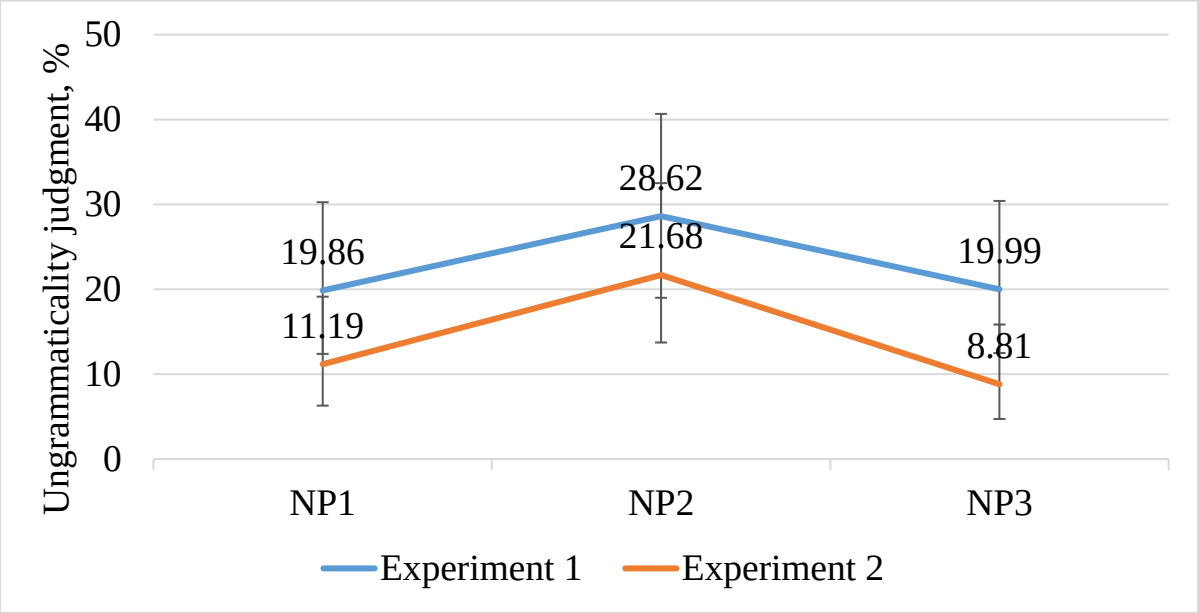
Attachment Predisp	Contrast	Estimate	SE	t	df	p	%CI
1	Exp1-Exp2	.087	.044	1.959	948	.050	[.000, .173]

2	Exp1-Exp2	.069	.054	1.277	948	.202	[-.037, .176]
3	Exp1-Exp2	.112	.044	2.561	879	.011	[.026, .197]

As shown in Figure 15, sentences in Experiment 1 received ungrammaticality judgments more often than sentences in Experiment 2.

Figure 15

The UJs about experimental sentences per condition and experiment: the L1 group



5.6.2.1.2. Results of the L2 group

The ungrammaticality judgments for each experimental sentence were taken from both experiments. There were 468 observations from Experiment 1 and 468 observations from Experiment 2, i.e., 936 observations in total.

In ungrammaticality judgments for the experimental sentences, the GLMM for the data set of the L2 group showed significant effects of attachment predisposition, F(2,930) =

18.262, $p < .001$ and experiment, $F(1,930) = 24.911$, $p < .001$, and no significant effect of their interaction term, $F(2,930) = 0.981$, $p = .375$ (Table 30).

Table 30

Main effects and interactions of the GLMM derived from the UJ data from Experiment 1 and Experiment 2: the L2 group

Effect	F	df1	df2	p
AttachmentPredisp	18.262	2	930	.000
Experiment	24.911	1	930	.000
Experiment * AttachmentPredisp	.981	2	930	.375

Table 31 summarizes the results of random-intercept GLMM for the ungrammaticality judgment data. There was a significantly large facilitation in Experiment 2 ($p < .001$), indicating that sentences in Experiment 2 were judged as ungrammatical less often than sentences in Experiment 1. There was a significant difference between the NP_1 condition and the NP_2 condition ($p = .007$), indicating that the ungrammaticality judgments about the NP_2 condition were made more often than in the NP_1 condition.

Table 31

Fixed coefficients of the GLMM fitted to the UJ data of the L2 group for experiment, attachment predisposition, and their interaction

Predictor	β	SE	t	p	%CI

Intercept	-1.329	.2432	-5.465	.000	[-1.812, -.847]
AttachmentPredisp=1	0	.	.	.	.
AttachmentPredisp=2	.706	.2629	2.686	.007	[.190, 1.222]
AttachmentPredisp=3	-.385	.2959	-1.301	.194	[-.966, .196]
Experiment=1	0	.	.	.	.
Experiment=2	-1.315	.3632	-3.620	.000	[.190, 1.222]
[Experiment=2]*[Attachment Predisp=2]	.625	.4463	1.400	.162	[-.251, 1.500]
[Experiment=1]*[Attachment Predisp=2]	0	.	.	.	.
[Experiment=2]*[Attachment Predisp=3]	.387	.5214	.743	.458	[-.636, 1.411]
[Experiment=1]*[Attachment Predisp=3]	0	.	.	.	.
[Experiment=2]*[Attachment Predisp=1]	0	.	.	.	.
[Experiment=1]*[Attachment Predisp=1]	0	.	.	.	.

Pairwise comparisons for the main significant effects of experiment and attachment predisposition on ungrammaticality judgments in the L2 group (Table 32) revealed significant differences between the experiments in the NP_1 condition ($p < .001$), in the NP_2 condition ($p = .008$), and in the NP_3 condition ($p = .015$), indicating the ungrammaticality judgments about each of these conditions were made more often in Experiment 1 than Experiment 2.

Table 32

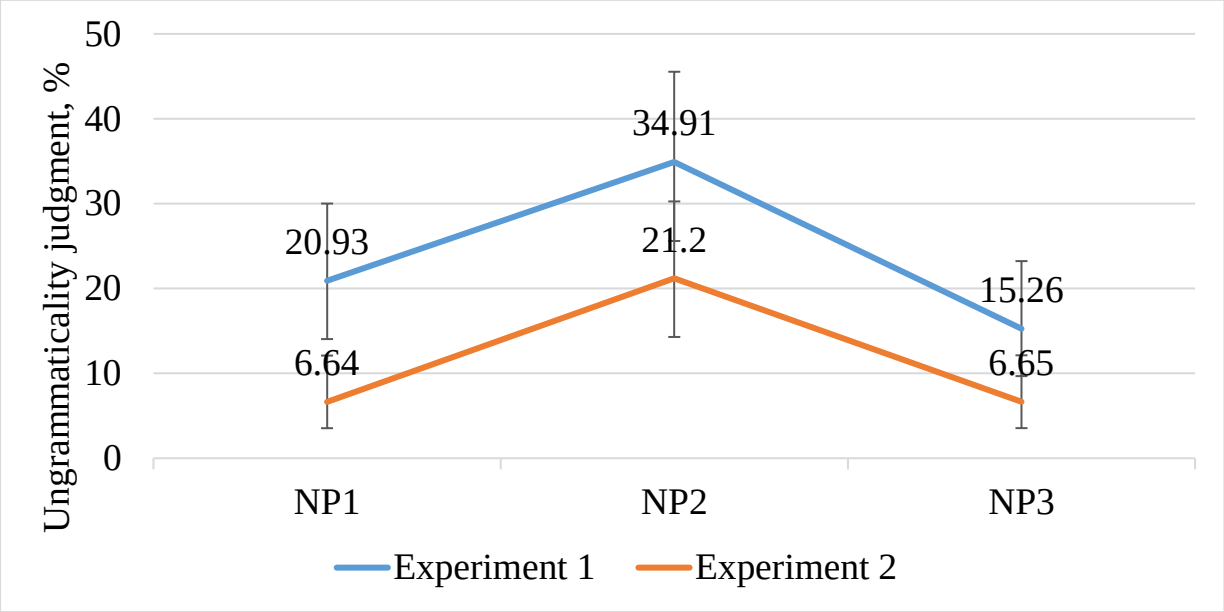
Pairwise contrasts of the GLMM fitted to the UJ data from Experiment 1 and Experiment 2: the L2 group

Attachment Predisp	Contrast	Estimate	SE	t	df	p	%CI
1	Exp1-Exp2	.143	.040	3.531	652	.000	[.063, .222]
2	Exp1-Exp2	.137	.052	2.642	930	.008	.[035, .239]
3	Exp1-Exp2	.086	.035	2.428	930	.015	[.017, .156]

As shown in Figure 16, sentences in Experiment 1 received ungrammaticality judgments more often than sentences in Experiment 2.

Figure 16

The UJs about experimental sentences per condition and experiment: the L2 group



5.6.2.2. NP selection responses and comprehension accuracy

To compare participants' answers to questions corresponding to sentences in both experiments, the frequencies of responses in the L1 group were calculated for each condition.

The numerical data of Experiment 2 (Table 33) showed that the number of the NP_1 responses (64.2% of the responses) in the L1 group was the highest to sentences in the NP_1 condition. In the NP_2 condition, the number of the NP_2 responses (60.5% of the responses) was the highest. The number of the NP_3 responses (74.2% of the responses) was the highest to sentences in the NP_3 condition.

Table 33

Frequencies of NP selection responses and ungrammaticality presses for each condition of Experiment 2: the L1 group

Condition	NP_1 response (%)	NP_2 response (%)	NP_3 response (%)	Ungrammatical response (%)
NP_1	104 (64.20)	25 (15.43)	13 (8.02)	20 (12.35)
NP_2	21 (12.96)	98 (60.49)	7 (4.32)	36 (22.22)
NP_3	12 (7.41)	14 (8.64)	120 (74.07)	16 (9.88)

As of the L2 group (Table 34), in the NP_1 condition, the number of the NP_1 responses (60.9% of the responses) was numerically the highest, whereas the number of the NP_2 responses (60.3%) was the highest in the NP_2 condition. The number of the NP_3 responses (85.3%) was the highest to sentences in the NP_3 condition.

Table 34

Frequencies of NP selection responses and ungrammaticality presses for each condition of Experiment 2: the L2 group

Condition	NP_1 response (%)	NP_2 response (%)	NP_3 response (%)	Ungrammatical response (%)
NP_1	95 (60.90)	31 (19.87)	18 (11.54)	12 (7.69)
NP_2	8 (5.13)	94 (60.26)	19 (12.18)	35 (22.44)
NP_3	4 (2.56)	7 (4.49)	133 (85.26)	12 (7.69)

To check further how participants responded to comprehension questions in each condition in Experiment 2, the means and SDs of their NP selection responses were computed from the collected data in each experimental condition for the L1 group and the L2 group (Table 35).

Table 35

Means and SDs of responses for each condition and group of Experiment 2

Condition	L1 group		L2 group	
	M	*SD*	*M*	*SD*
NP_1	.64	.481	.61	.490
NP_2	.60	.490	.60	.491
NP_3	.74	.440	.85	.356

Even though it was not a primary interest of the study to analyze responses to comprehension questions of participants across the experiments, the comparative analysis of responses was conducted to obtain supplementary information about how native Russian speakers and learners of Russian manifest their attachment preferences in Experiment 1 and Experiment 2.

The response data of each group for sentences of both experiments were taken for analyses in the GLMM to compare the effects of attachment predisposition, its types, and interaction of these effects on the comprehension question response. As in previous analyses, the model was fitted separately for each group with attachment predisposition, had three levels: NP_1 (AttachmentPredisp1), NP_2 (AttachmentPredisp2), NP_3 (AttachmentPredisp3), experiment with two levels: attachment predisposition by number agreement (Experiment1) and attachment predisposition by pragmatic congruence (Experiment2), and their interaction term (Experiment * AttachmentPredisp) as fixed effects. Individual variation among sentences and participants was adjusted by indicating Item, Participant, and their interaction term (Item * Participant) as random effects. Because there were either correct or incorrect responses, they were modeled with the binary logistic distribution. So, for this analysis, the dependent variable had the two categories: 1 (correct) and 0 (incorrect).

5.6.2.2.1. Results of the L1 group

There were 468 observations from Experiment 1 and 486 observations from Experiment 2, i.e., 954 observations in total. The GLMM for the data set of the L1 group showed that the effects of attachment predisposition, experiment, as well as interaction of these effects significantly affected responses to comprehension questions (Table 36).

Table 36

Main effects and interactions of the GLMM derived from the RespChoice data from Experiment 1 and Experiment 2: the L1 group

Effect	F	df1	df2	p
AttachmentPredisp	5.828	2	948	.003
Experiment	87.681	1	792	.000
Experiment * AttachmentPredisp	11.852	2	948	.000

Table 37 summarizes the results of random-intercept GLMM for the comprehension question response data. There was a significantly large facilitation in Experiment 2 ($p = .008$), indicating that the number of NP selection responses was higher in Experiment 2 than in Experiment 1. There was a significant difference between the NP_1 condition and the NP_3 condition ($p < .001$), indicating that the number of responses in the NP_3 condition was lower than in the NP_1 condition. There was a significant difference between the NP_1 condition and the NP_2 condition ($p < .001$), indicating that the number of responses in the NP_2 condition was lower than in the NP_1 condition. Significant differences were greater in the NP_2 condition in Experiment 2 than in the NP_1 condition in Experiment 1 ($p = .018$) and in the NP_3 condition in Experiment 2 than in the NP_1 condition in Experiment 1 ($p < .001$).

Table 37

Fixed coefficients of the GLMM fitted to the RespChoice data of the L1 group for attachment predisposition, experiment, and their interaction

Predictor	β	SE	t	p	%CI
Intercept	-.103	.1968	-.524	.601	[-.493, .287]
AttachmentPredisp=3	-1.262	.2586	-4.880	.000	[-1.769, -.754]
AttachmentPredisp=2	-.968	.2473	-3.914	.000	[-1.453, -.483]
AttachmentPredisp=1	0	.	.	.	.
Experiment=2	.641	.2424	2.647	.008	[.166, 1.117]
Experiment=1	0	.	.	.	.
[Experiment=2]*[Attachment Predisp=3]	1.739	.3575	4.864	.000	[1.037, 2.440]
[Experiment=1]*[Attachment Predisp=3]	0	.	.	.	.
[Experiment=2]*[Attachment Predisp=2]	.806	.3401	2.371	.018	[.139, 1.474]
[Experiment=1]*[Attachment Predisp=2]	0	.	.	.	.
[Experiment=2]*[Attachment Predisp=1]	0	.	.	.	.
[Experiment=1]*[Attachment Predisp=1]	0	.	.	.	.

Pairwise comparisons for the main significant effects of experiment, attachment predisposition, and the interaction of these effects on responses in the L1 group (Table 38) revealed significant differences between the experiments in the NP_1 condition (p = .007), the

NP_2 condition ($p < .001$), and the NP_3 condition ($p < .001$), indicating the number of responses for each of these conditions was higher in Experiment 2 than in Experiment 1.

Table 38

Pairwise contrasts of the GLMM fitted to the RespChoice data from Experiment 1 and Experiment 2: the L1 group

Attachment Predisp	Contrast	Estimate	SE	t	df	p	%CI
1	Exp2-Exp1	.157	.058	2.701	948	.007	[.043, .271]
2	Exp2-Exp1	.338	.055	6.161	948	.000	[.230, .445]
3	Exp2-Exp1	.531	.050	10.715	948	.000	[.433, .628]

Table 39 presents the estimated means of random-intercept GLMM for responses to comprehension questions with attachment predisposition and experiment as fixed effects in the L1 group. As shown in Figure 17, the number of NP selection responses was higher in Experiment 2 than in Experiment 1 in all conditions.

Table 39

The estimated means of fixed effects in the GLMM for the RespChoice data from Experiment 1 and Experiment 2 (sum score): the L1 group

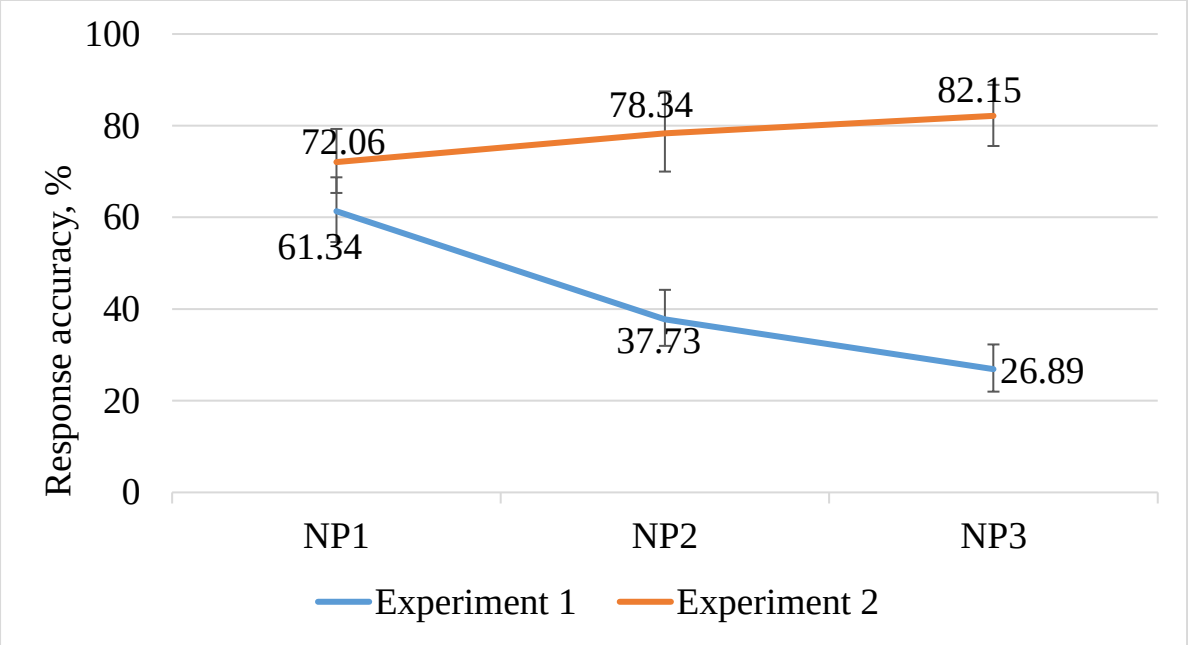
Experiment	AttachmentPredisp	Estimate	SE	95% Wald confidence interval	
				Lower	Upper
1	1	.474	.049	.379	.571

	2	.255	.041	.183	.344
	3	.203	.037	.140	.286
2	1	.631	.046	.536	.718
	2	.593	.048	.497	.683
	3	.734	.042	.645	.808

To compare the comprehension accuracy of L1 participants in Experiment 2 with those from Experiment 1 (already calculated), the percentages of their response selections were normed out of the percentages of the ungrammatical button presses. The accuracies for the NP_1 condition, the NP_2 condition, and the NP_3 condition in Experiment 2 equaled .7206, .7834, and .8215, respectively. As observed in Figure 17, the response accuracies in all the three conditions were higher in Experiment 2 than Experiment 1.

Figure 17

The RespAcc for experimental sentences per condition and experiment: the L1 group



5.6.2.2.2. Results of the L2 group

There were 468 observations from Experiment 1 and 468 observations from Experiment 2, i.e., 936 observations in total. The GLMM for the data set of the L2 group showed that the effects of attachment predisposition, experiment, and interaction of these effects significantly affected responses to comprehension questions (Table 40).

Table 40

Main effects and interactions of the GLMM derived from the RespChoice data from Experiment 1 and Experiment 2: the L2 group

Effect	F	df1	df2	p
AttachmentPredisp	8.777	2	930	.000
Experiment	70.167	1	930	.000
Experiment * AttachmentPredisp	9.911	2	930	.000

Table 41 summarizes the results of random-intercept GLMM for the comprehension question response data. There was a significantly large facilitation in Experiment 2 ($p = .017$), indicating that the number of NP selection responses in Experiment 2 was higher than in Experiment 1. Significant difference was found between the experiments in the NP_3 condition ($p < .001$), revealing that the number of NP selection responses in this condition was higher in Experiment 2 than in Experiment 1.

Table 41

Fixed coefficients of the GLMM fitted to the RespChoice data of the L2 group for experiment, attachment predisposition, and their interaction

Predictor	β	SE	t	p	%CI
Intercept	-.104	.1734	-.600	.549	[-.445, .237]
AttachmentPredisp=1	0	.	.	.	.
AttachmentPredisp=2	-.427	.2319	-1.840	.066	[-.882, .028]
AttachmentPredisp=3	-.263	.2298	-1.146	.252	[-.714, .188]
Experiment=1	0	.	.	.	.
Experiment=2	.551	.2313	2.384	.017	[.098, 1.005]
[Experiment=1]*[Attachment Predisp=1]	0	.	.	.	.
[Experiment=2]*[Attachment Predisp=1]	0	.	.	.	.
[Experiment=1]*[Attachment Predisp=2]	0	.	.	.	.
[Experiment=2]*[Attachment Predisp=2]	.400	.3287	1.216	.224	[-.245, 1.045]
[Experiment=1]*[Attachment Predisp=3]	0	.	.	.	.
[Experiment=2]*[Attachment Predisp=3]	1.585	.3623	4.375	.000	[.874, 2.296]

Pairwise comparisons for the main significant effects of experiment, attachment predisposition, and the interaction of these effects on responses in the L2 group (Table 42) revealed significant differences between the experiments in the NP_1 condition (p = .016), the

NP_2 condition ($p < .001$), and the NP_3 condition ($p < .001$), indicating the number of responses for each of these conditions was higher in Experiment 2 than in Experiment 1.

Table 42

Pairwise contrasts of the GLMM fitted to the RespChoice data from Experiment 1 and Experiment 2: the L2 group

Attachment Predisp	Contrast	Estimate	SE	t	df	p	%CI
1	Exp2-Exp1	.136	.056	2.415	930	.016	[.026, .247]
2	Exp2-Exp1	.233	.055	4.208	930	.000	[.124, .342]
3	Exp2-Exp1	.445	.049	9.042	930	.000	[.349, .542]

Table 43 presents the estimated means of random-intercept GLMM for responses to comprehension questions with attachment predisposition and experiment as fixed effects in the L2 group. As shown in Figure 18, the number of NP selection responses was higher in Experiment 2 than in Experiment 1 in all conditions.

Table 43

The estimated means of fixed effects in the GLMM for the RespChoice data from Experiment 1 and Experiment 2 (sum score): the L2 group

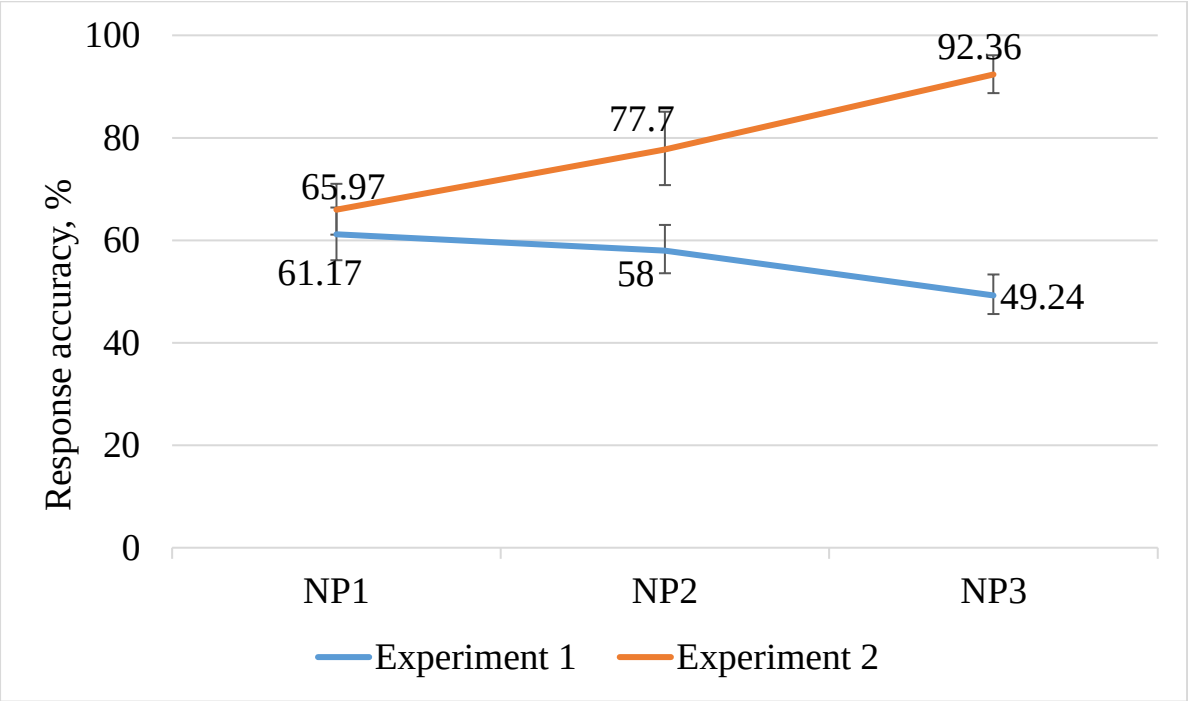
Experiment	AttachmentPredisp	Estimate	SE	95% Wald confidence interval	
				Lower	Upper
1	1	.474	.043	.390	.559

	2	.370	.042	.293	.455
	3	.409	.042	.329	.495
2	1	.610	.042	.525	.689
	2	.604	.042	.518	.683
	3	.854	.029	.787	.903

In order to compare the comprehension accuracy of L2 participants in Experiment 2 with those from Experiment 1 (already calculated), the percentages of their response selections were normed out of the percentages of the ungrammatical button presses. The accuracies for the NP1 condition, the NP2 condition, and the NP3 condition in Experiment 1 equaled .6597, .7770, and .9236, respectively. As seen in Figure 18, the response accuracies in all the three conditions were higher in Experiment 2 than in Experiment 1.

Figure 18

The RespAcc for experimental sentences per condition and experiment: the L2 group



5.7. Summary of findings

In the L1 group, the reading times at the disambiguating region in the NP_2 condition were shorter Experiment 2 than in Experiment 1 ($p < .001$), whereas they were also shorter in the NP_3 condition in Experiment 2 than in Experiment 1 ($p < .001$). The rate of ungrammaticality judgment in the NP_1 condition was higher in Experiment 1 than in Experiment 2 ($p < .05$), whereas in the NP_3 condition it was also higher in Experiment 1 than in Experiment 2 ($p < .01$). The number of NP selection responses in the NP_1 condition was lower in Experiment 1 than in Experiment 2 ($p < .01$). In the NP_2 condition and the NP_3 condition, it was lower in Experiment 1 than in Experiment 2 (both $p < .001$).

In the L2 group, the reading times at the disambiguating region in the NP_1 condition and in the NP_3 condition were shorter in Experiment 1 than in Experiment 2 (both $p < .001$), as well as in the NP_2 condition ($p < .01$). The rate of ungrammaticality judgment in the NP_1 condition was higher in Experiment 1 than in Experiment 2 ($p < .001$). In the NP_2 condition and in the NP_3 condition, the rates were also higher in Experiment 1 than in Experiment 2 (both $p < .01$). The number of NP selection responses in the NP_1 condition was lower in Experiment 1 than in Experiment 2 ($p < .05$). In the NP_2 condition and the NP_3 condition, the number was also lower in Experiment 1 than in Experiment 2 (both $p < .001$).

Chapter 6: General discussion and conclusion

Experiment 1 of the present study investigated whether native Russian speakers and learners of Russian show tendencies of attachment preferences in processing and comprehension of locally ambiguous participial relative clause sentences with three potential NP attachment sites and whether these tendencies are driven by the impact of predicate proximity factor and/or recency preference factor.

Experiment 2 of the study examined whether the effect of pragmatic congruence modulates the effects of predicate proximity and recency preference in processing and comprehension of locally ambiguous participial relative clause sentences with three NP attachment sites in Russian.

6.1. Findings of Experiment 1

It was hypothesized that among native Russian speakers the reading times at the disambiguating region would be shorter and the rate of ungrammaticality judgment would be lower for sentences in which the participle agrees with NP_1 in number (the NP_1 condition) than for sentences in other conditions. This stems from the force of Predicate Proximity factor, which operates in languages with a non-rigid word order like Russian. The factor yields high attachment preference by influencing to link modifiers to the phrase closest to the sentence's predicate. The reading times at the disambiguating region would be shorter and the rate of ungrammaticality judgment would be lower for sentences in the NP_3 condition than for sentences in the NP_2 condition. This is because of Recency Preference factor that influences to attach modifiers towards the most recent site. The force of this factor follows from general properties of WM but was hypothesized to be relatively weaker than of Predicate Proximity in native Russian speakers. Since there is no force behind the preference

to attach middle, both reading time and ungrammaticality judgment results would point at the pattern of NP_1 – NP_3 – NP_2 attachment preference ordering.

As for the English-speaking learners of Russian, it was hypothesized that the reading times of the disambiguating region would be shorter, and the rate of ungrammaticality judgment would be lower for sentences in the NP_3 condition than for sentences in other conditions. This stems from the force of recency preference factor, which is shown to operate in languages with a rigid word order like English. This factor yields the low attachment preference by influencing to link modifiers towards the most recent site. The reading times at the disambiguating region would be shorter and the rate of ungrammaticality judgment would be lower for sentences in the NP_1 condition than for sentences in the NP_2 condition. This is because of predicate proximity factor that comes from their L2 but was relatively weaker than recency preference factor. Since there is no force behind the preference to attach middle, both reading time and ungrammaticality judgment results would point at the pattern of NP_3 – NP_1 – NP_2 attachment preference ordering.

Based on the findings (see 4.7. Summary), the reading times at the disambiguating region of native Russian speakers are significantly shorter in sentences in the NP_1 condition than in the NP_2 condition and the NP_3 condition. The findings confirm Hypothesis 1a, suggesting that native Russian speakers prefer to attach a participial relative clause high to resolve a syntactic ambiguity. At the same time, the reading times at the disambiguating region are not significantly shorter in the NP_3 condition than in the NP_2 condition. This combination of findings does not demonstrate that both factors of the Recency Preference and Predicate Proximity model (Gibson et al., 1996) are operative with their varying force. However, the two-factor model is not entirely unpredictive, instead, the findings support it in that one of the factors, Predicate Proximity, is found to be strongly operative during processing in Russian as L1.

It was also found that the rate of ungrammaticality judgments does not significantly differ between sentence conditions, therefore, this finding rejects Hypothesis 1b. One potential explanation of this non-significant finding is that the results of timed and untimed tasks often diverge because each of them appeals to different cognitive mechanisms of sentence interpretation (Parker, 2019). One is the mechanism for rapid and continuous processing (parser), whereas the other is a less prompt mechanism that determines what is un/grammatical and according to the language rules (grammar). Pertinent to this experiment, low and middle attachment conditions are less favorable than high attachment during parsing and, therefore, longer to process, owing to a strong preference of native Russian speakers to attach high. However, since the low and middle attachment conditions are plausible and grammatical, just as the high attachment condition, there is an "upgrade" of the low attachment and middle attachment conditions (syntactically unpreferred), resulting in statistically similar rate of ungrammaticality among these conditions.

Additionally, it was found that native Russian speakers comprehend the NP_1 condition significantly more accurate than both the NP_2 condition and the NP_3 condition. At the same time, the NP_3 condition is comprehended not significantly more accurate than the NP_2 condition. These findings are consistent with the reading time results of the group and in part with the ungrammaticality judgment results and suggest that native Russian speakers are driven by high attachment preference when creating their final sentence representation. It may seem concerning that native Russian speakers have an average comprehension accuracy (61.34%) of the high attachment sentences and a rather low accuracy of the middle and low attachment sentences (37.73% and 26.89%, respectively). These low comprehension accuracies across the conditions may be explained by that the task only traces the result of processing the material, not its processing in real-time, therefore, may be a product of a considerable difficulty to recall the right noun in the sentences under consideration. These

results are indicative of the priority of the high attachment preference, because the low and middle attachment versions are incorrectly interpreted significantly more often than the high attachment versions. Thus, the effect of the strategy to have a participial relative clause modify the phrase farther back in the sentence could be strong enough to dismiss the morphological marking encoded in inflections (number agreement) that requires to attach low or middle. Again, this leads to more erroneous interpretations of the low and middle attachment sentences relative to the high attachment sentences.

The off-line study of the participial relative clause sentences with a two-site context disambiguated via case marking (Chernova, 2016) also found that low comprehension accuracy of syntactically non-preferred attachment condition, that is, sentences disambiguated towards low attachment. It must be noted that all experimental sentences in Chernova (2016) were syntactically unambiguous owing to overt case endings, whereas in this study they were also unambiguously marked but with number inflection. Although speculative, Chernova attributed her result to the distant location of the participial in relation to the noun and the subsequent attenuation of morphological characteristics of the noun from the WM. So, when required to choose an antecedent of the participial relative clause, the conceptual processor has to assemble the already processed structure to answer the comprehension question. However, it cannot retrieve (fully-fledged) information about morphological marking due to WM limitations and relies on the most preferred syntactic strategy in a language, that is, high attachment in Russian. Lopukhina et al. (2021) considered the low accuracy rate in the syntactically unpreferred condition (low attachment) in Chernova (2016) as a “surprisingly strong bias for high attachment in Russian”, which is “intriguing” in nature and requiring further examination of the reason that might drive it.

Seeking to determine such reason, let us recall that in real-time, participants took longer to read the critical region (participle) in the middle and low attachment sentences due to that

the resolutions towards middle and low attachments are syntactically unpreferred in Russian. In other words, the parser might have tried to recover from the misanalysis, i.e., a participial relative clause modifies the NP_1. This led to the increase of the reading time, therefore, the processing difficulty at the participle in the middle and low attachment sentence conditions, relative to the high attachment sentence condition. Given that sentence processing apparently involves an interaction of syntactic and lexical information, it might be that the parser could never recover from the misanalysis, because there was no information other than morphological marking that could facilitate processing and speak in favor of the strategy to attach middle or low. The likelihood of each NP being modified by the participle was pragmatically similar and did not help the parser abandon the incorrect but also syntactically preferred analysis (high attachment) in sentences predisposing to attach middle or low. Assuming the above, when required to explicitly determine the modified constituent, the parser could be informed by the commonly used syntactic strategy (attach high) rather than morphological information (number agreement) and, as a result, incorrectly associated the participle with the NP_1 in sentences predisposing to attach middle and low. Perhaps, this processing led the participants to select the NP_1 as a response to questions about the middle attachment condition more than the response appropriate to that condition, that is, the NP_2 (30.77% vs. 25.64%, respectively). In a similar way, the NP_1 was given as a response more frequently than the response appropriate to the low attachment condition, that is, the NP_3 (33.33% and 20.51%, respectively).

It may also be speculated that the low accuracy of syntactically non-preferred attachment conditions in the present study is the manifestation of that readers did not take cognizance of the linguistic manipulation with the noun phrases, i.e., only one noun phrase attaches to the participial relative clause through number agreement and did not accustom their answers accordingly. Nevertheless, the self-paced reading paradigm tapped into their

non-conscious processing, and the subsequent analyses of the reading times reflected more preference to attach high than middle or low. Overall, it is the comprehension accuracy data that allow us to know the final representation of locally ambiguous participial relative clause sentence in native Russian speakers, and, that is why, these data are just as informative as the reading data and somewhat more informative than the ungrammaticality judgment data.

The reading times at the disambiguating region of English-speaking learners of Russian are significantly shorter in the NP_3 condition than in the NP_2 condition. This finding confirms Hypothesis 2a and suggests that language learners prefer to attach a participial relative clause low to resolve a syntactic ambiguity. The reading times at the disambiguating region are not significantly shorter in the NP_3 condition than in the NP_1 condition. This finding suggests that learners also prefer to attach high. At the same time, the reading times are not significantly shorter in the NP_1 condition than in the NP_2 condition. This finding indicates that there are effects from both English and Russian, and language learners are just starting to align their preference with native Russian speakers. Based on conjunction of these findings, learners give the priority to low attachment preference as their parsing strategy, whereas they also show high attachment preference arising from their L2.

The presence of both attachment preferences in English-speaking learners of Russian could be an outcome of the two-factor model, but it may also be due to the learning of Russian that leads to high attachment preference in addition to low attachment preference that comes from L1. Many previous studies of self-paced reading (Deevy, 1999; Corley, 1995; Clifton, 1988), eye-tracking (Carreiras & Clifton, 1999) and corpus data (Gibson & Pearlmutter, 1994; Mitchell et al., 1992) found that monolingual English speakers demonstrate low attachment preference. In this regard, those studies point at that recency preference is the only factor that navigates parsing in monolingual English speakers and do not show that the two-factor model explains their processing behaviour. Considering previous

research and findings of this study, L2 processing in English-speaking learners of Russian is argued to be affected by both languages, with L1 being more dominant. The study, therefore, partially supports the two-factor model of Recency Preference and Predicate Proximity (Gibson et al., 1996) in that the relatively strong Recency Preference factor operative among English-speaking learners of Russian is a product of L1 interference. However, Predicate Proximity factor is growing in importance as an attempt to adjust their parsing strategy with L2.

Based on the ungrammaticality judgment data, it was found that English-speaking learners of Russian judge the NP_2 condition as ungrammatical significantly more often than the NP_3 condition. This finding is consistent with the respective reading time result of the group and suggests that participial relative clause sentences with syntactic ambiguity resolved by low attachment are favored by learners of Russian. They judge the NP_1 condition as ungrammatical not significantly more often than the NP_3 condition. This finding is consistent with the respective reading time result and suggests that learners of Russian also prefer high attachment. It was also found that they judge the NP_2 condition as ungrammatical significantly more often than the NP_1 condition. This finding is not consistent with the respective reading time result of the group and indicates that learners' preference is almost aligned with the native Russian speakers. The combination of such findings confirms Hypothesis 2b and suggests that English-speaking learners of Russian favour low attachment transferred from their L1, but also high attachment from their L2.

Interestingly, high attachment preference is manifested more robustly in the ungrammaticality judgment results than in the reading time results. Although speculative, this observation might suggest influence of the L1 grammar on L2. Let us refer to the experimental sentence, e.g., "The plaintiffs demanded the executions of the judgment of the cases having delayed due to the pandemic." In the course of self-paced reading (i.e., on-line

processing), English-speaking learners of Russian faced an attachment ambiguity in the three-site context enclosed in the genitive construction *NP1 (of) NP2 (of) NP3* (often referred to as the Norman genitive). Given the pragmatic considerations, these learners might have revised the initial sentence representation, being guided by L1 phenomenon, or the possessive *'s* genitive (often referred to as the Saxon genitive) which is unavailable in their L2. This speculation stems from the Construal hypothesis (Frazier & Clifton, 1996) claiming that native English speakers may rely on the Saxon genitive as a strategy to avoid an ambiguity or at least reduce it as much as possible. Pertinent to this study, language learners might have tried to alleviate a syntactic ambiguity through transforming their initial representation from the Norman genitive construction to the Saxon genitive construction. In the off-line ungrammaticality judgment task, learners might have retrieved from memory the transformed representation of the sentence with *NP2's NP1 of NP3*. The retrieved sentence "The plaintiffs demanded the judgment' executions of the cases having delayed due to the pandemic" was no longer bound to the three-site context of syntactic attachment ambiguity. As a result, NP_1 might have become a potential host of a participial relative clause just as NP_3, because *NP2's NP1 of NP3* construction, a less ambiguous alternative of *NP1 of NP2 of NP3*, does not intend NP_2 modification. In other words, English-speaking learners of Russian might have applied the L1 phenomenon to L2 sentence comprehension in order to come up with an alternative structure with less potential antecedents. Consequently, there is an "upgrade" of the high attachment condition, which is reflected in significantly lower ungrammaticality rate relative to the middle attachment condition.

Furthermore, it was found that English-speaking learners of Russian comprehend the NP_3 condition significantly more accurately than the NP_2 condition. This finding is consistent with the respective reading time and ungrammaticality judgment results of the group and suggests low attachment preference in learners of Russian. It was also found that they

comprehend the sentences in the NP_3 condition significantly more accurately than those in the NP_1 condition. This finding is inconsistent with the reading time and ungrammaticality judgment results. Also, comprehension of the sentences in the NP_1 condition is not significantly more accurate than those in the NP_2 condition. This finding is consistent with the respective reading time result and inconsistent with the ungrammaticality judgment result. Just as in the case with native Russian speakers, the comprehension accuracy data allow us to know the final representation of locally ambiguous participial relative clause sentence in English-speaking learners of Russian. One possible reason for variation of the results across measures may be attributed to differences between on-line and off-line processing. In this regard, language learners have difficulty keeping in their memory all possible interpretations of an L2 sentence because it is not in their dominant language, or they are less successful in this task as compared to their native counterparts (Dai, 2015). That is why, when making final interpretation of an ambiguous sentence in L2, language learners have to retain the initial interpretation created during on-line processing (Cunnings, 2017). Pertinent to this study, English-speaking learners of Russian shape their initial interpretation through attaching a participial relative clause low, therefore, low attachment preference prevails in creating final sentence representation.

To sum up, the experiment renders evidence for that only one factor of the model of Recency Preference and Predicate Proximity (Gibson et al., 1996) can account for L1 and L2 processing and comprehension of locally ambiguous participial relative clause sentences with three NP attachment sites in Russian. It is also worth noting that the experiment might have had an under-power problem to detect a significant difference between the NP_2 condition and the NP_3 condition, and even if that is so, it may still contain some evidential value. Partially in line with the predictions, the findings reveal a strong inclination to syntactic attachment preference of the respective native language in the course of L2 sentence processing. These

findings are consistent with previous research using ambiguous sentences (e.g., Nitschke et al., 2010) and especially with a number of relative clause attachment studies (e.g., Uludağ, 2020; Kim, 2010). The key finding of this experiment is that English-speaking learners of Russian can align their attachment preference with native speakers but without surpassing their L1 attachment preference. On the theoretical level, the study provides evidence that language learners are able to integrate native-like parsing strategies into L2 processing. This result validates previous studies (Hopp, 2014; Dekydtspotter et al., 2008), claiming that processing behavior of L2 learners is similar to L1 speakers despite that both languages are argued to adhere to the opposite principles. At the same time, the findings might suggest that learners apply L1 phenomena (e.g., ambiguity reduction through the Saxon genitive construction) that are unavailable in L2 aiming to resolve a syntactic ambiguity. This finding is in line with the Construal hypothesis (Frazier & Clifton, 1996) claiming that the language speakers pursue the pragmatic goal of avoiding ambiguity (e.g., the executions of the judgment of the cases) because a less ambiguous option is available to them (e.g., the judgment' executions of the cases).

Another interesting observation of the experiment is that when language learners need to form their final sentence representation, they stick to the initially dominant interpretation made in real-time course of reading guided by their L1. This is because unlike native speakers, they are challenged to retain all possible sentence interpretations in memory.

Based on the discussion of native Russian speakers, the study lends support to previous research (e.g., Chernova & Prokopenya, 2016; Sekerina, 2003) suggesting high attachment preference in native Russian speakers. It further refines these studies by providing evidence for high attachment preference at the stages of participial relative clause sentence processing and final sentence representation. Remarkably, native Russian speakers disregard their parsing strategy when making decisions about sentence grammaticality, because high, middle, and low

attachment versions are grammatically permissible. These results straightforwardly extend to speakers of other Slavic languages too and, perhaps, of those languages with flexible word order and shed light on relevant processing and comprehension mechanisms. In particular, the study verifies existing research focusing on native speakers of other Slavic languages, such as Bulgarian (Sekerina et al., 2003), Croatian (Matić & Kovačević, 2022; Lovrić, 2003), and Polish (Nowak, 2000).

6.2. Findings of Experiment 2

It was hypothesized that among native Russian speakers the decrease in reading times at the disambiguating region and ungrammaticality judgment rate would be significantly greater in the NP_2 condition than in the NP_1 condition. This is because the effect of pragmatic congruence overrides the effect of predicate proximity that yields high attachment preference. For English-speaking learners of Russian, it was hypothesized that the decrease in reading times at the disambiguating region and ungrammaticality judgment rate would be significantly greater in the NP_2 condition than in the NP_3 condition. This is because the effect of pragmatic congruence overrides the effect of recency preference that yields low attachment preference.

Based the findings (see 5.7. Summary), in native Russian speakers, the reading times at the disambiguating region in the NP_3 condition and the NP_2 condition are significantly shorter in Experiment 2 than in Experiment 1. It is apparent the disambiguating regions of the NP_3 condition and the NP_2 condition receive a processing benefit from the effect of pragmatic congruence. The reading times at the disambiguating region in the NP_1 condition are not significantly shorter in Experiment 2 than in Experiment 1. This finding suggests that the force of syntactic preference diminishes in the high attachment condition when an ambiguity

is eliminated through pragmatic congruence. The interaction between experiment and attachment predisposition in the GLMM is statistically significant, and the decrease in the reading times at the disambiguating region in the NP_2 condition is significantly greater than the decrease in the NP_1 condition between the experiments. At the same time, the decrease in the reading times at the disambiguating region in the NP_2 condition is at around same level as the decrease in the NP_3 condition between the experiments. These results show that there is greater facilitation for non-syntactically preferred NP positions, namely NP_2 and NP_3 than the syntactically preferred NP position (i.e., NP_1). Therefore, these findings confirm Hypothesis 3a, suggesting that pragmatic congruence modulates attachment preference in native Russian speakers when processing of locally ambiguous participial relative clause sentences with three NP attachment sites.

It was also found that the rate of ungrammaticality judgment in the NP_3 condition is significantly lower in Experiment 2 than in Experiment 1. This finding is consistent with the respective reading time result. The rate of ungrammaticality judgment in the NP_1 condition is significantly lower in Experiment 2 than in Experiment 1. This finding is not consistent with the respective reading time result. The rate of ungrammaticality judgment in the NP_2 condition is not significantly lower in Experiment 2 than in Experiment 1. This finding is not consistent with the respective reading time result. The interaction between experiment and attachment predisposition in the GLMM is not significant, and the decrease in the rate of ungrammaticality judgment in the NP_2 condition is not significantly greater than the decrease in the NP_1 condition between the experiments. The finding is not in line with the respective reading time result of the group and does not confirm Hypothesis 3b. This suggests that the effect of pragmatic congruence does not level out the ungrammaticality rate across conditions and retains syntactic attachment preference. In other words, when asked how they interpret sentences, native Russian speakers cannot get over their syntactic high attachment preference.

However, the response accuracy results are more informative than the ungrammaticality judgment results since they reflect their final sentence representation. Accordingly, it is fair to give them priority in addressing the question of modulating attachment preference by pragmatic congruence in sentence comprehension. It was found that native Russian speakers comprehend all conditions from Experiment 2 significantly more accurate than the respective conditions from Experiment 1. The interaction between experiment and attachment predisposition in the GLMM is statistically significant, and the increase in comprehension accuracy of the NP_2 condition is significantly greater than the increase in the NP_1 condition between the experiments. Surprisingly, there is also a significantly large facilitation in comprehension accuracy of the NP_3 condition. These findings suggest that pragmatic congruence modulates attachment preference in native Russian speakers when creating their final representation of locally ambiguous participial relative clause sentences with three NP attachment sites. This finding is in accordance with previous studies (Aurnhammer et al., 2021; Kuperberg & Jaeger, 2015; van Petten & Luka, 2012; Levy, 2008) indicating that interpretation of an input is based on its consistency with a reader's general knowledge.

As of English-speaking learners of Russian, the reading times at the disambiguating region in all conditions are significantly longer in Experiment 2 than in Experiment 1. There is no decrease in the reading times at the disambiguating region in the NP_2 condition relative to the NP_3 condition between the experiments. These results are surprising and suggest no facilitation in the NP_2 condition from the effect of pragmatic congruence. But it is more likely that the general slowdown in processing of the disambiguating region in all conditions of Experiment 2 is instigated by the level of Russian proficiency of L2 participants. Therefore, an independent-samples t-test was conducted to compare proficiency levels of learners from Experiment 1 and Experiment 2. On average, learners from Experiment 1 (M = 89.77, SD = 8.84) performed better than learners from Experiment 2 (M = 78.15, SD = 10.12). This

difference, 11.61, 95% CI [6.33, 16.91] was statistically significant, $t(50) = 4.41$, $p < .001$. Based on this result, it can be concluded that even passed the required threshold of at least 66% accuracy on the placement test, the factual proficiency level of participants from Experiment 2 still lags behind the level of participants from Experiment 1. This result potentially reflects the fundamental difference between backgrounds of participants from the experiments. In Experiment 1, L2 participants were subjected to intensive Russian as a part of their formal instruction at the university's language center and hypothetically are confronted with reading on an everyday basis atop of exposure to the target language outside classroom. In turn, the participants from Experiment 2 were working professionals based in Russia and allegedly not subjected to any formal Russian instruction at the time of the experiment. Although speculative, they may have had less exposure to written language processing in their daily life than those from Experiment 1 and, therefore, lack the automaticity of processing, because their current responsibility was not associated with formal learning of Russian. Instead, they may be more skilled in auditory language processing and speech production more than the participants from Experiment 1, but it is just a conjecture because these domains were not tested in this study. Given this, it is challenging to make conclusive remarks about the reading times, because learners of Russian from the experiments are not comparable in terms of their factual L2 proficiency. Thus, Hypothesis 4a is not confirmed.

It was also found that English-speaking learners of Russian judge all conditions from Experiment 2 as ungrammatical significantly less often than the respective conditions from Experiment 1. These findings are inconsistent with the respective reading time results of the group. The pattern of ungrammaticality judgment rate results of the group partially resembles the respective pattern in native Russian speakers, that is, in the NP_1 condition and the NP_3 condition between the experiments: the rate of ungrammaticality judgment in the NP_3 condition and the NP_1 condition is lower in Experiment 2 than in the respective conditions of

Experiment 1. This may be attributed to the fact that off-line ungrammaticality judgment tasks tap into explicit knowledge of L2 learners and not real-time processing (Ionin et al., 2021). In this regard, English-speaking learners of Russian, being advanced or fluent speakers, demonstrate explicit L2 knowledge comparable to the native speakers. The interaction between experiment and attachment predisposition in the GLMM is not significant, and the decrease in the rate of ungrammaticality judgment in the NP_2 condition is not significantly greater than the decrease in the NP_1 condition between the experiments. This finding does not confirm Hypothesis 4b and suggests that pragmatic congruence does not modulate attachment preference when English-speaking learners of Russian judge about grammaticality of locally ambiguous participial relative clause sentences with three NP attachment sites in Russian. The effects of pragmatic congruence and syntactic attachment preference are rather additive, and each exerts own influence on ungrammaticality judgments, leading to additional grammaticality benefits for the NP_1 condition and the NP_3 condition.

In addition, it was found that English-speaking learners of Russian comprehend all conditions from Experiment 2 significantly more accurate than the respective conditions from Experiment 1. The interaction between experiment and attachment predisposition in the GLMM is statistically significant, and the increase in comprehension accuracy of the NP_2 condition is significantly greater than the increase in the NP_1 condition between the experiments, but not significantly greater than the increase in the NP_3 condition between the experiments. These findings suggest that pragmatic congruence modulates attachment preference in English-speaking learners of Russian when creating their final representation of locally ambiguous participial relative clause sentences with three NP attachment sites in Russian.

To sum up, the findings of this experiment reveal that pragmatic congruence modulates syntactic attachment preference of native Russian speakers in both processing and final

sentence representation. What is more, there is a processing facilitation for both of syntactically unpreferred attachment variants, i.e., the middle and low attachments. Since there is no analogous study in this direction, these findings may be mapped to similar observations in studies of other processing types. An auditory processing and production study (Harding et al., 2019) showed that the pragmatic content of relative clause sentences informs sentence completion answers more robustly than syntactic attachment preference in German-speaking listeners with lower rhythm ability. Interestingly, syntactic attachment preference is kept intact, when native Russian speakers make decisions about grammaticality of sentences disambiguated through pragmatic congruence. This is attributed to that their linguistic experience is richer with high attachment resolutions than middle or low attachment resolutions. That is why, high attachment resolution is more preferred than other variants. A similar discrepancy in preferences during on-line and off-line processing is noted among native Portuguese speakers (Maia et al., 2007). In on-line task, they obeyed the Late Closure principle (Frazier, 1979) and showed low attachment preference, whereas when completing the off-line task, they completely ignored linguistic information available in sentences and depended on a parsing strategy that is generally used in their language (high attachment). On the theoretical level, the current study demonstrates that native language speakers prioritize real-world knowledge over their syntactic attachment preference during processing and final sentence representation of locally ambiguous participial relative clause sentences with a three-site context.

Based on the discussion of English-speaking learners of Russian, no conclusive remarks can be offered about their reading time results due to the possibility of language learners not having comparable L2 proficiency level in Russian across the experiments. Irrespective of this, the study suggests that pragmatic congruence does not modulate syntactic attachment preference in L2 grammaticality decisions, but it does in comprehension. The

pattern of L2 attachment preferences in grammaticality decisions is similar to the pattern in native Russian speakers: low and middle attachment resolutions are deemed more grammatical than the high attachment. On the theoretical level, the study is consistent with various studies (e.g., Pélissier et al., 2017; Kim et al., 2016; Roehr-Brackin, 2014) in providing evidence that language learners show explicit L2 knowledge at the level comparable to the native speakers. Another interesting observation is that the effects of pragmatic congruence and syntactic attachment preference are additive, and each exerts its influence on ungrammaticality judgments, leading to additional upgrade of grammaticality in both high and low attachment resolutions.

6.4. Conclusion

The study tested whether the two-factor model of Recency Preference and Predicate Proximity (Gibson et al., 1996) can predict the data of native Russian speakers and English-speaking learners of Russian. Based on findings from Experiment 1, the study demonstrates that only one factor, Predicate Proximity, of the two-factor model accounts for the data of native Russian speakers. They demonstrate $NP_1 > NP_3 \approx NP_2$ ordering of attachment preference in processing and comprehension of locally ambiguous participial relative clause sentences with three potential NP attachment sites. It must be noted though that they exhibit no attachment preference when judging grammaticality of these sentences. However, the experiment might have had an under-power problem to detect a significant difference in reading times between the middle and low attachment conditions, which could speak in favor of Recency Preference.

The study also suggests that the two-factor model may not account for the data of English-speaking learners of Russian, because their attachment preferences are resultant from

the influences from both L1 and L2. In particular, English-speaking learners of Russian demonstrate $NP_1 \approx NP_3 > NP_2$ ordering of attachment preference. It must be noted though that they exhibit robust low attachment preference when creating their final sentence representation, which is partially in line with the two-factor model.

Most importantly, the study establishes that only one factor, Predicate Proximity, is operative in native Russian speakers, and the factor of Recency Preference is dominant in English-speaking learners of Russian. However, the experiment might have been underpowered to detect in Russian as L1 the factor of Recency Preference that could only be demonstrated by the difference between the NP_2 condition and the NP_3 condition. The study also establishes high attachment preference in sentence processing and creating final representation among native Russian speakers. Just as important, this study brings in evidence in favor of both low and high attachment preferences in English-speaking learners of Russian and, therefore, contributes to our understanding of attachment ambiguity resolution in L2 reading. That is why, these findings are theoretically significant to sentence processing research because they reveal the exact parsing strategies used for syntactic ambiguity resolution by native and non-native speakers of Russian.

The results for the first two research questions of Experiment 1 provided a basis on which to answer the third and fourth research questions related to Experiment 2. Introducing such factor as pragmatic congruence of a NP with the participle in Experiment 2 allowed us determining what influences sentence processing and comprehension stronger, syntactic attachment preference or reliance on pragmatic congruence (real-world knowledge). Based on findings from Experiment 2, the study proposes that pragmatic congruence modulates attachment preferences in L1 processing and comprehension of locally ambiguous participial relative clause sentences with three NP attachment sites. It must be noted though that pragmatic congruence does not modulate attachment preference of native Russian speakers

when they decide on grammaticality of these sentences. The study cannot make conclusive remarks about L2 processing of locally ambiguous participial relative clause sentences with three NP attachment sites in Russian, because English-speaking learners of Russian from the experiments may be comparable in their Russian proficiency level. The study provides evidence pragmatic congruence modulates attachment preferences in English-speaking learners of Russian when creating final sentence representation. It must be noted though that pragmatic congruence does not modulate attachment preference of language learners when they decide on sentence grammaticality.

By examining English-speaking learners of Russian with advanced or fluent proficiency in both experiments, the present study indicates while showing attempts to adjust their parsing strategy to the native speakers, language learners do not exhibit native-like processing because of L1 interference. Potentially, controlling for years of residence in L2 environment and inclusion of participants with even higher proficiency level could reveal native-like results. For example, follow-up studies may involve those with residence in the country of their target language longer than in the country of L1 and with the test proficiency result of not less than 90%.

Furthermore, the study puts forward that an expectation-based approach, i.e., the association of an input with the preceding context, predicts rapid processing and effortless comprehension of locally ambiguous participial relative clause sentences with a three-site context in Russian. This is evidenced by general facilitation of sentences disambiguated through pragmatic congruence in sentence processing, grammaticality, and comprehension between conditions of the experiments.

In the view of the above, this study offers some revision of the existing disparate underpinnings by adding into the picture one of the missing puzzle pieces, that is, a facilitating role of congruence of an input with reader's general knowledge. This implies that

syntactic attachment preferences manifested in native and non-native processing and final representation of a sentence are forsaken once the contextual cues correspond with a reader's background knowledge. Likewise, the involvement of different cognitive mechanisms in sentence processing and comprehension changes and even suppresses syntactic attachment preferences in pragmatically rich context.

The main contribution of this dissertation research is providing novel evidence about the general parsing strategy applicable to processing syntactically ambiguous participial relative clause sentences with a three-site context in Russian. By bringing a grammatically unique and a rather new for psycholinguistics material into the spotlight of the literature on syntactic ambiguity resolution, findings of this study thus refine the psycholinguistic understanding of how human processor works with syntactic ambiguity. Remarkably, participial relative clauses were previously understudied in psycholinguistics, despite their high frequency in Russian as compared to relative clause constructions (their differences are outlined in Section 2.3), 57% and 43%, respectively (cf. Tsin & Baiduzh, 2015). To the best of the author's knowledge, the present study filled this gap by becoming the first to investigate processing and comprehension of Russian locally ambiguous participial relative clause sentences with a three-site context in both native Russian speakers and English-speaking learners of Russian. The study expands the Anaphoric Binding hypothesis (Hemforth, 2000; 1998) in that the power of anaphoric processes is greater than of syntactic processes in those languages, subordinate clauses of which feature relative pronouns, and if not, have another form of initiation of a subordinate clause, but also with internal marking (e.g., participle).

The study affords new evidence in favor of the middle attachment as the least preferred in the three-site context in L1 processing, although its difference from the second-preferred attachment preference may not be considerable (Miyamoto et al., 1999, for similar result).

Another key contribution of the study is that it reveals that language learners, despite advanced L2 being attested, prefer their L1 parsing strategy in L2 processing and comprehension but attempt to modify it to the one consistent with their target language. To the best of the author's knowledge, the study reported in this dissertation is the only one to explicitly probe the potential transfer of L1 attachment preference to L2 processing among native English speakers with advanced Russian.

The study supplements existing L2 research by producing evidence for language transfer effects on L2 sentence processing and comprehension. First, it is recognized that language learners give higher preference to their native language parsing strategy but can also demonstrate the ability of adopting the strategy arising from their L2. Even at advanced levels of L2 proficiency, they are yet to fully align their parsing strategy with the one that is typically adopted by native speakers of their target language. This resonates with Benson (2002) suggesting that L1 transfer gradually declines with an increasing L2 proficiency but never shrinks at higher levels of reading complexity.

One of the notable findings of the study is that language learners align with their L2 parsing strategy more robustly in comprehension than in processing. This is potentially due to the differences that are inherent in sentence processing (on-line) and comprehension (off-line) and specific to language learners only. They have less automaticity of processing and, therefore, experience more difficulty than native counterparts in storing all potential sentence interpretations in their memory. Once get pinged to revisit initial analyses after receving the comprehension task (e.g., judge sentence grammaticality), it is undoubtedly easier for them to recall the interpretation created during on-line processing through the parsing strategy that was prompted by the L1 interference. Thus, regardless of the advanced/near-native levels of L2 attested, language learners can still be negatively affected by their native language. It seems that these transfer effects are insurmountable once the orthographic systems at their disposal

are different (e.g., the Roman script vs. the Cyrillic script), and one of which is less dominant because it comes from a successively learnt L2.

From a methodological perspective, the study urges language instructors to be aware of the variation in difficulties that L2 learners may experience with morphology of the target language. For example, the insensitivity to the number morpheme during processing can be viewed as either performance deficiency or competence deficit. Competence deficit refers to the difficulties resulting from an incomplete competence in a given L2 aspect, whereas the performance deficiency implies difficulties in "accessing or controlling already internalized competence" (cf. Jiang, 2004). Pertinent to this study, those L2 learners who successfully passed the Russian placement test were verified with the formal knowledge about the number agreement. However, due to the syntactic complexity of the reading material, they were unable to (correctly) utilize the inflection marking information and, therefore, are deemed to have experienced the performance deficiency, not a competence deficit. The study also potentially stimulates further improvement in teaching Russian syntax to L2 population by providing insights into processing impediments and comprehension difficulties, discussed in respective chapters, that English-speaking learners of Russian encounter when reading locally ambiguous participial relative clause sentences with a three-site context in Russian. In this regard, the study also gives data based on empirical evidence to instructors of Russian into how literate L1 readers process and comprehend the same materials, so that it can be further decided how best to move their L2 learners in that developmental direction.

Perhaps, the stimuli used in the experiments may be incorporated to language classroom of both L1 and L2 learners of Russian. Despite the fact that humans tend to avoid ambiguity (see Grice, 1975, for the maxim of manner), materials with syntactic ambiguity are still pervasive in the written language, especially in legal, political, academic and media discourses. Syntactic ambiguity may be introduced intentionally, to grab a reader's attention

or create humor (e.g., news articles, especially headlines). Otherwise, the admission of a syntactic ambiguity may be unintentional and results from an attempt of the producer to keep the material as concise as possible (e.g., articles of law, academic and governmental documents). Having such materials for training in both L1 and L2 language classrooms will explicitly raise awareness of the issue of a syntactic ambiguity in language learners in the short run and may prevent or at least minimize such ambiguity on the part of its producers in the long run. Incorporation of syntactically ambiguous participial relative clause sentences with a complex nominal group may also promote effective learning scenarios by accelerating learner's processing of these and similar sentences in future and out-of-classroom, therefore, make the target input to be a step ahead of the learner's current stage of linguistic competence (Long & Prat, 2008; Krashen, 1985).

Despite all the above merits, the study has two limitations. As discussed earlier, there is a general slowdown in L2 processing of the disambiguating region in all conditions of Experiment 2 relative to the respective conditions of Experiment 1. This outcome could be prompted by lower proficiency level in L2 participants of Experiment 2 than in Experiment 1. Even though they passed the threshold of the Russian placement test, learners from Experiment 2 may not be comparable to learners from Experiment 1, because the factual level of L2 proficiency of the former lags behind.

The second limitation of the study is an ecological validity of the self-paced reading task. In particular, despite its common use in psycholinguistic research, it cannot fully represent natural reading because it does not provide readers with the ability to move backward throughout the sentence and, therefore, does not track regressions (Chung-Fat-Yim et al., 2017). If the task affords such an ability, most readers will return to segments of a stimulus as many times as they want and make it problematic to map the effects of the linguistic manipulation and gather data necessary for answering research questions. Another

issue with the self-paced reading task is that it can induce a spill-over effect, that is, when the impact of reading one region does not appear until one or two further regions are encountered (Kaiser, 2018). To control for the effect, the present study controlled for word frequency and did not have its region of interest placed near the end of a sentence. It is also fair to say that the task format chosen for this study, a non-cumulative (moving) paradigm, most closely resembles natural reading by giving readers full freedom to reveal each region (word) incrementally instead of forcing them to read in chunks of multiple words. In addition, the format allows for more comprehensive data about how sentence processing is implemented in real-time by tracking the reader's pace in a word-by-word fashion. Thus, it is a methodological challenge to have such a self-paced reading task that can be inexpensive and portable as it is in its current form but also as fine-grained as eye-tracking.

Future research is urged to control for participant's proficiency and potentially split the L2 group into sub-groups based on their test scores. As acknowledged earlier, this study actively controlled for the internal factors of the stimuli, such as number, tense, and form of the participle, as well as gender and animacy of antecedents. Other factors that are related to participants but were not controlled, such as years of residence in Russia (for L2 participants) and WM (for all participants) might have influenced all the results. Future research could collect data controlled for these factors as well and explore the dynamic interaction between them to build a more complete picture of L1 and L2 processing and comprehension of locally ambiguous participial relative clause sentences with three NP attachment sites in Russian. As a spin-off of this study, a future experiment may include both participial relative clause and relative clause sentences with local and global ambiguities, for a more thorough investigation of attachment preferences in Russian. It would also be interesting to test whether heritage speakers of Russian with dominant exposure to English are able to maintain their heritage-like attachment preference in processing Russian and English sentences. This research would

tackle the question of whether they are able to limit attachment preference to a single strategy for both of their languages or show appropriate strategies in processing each language.

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Appendix A: Russian (Romanized) placement test

1. Nasha produktsiya polnost'yu sootvetstvuyet ... (Our products fully comply with...)

   standartakh (standards$_{PREP}$)

   standarty (standards$_{NOM}$)

   standartam (standards$_{DAT}$)

2. Predpriyatiye zabotitsya ... svoyey produktsii. (The company takes care of ... its products.)

   o kachestve (about quality$_{PREP}$)

   s kachestvom (with quality$_{INS}$)

   kachestvom (quality$_{INS}$)

3. Reklama zainteresovala ... (The ad interested ...)

   molodykh lyudey (young people$_{GEN}$)

   molodyye lyudi (young people$_{NOM}$)

   molodymi lyud'mi (young people$_{INS}$)

4. ... , my vynuzhdeny otkazat'sya ot uslug etoy firmy. (... , we are forced to refuse the

services of this company.)

Togo i glyadi (It would likely look as if)

K sozhaleniyu (Unfortunately)

Kak voditsya (Typically)

5. Kompaniya ... produktsiyu v raznyye strany. (Company ... different countries with products.)

   poluchayet (receives)

   ostavlyayet (leaves)

   postavlyayet (supplies)

6. My gotovy ... vashe predlozheniye. (We are ready to ... your offer.)

   rassmotret' (consider)

   predusmotret' (provide for)

   sumet' (be able to)

7. Reklamnyye obraztsy ... dlya prodazhi. (Advertising samples ... for sale.)

   prednaznachalis' (were intended)

otkazalis' (refused)

nazyvalis' (were called)

8. Partnery ostalis' dovol'ny ... peregovorov. (Partners were satisfied with ... of negotiations.)

rezul'taty (results$_{NOM}$)

rezul'tatami (results$_{INS}$)

s rezul'tatami (with results$_{INS}$)

9. Vot informatsiya, ... vy zaprashivali. (Here is the information, ... you requested.)

kotoroy (which$_{GEN}$)

kotoraya (which$_{NOM}$)

kotoruyu (which$_{ACC}$)

10. Vse daty postavok ... v dogovore. (All delivery dates ... in the contract.)

ukazannyye (specified$_{PTCP(FULL).PL}$)

ukazany (are specified$_{PTCP(SHORT).PL}$)

ukazano (is specified $_{PTCP(SHORT).N.SG}$)

11. Sekretar' prines dannyye, ... vy prosili. (The secretary brought the data, ... you asked for.)

    kotorymi (which$_{INS}$)

    kotoryye (which$_{NOM}$)

    kotorykh (which$_{GEN}$)

12. Yesli by vy priyekhali na vystavku, vy ... nayti novykh partnerov. (If you come to the exhibition, you ... found new partners.)

    smogli (could have$_{INTR.IND.PF.PL.PST}$)

    mogli (could have$_{INTR.IND.IPFV.PL.PST}$)

    smogli by (could have$_{INTR.COND.PF.PL.PST}$)

13. My ne uvereny, ... eta produktsiya vsem standartam. (We are not sure ... these products are up to standard.)

    otvechayet (meet$_{INTR.IND.IPFV.S.PRS}$)

    otvechayet li (meet$_{INTR.COND.IPFV.S.PRS}$)

    sootvetstvovat' (meet$_{INF.INTR.IND.IPFV}$)

14. ... na vse spornyye voprosy, storony prishli k soglasheniyu. (… all controversial issues, the parties came to an agreement.)

    Nesmotrya (Despite)

    Khotya (Although)

    Odnako (However)

15. Kompaniya delayet vse, ... (The company does everything, ...)

    litsenziya byla poluchena (that a license had been obtained.)

    chtoby litsenziya budet poluchena (that a license will be obtained.)

    chtoby poluchit' litsenziyu (so as to get a license.)

16. Nasha firma ... na novyy uroven'. (Our firm ... to a new level.)

    perekhodit (moves)

    zakhodit (comes)

    khodit (walks)

17. Rost tsen v etom godu ... k snizheniyu sprosa. (The rise of prices this year ... to the

reduction of demand)

provel (spent)

privol (led)

uvol (led away)

18. Partnery poprosili ... avans za postavku tovara. (Partners asked (us) to ... an advance payment for the supply of goods.)

zavesti (start)

uvesti (take away)

vnesti (make)

19. Filial etoy torgovoy marki ... v sleduyushchem godu. (Branch of this brand ... next year.)

otkroyet (will open)

otkroyetsya (will be opened)

zakroyet (will close)

20. Kak tol'ko oni obsudyat vse detali, proyekt ... (Once they have discussed all the

details, the project ...)

budet podpisan (will be signed)

budet vypisan (will be discharged)

budet spisan (will be written off)

21. V etom godu uvelichilas' vyruchka ... (This year the revenue increased ...)

ot prodazh (from sales)

potomu chto prodazhi (because sales)

vokrug prodazhi (around the sales)

22. Partnery dogovorilis' ob usloviyakh, ... obe storony. (The partners agreed on the terms, ... both sides.)

ustroyennykh (suit$_{PTCP(FULL).GEN.PASS.PST.PFV.PL}$)

ustroyennyye (suit$_{PTCP(FULL).NOM.PASS.PST.PFV.PL}$)

ustraivayushchikh (suit$_{PTCP(FULL).GEN.PASS.PRS.IPFV.PL}$)

23. Ona sovsem ne uverena … (She's not at all sure...)

svoimi silami (with her powers).

na svoi sily (on her powers)

v svoikh silakh (in her powers)

24. Uzhe ne odin raz Andrey byl ulichon … (More than once Andrei was engaged ...)

s obmanom (with cheating)

v obmane (in cheating)

na obman (on cheating)

25. Etot uchitel' priznan … goda. (This teacher' is recognized the … of the year.)

luchshego uchitelya (best teacher$_{GEN/ACC}$)

luchshem uchitele (best teacher$_{PREP}$)

luchshim uchitelem (best teacher$_{INS}$)

26. Oni pozhenilis' 10 let nazad i ochen' schastlivy … (They got married 10 years ago and are very happy...)

v brake (in marriage)

s brakom (with marriage)

dlya braka (for marriage)

27. Dom byl vozvrashchon … (The house was returned to the ...)

prezhnikh vladel'tsev (previous owner$_{ACC.PL}$)

prezhnego vladel'tsa (previous owner$_{GEN.S}$)

prezhnemu vladel'tsu (previous owner$_{DAT.S}$)

28. Moy brat absolyutno ravnodushen … (My brother is absolutely indifferent…)

v klassicheskoy muzyke (in classical music)

k klassicheskoy muzyke (to classical music)

klassicheskoy muzyke (classical music)

29. … doroga tvoya druzhba. (... your friendship is dear.)

Mne (To me)

Mnoy (Me)

So mnoy (With me)

30. Brat postupil tak … (Brother did it …)

dlya moyego soveta (for my advice)

moyego soveta (my advice)

vopreki moyemu sovetu (against my advice)

31. Ty oshibayesh'sya … k nemu. (You are wrong ... to him.)

k svoyemu otnosheniyu (to your attitude$_{DAT}$)

v svoyom otnoshenii (in your attitude$_{PREP}$)

v svoyo otnosheniye (in your attitude$_{ACC}$)

32. Anna vsegda ochen' perezhivayet … na rabote. (Anna is always very worried ... at work.)

radi neudach (for the sake of failures)

vopreki neudacham (despite failures)

iz-za neudach (due to failures)

33. Tanya chasto obrashchayetsya k sestre … (Tanya often turns to her sister ...)

za sovetom (for advice$_{INS}$)

sovete (advice$_{GEN/ACC}$)

k sovetu (to advice$_{DAT}$)

34. V dveryakh poyavilas' dama … (A lady appeared at the door ...)

    na vishnovom pal'to (on a cherry coat$_{PREP}$)

    na vishnovoye pal'to (on a cherry coat$_{ACC}$)

    v vishnovom pal'to (in a cherry coat$_{PREP}$)

35. Nam bylo neponyatno, kak my ochutilis' … (It was not clear to us how we ended up ...)

    v eto mesto (in this place$_{ACC}$)

    k etomu mestu (to this place$_{DAT}$)

    v etom meste (in this place$_{PREP}$)

36. Eta zemlya prinadlezhit … (This land belongs ...)

    chastnomu litsu (to a private person)

    dlya chastnogo litsa (for a private person)

    chastnym litsom (by a private person)

37. Radi detey ona gotova … (For the sake of the children, she is ready ...)

dlya vsego (for the sake of everything)

na vso (for everything)

vo vsom (in everything)

38. Lyudi s izbytochnym vesom predraspolozheny … (Overweight people are predisposed ...)

k serdechnym zabolevaniyam (to heart diseases)

dlya serdechnykh zabolevaniy (for heart diseases)

s serdechnymi zabolevaniyami (with heart diseases)

39. Etot roman posvyashchon … Rossii. (This novel is dedicated to ... Russia.)

ob istoricheskom proshlom (about the historical past)

istoricheskomu proshlomu (the historical past)

s istoricheskim proshlym (with the historical background)

40. Yeyo muzh absolyutno neprikhotliv … (Her husband is absolutely unpretentious ...)

s yedoy (with food)

na yedu (on food)

v yede (in food)

41. Yego slova byli obrashcheny … (His words were addressed...)

ko vsem prisutstvuyushchim (to everyone present)

vsemi prisutstvuyushchimi (by everyone present)

dlya vsekh prisutstvuyushchikh (for everyone present)

42. Stikhi etogo poeta blizki i ponyatny … The poetry of this poet is close and understandable to...

k molodozhi (towards the youth)

na molodozh' (on the youth)

molodozhi (the youth)

43. Zavtra Ol'ga svobodna … (Tomorrow Olga is free ...)

na domashniye dela (to household chores)

v domashnikh delakh (in household chores)

ot domashnikh del (from household chores)

44. Zakalonnyye lyudi men'she podverzheny … (Hardy people are less susceptible to ...)

    v prostudnykh zabolevaniyakh (in colds)

    dlya prostudnykh zabolevaniy (for colds)

    prostudnym zabolevaniyam (colds)

45. Voda v reke zarazhena ... (The water in the river is contaminated with ...)

    ot toksicheskikh otkhodov (from toxic waste)

    toksicheskimi otkhodami (toxic waste)

    v toksicheskikh otkhodakh (in toxic waste)

46. Prava mnogodetnykh materey zashchishcheny … (The rights of mothers of many children are protected ...)

    zakonom (by law)

    v zakone (in law)

    dlya zakona (for the law)

47. Yego neudachnoye vystupleniye na Olimpiade svyazano … (His unsuccessful performance at the Olympics is linked ...)

plokhoy podgotovkoy (poor preparation)

v plokhoy podgotovke (in poor preparation)

s plokhoy podgotovkoy (with poor preparation)

48. Andrey rasserdilsya i vyshel, khlopnuv … (Andrey got angry and left, slamming the ...)

dver' (door$_{NOM.FEM.S}$)

dveri (door$_{NOM.PL}$)

dver'yu (door$_{INS.S}$)

49. Professor skazal, chto … poluchitsya prekrasnyy muzykant. (The professor said that a wonderful musician will be made …)

ot nego (from him)

iz nego (of him)

s nim (with him)

50. Ira povernulas' ko mne … i perestala razgovarivat' so mnoy. (Ira turned … on me and stopped talking to me.)

spinoy (back$_{INS}$)

spinu (back$_{ACC}$)

spine (back$_{DAT}$)

Appendix B: The lists of experimental sentences for Experiment 1

List 1

Attachment predisposition	Russian (Romanized)	English translation
NP_1	Rukovoditel' priderzhivayetsya punkta dogovorov proyektov, nakhodivshegosya pod kontrolem. Chto nakhodilos' pod kontrolem? 1 = PUNKT 2 = DOGOVORA 3 = PROYEKTY	The manager adheres to the point of the contracts of the projects having remained under control. What remained under control? 1 = POINT 2 = CONTRACTS 3 = PROJECTS
	Menedzher priderzhivalsya obraztsa materialov proyektov, vliyavshego na deyatel'nost'. Chto vliyalo na deyatel'nost'? 1 = OBRAZETS 2 = MATERIALY 3 = PROYEKTY	The manager followed the sample of materials of the projects having influenced the activity. What influenced the activity? 1 = SAMPLE 2 = MATERIALS 3 = PROJECTS
	Istorik priderzhivalsya istorii epidemiy likhoradok, opisannoy v uchebnike.	The historian stuck to the history of the outbreaks of fevers having described in the textbook.

	Chto opisyvalos' v uchebnike? 1 = ISTORIYA 2 = EPIDEMII 3 = LIKHORADKI	What was described in the textbook? 1 = HISTORY 2 = OUTBREAKS 3 = FEVERS
	Rezhissor priderzhivalsya opisaniya srazheniy voysk, trebovavshegosya dlya fil'ma. Chto trebovalos' dlya fil'ma? 1 = OPISANIYE 2 = SRAZHENIYA 3 = VOYSKA	The film director adhered to the description of the battles of the troops having required for the film. What was required for the film? 1 = DESCRIPTION 2 = BATTLES 3 = TROOPS
	Professor potreboval kartu stolits imperiy, izuchennuyu na lektsii. Chto izucheno na lektsii? 1 = KARTA 2 = STOLITSY 3 = IMPERII	The professor demanded the map of the capitals of empires having studied during the lecture. What was studied during the lecture? 1 = MAP 2 = CAPITALS 3 = EMPIRES
	Inspektor dobivalsya reyestra platezhey nalogov, zakreplonnogo zakonom goroda.	The inspector sought a register of payments of taxes having consolidated in the city’s law.

	Chto zakrepleno zakonom goroda? 1 = REYESTR 2 = PLATEZHI 3 = NALOGI	What is consolidated in the city's law? 1 = REGISTER 2 = PAYMENTS 3 = TAXES
NP_2	Advokat zatreboval opisaniya resheniya del, otlozhennogo iz-za pandemii. Chto otlozheno iz-za pandemii? 1 = OPISANIYA 2 = RESHENIYE 3 = DELA	The lawyer requested the descriptions of the judgment of the cases postponed due to the pandemic. What has been delayed due to the pandemic? 1 = DESCRIPTIONS 2 = DECISION 3 = CASES
	Doktor priderzhivalsya opisaniy proyavleniya zabolevaniy, obsuzhdavshegosya na konsiliume. Chto obsuzhdalos' na konsiliume? 1 = OPISANIYA 2 = PROYAVLENIYE 3 = ZABOLEVANIYA	The doctor adhered to the descriptions of manifestation of diseases discussed at the council. What was discussed at the council? 1 = DESCRIPTIONS 2 = MANIFESTATION 3 = DISEASES
	Novichok ispugalsya proyektov	The newcomer got scared by the

	ustava kholdingov, predstavlennogo na soveshchanii. Chto predstavleno na soveshchanii? 1 = PROYEKTY 2 = USTAV 3 = KHOLDINGI	drafts of the charter of the holdings having presented at the meeting. What was presented at the meeting? 1 = DRAFTS 2 = CHARTER 3 = HOLDINGS
	Direktor lishilsya vypuskov treylera fil'mov, vyzvavshego otritsatel'nuyu reaktsiyu. Chto vyzvalo otritsatel'nuyu reaktsiyu? 1 = VYPUSKI 2 = TREYLER 3 = FIL'MY	The director lost the releases of the trailer of the films having caused a negative reaction. What caused the negative reaction? 1 = RELEASES 2 = TRAILER 3 = FILMS
	Biznesmen zhazhdal resursov zavoda metallov, obespechivshego stabil'nost' ekonomiki. Chto obespechilo stabil'nost' ekonomiki? 1 = RESURSY 2 = ZAVOD	The businessman craved the resources of the plant of metals having ensured the stability of the economy. What ensured the stability of the economy? 1 = RESOURCES 2 = PLANT

	3 = METALLY	3 = METALS
	Master priderzhivalsya metodov raschota standartov, primenyavshegosya v stroitel'stve. Chto primenyalos' v stroitel'stve? 1 = METODY 2 = RASCHOT 3 = STANDARTY	The foreman adhered to the methods of calculation of the standards used in construction. What was used in construction? 1 = METHODS 2 = CALCULATION 3 = STANDARDS
NP_3	Kosmonavt osteregalsya polomok antenn rakety, opisannoy v zhurnale. Chto opisano v zhurnale? 1 = POLOMKI 2 = ANTENNY 3 = RAKETA	The astronaut bewared of the damages of the antennas of the rocket having described in the log. What was described in the log? 1 = DAMAGES 2 = ANTENNAS 3 = ROCKET
	Khimik priderzhivalsya opredeleniy kolebaniy tela, vyzvavshego nauchnyye debaty. Chto vyzvalo nauchnyye debaty? 1 = OPREDELENIYA 2 = KOLEBANIYA 3 = TELO	The chemist adhered to the definitions of the vibrations of the body having sparked scientific debates. What sparked the scientific debate? 1 = DEFINITIONS 2 = VIBRATIONS

		3 = BODY
	Prokhozhiy kosnulsya dosok sten khizhiny, sostarivsheysya ot vremeni. Chto sostarilos' ot vremeni? 1 = DOSKI 2 = STENY 3 = KHIZHINA	The passer-by touched the planks of the walls of the hut having aged with time. What aged with time? 1 = PLANKS 2 = WALLS 3 = HUT
	Predsedatel' priderzhivalsya chertezhey podvalov doma, prednaznachennykh dlya otsenki. Chto prednaznacheno dlya otsenki? 1 = CHERTEZHI 2 = PODVALY 3 = DOM	The chairman followed to the blueprints of the basements of the house having intended for evaluation. What was intended for evaluation? 1 = BLUEPRINTS 2 = BASEMENTS 3 = HOUSE
	Mal'chik ispugalsya zvukov razryvov snaryada, razrushivshego tishinu nochi. Chto razrushilo tishinu nochi? 1 = ZVUKI 2 = RAZRYVY 3 = SNARYAD	The boy was frightened by the sounds of the explosions of the shell having broken the silence of the night. What broke the silence of the night? 1 = SOUNDS 2 = EXPLOSIONS

		3 = SHELL
	Investor zhazhdal rezul'tatov proyektov kontserna, predstavlennogo na vystavke. Chto predstavleno na vystavke? 1 = REZUL'TATY 2 = PROYEKTY 3 = KONTSERN	The investor was eager for the results of the projects of the group having presented at the exhibition. What was presented at the exhibition? 1 = RESULTS 2 = PROJECTS 3 = GROUP

List 2

Attachment predisposition	Russian (Romanized)	English translation
NP_1	Advokat zatreboval opisaniye resheniy del, otlozhennogo iz-za pandemii. Chto otlozheno iz-za pandemii? 1 = OPISANIYE 2 = RESHENIYA 3 = DELA	The lawyer requested a description of the judgments of the cases having delayed due to the pandemic. What was delayed due to the pandemic? 1 = DESCRIPTION 2 = JUDGMENTS 3 = CASES
	Doktor priderzhivalsya opisaniya	The doctor adhered to the

	proyavleniy zabolevaniy, obsuzhdavshegosya na konsiliume. Chto obsuzhdalos' na konsiliume? 1 = OPISANIYE 2 = PROYAVLENIYA 3 = ZABOLEVANIYA	description of manifestations of diseases discussed at the council. What was discussed at the council? 1 = DESCRIPTION 2 = MANIFESTATIONS 3 = DISEASES
	Novichok ispugalsya proyekta ustavov kholdingov, predstavlennogo na soveshchanii. Chto predstavleno na soveshchanii? 1 = PROYEKT 2 = USTAVY 3 = KHOLDINGI	The newcomer got scared by the draft of the charters of the holdings having presented at the meeting. What was presented at the meeting? 1 = DRAFT 2 = CHARTERS 3 = HOLDINGS
	Direktor lishilsya vypuska treylerov fil'mov, vyzvavshego otritsatel'nuyu reaktsiyu. Chto vyzvalo otritsatel'nuyu reaktsiyu? 1 = VYPUSK 2 = TREYLERY 3 = FIL'MY	The director lost the release of the trailers of the films having caused a negative reaction. What caused the negative reaction? 1 = RELEASE 2 = TRAILERS 3 = FILMS

	Biznesmen zhazhdal resursa zavodov metallov, obespechivshego stabil'nost' ekonomiki. Chto obespechilo stabil'nost' ekonomiki? 1 = RESURS 2 = ZAVODY 3 = METALLY	The businessman craved the resource of the plants of metals having ensured the stability of the economy. What ensured the stability of the economy? 1 = RESOURCE 2 = PLANTS 3 = METALS
	Master priderzhivalsya metoda raschotov standartov, primenyavshegosya v stroitel'stve. Chto primenyalos' v stroitel'stve? 1 = METOD 2 = RASCHOTY 3 = STANDARTY	The foreman adhered to the method of calculations of the standards used in construction. What was used in construction? 1 = METHOD 2 = CALCULATIONS 3 = STANDARDS
NP_2	Kosmonavt osteregalsya polomok antenny raket, opisannoy v zhurnale. Chto opisano v zhurnale? 1 = POLOMKI 2 = ANTENNA 3 = RAKETY	The astronaut bewared of the damages of the antenna of the rockets having described in the log. What was described in the log? 1 = DAMAGES 2 = ANTENNA

		3 = ROCKETS
	Khimik priderzhivalsya opredeleniy kolebaniya tel, vyzvavshego nauchnyye debaty. Chto vyzvalo nauchnyye debaty? 1 = OPREDELENIYA 2 = KOLEBANIYE 3 = TELA	The chemist adhered to the definitions of the vibration of bodies having sparked scientific debates. What sparked the scientific debate? 1 = DEFINITIONS 2 = VIBRATION 3 = BODIES
	Prokhozhiy kosnulsya dosok steny khizhin, sostarivsheysya ot vremeni. Chto sostarilos' ot vremeni? 1 = DOSKI 2 = STENA 3 = KHIZHINY	The passer-by touched the planks of the wall of the huts having aged with time. What aged with time? 1 = PLANKS 2 = WALL 3 = HUTS
	Predsedatel' priderzhivalsya chertezhey podvala domov, prednaznachennykh dlya otsenki. Chto prednaznacheno dlya otsenki? 1 = CHERTEZHI 2 = PODVAL	The chairman followed to the blueprints of the basements of the house having intended for evaluation. What was intended for evaluation? 1 = BLUEPRINTS 2 = BASEMENTS

	3 = DOMA	3 = HOUSE
	Mal'chik ispugalsya zvukov razryva snaryadov, razrushivshego tishinu nochi. Chto razrushilo tishinu nochi? 1 = ZVUKI 2 = RAZRYV 3 = SNARYADY	The boy was frightened by the sounds of the explosion of the shells having broken the silence of the night. What broke the silence of the night? 1 = SOUNDS 2 = EXPLOSIONS 3 = SHELL
	Investor zhazhdal rezul'tatov proyekta kontsernov, predstavlennogo na vystavke. Chto predstavleno na vystavke? 1 = REZUL'TATY 2 = PROYEKT 3 = KONTSERNY	The investor was eager for the results of the project of the groups having presented at the exhibition. What was presented at the exhibition? 1 = RESULTS 2 = PROJECT 3 = GROUPS
NP_3	Rukovoditel' priderzhivalsya punktov dogovorov proyekta, nakhodivshegosya pod kontrolem. Chto nakhodilos' pod kontrolem? 1 = PUNKTY	The manager adheres to the points of the contracts of the project having remained under control. What remained under control? 1 = POINTS

	2 = DOGOVORA 3 = PROYEKT	2 = CONTRACTS 3 = PROJECT
	Menedzher priderzhivalsya obraztsov materialov proyekta, vliyavshego na deyatel'nost'. Chto vliyalo na deyatel'nost'? 1 = OBRAZTSY 2 = MATERIALY 3 = PROYEKT	The manager followed the samples of materials of the project having influenced the activity. What influenced the activity? 1 = SAMPLES 2 = MATERIALS 3 = PROJECT
	Istorik priderzhivalsya istoriy epidemiy likhoradki, opisannoy v uchebnike. Chto opisyvalos' v uchebnike? 1 = ISTORII 2 = EPIDEMII 3 = LIKHORADKA	The historian stuck to the stories of outbreaks of the fever having described in the textbook. What was described in the textbook? 1 = STORIES 2 = OUTBREAKS 3 = FEVER
	Rezhissor priderzhivalsya opisaniy srazheniy voyska, trebovavshegosya dlya fil'ma. Chto trebovalos' dlya fil'ma? 1 = OPISANIYA	The film director adhered to the descriptions of the battles of the troop having required for the film. What was required for the film? 1 = DESCRIPTIONS

	2 = SRAZHENIYA 3 = VOYSKO	2 = BATTLES 3 = TROOP
	Professor potreboval karty stolits imperii, izuchennuyu na lektsii. Chto izucheno na lektsii? 1 = KARTY 2 = STOLITSY 3 = IMPERIYA	The professor demanded the maps of capitals of the empire having studied during the lecture. What was studied during the lecture? 1 = MAPS 2 = CAPITALS 3 = EMPIRE
	Inspektor dobivalsya reyestrov platezhey naloga, zakreplonnogo zakonom goroda. Chto zakrepleno zakonom goroda? 1 = REYESTRY 2 = PLATEZHI 3 = NALOG	The inspector sought registries of payments of tax having consolidated in the city's law. What is consolidated in the city's law? 1 = REGISTRIES 2 = PAYMENTS 3 = TAX

List 3

Attachment predisposition	Russian (Romanized)	English translation

NP_1	Kosmonavt osteregalsya polomki antenn raket, opisannoy v zhurnale. Chto opisano v zhurnale? 1 = POLOMKA 2 = ANTENNY 3 = RAKETY	The astronaut bewared of the damage of the antennas of the rockets having described in the log. What was described in the log? 1 = DAMAGE 2 = ANTENNAS 3 = ROCKETS
	Khimik priderzhivalsya opredeleniya kolebaniy tel, vyzvavshego nauchnyye debaty. Chto vyzvalo nauchnyye debaty? 1 = OPREDELENIYE 2 = KOLEBANIYA 3 = TELA	The chemist adhered to the definition of the vibrations of bodies having sparked scientific debates. What sparked the scientific debate? 1 = DEFINITION 2 = VIBRATIONS 3 = BODIES
	Prokhozhiy kosnulsya doski sten khizhin, sostarivsheysya ot vremeni. Chto sostarilos' ot vremeni? 1 = DOSKA 2 = STENY 3 = KHIZHINY	The passer-by touched the plank of the walls of the huts having aged with time. What aged with time? 1 = PLANK 2 = WALLS 3 = HUTS

	Predsedatel' priderzhivalsya chertezha podvalov domov, prednaznachennykh dlya otsenki. Chto prednaznacheno dlya otsenki? 1 = CHERTOZH 2 = PODVALY 3 = DOMA	The chairman followed to the blueprint of the basements of the houses having intended for evaluation. What was intended for evaluation? 1 = BLUEPRINT 2 = BASEMENTS 3 = HOUSES
	Mal'chik ispugalsya zvuka razryvov snaryadov, razrushivshego tishinu nochi. Chto razrushilo tishinu nochi? 1 = ZVUK 2 = RAZRYVY 3 = SNARYADY	The boy was frightened by the sound of explosions of the shells having broken the silence of the night. What broke the silence of the night? 1 = SOUND 2 = EXPLOSIONS 3 = SHELLS
	Investor zhazhdal rezul'tat proyektov kontsernov, predstavlennogo na vystavke. Chto predstavleno na vystavke? 1 = REZUL'TAT 2 = PROYEKTY 3 = KONTSERNY	The investor was eager for the result of the projects of the groups having presented at the exhibition. What was presented at the exhibition? 1 = RESULT 2 = PROJECTS

		3 = GROUPS
NP_2	Rukovoditel' priderzhivalsya punktov dogovora proyektov, nakhodivshegosya pod kontrolem. Chto nakhodilos' pod kontrolem? 1 = PUNKTY 2 = DOGOVOR 3 = PROYEKTY	The manager adheres to the points of the contract of the projects having remained under control. What remained under control? 1 = POINTS 2 = CONTRACT 3 = PROJECTS
	Menedzher priderzhivalsya obraztsov materiala proyektov, vliyavshego na deyatel'nost'. Chto vliyalo na deyatel'nost'? 1 = OBRAZTSY 2 = MATERIAL 3 = PROYEKTY	The manager followed the samples of the material of the projects having influenced the activity. What influenced the activity? 1 = SAMPLES 2 = MATERIAL 3 = PROJECT
	Istorik priderzhivalsya istoriy epidemii likhoradok, opisannoy v uchebnike. Chto opisyvalos' v uchebnike? 1 = ISTORII 2 = EPIDEMIYA 3 = LIKHORADKI	The historian stuck to the stories of the outbreak of fevers having described in the textbook. What was described in the textbook? 1 = STORIES 2 = OUTBREAK

		3 = FEVERS
	Rezhissor priderzhivalsya opisaniy srazheniya voysk, trebovavshegosya dlya fil'ma. Chto trebovalos' dlya fil'ma? 1 = OPISANIYA 2 = SRAZHENIYE 3 = VOYSKA	The film director adhered to the descriptions of the battle of the troops having required for the film. What was required for the film? 1 = DESCRIPTIONS 2 = BATTLE 3 = TROOPS
	Professor potreboval karty stolitsy imperiy, izuchennuyu na lektsii. Chto izucheno na lektsii? 1 = KARTY 2 = STOLITSA 3 = IMPERII	The professor demanded the maps of the capital of the empires having studied during the lecture. What was studied during the lecture? 1 = MAPS 2 = CAPITAL 3 = EMPIRES
	Inspektor dobivalsya reyestrov platezha nalogov, zakreplonnogo zakonom goroda. Chto zakrepleno zakonom goroda? 1 = REYESTRY 2 = PLATEZH 3 = NALOGI	The inspector sought registries of payment of taxes having consolidated in the city's law. What is consolidated in the city's law? 1 = REGISTRIES 2 = PAYMENT

		3 = TAXES
NP_3	Advokat zatreboval opisaniya resheniy del, otlozhennogo iz-za pandemii. Chto otlozheno iz-za pandemii? 1 = OPISANIYA 2 = RESHENIYA 3 = DELO	The lawyer requested the descriptions of judgments of the case having delayed due to the pandemic. What was delayed due to the pandemic? 1 = DESCRIPTIONS 2 = JUDGMENTS 3 = CASE
	Doktor priderzhivalsya opisaniya proyavleniy zabolevaniya, obsuzhdavshegosya na konsiliume. Chto obsuzhdalos' na konsiliume? 1 = OPISANIYA 2 = PROYAVLENIYA 3 = ZABOLEVANIYE	The doctor adhered to the descriptions of manifestations of the disease discussed at the council. What was discussed at the council? 1 = DESCRIPTIONS 2 = MANIFESTATIONS 3 = DISEASE
	Novichok ispugalsya proyektov ustavov kholdinga, predstavlennogo na soveshchanii. Chto predstavleno na soveshchanii? 1 = PROYEKTY	The newcomer got scared by the drafts of the charters of the holding having presented at the meeting. What was presented at the meeting? 1 = DRAFTS

	2 = USTAVY 3 = KHOLDING	2 = CHARTERS 3 = HOLDING
	Direktor lishilsya vypuskov treylerov fil'ma, vyzvavshego otritsatel'nuyu reaktsiyu. Chto vyzvalo otritsatel'nuyu reaktsiyu? 1 = VYPUSKI 2 = TREYLERY 3 = FIL'M	The director lost the releases of the trailers of the film having caused a negative reaction. What caused the negative reaction? 1 = RELEASES 2 = TRAILERS 3 = FILM
	Biznesmen zhazhdal resursov zavodov metalla, obespechivshego stabil'nost' ekonomiki. Chto obespechilo stabil'nost' ekonomiki? 1 = RESURSY 2 = ZAVODY 3 = METALL	The businessman craved the resources of the plants of a metal having ensured the stability of the economy. What ensured the stability of the economy? 1 = RESOURCES 2 = PLANTS 3 = METAL
	Master priderzhivalsya metodov raschotov standarta, primenyavshegosya v stroitel'stve.	The foreman adhered to the methods of calculations of the standard used in construction.

	Chto primenyalos' v stroitel'stve? 1 = METODY 2 = RASCHOTY 3 = STANDART	What was used in construction? 1 = METHODS 2 = CALCULATIONS 3 = STANDARD

Appendix C: The lists of stimuli for Experiment 2

List 1

Attachment predisposition	Russian (Romanized)	English translation
NP_1	Patsiyent priderzhivalsya pravila khraneniya lekarstva, regulirovavshego tsirkulyatsiyu vozdukha. Chto regulirovalo tsirkulyatsiyu vozdukha? 1 = PRAVILO 2 = KHRANENIYE 3 = LEKARSTVO	The patient adhered to the rule of storage of the medicine having regulated the circulation of air. What regulated the circulation of air? 1 = RULE 2 = STORAGE 3 = MEDICINE
	Rebonok kosnulsya ruchki dveri kvartiry, vykruchennoy iz pazov. Chto vykrucheno iz pazov?	The child touched the handle of the door of the apartment having twisted out of the grooves. What was twisted out of the

	1 = RUCHKA 2 = DVER' 3 = KVARTIRA	grooves? 1 = HANDLE 2 = DOOR 3 = APARTMENT
	Biolog priderzhivalsya tablitsy khronologii epidemii, narisovannoy d tetradi. Chto narisovano v tetradi? 1 = TABLITSA 2 = KHRONOLOGIYA 3 = EPIDEMIYA	The biologist adhered to the table of the chronology of the epidemic having drawn in the notebook. What was drawn in the notebook? 1 = TABLE 2 = CHRONOLOGY 3 = EPIDEMIC
	Soldat ispugalsya zvuka vzryva snaryada, donosivshegosya iz khizhiny. Chto donosilos' iz khizhiny? 1 = ZVUK 2 = VZRYV 3 = SNARYAD	The soldier got scared by the sound of explosion of the shell having come from the hut. What was coming from the hut? 1 = SOUND 2 = EXPLOSION 3 = SHELL
	Rebonok boyalsya skrezheta dvigatelya mototsikla, kazavshegosya rykom zverya.	The child feared the roar of the engine of the motorcycle having seemed like a growl of an animal. What seemed like a growl of an

	Chto kazalos' rykom zverya? 1 = SKREZHET 2 = DVIGATEL' 3 = MOTOTSIKL	animal? 1 = ROAR 2 = ENGINE 3 = MOTORCYCLE
	Patsiyent lishilsya karty kliniki stolitsy, oformlennoy ego vrachom. Chto oformleno ego vrachom? 1 = KARTA 2 = KLINIKA 3 = STOLITSA	The patient lost the file of the clinic of the capital having issued by his doctor. What was issued by his doctor? 1 = FILE 2 = CLINIC 3 = CAPITAL
NP_2	Devochka boyalas' shuma zavoda kirpicha, predlagavshego optovuyu prodazhu. Chto predlagalo optovuyu prodazhu? 1 = SHUM 2 = ZAVOD 3 = KIRPICH	The girl was afraid of the noise of the plant of brick having offered wholesale. What offered wholesale? 1 = NOISE 2 = PLANT 3 = BRICK
	Istets boyalsya peresmotra prigovora suda, vynesennogo vo vtornik. Chto vyneseno vo vtornik? 1 = PERESMOTR	The plaintiff feared a review of the judgment of the court having handed down on Tuesday. What was handed down on Tuesday?

	2 = PRIGOVOR 3 = SUD	1 = REVIEW 2 = JUDGMENT 3 = COURT
	Vladelets lishilsya stellazha magazina khleba, prodavavshego sukhiye kruassany. Chto prodavalo sukhiye kruassany? 1 = STELLAZH 2 = MAGAZIN 3 = KHLEB	The owner lost the rack of the shop of bread having sold dry croissants. What was selling dry croissants? 1 = RACK 2 = SHOP 3 = BREAD
	Turist potreboval raspisaniya peredvizheniya taksi, vypolnyavshegosya po gorodu. Chto vypolnyalos' po gorodu? 1 = RASPISANIYE 2 = PEREDVIZHENIYE 3 = TAKSI	The tourist demanded the schedule of movement of a taxi getting around the city. What is getting around the city? 1 = SCHEDULE 2 = MOVEMENT 3 = TAXI
	Direktor boyalsya sryva plana tsekha, razrabotannogo na sobranii. Chto razrabotano na sobranii? 1 = SRYV	The director feared a disruption of the plan of the workshop having developed at the meeting. What was developed at the meeting?

	2 = PLAN 3 = TSEKH	1 = DISRUPTION 2 = PLAN 3 = WORKSHOP
	Fotograf izbegal polomki kamery studii, imevshey knopku blokirovki. Chto imelo knopku blokirovki? 1 = POLOMKA 2 = KAMERA 3 = STUDIYA	The photographer avoided the breakage of the camera of the studio having had a lock button. What had a lock button? 1 = BREAKAGE 2 = CAMERA 3 = STUDIO
NP_3	Passazhir kosnulsya dveri mashiny shkoly, vypuskavshey talantlivykh muzykantov. Chto vypuskalo talantlivykh muzykantov? 1 = DVER' 2 = MASHINA 3 = SHKOLA	The passenger touched the door of the car of the school having produced talented musicians. What produced talented musicians? 1 = DOOR 2 = CAR 3 = SCHOOL
	Prodyuser boyalsya kontsa pokaza seriala, vklyuchavshego dva sezona. Chto vklyuchalo dva sezona? 1 = KONETS	The producer feared the end of display of the series having included two seasons. What included two seasons? 1 = END

	2 = POKAZ 3 = SERIAL	2 = DISPLAY 3 = SERIES
	Zakazchik dobivalsya statusa remonta telefona, sdannogo v masterskuyu. Chto sdano v masterskuyu? 1 = STATUS 2 = REMONT 3 = TELEFON	The customer sought the status of repair of the phone having handed over to the workshop. What was handed over to the workshop? 1 = STATUS 2 = REPAIR 3 = PHONE
	Spiker treboval prosmotra rezul'tata proyekta, poluchivshego podderzhku mera. Chto poluchilo podderzhku mera? 1 = PROSMOTR 2 = REZUL'TAT 3 = PROYEKT	The speaker demanded the view of the result of the project having received the mayor's support. What received the mayor's support? 1 = VIEW 2 = RESULT 3 = PROJECT
	Patsiyent ispugalsya proyavleniya zabolevaniya serdtsa, imevshego neregulyarnyy ritm. Chto imelo neregulyarnyy ritm?	The patient was frightened by the manifestation of the disease of heart having had an irregular rhythm. What had an irregular rhythm?

	1 = PROYAVLENIYE 2 = ZABOLEVANIYE 3 = SERDTSE	1 = MANIFESTATION 2 = DISEASE 3 = HEART
	Investor treboval zaversheniya ispytaniya ustroystva, imevshego tekhnicheskiy defekt. Chto imelo tekhnicheskiy defekt? 1 = ZAVERSHENIYE 2 = ISPYTANIYE 3 = USTROYSTVO	The investor demanded the completion of testing of the device having had a technical defect. What had a technical defect? 1 = COMPLETION 2 = TESTING 3 = DEVICE

List 2

Attachment predisposition	Russian (Romanized)	English translation
NP_1	Devochka boyalas' shuma zavoda kirpicha, donosivshegosya s ulitsy. Chto donosilos' s ulitsy? 1 = SHUM 2 = ZAVOD 3 = KIRPICH	The girl was afraid of the noise of the factory of brick having come from the street. What was coming from the street? 1 = NOISE 2 = FACTORY 3 = BRICK
	Istets boyalsya peresmotra prigovora	The plaintiff feared a review of the

	suda, initsiirovannogo yego zhenoy. Chto initsiirovano yego zhenoy? 1 = PERESMOTR 2 = PRIGOVOR 3 = SUD	judgment of the court having initiated by his wife. What was initiated by his wife? 1 = REVIEW 2 = JUDGMENT 3 = COURT
	Vladelets lishilsya stellazha magazina khleba, vypolnennogo iz metalla. Chto vypolneno iz metalla? 1 = STELLAZH 2 = MAGAZIN 3 = KHLEB	The owner lost the rack of the shop of bread having made of metal. What is made of metal? 1 = RACK 2 = SHOP 3 = BREAD
	Turist potreboval raspisaniya peredvizheniya taksi, raspechatannogo na bumage. Chto raspechatano na bumage? 1 = RASPISANIYE 2 = PEREDVIZHENIYE 3 = TAKSI	The tourist demanded the schedule of movement of taxi having printed out on paper. What is printed on paper? 1 = SCHEDULE 2 = MOVEMENT 3 = TAXI
	Direktor boyalsya sryva plana tsekha, grozivshego otmenoy kontrakta.	The director feared the disruption of the plan of the workshop having threatened the contract's

	Chto grozilo otmenoy kontrakta? 1 = SRYV 2 = PLAN 3 = TSEKH	cancellation. What threatened the contract's cancellation? 1 = DISRUPTION 2 = PLAN 3 = WORKSHOP
	Fotograf izbegal polomki kamery studii, nosivshey postoyannyy kharakter. Chto nosilo postoyannyy kharakter? 1 = POLOMKA 2 = KAMERA 3 = STUDIYA	The photographer avoided breakage of the camera of the studio having had a continuing nature. What had a continuing nature? 1 = BREAKAGE 2 = CAMERA 3 = STUDIO
NP_2	Passazhir kosnulsya dveri mashiny shkoly, rabotavshey na gaze. Chto rabotalo na gaze? 1 = DVER' 2 = MASHINA 3 = SHKOLA	The passenger touched the door of the car of the school having run on gas. What ran on gas? 1 = DOOR 2 = CAR 3 = SCHOOL
	Prodyuser boyalsya kontsa pokaza seriala, ustroyennogo dlya zvozd.	The producer feared the end of display of the series having put on for the stars.

	Chto ustroyeno dlya zvozd? 1 = KONETS 2 = POKAZ 3 = SERIAL	What was put on for the stars? 1 = END 2 = DISPLAY 3 = SERIES
	Zakzachik dobivalsya statusa remonta telefona, vklyuchavshego zamenu kamery. Chto vklyuchalo zamenu kamery? 1 = STATUS 2 = REMONT 3 = TELEFON	The customer sought the status of repair of the phone having included a camera replacement. What included a camera replacement? 1 = STATUS 2 = REPAIR 3 = PHONE
	Spiker treboval prosmotra rezul'tata proyekta, dostignutogo chlenami komandy. Chto dostignuto chlenami komandy? 1 = PROSMOTR 2 = REZUL'TAT 3 = PROYEKT	The speaker demanded the view of the result of the project having achieved by the team members. What have the team members achieved? 1 = VIEW 2 = RESULT 3 = PROJECT
	Patsiyent ispugalsya proyavleniya zabolevaniya serdtsa, porazhavshego	The patient was frightened by the manifestation of the disease of

	yego mozg. Chto porazhalo yego mozg? 1 = PROYAVLENIYE 2 = ZABOLEVANIYE 3 = SERDTSE	heart affecting his brain. What affected his brain? 1 = MANIFESTATION 2 = DISEASE 3 = HEART
	Investor treboval zaversheniya ispytaniya ustroystva, provodivshegosya bez pereryva. Chto imelo tekhnicheskiy defekt? 1 = ZAVERSHENIYE 2 = ISPYTANIYE 3 = USTROYSTVO	The investor demanded the completion of testing of the device having carried out without a time-off. What was carried out without a time-off? 1 = COMPLETION 2 = TESTING 3 = DEVICE
NP_3	Patsiyent priderzhivalsya pravila khraneniya lekarstva, naznachennogo v bol'nitse. Chto naznacheno v bol'nitse? 1 = PRAVILO 2 = KHRANENIYE 3 = LEKARSTVO	The patient adhered to the rule of storage of the medicine prescribed in the hospital. What was prescribed in the hospital? 1 = RULE 2 = STORAGE 3 = MEDICINE

	Rebonok kosnulsya ruchki dveri kvartiry, zanimavshuyu ves' etazh. Chto zanimalo ves' etazh? 1 = RUCHKA 2 = DVER' 3 = KVARTIRA	The child touched the handle of the door of the apartment occupying the entire floor. What occupied the entire floor? 1 = HANDLE 2 = DOOR 3 = APARTMENT
	Biolog priderzhivalsya tablitsy khronologii epidemii, dostigshey yuga strany. Chto dostiglo yuga strany? 1 = TABLITSA 2 = VSPYSHKA 3 = EPIDEMIYA	The biologist adhered to the table of the chronology of the epidemic having reached the south of the country. What has reached the south of the country? 1 = TABLE 2 = CHRONOLOGY 3 = EPIDEMIC
	Soldat ispugalsya zvuka vzryva snaryada, izgotovlennogo iz metalla. Chto izgotovleno iz metalla? 1 = ZVUK 2 = VZRYV 3 = SNARYAD	The soldier got scared by the sound of the explosion of a shell made of metal. What was made of metal? 1 = SOUND 2 = EXPLOSION 3 = SHELL
	Rebonok boyalsya skrezheta	The child feared the roar of the

	dvigatelya mototsikla, prinadlezhavshego yego dedu. Chto prinadlezhalo yego dedu? 1 = SKREZHET 2 = DVIGATEL' 3 = MOTOTSIKL	engine of the motorcycle belonged to his grandfather. What belonged to his grandfather? 1 = ROAR 2 = ENGINE 3 = MOTORCYCLE
	Patsiyent lishilsya karty kliniki stolitsy, naselonnoy raznymi narodami. Chto naseleno raznymi narodami? 1 = KARTA 2 = KLINIKA 3 = STOLITSA	The patient lost the file of the clinic of the capital populated by different peoples. What was populated by different peoples? 1 = FILE 2 = CLINIC 3 = CAPITAL

List 3

Attachment predisposition	Russian (Romanized)	English translation
NP_1	Passazhir kosnulsya dveri mashiny shkoly, sorvannoy s petel'.	The passenger touched the door of the car of the school having torn off its hinges.

	Chto sorvano s petel'? 1 = DVER' 2 = MASHINA 3 = SHKOLA	What was torn off its hinges? 1 = DOOR 2 = CAR 3 = SCHOOL
	Prodyuser boyalsya kontsa pokaza seriala, privodivshego k razgadke. Chto privodilo k razgadke? 1 = KONETS 2 = POKAZ 3 = SERIAL	The producer feared the end of display of the series having led to the clue. What led to the clue? 1 = END 2 = DISPLAY 3 = SERIES
	Zakzachik dobivalsya statusa remonta telefona, korrektirovannogo na sayte. Chto vklyuchalo zamenu kamery? 1 = STATUS 2 = REMONT 3 = TELEFON	The customer sought the status of repair of the phone having updated on the website. What was updated on the website? 1 = STATUS 2 = REPAIR 3 = PHONE
	Spiker treboval prosmotra rezul'tata proyekta, zapuschennogo dlya naseleniya. Chto zapuscheno dlya naseleniya?	The speaker demanded the view of the result of the project having launched for the population. What was launched for the

	1 = PROSMOTR 2 = REZUL'TAT 3 = PROYEKT	population? 1 = VIEW 2 = RESULT 3 = PROJECT
	Patsiyent ispugalsya proyavleniya zabolevaniya serdtsa, sluchivshegosya pri pod"yome. Chto sluchilos' pri pod"yome? 1 = PROYAVLENIYE 2 = ZABOLEVANIYE 3 = SERDTSE	The patient was frightened by the manifestation of the disease of heart having happened when climbing. What happened when climbing? 1 = MANIFESTATION 2 = DISEASE 3 = HEART
	Investor treboval zaversheniya ispytaniya ustroystva, znamenovavshego uspekh raboty. Chto znamenovalo uspekh raboty? 1 = ZAVERSHENIYE 2 = ISPYTANIYE 3 = USTROYSTVO	The investor demanded the completion of testing of the device having marked the success of the work. What marked the success of the work? 1 = COMPLETION 2 = TESTING 3 = DEVICE
NP_2	Patsiyent priderzhivalsya pravila khraneniya lekarstva, organizovannogo v apteke.	The patient adhered to the rule of storage of the medicine organized in a pharmacy.

	Chto organizovano v apteke? 1 = PRAVILO 2 = KHRANENIYE 3 = LEKARSTVO	What organized in a pharmacy? 1 = RULE 2 = STORAGE 3 = MEDICINE
	Rebonok kosnulsya ruchki dveri kvartiry, zakhlopnuvshuyusya ot vetra. Chto zakhlopnulos' ot vetra? 1 = RUCHKA 2 = DVER' 3 = KVARTIRA	The child touched the handle of the door of the apartment slammed shut by the wind. What slammed shut by the wind? 1 = HANDLE 2 = DOOR 3 = APARTMENT
	Biolog priderzhivalsya tablitsy khronologii epidemii, ustanovivshuyu khod sobytiy. Chto ustanovilo khod sobytiy? 1 = TABLITSA 2 = KHRONOLOGIYA 3 = EPIDEMIYA	The biologist adhered to the table of the chronology of the epidemic having set the course of events. What has set the course of events? 1 = TABLE 2 = CHRONOLOGY 3 = EPIDEMIC
	Soldat ispugalsya zvuka vzryva snaryada, proizoshedshego v dome.	The soldier got scared by the sound of the explosion of a shell having happened in the house.

	Chto proizoshlo v dome? 1 = ZVUK 2 = VZRYV 3 = SNARYAD	What happened in the house? 1 = SOUND 2 = EXPLOSION 3 = SHELL
	Rebonok boyalsya skrezheta dvigatelya mototsikla, ustanovlennogo vchera vecherom. Chto prinadlezhalo yego dedu? 1 = SKREZHET 2 = DVIGATEL' 3 = MOTOTSIKL	The child feared the roar of the engine of the motorcycle installed last night. What was installed last night? 1 = ROAR 2 = ENGINE 3 = MOTORCYCLE
	Patsiyent lishilsya karty kliniki stolitsy, predlagavshey svoi uslugi. Chto predlagalo svoi uslugi? 1 = KARTA 2 = KLINIKA 3 = STOLITSA	The patient lost the file of the clinic of the capital offering its services. What was offering its services? 1 = FILE 2 = CLINIC 3 = CAPITAL
NP_3	Devochka boyalas' shuma zavoda kirpicha, izgotovlennogo iz keramiki. Chto izgotovleno iz keramiki? 1 = SHUM	The girl was afraid of the noise of the factory of brick made of ceramic. What was made of ceramic? 1 = NOISE

	2 = ZAVOD 3 = KIRPICH	2 = FACTORY 3 = BRICK
	Istets boyalsya peresmotra prigovora suda, izuchivshego prichiny avarii. Chto izuchilo prichiny avarii? 1 = PERESMOTR 2 = PRIGOVOR 3 = SUD	The plaintiff feared a review of the judgment of the court having studied the causes of the accident. What studied the causes of the accident? 1 = REVIEW 2 = JUDGMENT 3 = COURT
	Vladelets lishilsya stellazha magazina khleba, ispechennogo s syrom. Chto ispecheno s syrom? 1 = STELLAZH 2 = MAGAZIN 3 = KHLEB	The owner lost the rack of the shop of bread baked with cheese. What was baked with cheese? 1 = RACK 2 = SHOP 3 = BREAD
	Turist potreboval raspisaniya peredvizheniya taksi, kursiruyushchego po gorodu. Chto kursirovalo po gorodu? 1 = RASPISANIYE 2 = PEREDVIZHENIYE	The tourist demanded the schedule of movement of taxi cruising around the city. What is cruising around the city? 1 = SCHEDULE 2 = MOVEMENT

	3 = TAKSI	3 = TAXI
	Direktor boyalsya sryva plana tsekha, proizvodivshego detali mashin. Chto proizvodilo detali mashin? 1 = SRYV 2 = PLAN 3 = TSEKH	The director feared the disruption of the plan of the workshop producing machine parts. What was producing machine parts? 1 = DISRUPTION 2 = PLAN 3 = WORKSHOP
	Fotograf izbegal polomki kamery studii, zanimavshey ves' etazh. Chto zanimalo ves' etazh? 1 = POLOMKA 2 = KAMERA 3 = STUDIYA	The photographer avoided the breakage of the camera of the studio occupying the entire floor. What was occupying the entire floor? 1 = BREAKAGE 2 = CAMERA 3 = STUDIO

Appendix D: The list of filler sentences for Experiment 1 and Experiment 2

Type of filler	Russian (Romanized)	English translation
Ambiguous	Partnery boyalis' pozitsii kompanii, kotoraya byla raskritikovana.	The partners were afraid of the position of the company which was criticized.

	Chto bylo raskritikovano? 1 = POZITSIYA 2 = KOMPANIYA	What was criticized? 1 = POSITION 2 = COMPANY
	Proveryayushchiy dobivalsya dokumenta proyekta, kotoryy vyzval podozreniya. Chto vyzvalo podozreniya? 1 = DOKUMENT 2 = PROYEKT	The reviewer sought the document of the project which aroused suspicion. What aroused suspicion? 1 = DOCUMENT 2 = PROJECT
	Avtor lishilsya chernovika rasskaza, kotoryy poluchil otkaz. Chto poluchilo otkaz? 1 = CHERNOVIK 2 = RASSKAZ	The author lost the draft of the story which got rejected. What got rejected? 1 = DRAFT 2 = STORY
	Mekhanik kosnulsya dvigatelya avtomobilya, kotoryy vchera slomalsya. Chto vchera slomalos'? 1 = DVIGATEL' 2 = AVTOMOBIL'	The mechanic touched the engine of the car which broke down yesterday. What broke down yesterday? 1 = ENGINE 2 = CAR
	Gost' storonilsya balkona	The guest avoided the balcony of

	pansionata, kotoryy plokho ubirali. Chto plokho ubirali? 1 = BALKON 2 = PANSIONAT	the boarding house which was poorly cleaned. What was poorly cleaned? 1 = BALCONY 2 = BOARDING HOUSE
	Turist kosnulsya mozaiki tserkvi, kotoraya maloizvestna uchonym. Chto maloizvestno uchonym? 1 = MOZAIKA 2 = TSERKOV'	The tourist touched the mosaic of the church which is little known to scientists. What is little known to scientists? 1 = MOSAIC 2 = CHURCH
	Sotrudnik lishilsya modeli rakety, kotoraya interesovala shkol'nikov. Chto interesovalo shkol'nikov? 1 = MODEL' 2 = RAKETA	The employee lost the model of the rocket which interested schoolchildren. What were the schoolchildren interested in? 1 = MODEL 2 = ROCKET
	Nachal'nik priderzhivalsya politiki kompanii, kotoraya uvelichila dokhod. Chto uvelichilo dokhod? 1 = POLITIKA	The boss followed the policy of the company which increased revenue. What increased revenue? 1 = POLICY 2 = COMPANY

	2 = KOMPANIYA	
	Ekspert lishilsya fotografii nakhodki, kotoruyu khranil muzey. Chto khranil muzey? 1 = FOTOGRAFIYA 2 = NAKHODKA	The expert lost a photograph of the finding which was kept by the museum. What was kept by the museum? 1 = PHOTO 2 = FINDING
	Otets izbegal druga syna, kotoryy opozdal pozavchera. Kto opozdal pozavchera? 1 = DRUG 2 = SYN	The father avoided the friend of the son who was late the day before yesterday. Who was late the day before yesterday? 1 = FRIEND 2 = SON
	Strazhnik opasalsya slugi imperatora, kotoryy proyavil zhestokost'. Kto proyavil zhestokost'? 1 = SLUGA 2 = IMPERATOR	The guard was afraid of the servant of the emperor who showed cruelty. Who showed cruelty? 1 = SERVANT 2 = EMPEROR
	Kliyent izbegal sekretarya notariusa, kotoryy sostavil dokument.	The client avoided the secretary of the notary who drafted the document.

	Kto sostavil dokument? 1 = SEKRETAR' 2 = NOTARIUS"	Who drafted the document? 1 = SECRETARY 2 = NOTARY
	Gorozhanin izbegal okhrannika mera, kotoryy perezhil napadeniye. Kto perezhil napadeniye? 1 = OKHRANNIK 2 = MER	The townsman avoided the guard of the mayor who survived the attack. Who survived the attack? 1 = GUARD 2 = MER
	Administratsiya osteregalas' trenera gimnasta, kotoryy posetil stadion. Kto posetil stadion? 1 = TRENER 2 = GIMNAST	The administration bewared of the coach of the gymnast who visited the stadium. Who visited the stadium? 1 = COACH 2 = GYMNAST
	Starushka boyalas' gostya starika, kotoryy rasskazyval anekdoty. Kto rasskazyval anekdoty? 1 = GOST' 2 = STARIK	The old woman feared the guest of the old man who was telling jokes. Who was telling jokes? 1 = GUEST 2 = OLD MAN
	Advokat boyalsya naslednika millionera, kotoryy upravlyal	The lawyer was afraid of the heir of the millionaire who was driving

	avtomobilem. Kto upravlyal avtomobilem? 1 = NASLEDNIK 2 = MILLIONER	the car. Who was driving the car? 1 = HEIR 2 = MILLIONAIRE
	Sledovatel' lishil migranta rabotodatelya, kotoryy narushil zakon. Kto narushil zakon? 1 = MIGRANT 2 = RABOTODATEL'	The investigator deprived the migrant of the employer who violated the law. Who violated the law? 1 = MIGRANT 2 = EMPLOYER
	Zhenshchina izbegala syna uchonogo, kotoryy napisal bestseller. Kto napisal bestseller? 1 = SYN 2 = UCHONYY	The woman avoided the son of a scientist who wrote a bestseller. Who wrote a bestseller? 1 = SON 2 = SCIENTIST
	Student storonilsya podrugi otlichnitsy, kotoraya dala spisat'. Kto dal spisat'? 1 = PODRUGA 2 = OTLICHNITSA	The student avoided the friend of the valedictorian who gave to write off. Who gave to write off? 1 = GIRLFRIEND 2 = VALEDICTORIAN

	Master izbegal pomoshchnika izobretatelya, kotoryy porval chertozh. Kto porval chertozh? 1 = POMOSHCHNIK 2 = IZOBRETATEL'	The foreman avoided the assistant of the inventor who tore the blueprint. Who tore the blueprint? 1 = ASSISTANT 2 = INVENTOR
	Zhurnalist osteregalsya odnopolchanina veterana, kotoryy vspominal voynu. Kto vspominal voynu? 1 = ODNOPOLCHANIN 2 = VETERAN	The journalist bewared of the fellow of the veteran who was recalling the war. Who was recalling the war? 1 = SOLDIER 2 = VETERAN
	Ministr boyalsya biografa politika, kotoryy napisal pis'mo. Kto napisal pis'mo? 1 = BIOGRAF 2 = POLITIK	The minister was afraid of the biographer of the politician who wrote the letter. Who wrote the letter? 1 = BIOGRAPHER 2 = POLITIC
	Nachal'nik ispugalsya plemyannika sotrudnika, kotoryy kupil mashinu. Kto kupil mashinu?	The boss was scared of the nephew of the employee who bought the car. Who bought the car?

	1 = PLEMYANNIK 2 = SOTRUDNIK	1 = NEPHEW 2 = EMPLOYEE
	Sosed storonilsya sestry starushki, kotoraya raspuskala spletni. Kto raspuskal spletni? 1 = SESTRA 2 = STARUSHKA	The neighbor shunned the sister of the old woman who was spreading gossips. Who was spreading gossips? 1 = SISTER 2 = OLD WOMAN
	Khozyain lishilsya produktsii fermy, kotoraya neobkhodima rynku. Chto neobkhodimo rynku? 1 = PRODUKTSIYA 2 = FERMA	The owner has lost the produce of the farm which the market needs. What does the market need? 1 = PRODUCTS 2 = FARM"
	Sluzhanka boyalas' vnuchki korolevy, kotoraya izvestna miru. Kto izvesten miru? 1 = VNUCHKA 2 = KOROLEVA	The maid was afraid of the granddaughter of the queen who is known to the world. Who is known to the world? 1 = GRANDDAUGHTER 2 = QUEEN
	Pomoshchnitsa ispugalas' gornichnoy korolevy, kotoraya vyronila platok.	The assistant was frightened by the maid of the queen who dropped her handkerchief.

	Kto vyronil platok? 1 = GORNICHNAYA 2 = KOROLEVA	Who dropped her handkerchief? 1 = MAID 2 = QUEEN
	Sosedka boyalas' vnuka dedushki, kotoryy poteryal klyuch. Kto poteryal klyuch? 1 = VNUK 2 = DEDUSHKA	The neighbor was afraid of the grandson of the old man who lost the key. Who lost the key? 1 = GRANDSON 2 = OLD MAN
	Knyaginya storonilas' druga knyazya, kotoryy otlichalsya skupost'yu. Kto otlichalsya skupost'yu? 1 = DRUG 2 = KNYAZ'	The princess avoided the friend of the lord who was distinguished by stinginess. Who was distinguished by stinginess? 1 = FRIEND 2 = LORD
	Direktor osteregalas' mamy devochki, kotoraya zhdala podrugu. Kto zhdal podrugu? 1 = MAMA 2 = DEVOCHKA	The principal bewared of the mother of the girl who was waiting for her friend. Who was waiting for her friend? 1 = MOM 2 = GIRL

Ungrammatical	Kontrolor osteregalsya poputchika passazhira, kotoraya yekhala domoy. Kto yekhal domoy? 1 = POPUTCHIK 2 = PASSAZHIR	The controller bewared of a fellowMASC of the passengerMASC whoFEM was on way home. Who was on way home? 1 = FELLOW 2 = PASSENGER
	Zhitel' boyalsya syna gruzchika, kotoraya imela sudimost'. Kto imel sudimost'? 1 = SYN 2 = GRUZCHIK	The resident was afraid of the sonMASC of a loaderMASC whoFEM had a criminal record. Who had a criminal record? 1 = SON 2 = LOADER
	Voditel' lishilsya kresla avto, kotoryy slomalsya vchera. Chto slomalos' vchera? 1 = KRESLO 2 = AVTO	The driver lost his seatN of the carN whichMASC broke down yesterday. What broke down yesterday? 1 = SEAT 2 = CAR
	Kot ispugalsya gula vetra, kotoroye napugalo zhiteley. Chto napugalo zhiteley? 1 = GUL	The cat got frightened by the roarMASC of the windMASC whichN scared the residents. What scared the residents? 1 = HUM

	2 = VETER	2 = WIND
	Gost' storonilsya gostinoy villy, kotoryy zavalen musorom. Chto zavaleno musorom? 1 = GOSTINAYA 2 = VILLA	The guest avoided the living roomFEM of the villaFEM whichMASC was littered with garbage. What was littered with garbage? 1 = LIVING ROOM 2 = VILLA
	Koshka kosnulas' brata mal'chika, kotoraya risuyet domik. Kto risuyet domik? 1 = BRAT 2 = MAL'CHIK	The cat touched the brotherMASC of the boyMASC whoFEM is drawing a house. Who is drawing the house? 1 = BROTHER 2 = BOY
	Organizator lishilsya muzeya kolledzha, kotoraya byla zakryta. Chto bylo zakryto? 1 = MUZEY 2 = KOLLEDZH"	The organizer lost the museumMASC of the collegeMASC whichFEM was closed. What was closed? 1 = MUSEUM 2 = COLLEGE
	Prokhozhaya postoronilas' syna vora, kotoruyu iskala politsiya.	The passer-by stepped aside from the sonMASC of the thiefMASC whomFEM the police were

	Kogo iskala politsiya? 1 = SYN 2 = VOR	looking for. Who were the police looking for? 1 = SON 2 = VOR
	Voditel' lishilsya dvigatelya avtomobilya, kotoroye bylo neispravno. Chto bylo neispravno? 1 = DVIGATEL' 2 = AVTOMOBIL'	The driver lost the engineMASC of the carMASC whichN was malfunctioning. What was malfunctioning? 1 = ENGINE 2 = CAR
	Prezident lishilsya territorii strany, kotoryy izvesten mineralami. Chto izvestno mineralami? 1 = TERRITORIYA 2 = STRANA	The President lost the territoryFEM of the countryFEM whichMASC is known for minerals. What is known for minerals? 1 = TERRITORY 2 = COUNTRY
	Programmist kosnulsya diska noutbuka, kotoraya khranila informatsiyu. Chto khranilo informatsiyu? 1 = DISK 2 = NOUTBUK	The programmer touched the diskMASC of the laptopMASC whichFEM stored the information. What stored the information? 1 = DISK 2 = LAPTOP

	Sotrudnitsa stydilas' urovnya navyka, kotoraya trebuyetsya kompanii. Chto trebuyetsya kompanii? 1 = UROVEN' 2 = NAVYK	The employee was ashamed of the levelMASC of skillMASC whichFEM was required by the company. What was required by the company? 1 = LEVEL 2 = SKILL
	Sotrudnik storonilsya druga pisatelya, kotoroye zhilo bedno. Kto zhil bedno? 1 = DRUG 2 = PISATEL'	The employee shunned the friendMASC of the writerMASC whoN lived in poverty. Who lived in poverty? 1 = FRIEND 2 = WRITER
	Turistka izbegala oblast' provintsii, kotoryy maloizvesten geografam. Chto maloizvestno geografam? 1 = OBLAST' 2 = PROVINTSIYA	The tourist avoided the areaFEM of the provinceFEM whichMASC is little known to geographers. What is little known to geographers? 1 = AREA 2 = PROVINCE
	Zhitel' styditsya zagryazneniya ozera, kotoraya issleduyetsya	The resident is ashamed of the pollutionN of the lakeN

	ekologami. Chto issleduyetsya ekologami? 1 = ZAGRYAZNENIYE 2 = OZERO	whichFEM is being investigated by environmentalists. What are environmentalists researching? 1 = POLLUTION 2 = LAKE
	Medsestra priderzhivalas' nalichiya protivopokazaniya, kotoryy podtverzhdon vrachom. Chto podtverzhdeno vrachom? 1 = NALICHIYE 2 = PROTIVOPOKAZANIYE	The nurse adhered to the presenceN of a contraindicationN whichMASC is confirmed by the doctor. What is confirmed by the doctor? 1 = PRESENCE 2 = CONTRAINDICATION
	Gubernator izbezhal problemy politiki, kotoroye privlekayet vnimaniye. Chto privlekayet vnimaniye? 1 = PROBLEMA 2 = POLITIKA	The governor avoided the problemFEM of the policyFEM whichN attracts attention. What attracts attention? 1 = PROBLEM 2 = POLICY
	Ministr izbegal dinamiki zabolevayemosti, kotoryy vyzyvayet napryazheniye.	The minister avoided the dynamicsFEM of morbidityFEM which causes pressure.

	Chto vyzyvayet napryazheniye? 1 = DINAMIKA 2 = ZABOLEVAYEMOST'	What causes pressure? 1 = DYNAMICS 2 = MORBIDITY
	Zhitel'nitsa dobilas' resheniya ministerstva, kotoraya prodlit kanikuly. Chto prodlit kanikuly? 1 = RESHENIYE 2 = MINISTERSTVO	The resident obtained the decisionN of the ministryN whichFEM will extend the holidays. What will extend the holidays? 1 = DECISION 2 = MINISTRY
	Rukovoditel' lishilsya tranzita gaza, kotoroye imeyet spros. Chto imeyet spros? 1 = TRANZIT 2 = GAZ	The manager lost the transitMASC of gasMASC whichN is in demand. What is in demand? 1 = TRANSIT 2 = GAS
	Puteshestvennik storonilsya oblasti strany, kotoroye vvelo zaprety. Chto vvelo zaprety? 1 = OBLAST' 2 = STRANA	The traveler shunned the areaFEM of the countryFEM whichN imposed bans. What imposed bans? 1 = AREA 2 = COUNTRY
	Zhurnalist priglasil trenera boksora, kotoraya podvela itogi.	The journalist invited the trainerMASC of the boxerMASC

		whoFEM summed up the results.
	Kto podvol itogi? 1 = BOKSOR 2 = TRENER	Who summed up the results? 1 = BOXER 2 = TRAINER
	Direktor lishilas' shkoly gimnastiki, kotoryy pol'zuyetsya populyarnost'yu. Chto pol'zuyetsya populyarnost'yu? 1 = SHKOLA 2 = GIMNASTIKA	The director lost the schoolFEM of gymnasticsFEM which is popular. What is popular? 1 = SCHOOL 2 = GYMNASTICS
	Koordinator nagradil pomoshchnitsu shvei, kotoroye okazalo pomoshch'. Kto okazal pomoshch'? 1 = POMOSHCHNITSA 2 = SHVEYA	The coordinator rewarded the assistantFEM of the seamstressFEM whoN gave help. Who gave help? 1 = ASSISTANT 2 = SEAMSTRESS
	Uchastnik boyalsya polufinala konkursa, kotoruyu ozhidali zriteli. Chto ozhidali zriteli? 1 = POLUFINAL 2 = KONKURS	The participant was afraid of the semi-finalMASC of the competitionMASC whichFEM was expected by audience. What was expected by audience? 1 = SEMI-FINAL 2 = COMPETITION

	Patsiyentka osteregalas' shtamma virusa, kotoroye izuchayetsya professorami. Chto izuchayetsya professorami? 1 = SHTAMM 2 = VIRUS	The patient bewared of the strainMASC of the virusMASC whichN has been studied by professors. What has been studied by professors? 1 = STRAIN 2 = VIRUS
	Prepodavatel' lishilsya nagruzki distsipliny, kotoryy uzhe realizuyetsya. Chto uzhe realizuyetsya? 1 = NAGRUZKA 2 = DISTSIPLINA	The teacher has lost the (teaching) loadFEM of the disciplineFEM whichMASC is already being implemented. What is already being implemented? 1 = (TEACHING) LOAD 2 = DISCIPLINE
	Gruppa storonilas' doma rayona, kotoraya izvestna proisshestviyami. Chto izvestno proisshestviyami? 1 = DOM 2 = RAYON	The group avoided the houseMASC of the districtMASC whichFEM is known for incidents. What is known for incidents? 1 = HOUSE 2 = DISTRICT
	Velosipedist dostig posolka regiona, kotoraya otlichayetsya chistotoy.	The cyclist reached the villageMASC of the regionMASC

	Chto otlichayetsya chistotoy? 1 = POSOLOK 2 = REGION	whichFEM is distinguished by its cleanliness. What is distinguished by its cleanliness? 1 = VILLAGE 2 = REGION
	Boss ozhidal pribyli kompanii, kotoryy zainteresoval investorov. Chto zainteresovalo investorov? 1 = PRIBYL' 2 = KOMPANIYA	The boss expected the profitFEM of the companyFEM whichMASC interested the investors. What interested the investors? 1 = PROFIT 2 = COMPANY