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ACQUISITION AND PROCESSING OF CASE  
IN L2 RUSSIAN

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## **Publications**

Three publications were selected for the defense.

1. Cherepovskaia, N., Slioussar, N., & Denissenko Denissenko, A. (2021). Acquisition of the nominal case system in Russian as a second language. *Second Language Research*, online first, 1-26. doi: 10.1177/0267658320988058
2. Cherepovskaia, N., Reutova, E., & Slioussar, N. (2021). Becoming native-like for good or ill: Online and offline processing of case forms in L2 Russian. *Frontiers in Psychology*, 12, art. 652463, 1-15. doi: 10.3389/fpsyg.2021.652463
3. Slioussar, N., & Cherepovskaia, N. (2013). Processing of case morphology: Evidence from Russian. *Computational Linguistics and Intellectual Technologies*, 12, 726-735.

The results of the present study have also been presented in the following papers:

Slioussar, N., & Cherepovskaia, N. (2014). Case errors in processing: Evidence from Russian. In: C. Chapman, O. Kit, & I. Kučerova (eds.). *Formal Approaches to Slavic Linguistics: The First Hamilton Meeting 2013* (pp. 319-338). Ann Arbor, MI: Michigan Slavic Publications.

## **Conference presentations**

The main results and conclusions of the study have been presented in 2012–2021 in 25 oral and poster presentations at 15 international conferences, including:

- Architectures and Mechanisms of Language Processing (AMLaP) Conference (2013, 2016, 2017, 2019, 2021);
- CUNY Conference on Human Sentence Processing (2014, 2015);
- Formal Approaches to Slavic Linguistics (FASL) Conference (2013, 2020);
- Agreement across Borders Conference (2015);
- Linguistic illusions in sentence processing (2021);
- International Morphological Processing Conference (2015);
- International Morphology Meeting (IMM) (2014, 2018);
- International Conference on the Mental Lexicon (2018);

- International Computer Linguistics Conference “Dialogue” (2013);
- “Night Whites” Workshop on Experimental Studies of Speech and Language (2014, 2018);
- International Conference on Cognitive Science (2014);
- International Academic Conference, HSE (2018, 2019);
- 3rd ANPOLL International Psycholinguistics Congress (2015);
- 11th Symposium of Psycholinguistics (2013);
- 2nd Experimental Psycholinguistics Conference (ERP) (2012).

## 1. Introduction

This doctoral dissertation is devoted to acquisition and processing of the nominal case system by adult learners of Russian as a second language (L2). Since the study of L2 processing always involves a comparison with the processing of the first language (L1), it also includes experiments on case processing by native Russian speakers. The present dissertation summary consists of the introduction (section 1), sections 2-4 presenting three papers selected for the defense, conclusions (section 5), references and the three papers in appendices.

In the introduction, we provide an overview of research on the Russian case system from different perspectives. Firstly, we discuss the central features of the noun case paradigm that determine the choice of case, and must be acquired by L2 learners of Russian in order to use cases correctly (1.1). Then we present research on the acquisition of the noun case system in Russian as an L1 (1.2.1) and as an L2 (1.2.2). Afterwards we proceed to discuss different processing theories relevant for L2 studies (1.3.1), and the existing research on case processing in L2 Russian (1.3.2). A separate section is dedicated to processing problems, focusing on grammaticality illusions (1.3.3), since one of the papers selected for the defense identifies a particular problem in case processing characteristic of native speakers of Russian, and another paper aims to test whether L2 learners develop similar problems.

The study presented in section 2 (Cherepovskaia, Slioussar & Denissenko 2021) focuses on the production of case forms. As for the **materials and methods** it relies on, it is a corpus study based on a collection of texts produced by Catalan-Spanish learners of Russian. The studies in sections 3 and 4 (Cherepovskaia, Reutova, & Slioussar 2021; Slioussar & Cherepovskaia 2013) are devoted to processing of case forms during reading. They analyze experimental data obtained using the self-paced reading and grammaticality judgment methods.

The dissertation **aims** to address the following major research questions:

- In which order are cases acquired in Russian as an L2? What factors predetermine this order?
- Do L1 and (proficient) L2 readers rely on the same processing mechanisms?

As we show below, very few studies focus on the L2 acquisition of the case system as a whole, either in Russian or in other morphologically rich languages. The second

question above is central for the L2 processing research, but still unresolved. This defines **the relevance** of the present study.

The **novelty and theoretical significance** of this thesis are defined by the following considerations. It provides a much more detailed picture of case system acquisition than the one that can be found in the previous studies. The conclusions may be relevant for the L2 acquisition of other morphologically complex categories in other languages. As for the question concerning processing mechanisms, we suggest a novel way of addressing it: testing whether L2 learners develop native-like processing problems. It should also be noted that experimental studies of L2 case processing in a sentential context are sparse. The results of the dissertation can be used in teaching Russian as an L2. This defines the **practical significance** of the study.

**The main results of the study and provisions for the defense** can be summarized as follows:

- i. The order of case acquisition is defined primarily by two groups of factors, *necessity* and *complexity*: how essential a given case is for successful language use and how complex it is, both semantically and morphologically. In contrast, complexity almost does not influence the acquisition of cases in L1.
- ii. Syncretic adjective forms can trigger grammaticality illusions, i.e. impede case error detection on nouns they depend on. This happens because syncretic forms activate all feature sets they are associated with, which triggers retrieval errors in morphological processing.
- iii. As for L2 processing, beginners demonstrate non-native-like patterns both in online and in offline measures. But at the upper intermediate level, native-like problems emerge in offline measures. These results are compatible with the approaches assuming that the mechanisms for L1 and L2 processing are the same, but L2 processing is more cognitively demanding and therefore slower.

### **1.1. Russian nominal case system**

This section presents the central features of the noun case paradigms that are essential for the correct language use both in L1 and in L2. In Russian, several parts of speech have cases: nouns, adjectives, pronouns, participles and numerals, and each of them has different sets of inflectional endings (Shvedova, ed., 1980). Learners of Russian start their acquaintance with the case concept with nouns. The cases of adjectives, participles,

certain pronouns, and numerals are often determined by the case of the noun they depend on. Therefore, we decided to focus on nouns in the present dissertation. Studying how other case paradigms are acquired is a promising topic for future research.

Standard Russian has six cases: nominative, genitive, accusative, dative, instrumental, and locative (also called prepositional). Inflections carry information not only about the case of the noun, but also about its number (singular or plural) and, to a certain extent, gender (masculine, feminine, and neuter) and animacy. The choice of the inflection also depends on the final consonant of the stem. Based on their sets of inflections, Russian nouns are grouped into inflectional classes, or declensions.

The traditional Russian approach identifies three declensions with several paradigms and various exceptions (e.g. Shvedova, ed., 1980). The same division can be found in many other studies (e.g. Aronoff, 1994; Halle, 1994). In alternative approaches to inflectional classes, the number of declensions either increases to four (e.g. Alexiadou & Müller, 2008; Corbett & Fraser, 1993; Müller, 2004) or decreases to two (e.g. Zaliznjak, 1987; Wiese, 2004).

Although declensions are present in every theoretical description of Russian inflectional morphology and in schoolbooks for native speakers, they have never been used in teaching Russian as an L2. L2 learners acquire case inflections only in relation to gender, as it is shown in Tables 1 and 2 (after Kempe and MacWhinney, 1998). This system is similar to the system with four declensions, but ignores the small group of masculine nouns ending in *-a/ja* in nominative singular: they are presented as exceptions.

	Masculine		Neuter	Feminine	
	Animate	Inanimate		1 <sup>st</sup> class	2 <sup>nd</sup> class
Nominative	<i>ø/'ø</i>		<i>o/e</i>	<i>a/ja</i>	<i>'ø</i>
Genitive	<i>a/ja</i>		<i>a/ja</i>	<i>i/y</i>	<i>i</i>
Dative	<i>u/ju</i>		<i>u/ju</i>	<i>e</i>	<i>i</i>
Accusative	= Gen	= Nom	= Nom	<i>u/ju</i>	= Nom
Instrumental	<i>om/'om/em</i>		<i>om/'om/em</i>	<i>oj/'oj/ej</i>	<i>'ju</i>
Locative	<i>e</i>		<i>e</i>	<i>e</i>	<i>i</i>

Table 1. Case inflections of Russian nouns: singular paradigms

	Masculine		Neuter	Feminine	
	Animate	Inanimate		Animate	Inanimate
Nominative	<i>y/i a/ja</i>	<i>y/i a/ja</i>	<i>a/ja</i>	<i>y/i</i>	
Genitive	<i>ej ø/'ø</i>	<i>ov/'ov/ev/ej</i>	<i>ø/'ø ej</i>	<i>ej ø/'ø</i>	
Dative		<i>am/jam</i>	<i>am/jam</i>	<i>am/jam</i>	
Accusative	= Gen	= Nom	= Nom	= Gen	= Nom
Instrumental		<i>ami/jami</i>	<i>ami/jami</i>	<i>ami/jami</i>	
Locative		<i>ax/jax</i>	<i>ax/jax</i>	<i>ax/jax</i>	

Table 2. Case inflections of Russian nouns: plural paradigms

As Tables 1 and 2 make clear, the animacy of the noun often determines its ending in accusative case. Affixes from different subclasses inside one inflectional class are divided by slashes (*-y/i, -a/ja* etc.), and the choice between them depends on the final consonant of the stem. *ø* means no overt inflection — a bare stem ending in a consonant is used. ' stands for the letter *soft sign* that usually indicates that the preceding consonant is palatalized, but has a number of other functions.

Thus, the noun case system consists of several paradigms and includes various exceptions. Moreover, it exhibits diverse patterns of morphological syncretism. The choice of the right case is even more difficult than the choice of an inflection depending on the case. The case of a noun may be determined by its role in the sentence and/or by a verb or a preposition that governs it, as in (1) and (2). Some prepositions may require different cases depending on their functions. This creates many obstacles for L2 learners both when they learn the paradigms and when they try to determine the case and the syntactic role of the noun based on its inflection.

- (1) *govorit' s drugom*  
talk<sub>INF</sub> to friend<sub>INS.SG</sub>  
'to talk to a friend'
- (2) *zaviset' ot raboty*  
depend<sub>INF</sub> on work<sub>GEN.SG</sub>  
'to depend on work'

Case meanings or functions have long been a matter of debate in the theoretical literature (see Jakobson 1936/1984; Wierzbicka 1980, among many others). However, the system of case functions used in teaching Russian as an L2 does not rely on these theoretical approaches: it does not aim to reveal the common core of case meanings, only to list the most frequent contexts for every case. Each case is assumed to have main functions (see

e.g. Andryushina et al. 2009), such as: (i) Nominative: subject of a sentence; (ii) Genitive: possession, negation, quantity, measure, place etc. However, the number of functions introduced may be higher, for example, up to 23 for genitive.

L2 learners start the acquisition of cases with nominative. Other cases are presented in the following order in most Russian course books (e.g. Chernyshov & Chernyshova, 2019; Nakhabina et al., 2015): locative > accusative > genitive > dative > instrumental. A few authors prefer to introduce accusative before locative; in the course book used by the participants of the present study (Gorbatkina et al., 2003, 2004), instrumental is introduced before dative.

Relative frequency of different cases may be another factor affecting their acquisition. According to the studies based on different corpus counts (Kopotev 2008; Slioussar & Samojlova 2015), the following order may be established: genitive > accusative > locative > instrumental > dative. Thus, it is not evident which cases should be easier to master for L2 learners. For example, genitive is very frequent, but in most course books, it is introduced after locative and accusative; it has the largest number of functions and the greatest variability of inflections (if plural paradigms are considered).

Moreover, as we mentioned above, adjectives and participles that modify nouns agree with them in number, case and gender (only in singular). They have separate sets of inflections. Table 3 provides two examples: the paradigms of the noun phrases *novyj stol* ‘new table<sub>M</sub>’ and *novaja škola* ‘new school<sub>F</sub>’. Both nouns are inanimate and have the same non-palatalized consonant at the end of the stem, and the same adjective with a non-palatalized stem-final consonant is used in both phrases, so Table 3 does not illustrate variation determined by these factors. As Table 3 shows, the Russian case system involves complex patterns of syncretism.

	Singular		Plural	
Nominative	<i>novyj stol</i>	<i>novaja škola</i>	<i>novye stoly</i>	<i>novye školy</i>
Genitive	<i>novogo stola</i>	<i>novoj školy</i>	<i>novyx stolov</i>	<i>novyx škol</i>
Dative	<i>novomu stolu</i>	<i>novoj škole</i>	<i>novym stolam</i>	<i>novym školam</i>
Accusative	<i>novyj stol</i>	<i>novuju školu</i>	<i>novye stoly</i>	<i>novye školy</i>
Instrumental	<i>novym stolom</i>	<i>novoj školoj</i>	<i>novymi stolami</i>	<i>novymi školami</i>
Locative	<i>novom stole</i>	<i>novoj škole</i>	<i>novyx stolax</i>	<i>novyx školax</i>

Table 3. Paradigms of the noun phrases *novyj stol* ‘new table<sub>M</sub>’ and *novaja škola* ‘new school<sub>F</sub>’.



In general, the description of the Russian case system shows why its acquisition is very challenging for L2 Russian learners and difficult to analyze for a researcher: many diverse factors must be taken into account. At the same time, studying this topic potentially allows drawing wider conclusions: identifying the role and the relative importance of these factors in L2 acquisition. In this thesis, we investigate the role of different factors in the L2 acquisition of Russian in a production study (section 2). Sections 3 and 4 focus on errors characteristic of L1 processing (associated with syncretic forms) to find out whether L2 learners also develop similar patterns.

Now let us turn to a review of existing research on L1 and L2 case acquisition in Russian.

## **1.2. Acquisition of cases in Russian**

One of the major questions in second language research is how L1 and L2 language systems differ. Therefore, in this section, we review the literature on the acquisition of the noun case system in L1 Russian (1.2.1) and L2 Russian (1.2.2).

### ***1.2.1. L1 acquisition of cases in Russian***

Gvozdev (1948/1961) was the first to analyze the acquisition of Russian cases by a monolingual child. Even though this study was carried out on speech data obtained from a single child, it provided basic information about the development of the case system, and many findings were later confirmed in larger studies.

Gvozdev observed that his son could distinguish different cases quite early, at the age of two. The boy could mix nominative and accusative on some occasions in the beginning, but later Gvozdev did not find any case mixing. This meant that there were no difficulties for the child with the acquisition of case functions. However, Gvozdev noticed mixing of endings within one case. Therefore, case paradigms were acquired later than case functions.

Children start with nominative forms using them in single-word utterances. But as soon as multi-word sentences appear creating syntactic environments for case distinctions, nominative is used for subjects and accusative for objects. In early studies, there was a debate which case appears after nominative and accusative: analyses of different datasets suggested genitive or dative. However, after Lepskaya (1988) it was decided that there is no particular order of case acquisition by native Russian children. Lepskaya demonstrated that after the distinction between accusative and nominative is in

place, other cases appear very fast and almost simultaneously, i.e. the case paradigm is acquired as a whole (see (Voeikova, 2011; Voeikova & Gagarina, 2002) for an overview).

Babyonyshev (1993) criticized Gvozdev's study for the absence of quantitative analysis of the data. Besides, the data were collected from one child, whose development might have been atypical. Babyonyshev analyzed speech data obtained from two monolingual Russian children. The absolute majority were nominative, and a number of accusative, genitive and dative forms were recorded. There were very few locative forms, and no instrumental forms were observed. This pattern is consistent with the observations made by other authors.

Notably, children almost never used nominative in the contexts in which other cases were required. Its frequency was due to the prevalence of one-word and two-word utterances at the early stages of language development. In general, the number of case errors was very low. As for the distribution of oblique case forms, genitive and accusative are also the most frequent in adult speech, but dative is the least frequent. Presumably, children use it more actively because it is associated with the semantic roles of benefactor/addressee and experiencer that are important in child language.

Other studies have addressed different aspects of case-system acquisition by monolingual Russian children (e.g. Cejtin, 2003, 2009a, 2009b; Elkonin, 1958, 1958/1973; Ionova, 2007; Popova, 1958/1973; Schütze, 1995; Serebrennikova, 1954; Sizova, 2009; Zakharova, 1958/1973). The study by Janssen (2016) provided the first experimental data on the acquisition of case and gender by monolingual Polish and Russian children and Dutch-Russian and Dutch-Polish bilinguals. Monolinguals outperformed bilinguals of the same age in all production tasks. Janssen also noted that monolinguals and bilinguals produced different types of case errors. Bilinguals often used nominative forms where another case was required. Monolinguals did not show this tendency, although sometimes mixed different oblique cases. Non-experimental studies of children acquiring Russian, both monolingual and bilingual (e.g. Peeters-Podgaevskaja, 2008; Schwartz & Minkov, 2014, as well as the works mentioned above), confirm this generalization. In many unbalanced bilinguals and adult heritage speakers of Russian the case system is very poor, and the overuse of nominative forms is even more pronounced than in balanced bilinguals (see Polinsky 2007a, 2007b).

To conclude, the results of the existing studies on the L1 acquisition of Russian demonstrated that even though children initially experience difficulties with the case endings, they start using cases very early making minor errors with case functions.

### ***1.2.2. L2 acquisition of cases in Russian***

In this section, we summarize previous research on case acquisition in Russian as an L2. The complexity of the case system makes case acquisition one of the biggest problems in L2 learning of Russian. However, very few studies have focused on the L2 acquisition of this system as a whole.

Rubinstein (1995a, 1995b) is the only study directly addressing the acquisition of the whole Russian case system. Its goal was to establish the order in which different cases are acquired, to identify the most characteristic errors etc. Rubinstein recruited speakers of American English who were learning Russian at an intensive course in the middle and at the end of this course. Oral interviews consisted of 50 questions prompting participants to use particular oblique cases.

In (Rubinstein, 1995a), the author analyzed which oblique cases were produced correctly more often, comparing the number of contexts in which a certain case was required to the number of correct forms. On average, 60% and 74% oblique case forms were produced correctly in the two groups. Participants in both groups made fewest errors with accusative and locative, then came genitive and instrumental, and dative was the most difficult to produce. Rubinstein did not find any qualitative differences between the two groups (i.e. the distribution of error types did not change), arriving at a somewhat pessimistic conclusion that the incidence of errors decreases, but the overall picture does not change.

The order of oblique cases observed by Rubinstein does not coincide with the order of acquisition by Russian children and differs from the order of presentation in class. Rubinstein argued that his findings could be explained only by a combination of factors: morphological and semantic complexity of different cases, their relative frequency, and the order of presentation in class. Thus, the topic presents a unique opportunity to explore the role of these factors in L2 acquisition, and this is what we tried to do in our project. As we show in the study presented in section 2, unlike Rubinstein, we did observe qualitative changes in the course of case system acquisition, which allowed shading new light on the role of these factors.

In (Rubinstein 1995b), the author did not analyze correct case forms and paid closer attention to errors. In total, 2570 and 1705 errors were recorded in the midcourse and endcourse groups. Rubinstein divided them into three categories: “replacement of the correct form by the primary form (i.e. nominative)”, termed Primary Form errors; “misused inflection between different cases” (when different oblique cases were mixed),

termed Outside-the-Case errors; “misused inflection within one case” (when the student determined the case correctly, but used a wrong declension), termed Within-the-Case errors.

Our study presented in section 2 differed from Rubinstein’s in several important ways. Most importantly, we used a different method of data collection (written texts rather than oral answers to questions) and recruited participants with six proficiency levels from regular long-term language courses. Presumably, this is why we could see a more detailed picture and answer several questions that remained unclear after Rubinstein’s (1995a, 1995b) study.

### **1.3. L1 and L2 processing**

In the studies of L2 processing, the central question is whether mechanisms and strategies it relies on are essentially the same as in the L1, or there are qualitative differences. The answer to this question remains elusive. The obvious problems at the early stages of L2 acquisition might have different sources, while when the performance subsequently improves and becomes more native-like, non-native-like strategies might underlie this achievement.

In our experimental studies (sections 3 and 4), we focused on case processing problems characteristic of L1 readers. At early processing stages, L2 readers clearly differ from native speakers in a number of ways. However, when the performance of advanced L2 readers improves, it is often impossible to say whether this improvement relies on forming native-like mechanisms. However, if we can show that advanced L2 readers develop native-like processing problems, this would be a strong argument in favor of native-like mechanisms.

Thus, in the present section, we present an overview of theoretical approaches to the differences between L1 and L2 processing (1.3.1) and studies on L2 processing of case in Russian (1.3.2). Then we introduce the phenomenon of grammaticality illusions (1.3.3) — they are often described as one of the most typical L1 processing problems. For the present study, we selected grammaticality illusions associated with case syncretism.

#### ***1.3.1. L2 processing theories***

Many authors assume that L1 and L2 processing mechanisms are qualitatively different, but have divergent views on the source of these differences. According to the Shallow

Structure Hypothesis (SSH) (Clahsen & Felser, 2006a, 2006b, 2006c; Clahsen et al., 2010), L2 speakers are less sensitive to syntactic information in sentence processing and rely on semantic and pragmatic cues to a greater extent than L1 speakers. The Interface Hypothesis (IH) (Sorace, 2011) suggests that near-native L2 speakers have difficulties with the integration of syntactic information and information from other cognitive domains.

The Bottleneck Hypothesis (Slabakova, 2009) claims that while L2 acquisition of semantics, syntax, and even pragmatics flows relatively smoothly, inflectional morphology is the major source of problems. These problems have a dramatic effect on processing because inflectional morphology encodes grammatical features and is the locus of crosslinguistic differences. Prévost and White (2000) proposed another morphology-based theory, the “Missing Surface Inflection Hypothesis” (MSIH). According to it, the mapping of morphological forms to abstract grammatical categories is the weak link.

Another group of theories assumes that L1 and L2 might be different due to maturational changes in the memory processing mechanisms. For example, Ullman’s declarative/procedural (DP) model (Ullman et al., 1997; Ullman, 2015, 2018) claims that learning abilities in the procedural memory peak during early childhood, while learning abilities in the declarative memory improve during childhood and early adulthood. Hence L1 and L2 acquisition and processing rely on these two long-term memory systems to a different extent. In particular, procedural memory is responsible for generalized grammatical rules, which makes L1 processing faster and more automatic. Cunnings (2017) suggests that a primary source of L1/L2 processing differences lies in the ability to retrieve information from memory, and that L2 speakers are more susceptible to retrieval interference.

Now let us turn to the models assuming that L1 and L2 processing rely on the same mechanisms, and the observed differences are due to independent factors. Firstly, L2 processing is cognitively more demanding (e.g. Hopp, 2006, 2010; McDonald, 2006). This might be due to lower automaticity and speed (Jegerski, 2012; Kaan et al., 2015; Segalowitz, 2003; Segalowitz & Hulstijn, 2005), limitations in lexical access (McDonald & Roussel, 2010) and syntactic integration (Hopp, 2014).

Secondly, L2 processing can be less efficient due to the interference from L1 (Basnight-Brown et al., 2007; Feldman et al., 2010; Hopp, 2006, 2010; Jackson, 2010; McDonald, 2006; Portin et al., 2007, 2008; Sabourin & Haverkort, 2003). Thirdly, L2

proficiency level plays a major role (Coughlin & Tremblay, 2015; Gor & Jackson, 2013; Hopp, 2006). For instance, Hopp (2006) showed that depending on their level, L2 readers process subject-object ambiguities more or less similarly to native speakers.

Cognitive resource limitations may also be responsible for the fact that L2 speakers perform better in offline experiments than in online ones (e.g. Hopp, 2010; López Prego & Gabriele, 2014). Interestingly, if the processing load increases in the online task, native speakers can demonstrate the patterns similar to L2 learners. Based on this observation, Kaan et al. (2015) claim that L1 and L2 processing mechanisms are not different in nature, and the differences can be explained by the same factors that drive individual differences in L1 processing.

### ***1.3.2. L2 processing of case in Russian***

In this section, we briefly review the previous studies on L2 processing of case in Russian. Unfortunately, they are scarce not only in Russian, but also in other languages with rich case systems. The present thesis aims to start filling this gap.

Many processing studies on different languages focused on isolated case forms — mostly in L1, but also in L2. Languages with different case systems (such as German, Finnish, Serbian) were examined (e.g. Clahsen et al., 2001, 2010; Feldman & Fowler, 1987; Günther, 1988; Hyöna et al., 1995; Järvikivi & Niemi, 2002; Kostić, 1991; Kostić & Mirković, 2002; Kostić et al., 2003; Laine & Kovisto, 1998; Lukatela et al., 1978, 1980, 1987; Milin et al., 2009; Niemi et al., 1994; Penke et al., 2004). Several papers dealing with Russian are presented in more detail below. The general goal of these studies was to identify the factors determining which cases are processed faster or slower. Nominative, the primary form, is always the fastest. For oblique cases, case frequency, morphological syncretism, different properties of inflectional classes were found to be playing a role.

However, processing forms in a sentence is different. Only some forms fit a particular context, while the others do not (i.e. they are incorrect or ungrammatical in this context). An experienced reader can easily predict the correct forms. Therefore, the factors that matter in isolation may be irrelevant when processing sentences. Hyöna et al. (2002) demonstrated this in their L1 experiments with Finnish case forms. The differences between cases observed in isolation disappeared in a sentential context, where only the difference between correct and incorrect forms could be found. No similar

experiments were conducted with L2 readers. We started working in this direction in the present study.

Kempe and MacWhinney (1998) compared English speakers learning Russian and German. In their experiment, participants were asked to perform a speeded picture choice task after hearing simple noun-verb-noun sentences. The influence of different factors was tested: word order, animacy of the nouns, and case marking (only nominative and accusative cases were investigated). In total, the results demonstrated that the learners of Russian used case marking much more effectively than the learners of German. Kempe and MacWhinney concluded that this was due to the fact that cases are a stronger cue in Russian in spite of the complexity of the paradigm. Similar results were obtained in the following study (Kempe & MacWhinney, 1999).

Gor et al. (2017) conducted two auditory lexical decision experiments comparing native and non-native processing of different case forms. They used nominative and genitive forms with overt and zero inflections (as Tables 1 and 2 show, some Russian nouns have a zero inflection in nominative singular and an overt inflection in genitive plural, while for some other nouns, the opposite is true). Native speakers always processed nominative forms significantly faster irrespectively of the inflections. The performance of L2 learners who were native speakers of English depended on the task and on the proficiency level. In the first experiment, neither case nor inflection type significantly influenced reaction times. In the second experiment, more complex nonce word stimuli were used. As a result, a native-like pattern emerged in the more advanced L2 group.

In another auditory lexical decision study with cross-modal morphosyntactic priming, Gor et al. (2019) compared three cases: nominative, genitive and instrumental. Adjectives agreeing with nouns served as primes. Native speakers demonstrated significant differences between all three cases, with nominative being the fastest and instrumental the slowest (as before, individual form frequencies were considered). This reflects the hierarchical structure of the nominal paradigm where cases have different functional load and type frequency. Nonnative participants (English speakers) were early (heritage) and late learners of Russian with different proficiency levels. For all of them, a significant difference between nominative and oblique cases was found, but highly proficient late learners showed a native-like difference between genitive and instrumental. This demonstrates the maturation of the case system, which we are also going to explore in our study.

### 1.3.3. Grammaticality illusions

Now let us turn to the phenomenon of grammaticality illusions. Grammaticality illusions are processing problems that have been studied in numerous experiments, predominantly with L1 participants. Most studies focused on grammaticality illusions in subject-verb agreement (this phenomenon is also known as *agreement attraction*).

In particular, these studies show that number agreement errors are missed more easily in the sentences like (3a) than in the sentences like (3b) (e.g. Clifton et al., 1999; Dillon et al., 2013; Pearlmutter et al., 1999; Tanner et al., 2014; Wagers et al., 2009). In other words, (3a) is likely to be erroneously perceived as grammatical, hence the term *grammaticality illusion*. This is manifested both in online and in offline measures: in diminished error-related reading time delays, smaller P600 amplitudes in electroencephalographic studies and higher proportions of incorrect answers in grammaticality judgment tasks.

- (3) a. \**The key to the cabinets were rusty.*  
b. \**The key to the cabinet were rusty.*

There is a general consensus that the grammaticality illusion in (3a) is triggered by the dependent noun: its plural feature disrupts the agreement between the subject noun and the verb, but different authors disagree how exactly this happens. In their argumentation, they rely not only on processing, but also on production data: attraction errors are produced significantly more often than other agreement errors (e.g. Bock & Miller, 1991; Eberhard et al., 2005; Franck et al., 2002, 2006; Hartsuiker et al. 2003; Jespersen, 1924; Quirk et al., 1972; Solomon & Pearlmutter, 2004; Staub, 2009, 2010; Vigliocco et al., 1995, 1996).

Existing approaches can be divided into two groups. Some assume that the number representation on the noun phrase is faulty or ambiguous, the others argue that attraction takes place when we try to retrieve the agreement controller. Agreement attraction was studied not only in English, but also in many other languages. In Russian, it was observed in number, gender and person agreement (Laurinavichyute & Vasissth, 2016; Lorimor et al., 2008; Nicol & Wilson 1999; Slioussar, 2018; Slioussar & Malko, 2016; Yanovich & Fedorova, 2006).

A number of studies investigated subject-verb agreement violations and attraction in L2 (e.g. Hoshino et al., 2010; Jegerski, 2016; Lago & Felser, 2018; Lago et al., 2019;



Lim & Christianson, 2015; Nicol & Greth, 2003). While non-native speakers may be less sensitive to some factors like animacy or conceptual number of the noun (as opposed to the grammatical number), they show native-like agreement attraction patterns. This can be explained by the fact that the phenomenon relies on very general mechanisms in production and comprehension and is found across languages. Therefore, for our purposes we selected a different type of grammaticality illusion that relies on particular features of the Russian grammar. In the study presented in section 3, we identify these errors in L1 processing. In section 4, we test whether L2 learners of different proficiency levels exhibit similar patterns.

## 2. Case form production in L2 Russian

Paper selected for the defense: Cherepovskaia, Slioussar & Denissenko (2021).

In this paper, we address the question what factors influence the acquisition of cases, including the order in which they are acquired, in Russian as an L2. We analyzed written texts elicited from adult Catalan-Spanish learners of Russian with proficiency levels ranging from A1 (beginners) to C1 (Advanced), 6 levels in total (A1, A2, B1, B1+, B2, C1). In this study, we used the data collected by Anna Denissenko Denissenko for her PhD dissertation (Denissenko Denissenko, 2016), and analyzed them in a novel way.<sup>1</sup> Participants of the study were asked to write a short story based on a comic strip. This approach allowed us to compare texts within different proficiency groups, as well as compare learners' texts with the control group of Russian native speakers. We created an electronic database of the texts, assigned a code to every case form, and traced changes in the number and quality of correct and incorrect forms for all six cases across the six proficiency levels.

As a result, we found for every case how often participants produced contexts in which it was required at different proficiency levels, how often they succeeded in producing a correct form and how often they failed. We also distributed incorrect forms into three groups analogous to the ones in Rubinstein (1995b) (discussed in subsection 1.2.2). These were Primary Form errors (using nominative instead of oblique cases), Outside-the-Case errors (using one oblique case instead of another one, we also termed them *case mixing errors*), and Within-the-Case errors (selecting an inflection for the

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<sup>1</sup> Among other things, we digitalized the texts, found all noun forms, identified correct case forms and case errors, classified them and studied the resulting database (including statistical analyses).

correct case, but from a wrong inflectional class or subclass, we also termed them *misused ending errors*).

Participants produced very few completely random errors, which shows that cases are acquired as a system from the very start. The maturation of the case system was observed both in the number of correct forms participants produced and in error rates. The distribution of correct forms changed gradually approaching the one found for native speakers. With growth in proficiency, the incidence of different error types declined, and the relative frequency of errors more characteristic of the L1 acquisition increased. Namely, participants made relatively fewer Primary Form errors and more Within-the-Case errors. The share of Outside-the-Case errors first peaked and then declined in the process of acquisition.

Let us start by comparing different cases. Rubinstein registered the following error rates in his midcourse and endcourse groups: 33% and 21% for accusative, 31% and 23% for locative, 41% and 29% for genitive, 45% and 29% for instrumental, and 56% and 45% for dative. Based on the statistical analysis, he established the following accuracy order for oblique cases: first accusative and locative, then genitive and instrumental, and finally dative. Rubinstein used the term *accuracy order* to reflect his conclusion that some cases would always remain more difficult for L2 learners, triggering more errors than others. Thus, like in the distribution of different error types, he observed quantitative changes (decreasing error rates for every oblique case), but no qualitative changes here.

Our results do not contradict the order established by Rubinstein, but allow for a much more fine-grained picture including qualitative changes. According to our data, locative is acquired earlier than accusative, although initially only in its most important function: with prepositions indicating location. At the same time, since accusative is really essential as the direct object case, it outnumbers locative already at the A2 level.

If we look at the proportions of errors, genitive is similar to accusative. Nevertheless, at B1+ level, the error rate for accusative falls by 10%, while the error rate for genitive remains the same, decreasing at the following levels. However, the numbers of correct accusative and genitive forms and the numbers of contexts where these cases are required reveal very different acquisition trajectories. Students use many accusative forms already at the A1 level, their share increases at the A2 level and then remains relatively constant. On the contrary, the share of genitive forms gradually grows from the A1 to the C1 level.

The error rates for instrumental are always higher than those for genitive. As for correct forms, initially their numbers are similar, but the share of instrumental forms plateaus at 7–8% at the A2 level, while the share of genitive forms keeps growing. Thus, we can conclude that genitive is acquired earlier than instrumental, but its acquisition trajectory is more complex as a whole, presumably, because it has the largest number of functions that are acquired gradually.

Dative consistently has the highest error rates and the lowest number of correct forms out of all cases. The problems L2 learners experience with dative are in sharp contrast with those in L1 acquisition: as we showed in the introduction, in children's speech, dative forms are more frequent than locative and instrumental.

Notably, our data do not support Rubinstein's (1995a) claim that the accuracy order remains constant in the course of acquisition. At the A1 level, the error rates for locative are much lower than for accusative and especially for genitive. At the C1 level, their error rates converge (the error rate for genitive is even slightly lower than the error rates for locative and accusative).

Starting from Ellis (1994), the notions of order and sequence have been central for L2 acquisition studies. In particular, Ellis demonstrated that grammatical categories and inflectional morphemes in L2 English are acquired in a particular order, independently of the learner's L1. Our data show that the initial order of acquisition is only part of the picture that does not fully predetermine the dynamics of the system at later acquisition stages, contrary to Rubinstein's conclusions.

Now let us turn to factors that play a role in the case system development. The acquisition order we observed coincides with the order of presentation in the coursebook used by our participants: locative > accusative > genitive > instrumental > dative. However, reducing everything to this factor would be oversimplistic. Firstly, dative was the most difficult also for the participants of Rubinstein's (1995a) study, although in their coursebook, it was introduced before instrumental.

Secondly, all cases are introduced at the A1–A2 levels, while the differences between them can still be observed much later in the course of acquisition. This can hardly be explained exclusively by the initial order of presentation. Thirdly and most importantly, the order of presentation in different course books is not random, it is based on teaching experience of which cases are more necessary, and which are more difficult.

We concluded that the order of acquisition is determined by two groups of factors, *necessity* and *complexity*: how essential a given case is for successful language use and

how complex it is, both semantically and morphologically. In contrast, complexity almost does not influence the acquisition of cases in the first language (L1). The crucial role of morphological complexity provides evidence in favor of the SLA theories arguing that morphology is the main source of difficulties for L2 learners and thus the major source of differences between the L1 and L2 (e.g. Slabakova, 2009, 2014). In the L2 processing literature, there are also a number of studies regarding inflectional morphology as the weak link (e.g. McCarthy, 2008; Prévost & White, 2000).

### 3. Case form processing in L1 Russian: grammaticality illusion effects

Paper selected for the defense: Slioussar & Cherepovskaia (2013).

In the experimental part of our study, we address the question whether native and second language readers process sentences relying on the same mechanisms, or there are qualitative differences. We aim to contribute to this hotly debated question focusing on problems characteristic of native speakers: if L2 learners gradually develop successful native-like processing patterns, they may do so relying on different means; emerging native-like errors are a stronger indication of the same means being used.

In Slioussar and Cherepovskaia (2013), we identified a particular type of case errors that trigger grammaticality illusions in native Russian readers. They occur when an adjective form modifying a noun is syncretic, as in (4a–c). (4a) is grammatical, while in (4b) and (4c), the noun *gorod* ‘town’ is in a wrong case. We show that in the examples like (4b), grammaticality illusion effects can be observed both online (in reading time measures) and offline (in error detection accuracy rates in a speeded grammaticality judgment task) when these examples are compared to the sentences with other case errors, like (4c).

- (4) a. *Knigi o russkix gorodax byli interesnymi.*  
 book<sub>NOM.PL</sub> about Russian<sub>LOC.PL(=GEN.PL)</sub> town<sub>LOC.PL</sub> were interesting  
 ‘Books about Russian towns were interesting.’
- b. \**Knigi o russkix gorodov byli interesnymi.*  
 book<sub>NOM.PL</sub> about Russian<sub>LOC.PL(=GEN.PL)</sub> town<sub>GEN.PL</sub> were interesting
- c. \**Knigi o russkix gorodam byli interesnymi.*  
 book<sub>NOM.PL</sub> about Russian<sub>LOC.PL(=GEN.PL)</sub> town<sub>DAT.PL</sub> were interesting

Grammaticality illusions arise despite the fact that the preposition *o* ‘about’ can be used only with locative, which should resolve the ambiguity of the adjective form and

predetermine the case of the noun. Notably, syncretic adjective forms not only disrupt error detection in comprehension, but also increase error rates in production. Rusakova (2013) studied naturally occurring errors, while Slioussar et al. (2017) conducted two experiments in which participants were asked to finish sentence fragments using particular words. Sentence fragments had prepositions and syncretic or non-syncretic adjective forms at the end, so the next word was supposed to be a noun in the right case and number form, followed by a verb phrase. Case errors in different conditions were analyzed.

We demonstrated that grammaticality illusions can be observed with prepositions requiring different cases and with different syncretic adjective forms. We suggest the following explanation for this phenomenon, which relies on our data and on other processing studies dealing with syncretism, as well as on the retrieval approach to subject-verb agreement attraction (e.g. Badecker & Kuminiak, 2007; Dillon et al., 2013; Lewis & Vasishth, 2005; Solomon & Pearlmutter, 2004; Wagers et al., 2009).

Native speakers can easily predict the case of the noun based on the preposition, so the system detects a mismatch in the sentences like (4b) and (4c). The violation of the expectations always triggers rechecking, and grammaticality illusions arise at this stage. Syncretic forms activate not only the relevant set of features, but — to a lesser extent — all sets they are ambiguous for, so in examples like (4b), the system may retrieve the genitive plural feature set, which may lead to the wrong conclusion that the sentence is grammatical.

#### **4. Case form processing in L2 Russian: looking for native-like patterns**

Paper selected for the defense: Cherepovskaia, Reutova & Slioussar (2021).

In this study, we tested whether L2 learners of Russian exhibit native-like processing problems focusing on case errors presented in the previous section. We conducted self-paced reading experiments followed by a grammaticality judgment task with three groups of L2 learners: beginner groups of English native speakers and native speakers of Catalan and Spanish; and an upper intermediate group of English native speakers. The data in the last experiment was collected by Elizaveta Reutova while she was an MA student at Saint Petersburg State University in Russia.

Sentences with prepositions requiring locative (4a-c), genitive (5a-c) and dative (6a-c) were used in the experiments. Both the heads of the subject noun phrase and the

target nouns were in plural, all target nouns were masculine. Adjective forms are syncretic in genitive and locative plural, while non-syncretic dative plural forms were used as the control condition.

- (5) a. *Fil'my bez izvestnyx akterov byli skučnymi.*  
 movie<sub>NOM.PL</sub> without famous<sub>GEN.PL(=LOC.PL)</sub> actor<sub>GEN.PL</sub> were boring  
 ‘Movies without famous actors were boring.’
- b. *\*Fil'my bez izvestnyx akterax byli skučnymi.*  
 movie<sub>NOM.PL</sub> without famous<sub>GEN.PL(=LOC.PL)</sub> actor<sub>LOC.PL</sub> were boring
- c. *\*Fil'my bez izvestnyx akteram byli skučnymi.*  
 movie<sub>NOM.PL</sub> without famous<sub>GEN.PL(=LOC.PL)</sub> actor<sub>DAT.PL</sub> were boring
- (6) a. *Učitelja po inostrannym jazykam byli xorošimi.*  
 teacher<sub>NOM.PL</sub> on foreign<sub>DAT.PL</sub> language<sub>DAT.PL</sub> were good  
 ‘Teachers of foreign languages were good.’
- b. *\*Učitelja po inostrannym jazykax byli xorošimi.*  
 teacher<sub>NOM.PL</sub> on foreign<sub>DAT.PL</sub> language<sub>LOC.PL</sub> were good
- c. *\*Učitelja po inostrannym jazykov byli xorošimi.*  
 teacher<sub>NOM.PL</sub> on foreign<sub>DAT.PL</sub> language<sub>GEN.PL</sub> were good

At the beginner level, L2 readers differ from native speakers in online and offline measures: the online pattern will be discussed below, while offline, there are no significant differences across conditions — this is exactly what we expect in the absence of grammaticality illusions. The native language of the participants did not influence the results. At the upper intermediate level, the online pattern remains the same, but a native-like pattern emerges in grammaticality judgments. We interpret this as evidence in favor of similar processing mechanisms that L2 learners can rely on once the mental representation of nominal inflection develops to a certain extent.

As for the differences between online and offline measures, all models postulating the same processing mechanisms recognize that L2 processing is cognitively more demanding — due to lower automaticity and speed, to the limitations in lexical access, etc. In our case, L2 readers are slower in processing case forms and rechecking, so grammaticality illusions do not appear in online measures. Several previous studies demonstrated that L2 learners perform better in offline tasks than in online ones (e.g. Hopp, 2010; López Prego & Gabriele, 2014). In those studies, better meant more native-

like. In the present study, we show that L2 learners are more native-like offline even when this does not mean better.

Now let us turn to online measures, starting with a general picture. Many studies found differences between different case forms presented in isolation in a variety of languages including Russian (e.g. Niemi et al., 1991; Gor et al., 2017, 2019; Lukatela et al., 1978; Vasilyeva, 2018). These differences could be explained by type frequency (even when token frequency was controlled for) and by syncretism.

Gor et al. (2017, 2019), who compared L1 and L2 speakers of Russian, discovered that some distinctions found for native speakers are not (always) observed for L2 learners. In particular, all participants processed nominative forms faster than oblique case forms, and native speakers also processed genitive forms faster than instrumental ones (genitive is the most frequent out of oblique cases). L2 learners showed similar differences only at a certain proficiency level and in a certain experimental design specifically drawing attention to inflectional morphology.

Hyönä et al. (2002) working with Finnish compared form processing in isolation and in a sentential context and found that many distinctions attested in the former case disappear in the latter. Experiments with Russian language (Chernova et al., 2020; Slioussar & Cherepovskaia, 2013 discussed above) confirm this generalization. In a sentential context, only sentence-level factors play a role: grammaticality and factors like grammaticality illusions (for example, in the absence of grammaticality illusions, different ungrammatical forms are processed equally slowly independently of their case frequency and other properties).

The current study shows that the picture is different for non-native speakers: while they are *less sensitive* to different characteristics of case forms in isolation, they are *more sensitive* to them in a sentential context. We assume that native speakers retrieve some form characteristics automatically (hence the effects in isolation), but, when parsing a sentence, they can predict a particular case, which makes these characteristics irrelevant. Non-native speakers are less effective at both tasks, which produces the mirror effect.

In our study, we were able to compare genitive, dative and locative plural forms and found that both beginner and upper intermediate L2 learners process genitive forms significantly slower than locative and dative ones. In the studies in which oblique case forms were compared in isolation (Vasilyeva, 2018), genitive and accusative forms were the fastest because these cases are much more frequent than other oblique cases.

Apparently, this factor does not play a role for our L2 participants. As for the order of acquisition, L2 learners of Russian acquire genitive after locative, but before dative.

As far as we can judge, the only factor that can explain this pattern is morphological complexity. Many inflectional classes and subclasses that have different case affixes in singular use the same affixes in plural, but genitive is an exception: there are many affixes, and the choice is regulated by relatively complex rules. This factor was never found to be playing a role in L1 processing studies — native speakers acquire these rules very early and use them very efficiently. As we mentioned above, it is also not important for L1 case system acquisition.

## **5. Conclusions**

In this dissertation, we investigated acquisition, production and processing of the nominal case forms by adult learners of Russian as an L2. We combined corpus and experimental approaches in our research to analyze the development and functioning of such a morphologically complex category as case in Russian. We can now return to the research questions raised in the introduction.

Firstly, we asked in which order cases are acquired in Russian as an L2 and what factors predetermine this order. Our findings suggest that cases are acquired in the following order: nominative, locative, accusative, genitive, instrumental and dative. The acquisition trajectory of genitive is the most complex due to the highest number of functions. We claim that two groups of factors influence the acquisition of cases: necessity (how essential a given case is for successful language use) and complexity (both semantically and morphologically). The role of complexity is much less significant in L1 acquisition; therefore, the order of acquisition is different.

Secondly, we wanted to address the crucial question whether L1 and L2 readers rely on the same processing mechanisms. At the beginner L2 level, the experiments we conducted revealed non-native-like patterns both in online and in offline measures. But at the upper intermediate level, native-like problems emerged in offline measures. These results are compatible with the approaches assuming that the mechanisms for L1 and L2 processing are the same, but L2 processing is more cognitively demanding and therefore slower.