The Mental Lexicon of L2 Learners of Russian: Phonology and Morphology in Lexical Storage and Access

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Abstract: This review discusses a number of recent studies focusing on the role of phonological and morphological structure in lexical access of Russian words by nonnative speakers. This research suggests that late second language (L2) learners differ from native speakers of Russian in several ways: Lower-proficiency L2 learners rely on unfaithful, or fuzzy, phonological representations of words, which are caused either by problems with encoding difficult phonological contrasts, such as hard and soft consonants, or by uncertainty about the phonological form and form-meaning mappings for low-frequency words. In processing morphologically complex inflected words, L2 learners rely on decomposition to access the lexical meaning through the stem and may ignore the information carried by the inflection. The reviewed findings have broader implications for the understanding of nonnative word recognition, and the role of L2 proficiency in lexical processing.

1. Introduction

How do native speakers (NSs) and adult learners of Russian as a second language (L2) recognize Russian words? How do they map sound forms to meanings when they hear a word? How do they tell one word from the other, as in *стол* 'table' /stol/—*столь* 'so' /stol^{j}/, *брат* 'brother' /brat/—*брать* '(to) take' /brat^{j}/, or *говорит* '(s/he) speaks' /gavar^{j}it/—*говорить* '(to) speak' /gavar^{j}it^{j}/?[1] Conversely, how do they determine that two forms of a word that have little phonological resemblance, in fact, refer to the same lexical unit, as in *ищем* '(we) seek' /iščim/—*искать* '(to) seek' /iskat^{j}/? Furthermore, how do speakers recognize the noun *бумаг* 'of papers' as the genitive plural of *бумага* 'paper'? Do listeners decompose inflected words or store and access them as whole words? Does the inflectional paradigm play a role in organizing words in the mental lexicon? And how do all these aspects of lexical access differ in native

[1] The symbol / ^{j}/ marks phonological softness of the preceding consonant. Slanted brackets are used for phonemic transcription.

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and nonnative speakers?[2] The recent research reviewed below explores the difficulties that L2 learners of Russian encounter in different aspects of lexical processing: at the level of phonological encoding, and in distinguishing phonologically confusable words; in morphological decomposition of inflected verbs and nouns; and in processing gender and number agreement. This contribution to the silver anniversary issue of the *Journal of Slavic Linguistics* will review empirical findings on L2 Russian and discuss their implications for nonnative word recognition.

Since the turn of the 21st century, word recognition, lexical storage and access, and the structure of the mental lexicon in nonnative speakers have become prominent topics in the study of second language acquisition (SLA) (Broersma 2012; Clahsen et al. 2010; Cook et al. 2016; Coughlin and Tremblay 2015; Darcy, Daidone, and Kojima 2013; Diependaele, Lemhöfer, and Brysbaert 2013; Feldman et al. 2010; Foote 2015; Vainio, Pajunen, and Huönä 2014; see Gor 2015 for a review). At the same time, many issues regarding nonnative lexical storage and access remain poorly understood. One such area that has remained largely underresearched is the processing of inflected words. Nonnative morphological decomposition of inflected words continues to be a controversial topic partly because most research has been conducted on English, a language that lacks rich inflectional morphology (Clahsen et al. 2010; Feldman et al. 2010). Therefore, the field is in dire need of more research both on native and nonnative lexical processing in inflectionally rich languages, with several recent studies starting to fill this gap (Coughlin and Tremblay 2015; Foote 2015; Vainio, Pajunen, and Huönä 2014). Studies on L2 acquisition of Russian, a highly inflected language, were the first to demonstrate morphological decomposition in the L2, while at the same time reporting important differences in L1 and L2 morphological processing and documenting developmental trajectories for L2 learners (Gor and Cook 2010; Gor and Jackson 2013).

The contribution of research on L2 Russian to the understanding of the L2 mental lexicon and word recognition goes beyond the morphology/lexicon interface. Research on L2 Russian has recently focused on a new area in L2 phonology: the acquisition of nonnative phonological representations of words, or phonolexical representations, which involves the phonology/lexicon interface. In particular, two issues have received attention in the studies of L2 Russian discussed here: (1) the resolution of phonolexical ambiguity due to difficult L2 phonological contrasts when sentence context is available (Chrabaszcz and Gor 2014; 2017), and (2) the fuzziness of nonnative phonolexical representa-

[2] A caveat is needed when making generalizations regarding native versus nonnative populations. Indeed, native speakers are not always monolinguals, while L2 speakers vary in L1 backgrounds, level of proficiency, and age of acquisition. All these factors may potentially influence language processing. The reader is referred to the individual studies to find out how they took into account these variables.

tions when no difficult L2 phonological contrasts are involved (Cook and Gor 2015; Gor and Cook under review).

Overall, the study of L2 Russian targeting late (post-puberty) learners has made contributions to the understanding of five aspects of SLA associated with the lexical level. It has arrived at the following conclusions:

- L2 learners rely on top-down processing in the phonological categorization of difficult L2 contrasts. L2 word recognition is biased by sentence context and depends on it for disambiguation. Sentence context becomes unavailable to lower-proficiency L2 learners in noisy conditions.

- Fuzzy phonological representations of lexical items (phonolexical representations) lead to fuzzy form-to-meaning mappings in the L2 mental lexicon. Robust phonolexical representations develop in highly proficient L2 learners.

- In lexical access, L2 learners decompose inflected words into stem and inflection to access their lexical meaning through the stem. However, L2 morphological decomposition of inflected words is followed by recombination and checking only in higher-proficiency L2 learners and under specific task conditions.

- Hierarchical relations of inflected words belonging to an inflectional paradigm are gradually acquired by L2 learners with increasing proficiency.

- L2 learners show both similarities and differences from native (L1) speakers in processing dependencies for gender and number agreement.

The following sections will discuss recent research on L2 Russian in these five areas of lexical access. They will also address the role of these findings in the understanding of the learner of Russian who is engaged in lexical acquisition. Importantly, the nonnative features of lexical access documented in most studies reviewed below are characterized by developmental trajectories—from less nativelike to more nativelike—with increasing proficiency.

2. Processing Words with a Difficult Phonological Contrast in a Sentence: Hard and Soft Consonants

Late L2 learners are known to experience problems with difficult L2 phonological contrasts (Flege 1995; Darcy, Daidone, and Kojima 2013). One such perennial problem for L2 learners of Russian is phonological hardness and

softness in Russian consonants. From the point of view of articulation, soft consonants have an additional articulation: palatalization, while hard consonants have an additional articulation: velarization (Bondarko 2005). Soft consonants are often referred to as palatalized; however, palatalized articulation leads to different articulatory outcomes depending on the place and manner of articulation of the consonant. The phonological hard/soft distinction used in this review is more abstract and does not specify the exact type of articulation. The phonological contrast of hard and soft consonants—as in minimal pairs of words such as *мат* 'chessmate' /mat/; *мят* 'crumpled' /mʲat/, and *мать* 'mother' /matʲ/; *мять* 'to crumple' /mʲatʲ/—has several properties. First, the hard/soft contrast is pervasive: it differentiates most Russian consonants, which are organized in phonologically contrasted pairs: /p/-/pʲ/, /b/-/bʲ/, /t/-/tʲ/, /d/-/dʲ/, /f/-/fʲ/, /v/-/vʲ/, /s/-/sʲ/, /z/-/zʲ/, /m/-/mʲ/, /n/-/nʲ/, /l/-/lʲ/, and /r/-/rʲ/. Additionally, three velar consonants are phonetically hard or soft depending on the phonetic position: /k/-/kʲ/, /g/-/gʲ/, and /x/-/xʲ/ (Hamilton 1980: 21-22).[3] Second, the articulatory and phonetic cues to softness depend on the place of articulation of the consonant and consequently, vary greatly (Bondarko 2005). Third, the phonetic information about the softness of the consonants is mainly encoded in the formant transitions of the following, and to a lesser degree, preceding vowel (Kochetov 2002; Bondarko 2005). This means that word-final consonants are characterized by reduced phonetic cues to their hardness/softness since they are not followed by a vowel. Therefore, the phonological contrast is robust, while the phonetic cues to hardness/softness vary in strength and specific manifestations from one consonant to another and in different phonetic contexts.

Perceptual difficulties of English-speaking learners of Russian in distinguishing hard and soft consonants vary depending on the consonant and its place in the word (or nonce syllable) and reflect the strength of the perceptual cues. Thanks to the strong cues on the following vowel, word-initial hard and soft consonants are easy to discriminate (Lukyanchenko and Gor 2011). Conversely, even highly proficient L2 learners showed low discrimination of final /t/-/tʲ/, /l/-/lʲ/, and especially /p/-/pʲ/ and /f/-/fʲ/ in nonword syllables in several studies of American learners of Russian (Lukyanchenko and Gor 2011; Chrabaszcz and Gor 2014; Gor 2014). Uncertainty at the level of phonetic categorization based on weak phonetic cues led to problems with the phonemic categorization of speech segments in auditory word recognition. Furthermore, English-speaking L2 learners of Russian also experienced uncertainty when

[3] The /k/-/kʲ/, /g/-/gʲ/, and /x/-/xʲ/ contrasts are subject to distributional constraints, and the consonants in each pair are in complementary distribution. However, there are a few exceptions to those constraints, and the/k/-/kʲ/,/g/-/gʲ/, and /x/-/xʲ/ consonants are considered as phonologically contrasted by some phonologists, in particular, in the Leningrad/Saint-Petersburg Phonological School (see Bondarko 2005).

identifying members of minimal pairs contrasted only by a hard/soft consonant, as in *угол* 'corner' /ugal/—*уголь* 'coal' /ugalʲ/ (Gor 2014). This outcome was reported for a picture-word discrimination task, in which L2 participants saw pictures, heard matching or mismatching Russian words, and were asked to press the appropriate button depending on whether the word matched or mismatched the picture. Taken together, these studies suggest that ambiguity involved in the categorization of hard and soft consonants in lexical access may also lead to nonnative phonolexical representations of L2 words. It is important to note that all three studies discussed above (Lukyanchenko and Gor 2011; Chrabaszcz and Gor 2014; Gor 2014) included control groups of native speakers of Russian. In all the tasks, L2 learners' performance was far below the native baseline.

Two studies explored how English-speaking learners of Russian process such phonolexically ambiguous words in sentences, and whether they are biased by the context or, in other words, rely on top-down processing when dealing with phonolexical ambiguity (Chrabaszcz and Gor 2014; 2017). Highly proficient L2 learners listened to Russian words with word-final hard and soft consonants that constituted minimal pairs, and were congruent or incongruent with sentence context. The studies used several tasks, and two tasks from the most recent study will be reviewed here (Chrabaszcz and Gor 2017). The participants in the 2017 study were native speakers and L2 speakers rated as Advanced High and Superior on the ACTFL scale (ACTFL 1985; 2012).

In a sentence-primed lexical decision task (LDT), participants heard sentences without the last word, which served as primes, followed by the last words, which served as targets. They had to quickly and accurately respond by pressing the appropriate button to indicate whether the word they heard was a real word or a nonword.[4] The word targets in the critical conditions were minimal pairs differentiated by word-final /t/-/tʲ/ and /l/-/lʲ/. One word in the minimal pair was congruent with the context, and the other was incongruent. The minimal pairs belonged to three conditions: semantic (e.g., *мат* /mat/—*мать* /matʲ/), morphological (e.g., *говорить* '(to) speak' /gavarʲitʲ/—*говорит* 'speaks' /gavarʲit/), and syntactic (e.g., *брат* 'brother' /brat/—*брать* '(to) take' /bratʲ/.

The word-final /t/-/tʲ/ and /l/-/lʲ/ phonological contrasts were selected based on the results of discrimination tasks, which indicated that L2 learners showed decreased sensitivity to these contrasts but at the same time did not treat them as completely homophonous (Lukyanchenko and Gor 2011; Chrabaszcz and Gor 2014). The last consideration, namely, that L2 learners do not treat the hard-soft contrasts as homophonous, is important when interpreting the role of context in word recognition. If L2 learners are completely

[4] LDTs are designed in such a way that half of the trials have words and half nonwords as targets.

insensitive to the contrast and cannot tell one word in the minimal pair from the other, then the context becomes the only cue in guessing the word they hear. Alternatively, if the phonological contrast is acquired, but it is not very robust, phonolexical representations of words may be unfaithful. In this case, L2 learners identify words in a minimal pair better than at chance level, but significantly below the native level. If the context creates an additional bias, this will signal L2 reliance on top-down processing in resolving partial phonolexical ambiguity.

The same minimal pairs of words were then used in a self-paced listening task where they were again embedded in congruent and incongruent sentences but this time in the middle of the sentence (Chrabaszcz and Gor 2017). Participants were instructed to listen to sentences for meaning and answer yes/no comprehension questions after half of the sentences. In a self-paced listening task, participants hear sentences presented segment by segment, and they need to advance to the next segment by pressing a button—they are in control of the presentation pace. In the study by Chrabaszcz and Gor, each presented segment, or region, included one or more words; all sentences were divided into eight regions, and the critical region was always the fifth and contained only one word. Sentences in the congruent and incongruent conditions were identical except for the critical word. The task measured reaction times (i.e., the time needed to process the critical region in each sentence) to gauge participants' sensitivity to the incongruence of the word in the critical region with the previous sentence context. A set of phonologically unrelated context-incongruent words was used as a control condition. An example of a set of sentences used in the self-paced listening task is given in (1) (Chrabaszcz and Gor 2017).

(1) Učitel'nica priglasila na roditel'skoe sobranie otca i
teacher invited to parents' conference father and

mat' / mat / gaz moego lučšego druga.
mother / checkmate / gas (of) my best friend

'The teacher invited the father and **mother/checkmate/gas** of my best friend to the parent-teacher conference.'

The study reported that NSs of Russian in both tasks slowed down both for completely incongruent control words (e.g., *газ* 'gas') and incongruent members of the minimal pairs differentiated only by a hard/soft consonant (e.g., *мат*, 'checkmate' in the sentence above). The L2 learners' accuracy in lexical decisions and sentence comprehension in both tasks was above 90%, so they were familiar with the words and understood the sentences. At the same time, L2 learners slowed down only for completely incongruent control words (e.g., *газ* 'gas'). Conversely, L2 learners did not slow down for incon-

gruent members of minimal pairs with a hard/soft distinction, such as *мат* and *мать*, presumably, biased by the preceding context. This prompts the conclusion that contextual information overrides phonetic information when L2 listeners process words that are phonologically ambiguous to them in sentence context. The preceding sentence context biases L2 listeners and leads them to incorrect phonological categorizations when their sensitivity to the phonetic cues underlying the contrast is weak. The fact that the same pattern of results was observed in both tasks strengthens this conclusion. Similar results were reported in an offline task in an earlier study (Chrabaszcz and Gor 2014). Taken together, these studies build a strong case for the role of top-down processing, which has a biasing effect in nonnative lexical access when phonolexical ambiguity is involved.

3. Fuzzy L2 Phonolexical Representations

Difficult nonnative phonological contrasts are not the only source of lexical confusions. L2 speakers sometimes fail to differentiate similar-sounding words that are not contrasted by problematic L2 phonemes and may even differ in more than one phoneme. For example, L2 learners of Russian sometimes confuse *подушка* 'pillow' /paduška/—*подружка* girlfriend /padruška/ or *крыло* 'wing' /krɨlo/—*крыльцо* 'porch' /krɨlʲco/. Several studies in L2 Russian have explored the processing underlying such confusions, which until recently had been cited only as anecdotal evidence (Cook and Gor 2015; Cook et al. 2016; Gor and Cook under review; Gor, Cook, and Jackson 2010). These studies hypothesized that lexical confusions resulted from the fact that the phonological form of the pairs of Russian words was not accurately encoded in the L2 and tested this hypothesis in several experiments. And indeed, phonological priming experiments showed differences between NSs and L2 learners (Gor and Cook under review). In these experiments, participants listened to pairs of words, the prime and the target, which were semantically unrelated and had the same onset (overlapping in three initial phonemes) but nonoverlapping rhymes; e.g., *враг* 'enemy' /vrak/ and *врач* 'doctor' /vrač/. In a priming experiment, reaction times (RTs) to a target that is preceded by a related prime are compared to RTs to the same target preceded by an unrelated (control) prime in order to establish whether the prime influences the speed of lexical access to the target. If RTs in the related prime-target condition are faster than in the unrelated (control) condition, the priming effect is facilitation; if RTs are longer, the priming effect is inhibition.

NSs show inhibition in this version of phonological priming with phonologically overlapping onsets; i.e., when asked to decide whether the target is a real word, they respond slower to phonologically related than unrelated words (Hamburger and Slowiaczek 1996). Slower RTs to phonologically related words in NSs are interpreted as a result of the lexical competition of pho-

nologically similar words, or phonological neighbors, for selection (see Dufour and Frauenfelder 2016 and Vitevitch and Luce 2016 for recent discussions of phonological neighbors in auditory lexical access). For example, when the listener hears the beginning of the prime word /vrak/, words with the same onset stored in the mental lexicon are activated: /vrač/, and also *врать* '(to) lie' /vratʲ/, *врал* '(he) lied' /vral/, etc. When selecting the target /vrač/ that has the same onset, the listener needs to suppress all the other lexical candidates, i.e., all the phonological neighbors, including the prime. This is why NSs show additional processing costs—reflected by longer RTs—in phonological priming. It should be noted that the processing costs associated with lexical competition arise in NSs only when a considerable initial overlap (e.g., three-phoneme, see Hamburger and Slowiaczek 1996) is involved. Such overlap makes it possible to activate a set of lexical competitors. Conversely, a one-phoneme initial overlap leads to NS facilitation, which is characteristic of sublexical processing.[5] Taken together, these two effects in NSs indicate that when robust lexical competition is involved in auditory word recognition, inhibition is to be expected. When no lexical competition is involved, sublexical processing resulting in facilitation will resurface.

L2 learners of Russian also showed inhibition for high-frequency phonologically related prime-target pairs. However, they showed facilitation for low-frequency prime-target pairs (Gor and Cook, under review). If the strength of phonolexical representations in the mental lexicon is associated with the level of L2 word familiarity, then a measure of L2 lexical familiarity can be used as a proxy for the strength of phonolexical representations. To test the hypothesis that L2 facilitation for pairs such as /vrak/—/vrač/ is caused by low-resolution phonolexical representations of words in the L2 mental lexicon, Cook and Gor (2015) checked the L2 participants' knowledge of the prime meanings in a follow-up translation task with confidence ratings. When available, such an individualized measure of the level of L2 word familiarity is more accurate than corpus-based lexical frequency, which does not accurately approximate lexical frequency in individual L2 mental lexicons. When the reaction time (RT) data were analyzed separately for words that were well-known and for those that were only recognizable (participants provided no translation for recognizable words but indicated that they recognized them), only well-known words produced inhibition, while recognizable words produced non-significant facilitation. This nonnative tendency to phonological facilitation was interpreted as a consequence of low lexical competition, and putatively, a sublexical processing mode in learners of Russian. In a phonological priming experiment, the main competitor of the target is the prime.

[5] At the sublexical level, parts of words are analyzed, for example, the word onset that includes a consonant and a vowel. Such sublexical strings are processed without (and presumably before) lexical activation (Hamburger and Slowiaczek 1996).

The absence of lexical competition in L2 appears to be caused by low-frequency/less familiar prime competitors—and this should happen if they have weak phonolexical representations. Such an explanation is supported by the results of the word familiarity-based reanalysis of the RT data in the study by Cook and Gor (2015), where recognizable primes were weak competitors. Cook and Gor called such unfaithful lexical representations fuzzy and introduced the construct of the fuzzy L2 mental lexicon. Unfaithful lexical representations are not a unique property of the L2 mental lexicon—they occur for very low-familiarity words in native lexicons as well. The idea for native orthographic lexicons was proposed as the lexical quality hypothesis (Perfetti 2007). However, in L2 lexicons, especially in lower-proficiency L2 speakers, words with fuzzy representations occur not as an exception, but rather as a rule (see also Diependaele et al. 2013)

Another piece of evidence in support of fuzzy phonolexical representations in L2 comes from a translation judgment task (TJT) (Cook et al. 2016). L1 speakers and Advanced (lower-proficiency) and Superior (higher-proficiency) L2 learners of Russian heard Russian words (the primes) and then saw English translations that matched or mismatched the Russian word (the targets). Their task was to respond by pressing a button to indicate whether the translation was correct. Importantly, on the critical trials, the translation corresponded not to the prime, but to a word easily confusable with the prime given their phonological overlap. For example, *молоко* 'milk' /malako/ and *молоток* 'hammer' /malatok/ share onsets and have different meanings. If the Russian prime /malako/ is followed by the mismatched English translation HAMMER, longer RTs on such trials than on non-competitor mismatch trials (e.g., *звезда* /zvʲizda/ 'star' –BASEMENT) will signal confusion about the form of the words /malako/ and /malatok/. This inhibition effect, as well as a higher error rate, was observed in NSs and to a greater extent in both groups of L2 learners, and it was greater for high-frequency competitor words than for low-frequency competitor words. If the targets with high-frequency competitor words are processed slower than the targets with low-frequency competitor words, the effect cannot be explained by the lack of familiarity of L2 learners with the experimental stimuli. High-frequency words are more familiar to L2 learners than low-frequency words and are normally recognized faster.[6] The main contribution of the study is that it manipulated the phonological distance between the correct translation equivalent primes and their competitors to determine if phonological distance influenced the speed and accuracy

[6] Note that in this experiment, as in other experiments discussed in this review, care was taken to exclude the possibility that the observed effects could be explained by the complete lack of familiarity of L2 learners with lexical items in the critical conditions. Lexical items were selected in the frequency ranges accessible for L2 learners at the levels of proficiency included in the studies.

of participants' responses. NSs were not sensitive to the phonological distance manipulation. Lower-proficiency Advanced L2 participants showed the strongest effects of phonological distance, with confusion for words differing not only minimally, by one phoneme, but also by two phonemes. Higher-proficiency Superior speakers were in the middle. Apparently, lower-proficiency learners tended to access the incorrect lexical representation of a lexical competitor and needed additional time to recover from a lexical "garden path," which led to processing delays. Ultimately, this indicates that L2 phonolexical information was not accurately encoded and/or well entrenched in lower-proficiency Advanced learners.

One needs to consider the alternative possibility—that the source of nonnative lexical confusion is not in fuzzy representations stored in the mental lexicon, but in impaired lexical access. Such a scenario would imply that L2 learners are having difficulty when decoding the phonological form of the words they hear. While this scenario is possible, there is evidence that lexical confusions occur only when difficult phonological contrasts are involved. Recall that in the study by Chrabaszcz and Gor (2017), lexical confusion induced by the incongruent sentence context arose for the minimal pairs differentiated by a hard/soft final consonant, as in *говоритьь* /gavaˈrʲitʲ/—*говорит* /gavaˈrʲit/). Conversely, it did not arise in the control condition, in which pairs of phonologically similar words differed by an easy contrast, as in *любим* /lʲubʲim/ '(we) love'—*любишь* /lʲubʲiš/ '(you) love'. Such words were not ambiguous for learners of Russian in the incongruent context that biased listeners toward the selection of the competitor. Therefore, phonologically overlapping and potentially confusable words that are not differentiated by a difficult L2 contrast should not cause problems for lexical access. This strengthens the claim that the difficulty is associated with the level of representations.

Given this fuzziness in L2 phonolexical representations, one can expect that L2 confusion may arise not only when processing word forms but also when accessing word meanings. If L2 learners are confused about the form of two similar-sounding words, they should also be confused about the form-meaning mappings; for example, L2 learners of Russian may have problems telling which of the two words, /malako/ or /malatok/, refers to 'milk', and which to 'hammer'. Cook and colleagues explored this possibility in a pseudosemantic priming task (Cook et al. 2016), a version of an auditory semantic priming task with two critical conditions: semantic and pseudosemantic. In the semantic condition, the prime корова /karova/ 'cow' is followed by the target /malako/ 'milk'. In the pseudosemantic condition, the semantic target is replaced by a phonologically related word, e.g., /malatok/ 'hammer'. Advanced L2 learners of Russian, but not NSs, were slower at responding to such unrelated pseudosemantic targets that phonologically resembled the semantic ones. This result was taken as evidence for fuzziness in form-meaning mappings in L2 learners of Russian. Overall, this strand of

research on auditory word recognition by L2 learners of Russian contributes to a better understanding of nonnative properties of lexical access and storage.

4. Processing of Morphologically Complex Words: Verbal Inflection

Russian has a rich morphological system with inflection, derivation, and compounding (Townsend 1968). Nouns, adjectives, pronouns and verbs are organized in inflectional paradigms. This means that a Russian speaker more often than not deals with morphologically complex words in word recognition. According to the decompositional account of morphological processing, native speakers decompose morphologically complex words in word recognition (Taft 1979; 2004). Decomposition of inflected words proceeds from decomposition into stem and inflection, or affix stripping, to access of the stem and inflection in the mental lexicon, and finally, to recombination and checking of the recombined word (Taft 2004). According to the alternative, nondecompositional account, all morphologically complex words, including all inflected word forms, are stored and retrieved from memory as whole words (Butterworth 1983). Experimental evidence supports the decompositional account for regular inflectional morphology (see Gor 2010, 2015 for reviews). The study of L2 Russian has contributed to the ongoing polemics regarding morphological decomposition in the L2: whether L2 learners decompose inflected words in lexical access, as native speakers presumably do, or store and access them undecomposed, as whole words (Clahsen et al. 2010; Coughlin and Tremblay 2015; Feldman et al. 2010; Foote 2015; Gor 2010, 2015). The debates surrounding L1 processing started with English past-tense inflected regular and irregular verbs (see Gor 2010). Obviously, a more complex inflectional system, such as Russian verbal and nominal inflection, makes it possible to account for a number of factors influencing morphological processing, which are absent in English. These factors include type frequency of inflectional patterns; morphological complexity operationalized as complexity, transparency, and predictability in allomorphy; overtness of the inflectional morphemes; and the structure of the inflectional paradigm (Gor, Chrabaszcz, and Cook 2017a, 2017b; Gor and Cook 2010; Gor and Jackson 2013). The study of L2 Russian demonstrated sensitivity to morphological structure in L2 learners, and thereby challenged the strong claims about the absence of L2 decomposition for inflectional morphology (e.g., Clahsen et al. 2010), which were made based on data from L2 English and German. Importantly, the research on L2 Russian went beyond the general finding—establishing morphological decomposition in L2—and has provided results that deepen the understanding of the mechanisms underlying the learning of Russian verbal and nominal inflection.

The study of L2 processing of Russian verbal morphology by Gor and Jackson (2013) used the method of auditory morphological priming: participants heard one inflected verb form as a prime and another as a target. The

primes were in the first person singular nonpast tense and the targets in the infinitive. Half of the targets in the experiments were nonwords, and participants responded whether the target was a real word or a nonword by pressing a button. RTs to the targets preceded by an inflected form of the same verb (the related condition) were compared to the RTs to the same targets but preceded by a different verb inflected in the same form (the unrelated condition). It is believed that facilitation in morphological priming signals that both the prime and the target were decomposed into their morpheme constituents, and the same lexical unit was accessed in the mental lexicon through the stem twice, which led to facilitation on the second presentation (that of the target; see Marslen-Wilson, Hare, and Older 1993). Accordingly, the presence of morphological facilitation in L2 is taken as evidence for morphological decomposition, while the absence of facilitation signals the lack of decomposition.

The study by Gor and Jackson (2013) explored the developmental trajectory in L2 learners of Russian and tested their ability to take advantage of the prime when processing the target for three verb classes that vary by the predictability and complexity of their stem allomorphy. It relied on the one-stem verb system introduced by Jakobson (1948). According to this classification, Russian has eleven verb classes—ten with overt suffixes and one with a zero suffix—that vary in type frequency (class size) and the complexity of the morphological processes, such as consonant mutations and suffix and vowel alternations, involved in the generation of all the inflected forms in the paradigm. The conjugational pattern can be predicted from the stem, or more specifically, the verbal suffix, or verbal classifier, and in this sense, verbal conjugation in Russian is rule-governed. Therefore, most of Russian verb conjugation can be considered regular; however, the level of regularity ranges from one class to another. The study by Gor and Jackson (2013) selected three verb classes that ranged in regularity on a continuum from high to low. Lexical frequency was established based on the Sharoff Corpus of Russian, matched across the three verb classes, and was varied in order to explore how it affects morphological processing in different groups of participants.[7]

The most regular verb class in the study, the class with the *-aj-* suffix, is the largest, most productive class in Russian (see Townsend 1968 for a description of Russian verb classes). It has an automatic stem alternation, depending on whether the inflectional ending begins in a consonant or a vowel, dictated by a general morphophonological rule. If the stem ends in a consonant and the inflectional ending begins in a consonant, the consonant of the stem is truncated, and if the stem ends in a vowel and the ending begins with a vowel, the stem vowel is truncated. The *-aj-* class has automatic consonant truncation of /j/ before the consonant / t^{j} / of the infinitive, as shown in (2).

[7] The Sharoff Corpus of Russian later merged with the Russian National Corpus, which can be found at http://ruscorpora.ru.

(2) работать '(to) work'
stem: *rabot-aj-* 'work'
prime: 1st person sg.: *rabot-aj+u* → *rabotaju* 'I work'
target: *rabot-a(j)+t^{j}* → *rabotat^{j}* '(to) work'

The less regular class with the suffix *-i-* is also a large productive class, but it has more complex stem allomorphy, with consonant mutations governed by a system of morphophonological rules specific for the *-i-* class.[8] The *-i-* class has automatic vowel truncation, and also consonant mutation in the stem, which occurs only in the 1st person singular non-past tense, as illustrated in (3).

(3) ходить '(to) go'
stem: *xod-i-* 'go'
prime: *xo[d→ž](i)+u* → *xožu* 'I go'
target: *xod-i+t^{j}* → *xodit^{j}* '(to) go'

The last class consists of zero-suffixed verbs with very low type frequency (about 100 in all, with only a few verbs in each sub-class, or inflectional pattern), and is characterized by morphological processes idiosyncratic for those small clusters of verbs, an example of which is given in (4).[9] Besides automatic consonant truncation, it has a rare feature—vowel alternation in the stem.

(4) мыть '(to) wash'
stem: *moj-ø-* 'wash'
prime: *moj+u* → *moju*, 'I wash'
target: *m[o → ɨ](j)+ t^{j}* → *mɨt^{j}* '(to) wash'

In addition to the role of morphological complexity and lexical frequency, this study explored the role of Russian proficiency. It tested L2 learners of Russian at three oral proficiency levels on the Interagency Language Roundtable (ILR) scale established in oral proficiency interviews (OPIs): 2, 2+, and 3. These levels correspond to Advanced, Advanced High, and Superior on the ACTFL scale. A group of Russian NSs served as a native baseline for comparisons with L2 learners. All three verb classes—the *-aj-*, *-i-*, and zero-suffixed verbs—showed priming effects in NSs of Russian. The morphological priming effects

[8] Another small *-e-* class follows the same pattern of consonant mutations. The verbs of the *-i-* class may also have stress shifts that are not addressed in the reviewed studies.

[9] Note that zero-suffixed verbs are not considered as irregular in the one-stem verb system (see Jakobson 1948 and Townsend 1968). This is a convenient label for the least regular class in the reviewed study.

in L2 learners were also present in all three classes but only in high-frequency verbs. For low-frequency verbs, a developmental trajectory was observed in L2 learners: ILR 2 learners took advantage only of the *-aj-* class prime. Thus, while all L2 learners at these advanced levels showed robust priming for the most regular *-aj-* verbs, the priming effects in the two less regular classes with complex stem allomorphy were absent in ILR 2 learners of Russian. The study concluded that both NSs and L2 learners relied on decomposition in lexical access of inflected verbs, as shown by significant facilitation effects. However, there was a weakening of the priming effect as a function of increasing complexity in stem allomorphy from the *-aj-* to the *-i-* class and zero-suffixed verbs in less-proficient L2 learners. This finding indicates that morphological complexity, as well as lexical frequency, play a crucial role in the acquisition of Russian verbal morphology. The study referred to the observed processing pattern as a nesting-doll effect in L2 Russian: the first step is to learn to apply automatic decomposition, and the second step is to gradually learn to map different stem allomorphs to each other and the same lexical representation. While the first step is acquired early, the nativelike control of Russian verbal morphology is achieved only at very high proficiency levels.

5. Processing of Morphologically Complex Words: The Nominal Paradigm

The Russian nominal case system offers a testing ground for two hypotheses about how NSs and L2 learners process words belonging to inflectional paradigms. They were tested in a study devoted to Russian nouns with overt and zero inflectional endings in the nominative and genitive case (Gor, Chrabaszcz, and Cook 2017a). The study used an auditory lexical decision task and included both NSs and L2 learners of Russian in order to provide a native baseline for comparisons with L2 learners.

First, the study hypothesized that nouns in the nominative singular case, the citation form, would be accessed faster than oblique-case inflected nouns. The idea that the nominative singular acts as a nucleus with oblique-case inflected forms acting as satellites was expressed in the satellite-entries hypothesis based on Serbian nominal inflection (Lukatela et al. 1980). If faster access of the nominative singular compared to oblique cases is observed, this supports a hierarchical structure in the organization of the inflectional paradigm in the mental lexicon.

Second, the study hypothesized that the processing costs of accessing an inflected Russian noun would emerge not at the initial affix-stripping stage, but at a later recombination and checking stage. Finally, with respect to L2 learners, the study proposed that they are less committed to the recombination and checking stage when processing inflected words. Note that, in contrast to the reviewed study, the satellite-entries hypothesis assumes that all

the forms in the paradigm are stored and accessed by NSs as whole words with no morphological decomposition. Conversely, the studies of morphological processing discussed below provide evidence of decomposition both in L1 and L2.

Let us review the design of the study and its findings in more detail. Two auditory lexical decision tasks asked NSs and three groups of L2 learners of Russian with ILR OPI scores of 2, 2+, and 3 (Advanced, Advanced High, and Superior on the ACTFL scale) to decide as fast and as accurately as possible whether the stimulus was a real word or a nonword. Four case-inflected forms were selected for the four critical conditions. They included first-declension masculine nouns in the nominative singular (*zavod-ø* 'factory') and in the genitive singular case (*zavod-a*), and second-declension feminine nouns in the nominative singular (*bumag-a* 'paper') and the genitive plural (*bumag-ø*). Such a fully crossed design makes it possible to independently explore the role of case form (citation or oblique) and the type of inflection (overt: *-a* or zero). It avoids a confusion often present in comparisons of inflected words, and nouns in particular: when the citation form does not have an overt inflectional ending but the non-citation form does, as in English singular and plural nouns, e.g., *bird—bird-s*. If one case-inflected form of the Russian noun takes longer to recognize than the other, it is possible to establish what is driving the processing costs (increased RTs): case or inflection type. A comparison of the processing costs of *завода—завод* and *бумаг—бумага* establishes a RT pattern when processing the oblique-case inflected form compared to the citation form, regardless of whether an overt or a zero inflection is involved. At the same time, a comparison of RTs to *завод* and *бумага*, and then *завода* and *бумаг,* evaluates the potential costs of decomposition, which is interpreted as overt inflectional affix stripping (Taft 2004). In order for such comparisons to be valid, the frequencies of the nouns in the conditions corresponding to *завода—завод—бумаг—бумага* were closely matched. This ruled out the possibility that the observed effects were a result of one case-inflected form being more frequent than the other.

In Experiment 1 the response patterns of NSs and L2 learners of Russian were radically different. NSs showed additional processing costs (longer RTs) to the nouns in the oblique case compared to the same nouns in the citation form, while L2 learners did not show any differences in RTs to the nouns in the four critical conditions. The results obtained for NSs—no difference in RTs to the nouns in the same case, whether with overt or zero inflections—were interpreted as the cost of checking the recombined word within the inflectional paradigm rather than the cost of affix stripping, because there is no affix (inflection) to strip in zero-inflected words (e.g., *бумаг*). This interpretation of the findings on NSs suggests that L2 learners are not engaged in recombination and checking—the stage of word recognition that is associated with additional decomposition costs.

Experiment 2 used an additional manipulation in the nonword condition: the structure of nonwords, which illegally combined real stems and real inflections, as in **диван-ой* (correct form: *диван-ом* instrumental singular for 'sofa'), emphasized the need for processing the inflection. As a result, in Experiment 2 L2 learners started to show decomposition costs for the oblique case, and these decomposition costs increased with increasing proficiency levels. In ILR 3 learners, sensitivity to case approached that of NSs of Russian. The study concluded that nonnative speakers' engagement of morphological information was task- and proficiency-dependent. The results of this study, first, highlight the special status of the nominative singular, the citation form, in native and nonnative processing; nouns in the nominative case are recognized faster than in oblique cases. Second, they reveal a nonnative processing strategy when dealing with inflected Russian nouns—to decompose the noun into the stem and inflection, access the lexical meaning of the stem, and then show no strong commitment to recombination and checking. This lack of strong commitment means that lower-proficiency L2 learners get engaged in recombination and checking not automatically but under some pressure, which may be, for example, task-related, as in the reviewed study. Only highly proficient L2 learners of Russian are committed to recombination and checking, which makes it possible to process the morphosyntactic information about case carried by the inflected noun. This lack of commitment shown in single-word recognition provides explanation for the lack of morphosyntactic sensitivity at the sentence level observed in L2 learners (e.g., Hopp 2010).

A follow-up cross-modal priming study has confirmed the processing advantage for the nominative case, the citation form, compared to oblique cases (Gor, Chrabaszcz, and Cook 2017b). In that study, the primes were auditorily presented adjectives with an ambiguous case inflection *-oj,* and the targets were visually presented second-declension nouns in the nominative (an incongruent condition) and two oblique cases, the genitive and the instrumental (both congruent conditions but differing in case frequency and other parameters). Both NSs and L2 learners of Russian at two proficiency levels, Advanced and Superior, processed the nouns in the nominative case significantly faster than the ones in oblique cases, despite the opposite bias created by the adjective prime. The next section will review a priming study that targets gender and number agreement in L2 learners of Russian and also transcends the single word level to look at two-word dependencies.

6. Gender and Number Agreement

Gender and number agreement play such an important role in Russian morphosyntax that they can even influence speakers' gender assignment in another language that does not have gender marking. Thus a recent study shows that NSs of Russian expect Russian gender-congruent personal pronouns in

English, a genderless language (Cook 2016). Russian NSs read English sentences that differed in the personal pronoun representing animate referents in the embedded clause, e.g., 'The turtle climbed under the rock where *it/she/he* felt safe again'. While monolingual English speakers preferred the pronoun 'it' and did not make a difference between 'she' and 'he', NSs of Russian showed a preference for 'she' as opposed to 'he' in reference to the 'turtle', corresponding to *черепаха*, a feminine noun in Russian.

Processing of gender and number agreement in Russian noun and verb dependencies extends the interpretation of the morphological information carried by the inflection beyond the single-word level. In a noun phrase with the adjective preceding the noun, a standard word order in Russian (e.g., masculine *prostoj mal'čik* 'simple boy', feminine *prostaja devočka* 'simple girl', or plural *prostye mal'čiki/devočki* 'simple boys/girls'), upon hearing the adjective, one expects a noun that is congruent with the adjective in gender and/or number. Similarly, in a verb phrase, such as *byl mal'čik* 'was (a) boy', *byla devočka* 'was (a) girl', *byli mal'čiki/devočki* 'were boys/girls', the past-tense form of the verb carries the information about the gender and/or number of the upcoming noun. A visual priming experiment tested the expectations of a target noun of a certain gender and/or number based on the gender/number of the adjective or verb prime in word pairs listed above in NSs and advanced L2 learners of Russian (Romanova and Gor 2016).

The study had an important design feature: the testing materials included a condition with a neutral prime—the adverb *npocmo* 'simply'—that did not predict the gender/number of the upcoming noun, in addition to the conditions exemplified above. The rationale for including the neutral prime was based on the understanding that participants should process congruent trials with gender/number agreement between the prime and the target faster, and incongruent trials with no agreement slower compared to a neutral baseline (the neutral prime condition) where neither facilitation nor inhibition were expected (see Akhutina et al. 2001). It should be noted that this novel approach to testing sensitivity to agreement and expectations regarding the gender/number of the upcoming noun dissociates the components of the priming effect that are usually measured together without a reference to a neutral baseline. The drawback of the simpler two-way approach is that it is impossible to tell what processing mechanism underlies the observed difference in RTs: Is it the congruent condition that is faster or the incongruent that is slower? The comparison of the results obtained for NSs and L2 learners of Russian using the neutral baseline revealed an important difference. While both groups of participants showed significant priming effects for gender and number agreement, i.e., facilitation in congruent trials compared to incongruent ones in noun dependencies, the components of priming were different across the groups. Whereas both significant facilitation for congruent and inhibition for incongruent trials compared to the neutral baseline were observed in NSs of

Russian, only significant facilitation was observed in L2 learners. This finding sheds new light on the processing of agreement in the L2 (e.g., in L2 Russian): apparently, L2 learners develop expectations about the gender/number of the noun following an adjective or verb, which are morphologically marked for these features. At the same time, these same L2 learners do not react to gender/number incongruence, as if their processing was based on a low commitment to agreement. The other finding of the study concerns the nonnative treatment of markedness in Russian gender and number, which in its narrow sense can be construed as defaultness of some forms compared to other forms. As expected, NSs were sensitive to the default status of the masculine gender and singular number in Russian. They were biased to strongly expect agreement-congruent masculine singular nouns, and their RTs to incongruent trials were longer than to the neutral ones (inhibition effect). Conversely, only facilitation was observed in NSs for non-default, or marked feminine gender and plural number. Given that L2 learners did not show significant inhibition, one can conclude that they did not differentiate the default and nondefault gender and number.

Overall, the study demonstrated that processing of morphosyntactic information on agreement engages different mechanisms in NSs and L2 learners of Russian. Both NSs and L2 learners rely on predictions about the gender and/or number of the upcoming noun based on the information encoded in the preceding adjective and verb inflections. However, only NSs, but not L2 learners, show sensitivity to incongruence in agreement. L2 learners do not react to such incongruent noun and verb phrases presented in a priming experiment, as evidenced by the absence of longer RTs in incongruent conditions.

7. Words in Sentence Context and Adverse Conditions: Processing Speech in Noise

Finally, we return to the role of highly constraining sentence contexts in word recognition in Russian. In the opening section, we discussed the influence of a constraining context with high cloze probability on L2 processing of phonolexical ambiguity caused by reduced L2 sensitivity to the hard/soft phonological contrast (Chrabaszcz and Gor 2014, 2017). However, it has been observed that L2 learners experience difficulties with the use of the context when listening to speech in noisy conditions (see Gor 2014 for a review). Therefore it remains to be seen whether the constraining context will play the same role in L2 word recognition if the auditory speech signal is degraded due to adverse conditions, such as when listening to speech in noise. A study of processing of Russian speech in noise compared the role of the constraining context in the recognition of the last word in sentences in NSs of Russian and L2 learners at two

proficiency levels (Gor 2014).[10] The low-proficiency group included ILR OPI scores of 1 to 2 (Intermediate to Advanced level on the ACTFL scale), while the high-proficiency group included ILR OPI scores of 2+ to 4 (Advanced High to Distinguished level on the ACTFL scale). The sentence-final words came from balanced lists of Russian words specifically developed for the perceptual testing of words in adverse conditions (Shtern 1992). Here are examples of the high (5) and low (6) cloze probability contexts:

(5) High cloze probability context

U	menja	net	sestry,	no	est'	brat.
at	me	no	sister	but	(there) is	brother

'I don't have a sister, but I have a brother.'

(6) Low cloze probability context

Rebenok	ne	znal,	čto	èto	otvet.
child	not	knew	that	this	answer

'The child did not know that this was the answer.'

Participants listened to sentences with two levels of babble noise, high and low, superimposed on them.[11] They were instructed to repeat the last word in the sentence, and their responses were recorded, transcribed, and coded. As expected, the low-noise condition was easy for all participants, while the high-noise condition revealed significant differences. Only NSs of Russian were able to take advantage of sentence context to recognize the last words in the high-noise condition. Neither low- nor high-proficiency learners of Russian showed a better rate of correct last word recognition for sentences with highly constraining contexts compared to low-constraining contexts. Therefore, sentence context did not help them to access the last words, presumably because the whole sentence was presented in noise, and L2 learners had difficulty in combining degraded bottom-up phonetic cues and top-down sentence-level cues. Based on the results, one can conclude that in adverse conditions, L2 word recognition is less robust than native word recognition even in highly proficient L2 learners. The findings are in conformity with the existing literature on nonnative processing of speech in noise (e.g., Bradlow and Alexander 2007; see Gor 2014 for a review), and at the same time, they

[10] The study also included heritage speakers, who acquired Russian from birth from their caregivers, and later switched to English, which became their dominant language. Heritage speakers are not the focus of this review, and accordingly, they will not be discussed here.

[11] Babble noise is the noise of several speakers talking simultaneously in the background.

document L2 difficulties with sentence integration and the use of context in word recognition in noisy conditions. These results have implications both for setting realistic expectations for L2 learners of Russian and for classroom teaching. Listening to speech in noise and efficient sentence parsing and word integration based on reduced auditory information is a special skill that requires intense specialized practice. While it is true that in real life, listeners, whether native or nonnative, are constantly exposed to speech in noise, the situation is different in a formal classroom where learners are often sheltered from ambient noises. Practice in listening to speech in noise will provide L2 learners with a task to retrieve important information from degraded speech and train them to use both bottom-up and top-down processing.

8. Conclusions

The reviewed studies have identified nonnative properties in Russian word recognition in L2 learners, such as L2 uncertainty and confusion regarding the phonological makeup of words, i.e., phonolexical ambiguity of nonnative words. Phonolexical ambiguity may be associated with the absence of robust categories for difficult L2 phonemes and contrasts, for instance, the hard-soft contrast in Russian consonants. Remarkably, this ambiguity may arise even in the absence of difficult phonological contrasts. L2 learners of Russian were confused about the phonological form of similar-sounding words, e.g., /malako/ 'milk' and /malatok/ 'hammer', and as a result, were also confused about their meanings due to fuzzy form-meaning mappings. Furthermore, even distant phonological neighbors, or words that differ in at least two phonemes, caused increased processing times in L2 learners. While predictions based on sentence context helped learners of Russian to deal with phonolexical ambiguity, their ability to make use of the context was very vulnerable and disappeared when they heard sentences in noisy conditions.

The second contribution of this research on the acquisition of L2 Russian is to the study of nonnative lexical access and storage of morphologically complex inflected words. Two types of Russian inflection, verbal and nominal, were examined in lexical decision tasks with and without priming. The goal was to establish whether L2 learners of Russian rely on nativelike mechanisms in the processing of inflected words and whether they are sensitive to the structure of the inflectional paradigm.

The auditory priming study exploring Russian verbal morphology revealed a nesting-doll effect that captures the two-stage processing required to fully access both the word meaning and its morphosyntactic features: first, decomposition into stem and inflection and then processing the stem, including the affix that determines the inflectional properties of each class. While all L2 learners decomposed verbs in all three classes—the *-aj-*, *-i-*, and zero-suffixed verbs—into stems and inflections, the efficient processing of stem allomorphy

depended on L2 proficiency level. The more complex and uncommon the morphological process in the stem (e.g., vowel alternations in zero-suffixed verbs), the less efficient lower-proficient learners of Russian became when processing verbal morphology in low-frequency verbs. There was a clear developmental trajectory from efficient morphological processing only of the *-aj-* verbs in Advanced learners, to the *-aj-* and *-i-* verbs in Advanced High, to all three classes, including zero-suffixed verbs, in Superior proficiency learners.

The study of lexical access of Russian case-inflected nouns established another nonnative property of inflectional processing in addition to a developmental trajectory in dealing with complex stem allomorphy—low commitment to processing morphosyntactic information encoded in the inflection. Lower-proficiency learners of Russian do not take extra time to process an oblique-case inflected noun compared to the same noun in the nominative singular, the citation form. In contrast, shorter response latencies to the nouns in the nominative singular compared to the genitive singular or plural were a very robust finding for NSs of Russian. This processing advantage for the citation form emerged in L2 learners of Russian when the task made them focus on the recombination of the stem and the inflection (after affix stripping, as the initial stage of decomposition) and checking of the whole word. The processing advantage became stronger with increasing proficiency and was nativelike in Superior learners. Therefore learners of Russian at lower proficiency levels tend to decompose inflected nouns into stem and inflection and then focus on accessing the lexical meaning through the stem while potentially ignoring the morphosyntactic information. This effect has important consequences for reconciling two seemingly contradictory sets of observations in the literature. On the one hand, L2 learners are reported to decompose inflected words (e.g., Gor and Cook 2010; Gor and Jackson 2013 for Russian). On the other hand, L2 learners show insensitivity to morphosyntactic information in sentence processing (see Hopp 2010 for a review). If indeed learners decompose inflected words but do not always recombine and check them in order to access morphosyntactic information, then the effect observed in Russian noun processing underlies both nonnative morphological decomposition (interpreted as affix stripping) and reduced sensitivity to morphosyntactic information in sentence processing.

Finally, these studies of L2 Russian have contributed to the understanding of the processing of gender and number agreement in noun and verb phrases, which is morphologically encoded. In a grammatical priming experiment with adjectives or verbs encoded for gender and/or number serving as primes and nouns as targets, NSs of Russian showed both facilitation for congruent trials and inhibition for incongruent trials. Moreover, facilitation was stronger for the nondefault (marked) feminine gender and plural number, while inhibition was stronger for default (unmarked) masculine gender and singular number. Facilitation is associated with prediction, or expectation of a certain

grammatical form, whereas inhibition is associated with later controlled processing—for instance, rechecking of grammatical information. Unlike NSs, L2 learners showed only facilitation and no inhibition, and appeared to make little or no use of the default when predicting the gender or number of the upcoming noun in noun-adjective agreement.

The reviewed set of findings on nonnative lexical access of Russian words, with a focus on their phonological and morphological structure, can be summarized in the following way:

1. When processing words that differ by a problematic phonological contrast, e.g., hardness/softness in Russian consonants, L2 learners greatly depend on sentence context. However, they are not efficient at making use of the context to recognize words in adverse conditions, such as speech in noise. These deficits both at the lower phonetic level and top-down use of sentence context lead to a double disadvantage in L2 lexical access in adverse conditions.

2. In word storage and access, L2 learners rely on unfaithful, or fuzzy phonolexical representations for less familiar words. As a result, they experience problems with accessing the correct lexical item: they are confused about form-meaning mappings, and they are inefficient at handling lexical competition and selection.

3. L2 learners of Russian show developmental trajectories in the acquisition of nominal and verbal inflection. Contrary to some claims made for other languages (e.g., Clahsen et al. 2010), L2 learners of Russian do not store and access all inflected words as whole words, but decompose them into morpheme constituents.

4. L2 learners decompose inflected words to access the lexical meaning through the stem but may skip the checking stage and ignore the information carried by the inflection.

5. L2 learners of Russian gradually develop sensitivity to the properties of words as members of inflectional paradigms. They learn to process oblique-case nouns according to the hierarchical structure of the nominal paradigm with increasing proficiency.

6. L2 learners of Russian show lowered commitment to gender and number agreement in the sense that they are faster at processing dependencies with correct agreement (i.e., they expect agreement), but they are not slower in processing dependencies with agreement violations, compared to a neutral baseline with no agreement.

The discussed set of findings on auditory processing of Russian words documents L2 learners' difficulties with auditory word recognition at different levels, from identifying phonetic cues to morphological decomposition, and to sentence integration. These findings potentially have broader implications for nonnative lexical processing—studies targeting nonnative speakers of other languages will test their generalizability in the future. The emerging portrait of a late learner of Russian with English as the native language is not definitive; rather, it invites further research to support, refute, or deepen the claims made in the reviewed studies.

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