Native Intuitions of Speakers of a Lexical Accent System in L2 Acquisition of Stress. The Case of Russian Learners of Polish.

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Abstract

Native speakers of a lexical accent system (Russians) were tested on their second language (L2) acquisition of a phonological stress system (Polish). In Russian, a sizeable part of the lexicon is underlyingly marked for accents and claims on the position of default stress vary. This makes it interesting to investigate which L1 characteristics (distribution of lexical accents vs. phonological default) are transferred to L2 (if any). 35 Russian subjects were tested on their L2 production of Polish stress. The data shows a very consistent and almost uniform pattern of mistakes: the stem-final position. These results mirror one of the claims on the default stress in Russian suggesting that L2 errors originated from L1 transfer of that default. L1 transfer generally did not reflect the distribution of all lexical accent positions (though the latter were not completely excluded, they were restricted in their type). Results on the individual level show that various subjects possibly followed two alternative L2 learning paths.

1. Introduction

Metrical phonology is a fruitful area for second language acquisition research as stress systems are well-documented and increasingly well investigated. A growing body of research provides promising results showing that even 'late' L2 acquisition of stress might be at least partially successful (in a theoretically meaningful way) [2,4,10,13]. However, most L2 research in this area so far tested native speakers of phonological stress systems for L2 English. Here, I present data obtained from native speakers of a lexical accentual system (L1 Russian) learning Polish, which is a phonological stress system. The study reported here involves main stress on word level, in the nominal system only and inflectional morphology only. Therefore, the domain of stress assignment is the morphological frame for underived nouns given in (1) [1], which is the same in Russian and Polish:

$$[\text{Root}]_{\text{Stem}} + \text{Inflection(s)} \tag{1}$$

Let us introduce some facts about the metrical systems of Polish and Russian. Polish has fixed penultimate stress [12] and morphology plays no role in the assignment of stress in the nominal system. There are some loanwords that can be stressed antepenultimately. However, even those are stressed by Polish native speakers penultimately in the majority of cases (70%) [8]. The regularity of Polish stress system makes it an especially 'convenient' L2 target, as it enables clear identification (and therefore, facilitates subsequent analysis) of non-L2 performance. Contrary to Polish, in Russian lexical accents are inherent and are mapped directly onto the surface form without any phonological mechanism involved [1].

Accents can occur on any syllable of the word. When there is no underlying lexical marking for accent present, the phonological default comes into play. However, claims on the default position of stress in Russian vary, starting from initial [5,6,7,9], through final [11], post-stem [1] to stem-final [3]. Therefore, the crucial differences between Polish and Russian that bear on the L2 acquisition task are first of all, the fact that in Russian accents can occur in all positions in a word while in Polish stress occurs only penultimately, and secondly that morphological structure is at least potentially crucial in case of default stress in Russian while in Polish it plays no role in stress assignment. The following research questions arise:

- Can Russian native speakers acquire the Polish stress rule and what are the characteristics of this process?
- If language transfer from Russian occurs, will it reflect:
  a. the distribution of lexical accents; or
  b. the phonological default (if so, which one (initial, final, post-stem, stem-final)?

In an attempt to answer these questions, an experimental study was conducted, the methodology and results of which are presented in the remainder of this paper. In section 2, I provide the details of the experimental design and in section 3 the results obtained. Discussion follows in section 4 and section 5 contains conclusions.

2. Experimental design

2.1. Materials

To investigate if Russian native speakers are able to acquire the L2 stress rule (as opposed to lexically storing L2 stress), the stimuli used in the experiment were 54 nonsense words [10]. They were at the same time phonotactically correct Polish words. They were pre-tested with 8 native speakers of Polish for their acceptability as possible novel Polish words and for their lack of immediate similarity to real, existing words. They were also pre-tested with 2 native speakers of Russian to avoid coincidental overlap or striking similarity to real, existing Russian words. Taking into consideration the possible relevance of morphology in the assignment of default in Russian (and its possible transfer) as well as word length, the basic experimental design of the stimuli was as follows:

Table 1: *The experimental design.*

Stimuli:	3-syllabic	4-syllabic
Bare stem	12	12
Stem + monosyllabic inflection	12	12
Stem + bisyllabic inflection	2	4

Both in Polish and Russian nominal stems are consonant-final and any single vowel following the stem would be interpreted as an inflection assigning case, gender and number. This was implemented in the construction of the stimuli. Consonant-final stimuli could be interpreted as bare stems and those ending in a vowel following a consonant as stems with monosyllabic inflections. In case of disyllabic inflections only one was used in the test: –ami (Russian has an identical equivalent). As a precaution, the syllable structure in the stimuli was controlled as well (despite the fact that both systems are quantity-insensitive).

The stimuli were for example: *porenda, kasalforbant, falimont, szarmander, bogadoro, trodami*. They were all put in a carrier sentence: *Mała/e/y ... leży na stole*. ('A little...is lying on the table.') (for items that could be interpreted as bare stems and stems with monosyllabic inflections) and *Z małymi ... leżą na stole* ('They are lying on the table with little...') (for stems with disyllabic inflections). The case ending of the adjective preceding the test item implied the case interpretation. Bare stems and stems with monosyllabic inflections would receive a singular nominative case interpretation and stems with bisyllabic inflections a plural instrumental case. Each sentence was put on a separate card, and these were arranged (together with 23 fillers) in a randomized order (but the same for all subjects).

2.2. Procedure

The context language of the entire experiment was Polish. Subjects were asked to read aloud carrier sentences containing the stimuli. They were semi-blind to the purpose of the study being informed that they were being tested on the pronunciation of new, very rare and/or difficult Polish words. They were encouraged to familiarize themselves with the sentences and practice them before reading them aloud. In the test, subjects were asked to read all sentences three times (set by set, not sentence by sentence). Their performance was recorded on a DAT-recorder Tascam model no. DA-P1 at 48 000 Hz and using a microphone head-set AKG C-420. Afterwards, the stresses in the test items were transcribed by two judges (both Polish natives speakers and phonologists) and the agreement rate between them was κ=.821 (p<.01) or 89.4% (which qualifies as excellent [14]).

2.3. Subjects

The participants in this experiment were 35 Russian native speakers (26 female, 9 male) with mean age 18.10 (ranging from 17 to 34; s=3.16) and the mean age of onset of L2 acquisition at 14.10 (ranging from 5 to 34; s=5.24). They were all students residing in Poland and attending Polish courses in institutes at Polish universities. They were selected via detailed questionnaires with the following main selection criteria: being raised in monolingual Russian speaking homes, having received formal education in Russian and having used Russian primarily with family and friends in everyday life. Russian subjects were classified into two different proficiency levels: 65.7% lower (2 beginners & 21 intermediate) and 34.3% higher (12 advanced) (based on their proficiency results provided by the institutes where they attended Polish proficiency courses).

Moreover, a control group of 18 Polish native speakers was tested (10 female, 8 male). They were students from different parts of Poland, but all speaking a standard variety of Polish known as the Warsaw dialect. They were all 'naive' non-language students to maximize language 'intuitional' performance. The mean age of that group was 23.2 (ranging from 18 to 29; s=2.92).

All subjects were paid for their participation in the study.

2.4. Method of analysis

In this study, overall percentages of the relevant data were calculated. A multinominal regression model was used to check for significant predictors of the position of stress and for interactions between the predictors. Subsequently, separate Chi[2] tests were conducted on these predictors. For the measurement of agreement between judges, the Kappa test was used.

3. Results

3.1. Control group – Polish native speakers

Overall 2829 items were obtained from Polish native speakers. They produced an overwhelming percentage of penultimate stress, namely 99.4%. This is of course completely in line with the main stress position of their L1.

3.2. L2 learners – Russian native speakers

As already pointed out in section 2.2, subjects were asked to read all test items three times. They made roughly the same number of errors across the three reading trials (8-10%). There was no significant relation between the percentage of correct vs. incorrect answers across the three trials ($\chi^2(2)$=3.117, p=.210) showing there was no learning effect. Errors made across the trials were independent of test items, i.e. if a subject made a mistake in item X in trial 1, it did not imply that (s)he made a mistake within the same item in trial 2 and 3. Therefore, in the interpretation of the test results the three trials were treated as independent replications of the experiment, and all data was used in the overall analysis.

3.2.1. Group results

Group results obtained from Russian subjects are presented in Table 2. In general, subjects were very good at rendering the stress pattern of Polish (91% correct penultimate stress), suggesting successful acquisition. The non-target stress patterns were mostly final (7.4%) and antepenultimate (1.6%). Only 21.6% (0.3% of the overall data) of that antepenultimate stress was produced in three-syllabic words, i.e. it coincided with initial stress. Just one case of initial stress was found outside the right edge three-syllabic window.

Table 2. *L2 production of stress by Russian subjects.*

Stress patterns		Frequency	Percent	Valid Percent
Valid	final	404	7.1	7.4
	penultimate	4960	87.5	91.0
	antepenultimate	88	1.6	1.6
	initial (not antep.)	1	.0	.0
	Total	5453	96.2	100.0
Missing		217	3.8	
Total		5670	100.0	

Further, a multinominal regression analysis was conducted on the following predictors: morphological build-up of stimuli,

the syllable number, proficiency level, gender and age of onset of L2 acquisition. The model was significant ($\chi^2(5)=747.511$, p<.001) and it accounted for 28.2% of the variation in the data (Nagelkerke=.282). All predictors were significant except for the syllable number. Further separate Chi^2 tests were conducted on all predictors and then they all proved significant. However, in this paper I will concentrate only on the most significant predictors.

The strongest predictor in the model was the morphological build-up of stimuli, which on its own accounted for 23.1% of the variation in the data. In case of stimuli interpretable as stems with inflections, subjects were correct in roughly 98-99% of the cases (99.2% with monosyllabic and 97.8% with bisyllabic inflections) and in case of bare stems it was in 80.8% of the cases ($\chi^2(2)=539.575$, p<.001). These data also show that penultimate stress was produced in a majority of cases across all morphological classes.

Table 3 shows a more detailed picture of the responses given by subjects crosstabulated with the morphological build-up of the stimuli ($\chi^2(6)=559.746$, p<.001). 96.8% of the final stress was produced in words interpretable as bare stems and so was 78.4% of the antepenultimate stress. This gives a total of 93.5% of the errors which were produced in bare stems. The 96.8% of final stress in bare stems coincided with stem-final stress and so did 14.8% of antepenultimate stress (in stems with disyllabic inflections). This comes to 81.9% of a uniform erroneous stress pattern - stem-final.

As for other relevant predictors, proficiency level proved significant ($\chi^2(1)=74.376$, p<.001). Not surprisingly, subjects with lower proficiency levels produced the most errors (82.8%).

Syllable structure did not affect the position of stress – its only significance in case of non-L2 stresses completely overlapped with the morphological condition, i.e. the stem-final syllable being closed at the same time.

Table 3. *Subjects' responses and morphological build-up of stimuli.*

Subjects' responses		Items morph. build-up			Total
		bare stem	monosyll. infl.	disyll. infl.	
final	Count	391	13	0	404
	%	96.8%	3.2%	.0%	100%
penult	Count	1940	2436	584	4960
	%	39.1%	49.1%	11.8%	100%
antepenult	Count	69	6	13	88
	%	78.4%	6.8%	14.8%	100%
initial (not antep.)	Count	1	0	0	1
	%	100.0%	.0%	.0%	100%
Total	Count	2401	2455	597	5453
	%	44.0%	45.0%	10.9%	100%

3.2.2. Individual results

An analysis of the data on the individual level allows identifying interlanguage grammars (and their further possible interpretation in terms of L2 learning paths). These grammars fell within four types. Interestingly, the types of grammar were significantly related to the proficiency level of subjects ($\chi^2(3)=10.866$, p<.025). Table 4 provides an overview of these grammars, their frequency and information on the number of subjects from each proficiency group that produced stress patterns falling within a particular grammar type.

Table 4. *Individual interlanguage grammars.*

Interlanguage grammar	grammar frequency	proficiency level	
		lower	advanced
I: penult/ final	16 subjects 45.7%	11 47.8%	5 41.7%
II: penult/ final/ antepenult	9 subjects 25.7%	9 39.1%	0 0%
III: penult/ antepenult	5 subjects 14.3%	1 4.3%	4 33.3%
IV: penult	5 subjects 14.3%	2 8.7%	3 25%

4. Discussion

Given the overall results and the stress patterns produced by the subjects, it seems that first of all, Russian subjects are quite successful in L2 acquisition of Polish stress – the overall percentage of penultimate stress produced by subjects is very high and there are 5 subjects who produced penultimate stress only. Russian subjects seem to have observed that the position of stress in Polish does not extend outside the three-syllabic window on the right edge of the word. Errors occur within that window and they illustrate a consistent strategy. An overwhelming majority of mistakes (93.5%) is made in stimuli that could be interpreted as bare stems and about 82% of all errors are uniform – they are stem-final. These patterns strongly resemble the results obtained by [3] for the default position of stress in Russian. [3] conclude that it is the right edge of the stem that hosts default stress which is encoded directly into the phonology of Russian native speakers. Thus, the majority of mistakes in L2 seem to occur within the L1 default domain and they are of the L1 default type. Hence, we can conclude that it is the L1 transfer of the stem-final default that is the main source of errors in L2. Following [3] and references therein, I assume that stem-final stress could not be just a(n L1) frequency effect, as stem-final accents occur in about 30% of Russian nouns. This cannot be compared to the 80% of stem-final stress in the data obtained by [3] neither to a similar 81.9% of stem-final errors reported here. What is more, the L1 transfer crucially does not generally reflect the distribution of all accents. While initial stress is attested in Russian and much of the literature claims that initial stress is the default of the language, in the current test it almost never transfers. The only stress pattern other than the L1 transfer of the stem-final default found in the L2 data was antepenultimate. As it occurred mainly (78.4%) in bare stems it cannot be accounted for in terms of L1 default transfer. The antepenultimate position commonly hosts lexical accents in Russian, so this type of knowledge might indeed have been transferred by the subjects. Despite the minor antepenultimate stress in the data, the L1 transfer of stem-final default remains the main strategy governing the non-L2 stress patterns.

While stem-final is the main non-L2 stress pattern, we are able to say that at the same time in cases where correct Polish penultimate stress coincided with stem-final stress (i.e. in stems with monosyllabic inflections), it was not 'merely' an L1 transfer of the default. Penultimate stress was produced in the majority of cases across *all* morphological classes. If subjects had assumed an overall L2 strategy of stem-final default, it should have manifested itself in different types of items. For example, in case of stems with disyllabic inflections subjects should have produced more antepenultimate stress, but it occurred only in 2.2% of such items.

Let us now turn to individual results which enrich the analysis by establishing interlanguage grammars as well as their possible interpretation in terms of L2 learning paths. Individual data show that subjects produced stress patterns indicating four types of interlanguage grammars (see Table 4). Importantly, these grammar types are in significant relationship with subjects' proficiency level. Several generalizations follow from these data (Table 4). Firstly, grammar I (pen/fin[1]) is by far the most common one. Secondly, only subjects with lower proficiency fall within grammar II type (pen/ant/fin) which implies it might be a starting point in the L2 acquisition process. Thirdly, many more advanced (than lower proficiency) subjects produced stress patterns within grammar III (pen/ant), suggesting it might be a later stage of the developmental path. Finally, the percentage of the target L2 grammar (IV) increases with proficiency level.

Given this significant relationship between individual grammars and subjects' proficiency level, as well as the generalizations mentioned above, it seems plausible that these grammars illustrate different stages of L2 acquisition. This invites an attempt to recreate the possible L2 learning paths.

The first possible interpretation of these data is schematized in Fig. 1.

grammar II → grammar I → grammar III → grammar IV
(pen/fin/ant)   (pen/fin)   (pen/ant)   (pen)

Fig. 1. *Possible developmental path (interpretation 1).*

Subjects initially produce all three stress patterns, then they eliminate antepenultimate stress and produce final stress only. After some time they realize Polish has no final stress and they exclude it, but antepenultimate stress occurs occasionally. Finally, they arrive at the L2 grammar. However, this interpretation faces problems such as explaining the necessity of the ordering of grammar I and III, or accounting for the fact that subjects first eliminate a stress pattern from a grammar (be it either final or antepenultimate) and then return to producing it at a later stage.

Another interpretation of these data is possible, which solves the problems related to the ordering of grammars I and III. The problem disappears if we do not treat all interlanguage grammars as possible stages of just *one and the same* learning path but rather as belonging to two *different* learning paths represented in Fig. 2.

(grammar II →) grammar I → grammar IV   (a)
(pen/fin/ant)   (pen/fin)   (pen)
(grammar II →) grammar III → grammar IV   (b)
(pen/fin/ant)   (pen/ant)   (pen)

Fig. 2. *Possible developmental paths (interpretation 2).*

The fact that grammar II is produced only by lower proficiency subjects supports its plausibility as a possible (though perhaps not necessary) starting point. At the next stage some subjects eliminate antepenultimate stress but keep producing the final one (Fig. 2a) while others do the reverse

(Fig. 2b). Finally, both groups arrive at the correct L2 grammar. Judging by the percentages in Table 4, the strategy in (Fig. 2a) is more common by far.

5. Conclusions

Summarizing, in the current test the L2 acquisition of Polish stress by Russian native speakers manifests itself as quite successful. The major source of errors in L2 could be characterized mainly in terms of L1 transfer of stem-final default. L1 transfer did not generally reflect the distribution of all lexical accents. Individual data made it possible to identify four different interlanguage grammars. The significant distribution of the grammars among subjects with different proficiency levels suggested two alternative L2 learning paths.

6. References

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1 Henceforth the following abbreviations are used in reference to different interlanguage grammars: 'pen' for penultimate, 'fin' for final and 'ant' for antepenultimate stress.