

Formal Instruction and the Acquisition of Verbal Morphology

Kira Gor and Tatiana Chernigovskaya

The present study investigates the processing of complex verbal morphology in second language (L2) learners. It focuses on the role of input frequencies, morphological complexity, and morphological cues in L2 acquisition of inflectional morphology in a formal instructional setting, and compares the L2 processing data to the baseline native language (L1) data. In particular, the study addresses the following research issues: (1) Does explicit instruction in complex morphological rules result in the successful learning of these rules as reflected on pencil-and-paper tests? (2) Does explicit instruction on verb conjugation facilitate the development of native-like verbal processing strategies in L2 learners (3) What is the role of input frequencies in L2 processing of complex verbal morphology? Two groups of subjects, adult American formal learners and adult native speakers of Russian, participated in the experiments, which involved oral and written generation of the non-past tense Russian novel verb forms from the past-tense stimuli. The study uses its own L2 input frequency counts obtained for the L2 participants. The results of the study indicate that both groups of subjects used the same processing strategies, and relied on default processing in similar ways. The differences in the rates of L2 and L1 use of the individual conjugational patterns are to a considerable extent due to the differences in the input frequencies to the L2 and L1 speakers. Neither the dual-system nor the single-system theories of morphological processing can handle the reported data on the processing of complex Russian morphology, which calls for a model integrating both of these theories. The influence of input frequencies on L2 verbal processing documented in this study highlights the importance of the statistical characteristics of the language used in a formal classroom for the development of native-like processing strategies in L2 learners.

1. Focus on Form in Formal Instruction

In the last decade, SLA research has experimentally tested Stephen Krashen's hypothesis that comprehensible input is not only necessary, but sufficient for SLA (Krashen 1977). Research demonstrated that while comprehensible input itself is insufficient for learning to take place (Trahey and White 1993), some properties of the input and of L2 processing contribute to input becoming intake. For example, the learner needs to be aware of the structural features of the input which is to be acquired; as according to Richard Schmidt, without noticing there can be no learning (Schmidt 1995a)¹. A distinction between **focus on forms** adopted in traditional methodologies when forms are taught in isolation as grammatical paradigms, and **focus on form**, attention to linguistic form within a meaningful context, which was drawn by Michael Long, influenced the research agenda (Long 1991; Long and Robinson 1998)². Numerous data indicate that in a meaning-focused classroom, focus on the formal properties of language, whether one uses explicit explanations (Spada and Lightbown 1993; Alanen 1995; Robinson 1995, 1996) or specifically structured input, drawing the learner's attention to the formal properties of language (VanPatten and Cadierno 1993; VanPatten and Oikkenon 1996; VanPatten 1996), contributes to successful acquisition of linguistic structures.

Michael Sharwood Smith suggested that one possible way to raise language learners' consciousness is to use enhanced input to the learner, e.g., typographical modifications of target language structures in a written text (Sharwood Smith 1993). In fact, such typographically enhanced input was shown to have a positive influence on learners' output in a second semester Spanish class (Jourdenais et al. 1995). In another study, input enhancement increased student accuracy in Spanish within a content-based instructional setting. The enhanced version of the reading passage administered to the Focus on Form group contained all the preterit and imperfect verbs underlined and colour-coded. Within this setting, the Focus on Form group outperformed the group, which received purely communicative instruction (Leeman et al. 1995). The positive effect of focus on form within a communicative classroom was also found in a Canadian study of the acquisition of several English structures by 10–12-year-old francophone students in an intensive ESL course (Spada and Lightbown 1993). Study of a similar student sample in a similar learning environment revealed that flooding learners for 2 weeks with specially prepared materials on adverb placement in English without any form-focused instruction was not sufficient to drive out forms that are permitted in French but not in English from the students'

output. This conclusion is based on students' performance on a battery of tests ranging from grammaticality judgment to oral production tasks (Trahey and White 1993). Interestingly enough, even young children, whose cognitive abilities and metalinguistic awareness are much more limited than adults', benefited from focus on form within a communicative, content-oriented French immersion classroom (Harley 1993, 1998).

Although instruction, which provides explicit explanations of grammar rules, especially simple rules involving transparent form-function relations, proves beneficial to adult learners (Alanen 1995; Robinson 1995; Williams and Evans 1998), the positive role of implicit instruction remains to be proven empirically. In fact, research has failed to show the positive influence of implicit instruction so far (Ellis 1993; White 1998). For example, extensive amounts of implicit training (with no explanations) had no positive effect on the acquisition of the rule for soft mutation in Welsh (Ellis 1993). As for explicit instruction, several studies have experimentally demonstrated its advantages. Riika Alanen studied the acquisition of Finnish locative suffixes by 4 groups of beginning learners who were native speakers of English. On most tests she obtained a clear advantage for the rule only and rule plus enhanced input groups over the control and enhanced input only groups (Alanen 1995). Peter Robinson reported similar results for the acquisition of easy rules in ESL: the explicitly instructed group outperformed three other non-instructed groups (Robinson 1995). At the same time, the literature suggests that grammar explanations provided to the learner without any practice may result in relatively poor performance (VanPatten and Cadierno 1993; VanPatten and Oikkenon 1996). Therefore, activities promoting language use are a necessary condition for explicit input to become intake.

To summarize the above, recent literature on instructed SLA provides numerous examples of the positive influence that focus on form, or **FonF** instruction (explicit explanations and enhanced or structured input) has on learners' performance (Doughty and Williams 1998)³. However, there are no experimental data on the role of formal instruction in developing native-like processing strategies, which go beyond the direct application of the rules explicitly taught and practiced in a language classroom. Our study is devoted to the structure of the mental lexicon and processing strategies in American learners of Russian shaped exclusively by the classroom experience. It focuses on the following issue: What is accomplished in a beginning language classroom, not in terms of committing to memory a set of target language forms and patterns, but in terms of developing native-like intuitions about how the target language system works?

Two aspects of the beginning Russian language classroom shaped the learners taking part in this study. First and foremost, it is a communicative classroom. The course our subjects took is video-based, and the soap-opera-like video with its characters and story line provides motivation for extensive conversational practice. And second, it delivers focus on form instruction with explicit explanations and practice of language rules.

2. The Processing of Verbal Morphology

The general framework for this study comes from research on the processing of English past-tense regular and irregular verbs, which raised the issue of modularity in morphological processing. The modular, or dual-system approach, claims that regular and irregular verbs are processed by two distinct mechanisms. Regular verb forms are computed in a rule-processing system, while irregular verbs are processed in associative memory (Marcus et al. 1992, 1995; Pinker 1991; Pinker and Prince 1988, 1991, 1994; Prasada and Pinker 1993; Jaeger et al. 1996, Ullman 1999). The opposite single-system approach, in its two variations, the connectionist (MacWhinney and Leinbach 1991; Plunkett and Marchman 1991, 1993; Rumelhart and McClelland 1986) and network (Bybee 1985, 1995; Langacker 1987, 1988) approaches, holds that both regular and irregular verbs are processed by one single mechanism in associative memory.

The proponents of the dual- and single-system approaches make opposite predictions about the role of input frequencies in processing English past-tense regular and irregular verbs. According to the dual-system approach, only irregular verbs, which are retrieved from associative memory, will be frequency-sensitive. The single-system approach predicts that frequency will influence the processing of both regular and irregular verbs.

Experimental data on frequency effects in English past-tense inflection are controversial. While some studies demonstrate frequency effects only in irregular verbs (Prasada, Pinker, and Snyder 1990; Ullman 1999) and therefore do not support the single-system view, other studies demonstrate frequency effects for regular verbs as well (Stemberger and MacWhinney 1988; Marchman 1997). One study, which showed frequency effects in regular inflection, measured reaction times in a lexical decision task involving English verbs, nouns, and adjectives, as well as nonce forms. It detected whole-word frequency effects for regularly inflected verbs above the threshold of about 6 per million when stem-cluster frequencies were held constant (Alegre and Gordon 1999).

Thus, the role of frequency effects in English past-tense inflection remains an unresolved issue⁴. However, even if this were not the case, English past-tense inflection with only one regular verb class and the virtually non-existent conjugational paradigm, obviously cannot be readily generalized to other languages with developed inflectional morphology. And indeed, the emerging data on languages with rich verbal morphology indicate that these languages do not exhibit a sharp distinction between regular and irregular verb processing (Ragnasdóttir, Simonsen, and Plunkett 1997; Matcovich 1998; Orsolini and Marslen-Wilson 1997; Orsolini, Fanari, and Bowles 1998; Simonsen 2000). Both developmental and adult data on past tense processing in Italian demonstrate the effects of phonological similarity even in the Conjugation 1 class, considered to be a regular and default class (Matcovich 1998). Two developmental studies of child first language (L1) acquisition of verbal morphology, one in Norwegian and Icelandic and the other in Italian – languages with complex verbal morphology – recorded the influence of both type and token frequencies on their subjects' responses (Ragnasdóttir, Simonsen, and Plunkett 1997; Matcovich 1998). For Norwegian and Icelandic, this influence was manifested in generating past participles of both strong (irregular) and weak (regular) verbs; in Italian, it was manifested across the verb conjugation classes. The results of these studies, which assessed the influence of input frequencies through the rates of overgeneralization, are in conflict with the predictions made by the proponents of the dual-system approach. Consequently, the application of the modular approach, which assumes a sharp distinction between regular and irregular processing, needs to be reconceptualized in regard to languages with complex morphology.

Given the fact that languages with complex morphology do not easily lend themselves to the same type of analysis as English, one should probably seek a more flexible theoretical position in dealing with them. And indeed, in addition to two strong and consistent positions held by the proponents of the dual- and single-system approaches, there exist several attempts to create models of morphological processing which would integrate both of these approaches. The dual-route model (Baayen et al. 1997) claims that symbolic rule application and search in associative memory proceed simultaneously and whichever route is faster wins the "competition." Another model, which posits the parallel activation of the two systems, the memory system and the rule system, in morphological processing, is the mental model of morphology (Ullman 2000). This model views the memory and rule systems as domain-general, and therefore departs from the classical modular approach based on the idea of domain-specificity. However, it postulates modularity within morphology itself.

An alternative solution to the sharp regular-irregular distinction, which may be more appropriate when dealing with languages with complex morphology, would be to range the verb types on a continuum of morphological complexity and then look for possible dissociations in verbal processing. In fact, research on languages with rich verbal morphology has made attempts to account for the role of morphological complexity in verbal processing. For example, the study of L1 acquisition of Norwegian and Icelandic makes a claim that morphological complexity influences developmental rates. Icelandic has more complex verbal morphology than Norwegian. In accordance with this fact, the Icelandic children were delayed in relation to the Norwegian children at age 4 on the strong verbs (Ragnasdóttir, Simonsen, and Plunkett 1997). A series of studies on morphological processing in German, a language with more complex inflectional morphology than English, raises another important issue. These studies demonstrate that the most likely, if not the only candidate for symbolic rule application is the default class, while the status of other regular non-default classes in morphological processing remains highly controversial (Clahsen 1999)⁵. The polemics reviewed above focus entirely on the formal aspects of the processing of verbal morphology and do not address the role of inherent verb semantics in contextualized morphological marker application. Research on the acquisition of temporal-aspectual and form-meaning relations emphasizes the importance of inherent verb semantics in the use or nonuse of morphological markers in speaking. Moreover, recent studies report on interaction between formal and semantic properties in morphological rule learning. Thus, it appears that primitive conceptual-semantic notions such as stativity, durativity, and telicity mainly affect the processing of regular rule-based morphology, and not irregular morphology in L2 acquisition of English (Housen 2002: 107; Housen 2003: 188).

3. Goals of the Study and the Verbal System of Russian

This study investigates the processing of verbal morphology in Russian, a language with numerous verb classes and complex conjugational paradigms, by American formal learners of Russian⁶. It compares the results obtained for second language (L2) learners with the baseline data from adult Russian native speakers, and addresses the following questions:

1. Does explicit instruction in complex morphological rules⁷ result in the successful learning of these rules as reflected on pencil-and-paper tests?

2. Does explicit instruction on verb conjugation facilitate the development of native-like verbal processing strategies in L2 learners?
3. What is the role of input frequencies in L2 processing of complex verbal morphology?

The study introduces the parameter of the complexity of paradigm, and *a priori* establishes a hierarchy of complexity for the verb classes it includes. It uses type frequencies in standard Russian and input frequencies specifically computed for the L2 learners taking part in the experiment. It is important to note that these learners were shaped by a communicative classroom with focus on form instruction. The course is video-based and includes various communicative activities in addition to explicit formal training in verb conjugation.

What will follow is a short introduction to Russian verb conjugation based on the one-stem verb system developed by Jakobson and his followers (Jakobson 1948; Townsend 1975; Davidson, Gor, and Lekic 1996). This is not the only system describing Russian verb conjugation, and there is an alternative description endorsed by the Russian Academy of Sciences. There is no research to date demonstrating the psycholinguistic validity of either system, and we have chosen the one-stem system for two main reasons:

1. This description allows the generation of all forms of all Russian verbs, with the exception of a dozen truly irregular ones by the application of a set of rules. These sets of rules are different for the different verb classes (and subclasses).
2. The one-stem system was used in the instructional setting for the group of American learners taking part in the matching experiment.

According to the one-stem description, Russian has 11 verb classes, each with its own suffix (also called morphological marker or verb classifier). The eleventh class has a zero suffix, and is subdivided into smaller subclasses depending on the quality of the root-final consonant and the root vowel. This is a small class, especially given the variety of conjugational patterns it includes, and there are less than 100 basic stems in it⁸ (Townsend 1975). The remaining 10 suffixed classes are identified by the suffix. These are the following classes: -aj-, -ej-, -a-, -e-, -i-, -o-, -ova-, -avaj-, -nu- (including the “disappearing -nu-”), and -zha. The suffix determines all the parameters of the conjugational paradigm, which include:

1. Conjugational type (type of endings), 1st or 2nd;
2. Consonant mutations (mutations of the root-final consonant);
3. Stress shift (specific patterns in the -a-, -e-, and -i- classes);
4. Suffix alternations (-ova- alternates with -uj-, -avaj- alternates with -aj-, and -(nu)- disappears under specific conditions).

In addition, there are vowel alternations in zero-suffixed stems: “o” in the (o)j-stem alternates with “y.”

Before taking a closer look at the stems⁹ chosen for our experiment, we will review some facts about the morphological processes taking place in verbal conjugation. When the endings are added to the stem (which includes the optional prefix, the root, and the suffix), an automatic truncation rule works at the juncture of the stem and the ending. If the stem ends in a vowel and the ending begins in a vowel, the first vowel is truncated. The same is true for the consonants: the first one is deleted. Past tense endings begin with a consonant, and non-past tense endings begin with a vowel; therefore, stem-final vowels will be deleted in the non-past tense forms, and consonants will be deleted in the past tense forms.

The morphological processes in two Russian verbs, *chitat'* ‘to read’, and *pisat'* ‘to write’, will illustrate this description. Despite the fact that their infinitives look similar, they belong to different stems and have different conjugational patterns. The verb *chitat'* belongs to the -aj- class, and its stem *chit-aj-* ends in a consonant. In the past tense (and the infinitive as well), the -j- is truncated before consonantal endings:

chit-aj- + *-l* = *chital* ‘he read’

In the non-past tense, vocalic endings are simply added to the stem:

chit-aj- + *u* = *chitaju* ‘I read’

The verb *pisat'* belongs to the -a- class, with its stem ending in a vowel, and the past-tense consonantal ending is added to the stem:

Pis-a- + *-l* = *pisal* ‘he wrote’

In the non-past tense, vowel truncation takes place:

Pis-a- + *-u* = *pishu* ‘I write’

Note the consonant mutation “s”–“sh”, which in the -a- stem occurs throughout the non-past paradigm.

Table 1. Morphological Processes in the Stems Included in the Experiments

Verb classes	-aj-	-a-	-ej-	-e-	(i)j-	-i-	-ova-	-avaj-	(o)j-
Consonant truncation before conson. endings	✓		✓		✓			✓	✓
Vowel truncation before vowel endings		✓		✓		✓	✓		
Consonant mutation		✓		✓		✓			
Stress shift ¹⁰		✓		✓		✓			
Suffix alternation							✓	✓	
Vowel alternation									✓

Table 1 lists the morphological processes or “rules” shaping the conjugational patterns of the stems chosen for the experiment and includes automatic consonant or vowel truncation, which occurs at the juncture of the stem and the ending¹¹. Note that the table does not list the stems, which are not part of the experimental material. The reasons for the actual choice of the stems are provided in section 4 below. The most straightforward way to assess the complexity of paradigm for each verb class is to add up all the morphological processes occurring in this class. Thus, the -aj-, -ej-, and (i)j- stems have only one rule, that of consonant deletion, in their paradigm. The -a-, -e-, and -i- stems have three. The -ova-, -avaj-, and (o)j- stems have two. However, this mechanical computation does not take into account the relative complexity of the individual rules. Consonant and vowel truncation are automatic processes, which take place in every conjugational pattern. Consonant mutation and stress shift occur only in the -a-, -e-, and -i- stems; therefore, they are less common, and involve more complex rules. Suffix alternation in the -ova- and -avaj- stems is even more marginal in the Russian verbal system. The vowel alternation occurring in the 5 (o)j- stems places this class in the exceptions category.

4. Experimental Material

Type and token frequencies (whole-word and stem-cluster) were shown to influence verbal processing in both adult and child native speakers. But while

adult native speakers potentially have full access to type and token frequencies, formal L2 learners with lower proficiency in L2 have limited access to input frequencies in the target language. A beginning classroom typically exposes learners to most verb classes (types), but the relative size of these classes (type frequency) is not available to the learners, and the frequency of use of individual verb classes may differ substantially from the one found in native Russian. Likewise, token frequencies of individual verbs used in a highly structured situation of learning and a controlled classroom setting do not reflect the ones found in native speech. As a result, L2 learners may develop an interlanguage (IL) system based on verb classes of a more uniform size than the classes in the native language and with non-native token frequencies of individual verbs. Therefore, one can hypothesize that native input frequencies will affect non-native verbal processing indirectly, only to the extent that they are reflected in the actual L2 input frequencies.

Table 2. Type Frequencies of the Verb classes Included in the Experiments: Native and Second Language Input

Verb classes	-aj- Productive	-a- Productive	-ej- Productive	-e- Productive	(ij)- Productive	-i- Productive	-ova- Productive	-avaj- Productive	(oj)- Productive
Russian language Type frequency	11814	940	608	328	160	7019	2816	94	98
Russian language Number of unprefixes stems		Appr. 60 stems		Appr. 50 stems	7 stems			3 stems	5 stems
Input to L2 learners Type frequency	55 (86) ¹²	14 (24)	0 (4)	8 (12)	3 (3)	52 (80)	13 (34)	2 (7)	2 (5)
Input to L2 learners Number of uses	4333	1298	12	782	239	4546	555	273	158

Accordingly, the study uses its own frequency counts, which were done with the assumption that the frequencies found in the instructional materials used in first-year Russian would be the best approximation available of the

input frequencies to which our subjects were exposed¹³. The type frequencies and the number of uses of all the verbs were computed for two volumes of the textbook and two volumes of the workbook, which are part of the instructional package *Live from Moscow!* (Davidson, Gor, and Lekic 1996) that was used in first-year Russian. The counts included not only all of the verbs present in the books, but also the verbs in exercises that the students had to generate themselves. For example, if the assignment was to say where the student eats his/her breakfast, lunch, and dinner, the verb “to eat” was counted 3 times in the 1st person singular non-past tense. The type frequencies found in the input to the learners were compared with the data on the Russian language (Townsend 1975; Zalizniak 1980).

Table 2 contains information about the type frequencies of the stems included in the experiment and about their productivity. In the first row corresponding to the Russian language, the numbers in each column represents the results of the verb counts, which we performed on the *Grammatical Dictionary of the Russian Language* (Zalizniak 1980) with approximately 100,000 entries. These counts contain all the verbs belonging to a particular conjugation class and include the prefixed and reflexive verbs. The second row provides the number of unprefixed stems for the small unproductive classes (based on Townsend 1975 and Davidson et al. 1996). The next two rows contain two types of data on input frequencies obtained for L2 learners taking part in Experiment 2. The third row shows the L2 type frequencies, and the fourth row the data on the frequency of use, which were computed by adding all the occurrences of all the verbs belonging to each stem¹⁴. In the counts based on first-year Russian instructional materials, all the prefixed and reflexive verbs were computed as separate items. Therefore, the counts in the first row for Russian language and the third row for L2 speakers are based on the same criteria. According to Joan Bybee (1995), type frequency contributes to the productivity of a given schema¹⁵. And indeed, the type frequencies and productivity of the stems used in the study confirm the prediction made by Bybee (1995) that the patterns (schemas) with high type frequency are productive. One can expect the conjugational patterns of the productive classes with high type frequency to be generalized more often than the patterns for the low type frequency classes.

The experimental material included 3 pairs of stems, which have a similar past tense (and infinitives as well), but have different conjugational patterns in the non-past tense:

-aj- and -a-
 -ej- and -e-
 (i)j- and -i-

The stem is not recoverable in the past tense because the “j” is truncated; therefore the speakers need to “guess” the underlying stem to conjugate the verb in the non-past tense. The experiment aims at establishing which conjugational patterns will be generalized. Of these 6 stems, three belong to the high type frequency productive classes -aj-, -ej-, and -i-. One can expect the conjugational patterns of the productive classes with high type frequency to be generalized more often than the patterns for the low type frequency classes. Therefore, one can predict that the -aj-, -ej-, and -i- patterns will be generalized to the -a-, -e-, and (i)j- classes. At the same time, the three stems ending in “j,” -aj-, -ej-, and (i)j-, have less complex conjugational patterns, and if the complexity of paradigm plays a role in verbal processing, these stems should be more generalizable. One can easily see that there is a conflict between two predictions for the -i- and (i)j- stems. From the point of view of the complexity of paradigm, the (i)j- pattern should be generalized. But the (i)j- pattern occurs only in 7 stems; therefore based on type frequency, the -i- pattern should be generalized.

The next two stems included in the testing material, -ova- and -avaj-, have similar conjugational features – they show suffix alternations in the non-past tense: -ova- alternates with -uj-, and -avaj- alternates with -aj-. For such stems, the past tense form contains sufficient morphological information (morphological cues) for the speakers to be able to identify the stems. However, these classes differ radically in their type frequencies: the -ova- class has high type frequency, whereas the -avaj- class has only three basic stems. The experiment tests whether the subjects actually pay attention to the morphological cues and produce the suffix alternation expected in these stems, and whether type frequency influences their processing.

The last stem, or more exactly, the subclass of zero-suffixed stems, (o)j-, has a very special feature: alternation of the root vowel in the past tense: “o” alternates with “y”. The vowel “y” does not occur in any of the suffixes, and the past tense form of such verbs sounds unusual. This stem was included to test whether the presence of the vowel “y” serves as a cue for the low type frequency (o)j- stems.

The study included 3 experiments; Experiments 1 and 2 involved American learners, and Experiment 3, which matched Experiment 2, native Russian speakers.

5. Experiment 1 with American Learners (Written)

5.1. Experimental Procedure

Experiment 1 was a paper-and-pencil test, which tested the knowledge of the conjugational rules, since the conjugational pattern was recoverable from the provided stimuli¹⁶. This experiment aimed at establishing the baseline for the oral Experiment 2 with unrecoverable stems. The data for Experiment 1 were collected from 15 volunteer students at the University of Maryland, College Park in the middle of their third semester of Russian. The testing material consisted of 46 real Russian verbs belonging to 9 stems (see the Appendix for the list of verbs)¹⁷. The experiment consisted of 2 parts. In the first part, the stimulus verb was provided as a basic stem¹⁸, and the subjects were asked to generate 3 non-past tense forms: the 1st and 2nd person singular, and the 3rd person plural. In the second part, 2 forms of the stimulus verb were provided: the past tense plural and the non-past 3rd person plural. The subjects had to generate 2 forms: the 1st and 2nd person of the non-past tense. In both parts of the test, the conjugational pattern was recoverable from the provided stimuli. In addition to establishing the baseline for the oral Experiment 2 with unrecoverable stems, the goal of Experiment 1 was to determine, which condition, “stem” (the stimulus verb provided as a basic stem) or “forms” (the stimulus verb provided as two verb-forms), facilitates verbal processing to a greater extent.

5.2. Results of Experiment 1

The experiment measured two parameters of the subjects' responses: the rates of correct stem recognition (which ignored errors in consonant mutation and conjugation type), and correct response rates for each verb class. All of the 15 students' responses to the set of 46 verbs were transcribed, and the scores for all individual verbs grouped by the stem were entered in a table as numbers of verbs that were conjugated as belonging to one of the verb classes included in the experiment. The last column, “Other,” was reserved for the responses that did not follow the paradigm for any of the stems used in the initial set of verbs. By averaging these data we computed the percentages of stem recognition as well as the rates of generalization for each verb class, which are represented in Table 3. The experiment tested the students' knowledge of the Russian conjugational system, and more specifically, of its one-stem description. Since most of the verbal

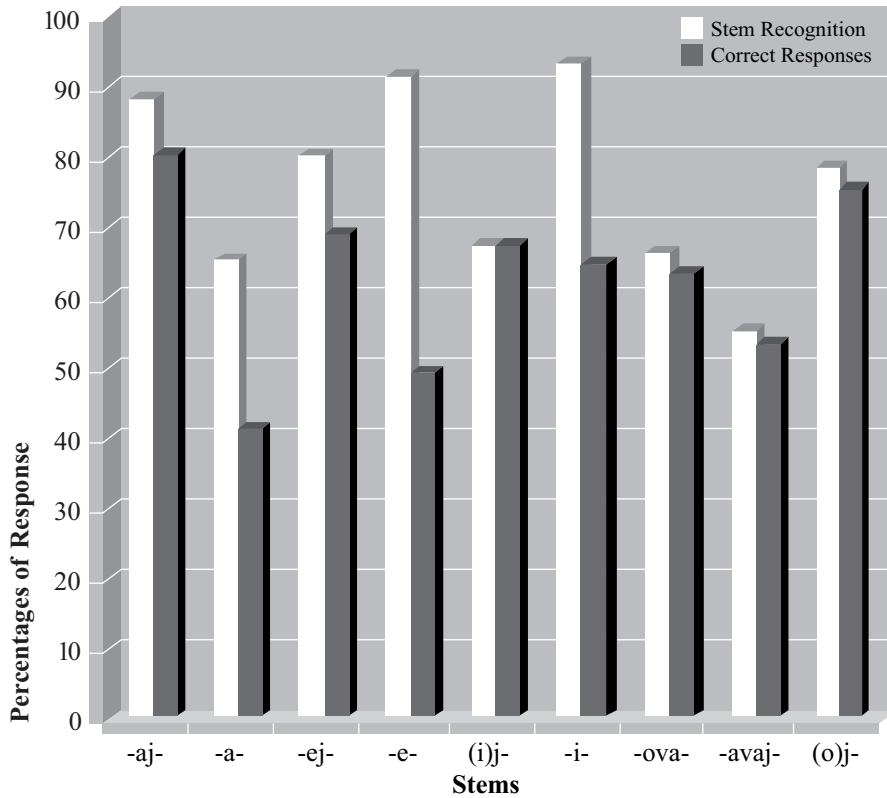


Figure 1. Rates of Stem Recognition and Correct Responses in the Written Experiment (American Learners)

stimuli were unfamiliar to the subjects, the written experiment revealed not their knowledge of the conjugational paradigms of individual verbs, but their ability to process the novel verbs belonging to different classes. The results of Experiment 1 demonstrated that the beginning American learners were reasonably good at stem recognition. For most stems the rate was above 60%, and for 5 stems it was above 75%. Figure 1, which combines the results for both parts of the experiment, the “stem” and “forms” conditions, compares the rates of stem recognition and correct responses. The percentage of correct responses was predictably lower. The greatest discrepancies are found in the -a-, -e-, and -i- stems, which have complex conjugational patterns including consonant mutations and stress shifts, and which belong to different conjugation types, the latter fact representing another source of confusion for beginning learners.

Table 3. Distribution of Responses in Experiment 1 with American Learners: Stem Recognition (Written)

Stimuli	Responses									
	-aj-	-a-	-ej-	-e-	(i)j-	-i-	-ova-	-avaj-	(o)j-	Other
-aj-	88.0	3.6			0.4			1.3		6.7
-a-	28.0	64.9							0.4	6.7
-ej-			80.4	14.3	1.3					4.0
-e-	0.4	0.8	4.7	91.0						3.1
(i)j-		6.7			67.0	13.3				6.7
-i-	0.7	1.3			1.0	93.0		2.0		2.0
-ova-	16.9	3.1					65.8	0.4	3.1	10.7
-avaj-	40.6	0.6	0.6					55.0		3.2
(o)j-						4.0			86.7	5.3

The “stem” condition required the use of the most analytical procedures – the subjects had to apply the conjugational pattern to the abstract representation of the stimulus verb, its basic stem. The “forms” condition provided two real verb-forms, which, depending on the specific stem, could contain the information about the conjugation type, the conjugational pattern (“Vowel+j” in the -aj-, -ej-, and (i)j- stems versus “Vowel” in the -a-, -e-, and -i- stems), consonant mutations, suffix, and vowel alternations. The comparison of the results for these two conditions established that, overall, the “forms” condition produced higher rates of stem recognition than the “stem” condition. The Z-test was performed for 8 stems¹⁹, and on 5 of them the form condition scored significantly higher at the 0.05 confidence level. Only in the -i-, -e-, and (o)j- stems were there no significant differences between the two conditions.

6. Experiment 2 with American Learners (Oral)

6.1. Experimental Procedure

The same group of 15 volunteer students at the University of Maryland took part in Experiment 2. It was conducted orally and individually with each subject, and recorded on audiotape. The subjects met with the experimenter and received the printed version of the test, which included written instruc-

tions. The experimenter read aloud all the sentences carrying the verb in the past tense and the question designed to trigger the use of non-past forms by the subject. A warm-up containing the verbs not included in the main testing material preceded the main part of the experiment.

The testing material consisted of 48 real Russian verbs, which served as prototypes for the nonce verbs used in Experiment 3 with native speakers of Russian. These 48 verbs belonged to the following verb classes and subclasses of non-suffixed stems (based on Jakobson's one-stem verb system): -aj-, -ej-, (i)j-, (o)j-, -a-, -e-, -i-, -ova-, -avaj- (see the Appendix for the list of verbs). The number of verbs in each class varied from 2 for very small (i)j- and (o)j- subclasses to 6-8 in other classes. Half of the students received the test with a different order of verb presentation – the last 24 verbal stimuli were moved to the beginning of the test in order to control for the fatigue factor. The verbal stimuli were in the past tense plural form. The subjects were asked to generate the non-past 3rd person plural and 1st person singular forms of the verbal stimuli. All the verbs were embedded in simple carrying sentences, which, together with follow-up questions, formed a quasi-dialogue:

Experimenter: Yesterday they _____. And what are they doing today?
 Subject: Today they _____²⁰.
 Experimenter: And you?
 Subject: Today I _____.

This elicitation technique is based on the adaptations of the instrument developed by Bybee and Slobin (1982) used in the studies of child L1 acquisition of Norwegian, Icelandic (Ragnasdóttir, Simonsen, and Plunkett 1997; Simonsen 2000), and Italian (Matcovich 1998).

After the oral part was completed, students received the list of all the verbs included in the main part of the test and were asked to check off all the verbs that they knew. Most of the verbs in the testing material were unfamiliar to the learners, but we decided to include several verbs from the active 1st year vocabulary frequently used in the classroom to make the task psycholinguistically more authentic for the beginning learners of Russian. In order to control for the familiarity factor, we performed all the computations separately for 25 verbs that no more than 2 students identified as familiar. Since the results for these 25 unfamiliar verbs showed exactly the same tendencies as the entire sample, we will discuss the data on all the 48 verbal stimuli.

6.2. Results of Experiment 2

This experiment also computed the rates of stem recognition and correct responses. Table 4 contains the rates of stem recognition collapsed for each stem. The results obtained for the -aj- and -a- stems indicate that L2 learners identified and generalized the high type frequency -aj- pattern. The next pair of stems, -ej- and -e-, manifests a weaker tendency to identify and generalize the -ej- pattern. In the last, “problematic,” pair of stems, (i)j- and -i-, the tendency to generalize the (i)j- pattern is even weaker than in the two preceding stems. At the same time, the -i- pattern had low generalizability as well. Overall, the non-native processing of the “paired” stems shows the following tendency: the -aj- pattern demonstrates high generalizability, while the -ej- and (i)j- patterns are used more often in the responses to the appropriate stems than to their counterpart stems without

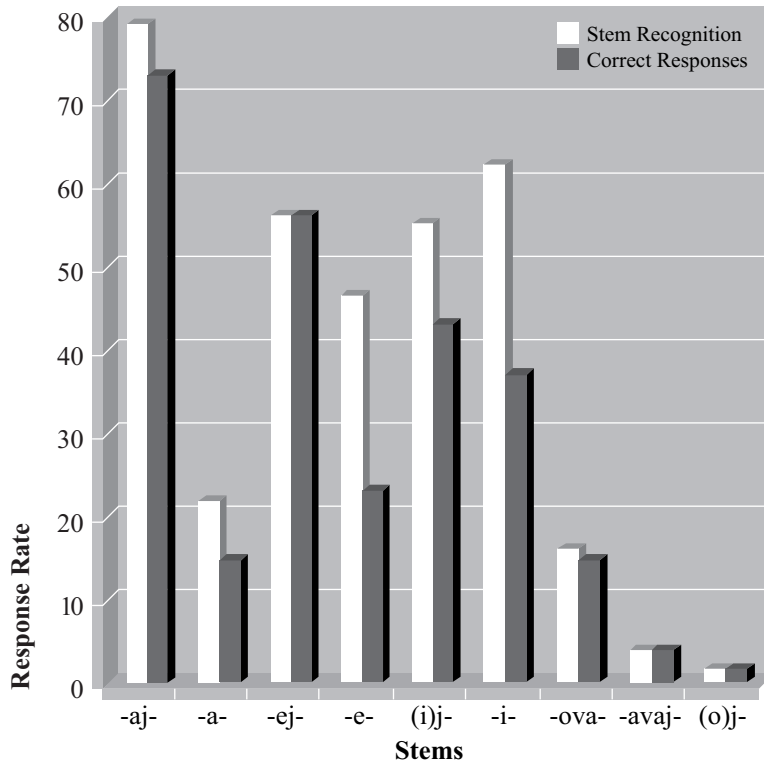


Figure 2. Rates of Stem Recognition and Correct Responses in the Oral Experiment (American Learners)

the -j-. Thus, in the last two pairs of stems, the American learners proved to be reasonably efficient at “guessing” the underlying unrecoverable stem.

L2 learners experienced difficulties with the identification of the -ova- and -avaj- suffixes (or possibly, with the application of the pattern with suffix alternation). The low type frequency (o)j- stem was very poorly identified. The responses to this stem showed an interesting feature: 1/3 of the (o)j- verbs were conjugated using the *(y)j- pattern illegal in Russian. Figure 2 compares the rates of stem recognition and correct responses in this experiment and reveals that the differences are the greatest for the -e- and -i stems with complex conjugational paradigms.

Table 4. Distribution of Responses in Experiment 2 with American Learners: Stem Recognition (Oral)

Stimuli	Responses									
	-aj-	-a-	-ej-	-e-	(i)j-	-i-	-ova-	-avaj-	(o)j-	Other
-aj-	79.0	12.0			2.2			0.8		6.0
-a-	66.0	22.0			0.5	0.5				11.0
-ej-	3.9	18.2	56.0	9.3	1.1	0.5				11.0
-e-	5.2	1.9	30.0	46.6	4.3		1.0			11.0
(i)j-	1.6	15.0		1.6	55.0	22.0			1.6	3.2
-i-	10.0	2.5	7.1		7.9	62.0				10.5
-ova-	68.3					6.7	16.1		0.6	8.3
-avaj-	80.6		0.6			3.3	5.8	3.9		5.8
(o)j-			1.7		13.3	1.7			1.7	81.6

7. Experiment 3 with Russian Speakers (Oral)

7.1. Experimental Procedure

Experiment 3 was conducted with 27 adult Russian speakers at St. Petersburg State University, and provided a native baseline for Experiment 2 with American learners of Russian. The experimental procedure was the same as in Experiment 2. The testing material consisted of 48 nonce verbs, which we created by manipulating the initial segments in the real Russian verbs used with American learners (see the list of verbs in the Appendix).

The aim of modifications was to preserve as much of the phonological shape of the real verbs as possible, but at the same time, to avoid any close resemblance to the real verbs. In most cases, only the initial consonant was modified.

7.2. Results of Experiment 3

Table 5 shows the distribution of the rates of stem recognition for this experiment. In the “paired” stems, Russian speakers consistently identified and generalized the nonce verbs derived from the -aj- and -ej- classes. However, the same tendency cannot be observed in the -i- and (i)j- stems. Here the frequent -i- pattern is not dominant, in fact, neither pattern is very active. Native speakers conjugated approximately 1/2 of the -ova- verbs using the -ova- pattern involving the suffix alternation. But they did even less well on the -avaj- stem. Less than 1% of the (o)j-verbs with “y” in the past tense were conjugated as (o)j- stems. At the same time, approximately 1/2 of the (o)j- verbs were conjugated using the non-existent *(y)j- pattern.

Table 5. Distribution of Responses in Experiment 3 with Native Speakers of Russian: Stem Recognition (Oral)

Stimuli	Responses									
	-aj-	-a-	-ej-	-e-	(i)j-	-i-	-ova-	-avaj-	(o)j-	Other
-aj-	89.7	0.6	3.1			3.5				3.1
-a-	80.9	11.7	3.1							4.3
-ej-	0.6		73.8	7.4	0.6					17.6
-e-	1.3		60.4	25.5			0.8			12.0
(i)j-			2.8		24.1	16.7	8.3			48.1
-i-	2.6		12.2		30.0	36.6	0.2			18.4
-ova-	40.4					1.6	47.2			10.8
-avaj-	61.1		3.0			0.4	9.3	21.8		4.4
(o)j-	0.9		0.9			6.5			0.9	90.8

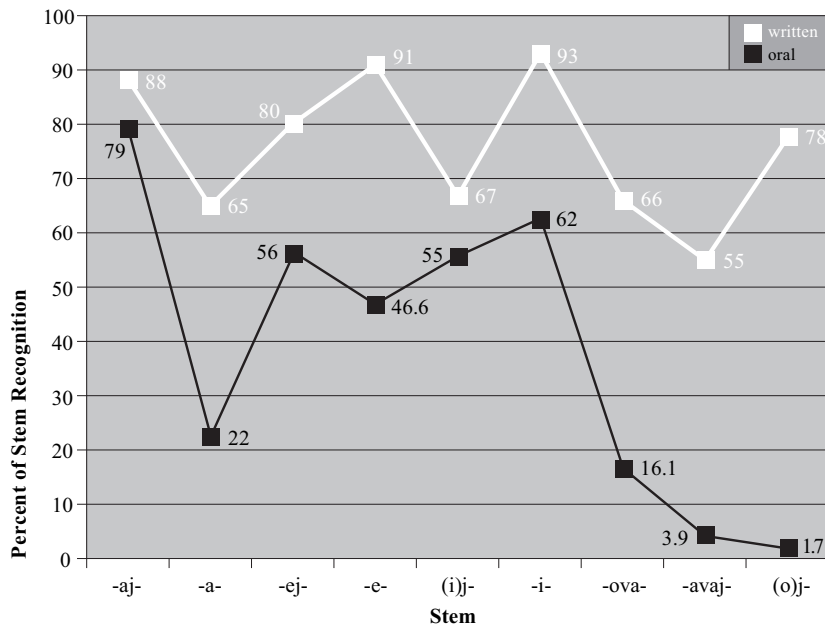


Figure 3. Rates of Stem Recognition in the Oral and Written Experiments (American Learners)

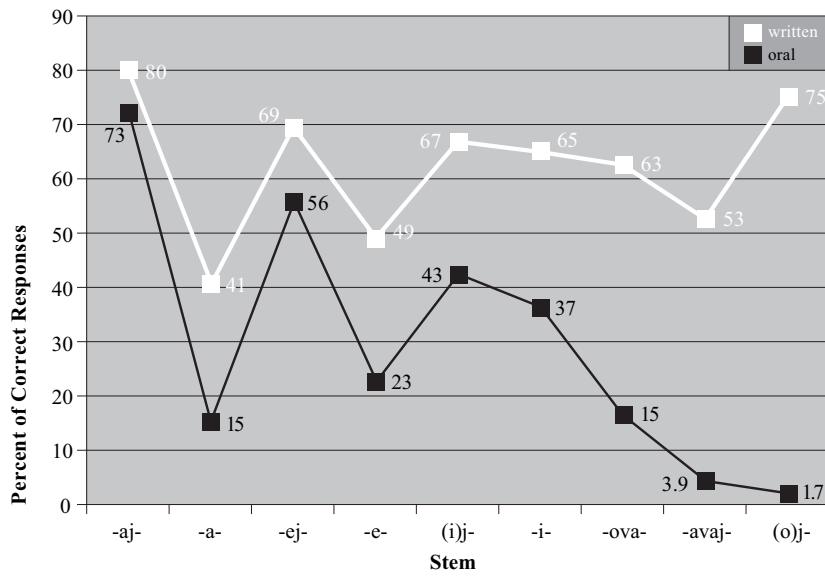


Figure 4. Rates of Correct Responses in the Oral and Written Experiment (American Learners)

8. Comparison of the Results of Experiments 1, 2, and 3 and Discussion

This section will compare and discuss two sets of data, oral and written, for the American learners, and the oral results obtained for the American learners and native speakers of Russian. It will then analyze the experimental evidence on the rates of missed consonant mutations in Experiments 1, 2, and 3.

8.1. Comparison of the Written and Oral Results (Experiments 1 and 2)

The comparison of the rates of stem recognition and correct responses in Experiments 1 and 2 yielded a fully predictable result: they were higher in the written experiment than in the oral one (see Figures 3 and 4). The Z-test performed on the results established that this difference was statistically significant for all the stems at the 0.05 confidence level. Apparently, two factors contributed to this effect. The most important factor is that in the written experiment, all the stems were recoverable from the provided stimuli, whereas in the oral experiment 6 “paired” stems were unrecoverable. Accordingly, the subjects were performing different tasks – applying their

Figure 1. Rates of Stem Recognition and Correct Responses in the Written Experiment (American Learners)

knowledge of the conjugational system in the written experiment and “guessing” based on their knowledge of the conjugational system, which included statistical probabilities, in the oral experiment. The analysis of the data for individual stems reveals that the greatest difference between the written and oral results is observed in the stems containing the morphological cues, -ova-, -avaj-, and especially (o)j-. This is due to the presence of the target conjugational pattern in the provided stimuli for these stems, in the “forms” condition for all three of them, and in both conditions for the (o)j- stem.

8.2. Comparison of Non-Native and Native Processing (Experiments 2 and 3)

Figure 5 compares the rates of stem recognition in the two oral experiments with American learners and native speakers of Russian. The discussion will focus, first, on the similarities, and then on the differences in the obtained results.

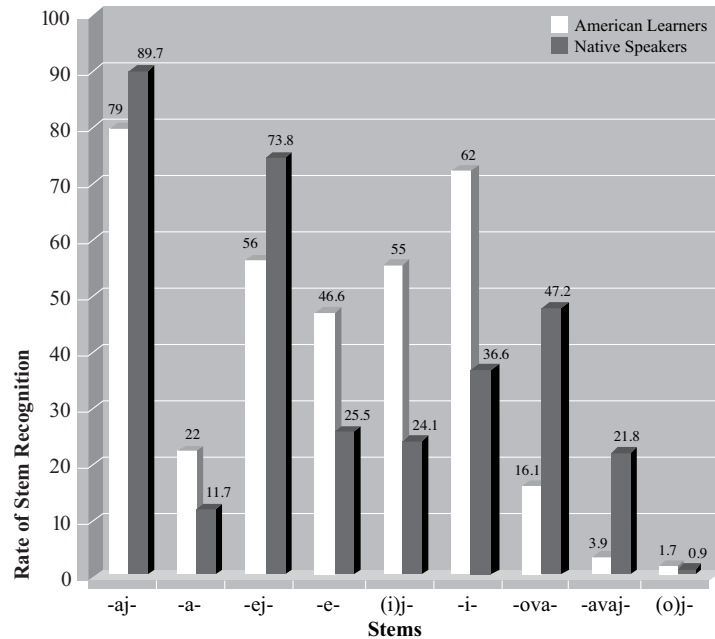


Figure 5. Rates of Stem Recognition in American Learners and Russian Native Speakers

Both groups of subjects identified and generalized the productive -aj- and -ej- patterns. Both the American and Russian speakers created the *(y)j- pattern illegal in Russian in response to the (o)j- stems. Thus, both non-native and native speakers relied heavily on the “Vowel + j” pattern, apparently the default pattern in Russian. The results obtained for the -aj-/-a- and -ej-/-e- pairs fully confirm the prediction that the conjugational pattern of high type frequency verbs will be generalized to low type frequency stems. At the same time, these results are not in conflict with the predictions based on the complexity of paradigm. We will return to the L2 data regarding the -ej-/-e- stems later in this section. However, the results for the -i- and (i)j- stems do not show the same tendency. Here the frequent -i- pattern was competing with a less complex (i)j- pattern. Since the -i- class is productive and has high type frequency, while the (i)j- subclass of zero-suffixed verbs includes only 7 basic stems, it was expected that the -i- pattern would be generalized to the (i)j- stems. However, the rate of generalizations of the -i- pattern was relatively low. There are two possible interpretations for this effect:

1. In individual stems the complexity of paradigm factor overrides the frequency factor.
2. The overall pattern of responses in the experiment suggests that both groups of subjects favour the default rule “recover the j,” regardless of the stem. Consequently, the low generalization rates for the -i- stem in comparison with the -aj- and -ej- stems could reflect the differences between default and non-default processing rather than regular and irregular processing.

The -ova- class has high type frequency and is productive, while the -avaj- class includes only 3 stems. Therefore, the fact that the -ova- marker worked better as a cue to the conjugational pattern than the -avaj- marker for both groups of subjects, confirms the role of frequency in processing novel verbs. However, the -ova- cue has limited efficiency and does not automatically trigger the suffix alternation. As for the (o)j- class, which includes only 5 stems, the results indicate that neither group of speakers established analogies with this class in processing the verbal stimuli.

At the same time, the Z-test showed significant differences in the rates of stem recognition in L2 and L1 processing for all the stems, except the (o)j- stem at the 0.05 confidence level. American learners had significantly lower rates of stem recognition for the -aj-, -ej-, -ova-, and -avaj- stems, as well as significantly higher rates for the -a-, -e-, -i-, and (i)j- stems (see Figure 5). These differences suggest that the beginning American learners relied on the default “Vowel+j” pattern less often, and generalized less “regular” patterns more often than the native Russians.

One of the goals of this study was to compare the input frequencies to L2 learners and native speakers of Russian, and determine if the differences between them can account for the differences in the results obtained for the two groups of subjects. While the type frequencies of the different verb classes obtained for non-native input generally reflect the ranking of classes in Russian language, there are significant differences (see Table 2):

1. Quantitative differences between the verb classes are less salient in the L2 input.
2. The -ej- stem is practically not represented in the L2 input (it occurs only in the passive vocabulary).

Given the leveling of differences in class size in the non-native input, one could expect fewer generalizations of high type frequency classes to small classes and less reliance on the default patterns in L2 processing. And

indeed, L2 speakers tended to generalize the -aj- pattern less than the native speakers. The most striking result, however, is that L2 speakers consistently identified and generalized the -ej- pattern, which was very poorly represented in the L2 input, and the (i)j- pattern, which has low type frequencies both in native Russian and the input to L2 learners. Here, L2 learners were relying not on input frequencies, but rather on the default “Vowel+j” pattern in Russian. At the same time, they were avoiding the more complex conjugational pattern. Thus, the American learners were efficient in their use of the native processing strategy – generalization of the default pattern. At the same time, they used the default pattern less often than the native speakers, probably at least in part due to the leveling effect in the input they had received.

8.3. Consonant mutations (Experiments 1, 2, and 3)

The results of both oral experiments suggest that neither non-native nor native processing necessarily trigger all the rules shaping the conjugational pattern for a particular paradigm. It appears that speakers can single out and apply individual discrete rules, but the whole pattern is not always activated. Thus, one such rule (“recover the j”) was generalized in cases of ambiguity, and its application even resulted in the creation of the *(y)j-pattern illegal in Russian. One way to test this claim on additional data was to look at the pattern of consonant mutations. The rates of stem recognition did not take into account the errors in consonant mutation, and we analyzed the rates of missed mutations for the -a-, -e-, and -i- stems separately for the oral non-native, written non-native, and oral native data.

Table 6. Rates of Missed Consonant Mutations in Experiments 1, 2, and 3

Stems	-a-	-e-	-i-	Average
American Oral	41.4	58.3	34.6	43.9
American Written	19.6	36.7	37.3	29.3
Russian Oral	65.0	63.0	47.4	56.1

Table 6 demonstrates that the rates of missed mutations were high, with native Russians scoring the highest, and American learners scoring the lowest on the writing test. According to the Z-test, the differences between

all the three average figures were statistically significant at the 0.05 confidence level, however, the difference between the American and Russian oral data is borderline significant. It still remains to be explained why the Russian speakers omitted slightly more mutations than the American learners. The first possible explanation involves the use of the avoidance strategy documented in SLA research: because L2 learners are not confident with the application of the mutation rules, they use the forms requiring mutation less frequently. But this explanation is not borne out by the data, since the American learners used the -a-, -e-, and -i- conjugational patterns more often than the Russian speakers. Based on these results, one may speculate that the paradigm is more dissociated in L1 processing, and that L2 learners are more consistent in applying the entire conjugational pattern.

9. Conclusions

This study analyzed the role of input frequency (type frequency), the complexity of paradigm, and morphological cues in L2 and L1 processing of Russian verbal morphology. It demonstrated that American learners approached the task of generating Russian verbs in the same way as Russian native speakers. Both groups of speakers dealt with morphological complexity and relied on morphological cues in similar ways. Both L2 learners and L1 speakers identified and generalized the default “Vowel+j” pattern. The high rates of missed consonant mutations and the application of the rule “recover the j” to an inappropriate verb class indicate that the rules constituting the conjugational paradigm are not necessarily applied in a set. The type frequencies of the verb classes influenced both non-native and native verbal processing – high frequency conjugational patterns were more readily generalized to other classes. Also, the morphological cues worked better in the processing of high frequency classes. However, in the task, which required the generation of novel verb forms, the complexity of paradigm overrode the frequency factor. At the same time, there are significant differences in the rates of L2 and L1 use of the individual conjugational patterns – L2 learners relied on the default pattern less and generalized the less “regular” patterns more than L1 speakers, which is to a large extent due to the differences in the L2 and L1 input frequencies. In the small subset of the Russian verbs the beginning learners of Russian were exposed to, the differences between the type frequencies of the verb classes were much less salient than in the Russian language as spoken by native speakers.

The obtained results shed new light on the discussion between the proponents of the dual- and single-system approaches to morphological processing. On the one hand, the role of type frequencies both in L2 and L1 processing is an indication that symbolic rule application, which is completely independent of input frequencies, can hardly be found in the processing of Russian complex morphology. On the other hand, the generalization of the “Vowel+j” pattern to inappropriate verb classes is an indication that the processing of Russian verbal morphology is not entirely dependent on phonological similarity or morphological cues. Thus, neither the dual- nor single-system approach account for all the aspects of the reported data. A hybrid model combining these two approaches seems to be in order. Such a model integrating both approaches, which has a better fit to the reported data, is actually being developed (Gor 2003).

Therefore, the study has demonstrated that in processing complex verbal morphology, L2 speakers could successfully apply the pedagogical rules taught explicitly in the focus on form classroom. In addition to that, structured exposure to the target verbal system led to the development of native-like processing strategies in L2 learners – similarly to native speakers, they generalized the default pattern to other verb classes. L2 speakers relied on their knowledge of the statistical probabilities (type frequencies of the verb classes), which was shaped by the input they had received in the classroom. The role of input frequencies demonstrated in this study emphasizes the importance of the statistical characteristics of the language used in the classroom for the internalization of the target language system and for the development of native-like processing strategies in L2 learners. And finally, the results of this study highlight the positive outcome of focus on form instruction, which combines a meaning-based approach with explicit explanations and practice in the formal aspects of linguistic processing.

Acknowledgements

The work was partly supported by The Russian Scientific Foundation for Research in Humanities (grant 00-04-00338a) and by The Russian Foundation for Basic Research (grant 00-15-98855).

Appendix

The Russian Verbs and Matching Nonce Verbs Used in the Experiments

(In some cases both simple and progressive forms are possible in translating Russian forms.)

Real Russian verbs	Nonce Verbs	Real Russian verbs	Nonce Verbs
-aj- plAvali (they) swam pr'Adali (they) moved their ears kArkali (they) croaked igrAli (they) played gul'Ali (they) walked lAzali (they) climbed	-aj- klAvali tr'Adali pArkali kidrAli tul'Ali rAzali	(i)j- pIli (they) drank gnIli (they) rotted	(i)j- kIli bnIli
-a- pisAli (they) wrote mAzali (they) spread plAkali (they) cried kIkali (they) called sYpali (they) strewed pr'Atali (they) hid	-a- kisAli vAzali trAkali tIkali tYpali ml'Atali	-i- l'ubIli (they) loved prosIli (they) asked vozIli (they) carried plAvili (they) swam krivIli (they) twisted glAdili (they) stroked razIli (they) hit mutIli (they) stirred up	-i- d'ubIli trosIli gozIli klAvili tlivIli grAdili gazIli lutIli
-ej- umEli (they) were able zhalEli (they) felt sorry krasnEli (they) turned red imEli (they) had grEli (they) warmed up tlEli (they) smouldered	-ej- ugEli talEli plasnEli irEli drEli glEli	-ova- risovAli (they) drew diktovAli (they) dictated ekzamenovAli (they) examined gazovAli (they) speeded up prObovali (they) tried kantovAli (they) edged	-ova- lisovAli biktovAli vremenovAli bazovAli sObovali tantovAli
-e- visEli (they) hanged sidEli (they) sat vIdeli (they) saw kipEli (they) boiled zavIseli (they) depended xrapEli (they) snored gl'adEli (they) looked	-e- bisEli fidEli mIdeli tipEli davIseli shkapEli br'adEli	-avaj- vstavAli (they) stood up prodavAli (they) sold ustavAli (they) got tired predavAli (they) betrayed uznavAli (they) recognized	-avaj- vtlavAli udavAli ispavAli kledavAli oznavAli
		(o)j- mYli (they) washed krYli (they) covered	(o)j- zYli brYli

Notes

1. Schmidt contends that subliminal learning is impossible: “One convincing demonstration of learning without attention would be enough, but so far there have not been any. Several studies purporting to demonstrate learning without attention are shown to really have demonstrated only a low level of learning associated with a low level of attention” (Schmidt 1995b: X).
2. A special volume, “Focus on Form in Classroom SLA”, introduces the acronym for the term, **focus on form instruction** – FonF instruction (Doughty and Williams 1998).
3. Another issue addressed by empirical research is the positive role of negative feedback including explicit corrections on SLA (see Spada and Lightbown 1993; and Trahey and White 1993).
4. Most studies mentioned above deal with token frequency, or the frequency of individual verbs. For them Bybee, the proponent of the network approach, predicts that high-frequency verbs, both irregular and regular, will have high lexical strength and weak lexical associations with other verbs. As a result, these verbs will be easy to retrieve, but will influence other verbs belonging to the same class to a lesser extent (Bybee 1995: 450). Earlier studies did not take into account the distinction between whole-word and stem-cluster frequencies, which could have caused some of the discrepancies in the obtained results. This study is concerned with type frequencies, or in other words, with the sizes of verb classes. According to Bybee, the type frequency of a given class correlates with its productivity (Bybee 1995: 452).
5. For a detailed discussion of this issue see responses to the article by Harald Clahsen (*Behavioral and Brain Sciences* 22, 1999) and Gor 2003.
6. For an earlier discussion of the oral results on adult L1 and L2 verbal processing presented in this paper, see Chernigovskaya, and Gor 2000, and Gor and Chernigovskaya 2001.
7. The term “rule” refers to pedagogical rules, or in other words, explicit explanations provided to the learners in the language classroom. It is not intended to mean symbolic rules used in linguistic descriptions or psycholinguistic rules involved in mental processing.
8. Note that two such subclasses, the (o)j- and (i)j-, are part of the testing material. The subclasses of non-suffixed stems are listed by the stem vowel (in parentheses) and the stem-final consonant.
9. Since the verb class in the one-stem system is defined by the stem, this paper will use the terms verb class and stem interchangeably to refer to individual conjugational patterns. Each of these conjugational patterns is characterized by a type frequency – the size of the class, or the number of verbs that are conjugated using this particular pattern. Concurrently, the term stem will also refer to a specific part of the verb.
10. This paper does not discuss stress shifts in the obtained data.
11. All but two of the verb classes included in the testing material belong to the suffixed stems (classes). Two stems, (i)j- and (o)j-, belong to non-suffixed

stems ending in -j and differing by the root vowel (these are the subclasses of non-suffixed stems). For these subclasses, the conjugational pattern is defined by the stem vowel and the root vowel and the root-final consonant.

12. The first figure corresponds to the number of verbs in the active vocabulary, and the second figure (in parentheses) to all the verbs from the active and passive vocabulary combined.
13. The advantage of using the subjects who have completed only one year of instruction with a highly structured set of materials is that the experimenters can be confident that the frequencies computed based on the textbook and workbook truly reflect the input the learners have received. This approach becomes much more problematic with more advanced learners.
14. In discussing the data on the acquisition of French verbs (Guillaume 1927/1973), Bybee concludes that the number of uses influences the rate of generalizations less than type frequency (Bybee 1995: 433). We do not support Bybee's interpretation of the French verb data, which treats all the irregular 3rd conjugation verbs together, and provide the frequency of use data for our L2 learners. One can observe that except for the -ova- stem, the ranking of the stems based on type frequency and frequency of use is the same.
15. At the same time, Bybee claims that productivity, regularity, and default are different categories, which overlap in verbal processing only to a certain extent (Bybee 1995).
[K0]I'm replacing Table 2 by text.
16. This test was administered 1–2 weeks after the oral one depending on the individual schedule of the subjects. By conducting the written test after the oral one, we wanted to prevent any influence of the training potentially occurring in the course of the written test from impacting the results of the oral test.
17. The stimulus set was the same as in Experiment 2, with the exception of 2 verbs.
18. This abstract notation containing the information about the verbal suffix was used as a pedagogical tool in the classroom.
19. The (i)j- stem was represented in this experiment by only one verb.
20. In Russian, present-tense verb forms are synthetic.

References

- Alanen, R.
1995 Input enhancement and rule presentation in second language acquisition. In *Attention and Awareness in Foreign Language Learning*, R. Schmidt (ed.), 259–302. University of Hawai'i at Manoa: Second Language Teaching and Curriculum Center.
- Alegre, M. and P. Gordon
1999 Frequency effects and the representational status of regular inflections. *Journal of Memory and Language* 40: 41–61.

- Baayen, H., T. Dijkstra and R. Schreuder
 1997 Singulars and plurals in Dutch: Evidence for a dual parallel route model. *Journal of Memory and Language* 37: 94–119.
- Bybee, J. L.
 1985 *Morphology: A Study of the Relation Between Meaning and Form*. Philadelphia: John Benjamins Publishers.
 1995 Regular morphology and the lexicon. *Language and Cognitive Processes* 10: 425–455.
- Chernigovskaya, T. and K. Gor
 2000 The complexity of paradigm and input frequencies in native and second language verbal processing: Evidence from Russian. *Language and Language Behavior* 3 (2): 20–37.
- Clahsen, H.
 1999 Lexical entries and rules of language: A multidisciplinary study of German inflection. *Behavioral and Brain Sciences* 22: 991–1060.
- Davidson, D. E., K. S. Gor and M. D. Lekic
 1996 *Russian: Stage One: Live from Moscow!* Kendall/Hunt Publishing Company: Dubuque, Iowa.
- Doughty, C. and L. Williams
 1998 Pedagogical choices in focus on form. In *Focus on Form in Classroom Second Language Acquisition*, C. Doughty and J. Williams (eds.), 197–261. Cambridge, UK: Cambridge University Press.
- Gor, K.
 2003 The rules and probabilities model of complex morphological processing. (forthcoming)
- Gor, K. and T. Chernigovskaya
 2001 Rules in processing of Russian verbal morphology. In *Current Issues in Formal Slavic Linguistics*, G. Zybatow, U. Junghanns, G. Mehlhorn and L. Szucsich, (eds.), 528–535. Frankfurt/Main: Peter Lang.
- Ellis, N.
 1993 Rules and instances in foreign language learning: Interactions of explicit and implicit knowledge. *European Journal of Cognitive Psychology* 5: 289–318.
- Harley, B.
 1993 Instructional strategies and SLA in early French immersion. *Studies in Second Language Acquisition* 15: 245–259.
 1998 The role of focus-on-form tasks in promoting child L2 acquisition. In *Focus on Form in Classroom Second Language Acquisition*, C. Doughty and J. Williams (eds.), 156–174. Cambridge, UK: Cambridge University Press.
- Housen, A.
 2002 The development of Tense-Aspect in English as a second language and the variable influence of inherent aspect. In *The L2 Acquisition of Tense-Aspect Morphology* R. Salaberry and Y. Shirai (eds.), 155–197. Amsterdam: John Benjamins.

- 2003 A corpus-based study of the L2-acquisition of the English verb system. In *Computer Learner Corpora, Second Language Acquisition and Foreign Language Learning*, S. Granger, J. Hung and S. Petch-Tyson (eds.), 77–116. Amsterdam: John Benjamins.
- Jaeger, J. J., A. H. Lockwood, D. L. Kemmerer, R. D. van Valin Jr., B. W. Murphy and H. G. Khalak
1996 A positron emission tomographic study of regular and irregular verb morphology in English. *Language* 72: 451–497.
- Jakobson, R. O.
1948 Russian conjugation. *Word* 4: 155–167.
- Jourdenais, R., M. Ota, S. Stauffer, B. Boyson and C. Doughty
1995 Does textual enhancement promote noticing? A think-aloud protocol analysis. In *Attention and Awareness in Foreign Language Learning*, R. Schmidt (ed.), 183–216. University of Hawai'i at Manoa: Second Language Teaching and Curriculum Center.
- Krashen, S.
1977 Some issues relating to the monitor model. In *On TESOL '77*, H. Brown, C. Yorio and R. Crymes (eds.), 144–158. TESOL, Washington, D.C.
- Langacker, R.
1987 *Foundations of Cognitive Grammar, vol. 1. Theoretical Prerequisites*. Stanford, CA: Stanford University Press.
1988 A usage-based model. In *Topics in cognitive linguistics*, B. Rudzka-Ostyn, (eds.), 127–161. Amsterdam: John Benjamins.
- Leeman, J., I. Arteagoitia, B. Fridman and C. Doughty
1995 Integrating attention to form with meaning: Focus on form in content-based Spanish instruction. In *Attention and Awareness in Foreign Language Learning*, R. Schmidt (ed.), 217–258. University of Hawai'i at Manoa: Second Language Teaching and Curriculum Center.
- Long, M. H.
1991 Focus on form: A design feature in language teaching methodology. In *Foreign Language Research in Cross-Cultural Perspective*, K. de Bot, R. B. Ginsberg and C. Kramersch (eds.), 39–52. Amsterdam/Philadelphia: John Benjamins Publishing Company.
- Long, M. H. and P. Robinson
1998 Focus on form: Theory, research, and practice. In *Focus on Form in Classroom Second Language Acquisition*, C. Doughty and J. Williams (eds.), 15–63. Cambridge, UK: Cambridge University Press.
- MacWhinney, B. and J. Leinbach
1991 Implementations are not conceptualizations: Revisiting the verb learning model. *Cognition* 40: 121–157.
- Marchman, V.A.
1997 Children's productivity in the English past tense: The role of frequency, phonology, and neighborhood structure. *Cognitive Science* 21, 283–304.

- Markus, G. F., S. Pinker, M. Ullman, M. Hollander, T. J. Rosen and F. Xu
 1992 *Overregularization in language acquisition*. Monographs of the Society for Research in Child Development 57 (4), Serial No. 228. Chicago: University of Chicago Press.
- Markus, G. F., U. Brinkmann, H. Clahsen, R. Weise and S. Pinker
 1995 German inflection: The exception that proves the rule. *Cognitive Psychology* 29: 189–256.
- Matcovich, O.
 1998 Regular inflection in the mental lexicon: Evidence from Italian. *Proceedings from the conference "The Verb in Cognitive Grammar,"* Gran.
- Orsolini, M. and W. Marslen-Wilson
 1997 Universals in morphological representation: Evidence from Italian. *Language and Cognitive Processes* 12: 1–47.
- Orsolini, M., R. Fanari and H. Bowles
 1998 Acquiring regular and irregular inflection in a language with verb classes. *Language and Cognitive Processes* 13: 425–464.
- Pinker, S.
 1991 Rules of language. *Science* 253: 530–535.
- Pinker, S. and A. Prince
 1988 On language and connectionism: Analysis of a parallel distributed processing model of language acquisition. *Cognition* 28: 73–193.
 1991 Regular and irregular morphology and the psychological status of rules of grammar. *Proceedings of the 1991 Meeting of the Berkeley Linguistics Society*.
 1994 Regular and irregular morphology and the psychological status of rules of grammar. In *The Reality of Linguistic Rules*, S. D. Lima, R. L. Corrigan and G. K. Iverson, (eds.), 353–388. Amsterdam: John Benjamins.
- Plunkett, K. and V. Marchman
 1991 U-shaped learning and frequency effects in a multi-layered perception: Implications for child language acquisition. *Cognition* 38: 43–102.
 1993 From rote learning to system building: Acquiring verb morphology in children and connectionist nets. *Cognition* 48: 21–69.
- Prasada, S. and S. Pinker
 1993 Generalization of regular and irregular morphological patterns. *Language and Cognitive Processes* 8: 1–56.
- Prasada, S., S. Pinker and W. Snyder
 1990 Some evidence that irregular forms are retrieved from memory but regular forms are rule-generated. Paper presented at *The 31st Annual Meeting of the Psychonomics Society*, 16–18 November.
- Ragnasdóttir, H., H. G. Simonsen and K. Plunkett
 1997 Acquisition of past tense inflection in Icelandic and Norwegian Children. In E. V. Clark (ed.), *Proceedings of the 28th Annual Child Language Research Forum*, Stanford.

- Robinson, P.
 1995 Aptitude, awareness and the fundamental similarity of implicit and explicit second language learning. In *Attention and Awareness in Foreign Language Learning*, R. Schmidt (ed.), 303–358. University of Hawai'i at Manoa: Second Language Teaching and Curriculum Center.
 1996 *Consciousness, Rules, and Instructed Second Language Acquisition*. New York: Peter Lang.
- Rumelhart, D. E. and J. L. McClelland
 1986 On learning the past tenses of English verbs. In *Parallel Distributed Processing: Explorations in the Microstructures of Cognition* vol. 2, J. L. McClelland and D. E. Rumelhart, (eds.), 216–271. Cambridge, MA: Bradford/MIT Press.
- Schmidt, R.
 1995a Consciousness and foreign language learning: A tutorial on the role of attention and awareness in learning. In *Attention and Awareness in Foreign Language Learning*, R. Schmidt (ed.), 1–63. University of Hawai'i at Manoa: Second Language Teaching and Curriculum Center.
- Schmidt, R.
 1995b Preface. In *Attention and Awareness in Foreign Language Learning*, R. Schmidt (ed.), IX–XVII. University of Hawai'i at Manoa: Second Language Teaching and Curriculum Center.
- Sharwood Smith, M.
 1993 Input enhancement in instructed SLA: Theoretical bases. *Studies in Second Language Acquisition* 15: 165–179.
- Simonsen, H. G.
 2000 Past tense acquisition and processing in Norwegian: Experimental evidence. *Language and Language Behavior* 3 (2): 86–101.
- Spada, N. and P. Lightbown
 1993 Instruction and the development of questions in L2 classrooms. *Studies in Second Language Acquisition* 15: 205–224.
- Stemberger, J. and B. MacWhinney,
 1988 Are inflected forms stored in the lexicon? In *Theoretical Morphology: Approaches in Modern Linguistics*, M. Hammond and M. Noonan, (eds.), 101–116. New York: Academic Press.
- Townsend, C. E.
 1975 *Russian Word-Formation*. Slavica Publishers.
- Trahey, M. and L. White
 1993 Positive evidence and preemption in the second language classroom. *Studies in Second Language Acquisition* 15: 181–204.
- Ullman, M. T.
 1999 Acceptability ratings of regular and irregular past-tense forms: Evidence for a dual-system model of language from word frequency and phonological neighborhood effects. *Language and Cognitive Processes* 14: 47–67.

- 2000 A mental model of morphology: The psychological and neural bases of the computation of complex words. *University of Maryland Working Papers in Linguistics* 10: 127–156.
- VanPatten, B.
1996 *Input Processing and Grammar Instruction in Second Language Acquisition*. Norwood, New Jersey: Ablex Publishing Corporation.
- VanPatten, B. and T. Cadierno
1993 Explicit instruction and input processing. *Studies in Second Language Acquisition* 15: 225–243.
- VanPatten, B. and S. Oikkenon
1996 Explanation versus structured input in processing instruction. *Studies in Second Language Acquisition* 18: 495–510.
- White, J.
1998 Getting the learners' attention: A typographical input enhancement study. In *Focus on Form in Classroom Second Language Acquisition*, C. Doughty and J. Williams (eds.), 85–113. Cambridge, UK: Cambridge University Press.
- Williams, J. and J. Evans
1998 What kind of focus and on which forms? In *Focus on form in classroom second language acquisition*, C. Doughty and J. Williams (eds.), 139–155. Cambridge, UK: Cambridge University Press.
- Zalizniak, A. A.
1980 *The Grammatical Dictionary of the Russian Language*. Moscow: Russian Language Publishers.