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Experimental evidence for intraparadigmatic effects in Russian verbs

BACKGROUND: Some Russian verbs famously have a paradigm gap in the 1p.sg. present tense form. For example, speakers cannot confidently determine the 1p.sg. form of *pylesosʲ-itʲ* "to vacuum"; but if pressed, they will reluctantly produce *pylesoʃ-u* (with the expected and regular stem-final alternation) or *pylesosʲ-u* (without the alternation). Most previous studies of these verbs conclude that the gaps are historically motivated, but synchronically arbitrary (Graudina et. al. 1976, Daland et.al. 2007, Baerman 2009). Contrary to these claims, Pertsova (2014) suggests that the 1p.sg. gaps are due to a conflict between a (1) a regular morphological rule demanding stem-final consonantal alternations (e.g., the *sʲ~ʃ* alternation in the verb above), and (2) a paradigmatic pressure against alternations coming from Paradigm Uniformity. The alternations that affect 1p.sg. form also appear in past passive participles (ppp), but the rest of verbal forms have no alternations (and, hence, exert paradigmatic pressure on the 1p.sg. form not to alternate). Practically all verbs with paradigm gaps lack ppp's, and most verbs that have ppp's do not have gaps (Pertsova, 2014).

OBJECTIVES OF THE CURRENT STUDY: The goal of this study was to test the hypothesis <u>that the speakers' confidence in 1p.sg. pres. forms depends on presence/absence of expected alternations elsewhere in the paradigm</u>. We tested this hypothesis in a web-experiment, which recorded speakers' productions and subjective confidence ratings of the singular forms of low-frequency verbs that have or do not have ppp's. The results of this experiment overall support the above hypothesis. Further experiments are in progress to test the more fine-grain prediction that more frequent forms exert stronger paradigmatic pressure. In particular, we are testing whether higher frequency of ppp forms (for verbs that have them) is correlated with greater confidence in 1p.sg. alternations. Confirmation of this hypothesis will strengthen the view that computation of an inflectional form depends not only on morphological and phonological rules applying to that form, but also on the robustness of the relevant pattern in the paradigm (more details below).

METHODS: The experiment was a forced production task, in which subjects first read a sentence with a target verb in the infinitive form, and then used this verb in the next sentence either in 1st, 2nd, or 3rd person singular present tense. The verbs included 36 dental and 36 labial stems of conjugation II (verbs which have consonantal alternations in 1p.sg. forms). For reasons of space, we will only discuss dental stems. All verbs were of low frequency (< 2.5 ipm in the RNC), that is, verbs whose 1p.sg. forms are unlikely to be memorized. They were divided into three groups: **Group A** was comprised of verbs which are known to have a gap in 1p.sg. and which lack ppp's (e.g., *erunditʲ* "to speak nonsense"); **Group B** was comprised of verbs that are not marked in dictionaries as having a gap, but that also lack ppp's (e.g., *smerdetʲ* "to stink"); **Group C** was comprised of verbs that have ppp's and no gaps (e.g., *orositʲ* "to dew"). Within each group there were an equal number of stems ending in each of the four dental consonants *(-d, -t, -s, -z)*. The groups had stems of similar stress patterns and number of syllables. 223 native speakers of Russian participated in the experiment, which was administered over the web (23 of them currently live outside Russia or did not indicate their location). Three types of data were collected: the written responses in the fill-in the blank task, the subjective confidence ratings on the 5-point Likert scale, and RTs (not discussed here).

RESULTS: All responses were coded into three categories: expected stem-final alternation, non-alternation, and other (this category included erroneous responses in the wrong person or tense, as well as responses in which an unexpected alternation was applied, or the field was left blank). Table 1 reports proportions of each type of response per group. Only 1% of responses in Group C were non-alternations, in stark contrast to the other two groups. Figure 1 shows the distribution and means of confidence ratings within each group (the wider the "bean" the more responses are in

that category). For example, majority of responses in group C received the highest rating of 5. We used R (R Core Team 2014) and lme4 (Bates et. al. 2012) to perform a mixed-effects logistic regression with subject and item as random effects and group (A,B,C), stem-type (-d, -s, -z, -t), and lemma frequency as fixed effects was run on the proportion of non-alternations. Our analysis shows that group significantly impacts the results (χ^2 = 41.6, d$_f$=2, P=8.9e-10). P-values were obtained by likelihood ratio tests of the full model with the effect in question against the model without the effect in question.

Table 1: percent of responses in the fill in the blank task

Types of response in 1p.sg.	Group A (gaps, no ppp's)	Group B (no ppp's)	Group C (ppp's attested)
Expected alternation	60%	69%	86%
Non-alternation	27%	18%	1%
Other	13%	13%	13%

THEORETICAL IMPLICATIONS:

These results support a model in which there are two dimensions of well-formedness of morphological generalizations: (i) an interparadigmatic robustness (regularity and frequency of a pattern throughout different paradigms) and (ii) intraparadigmatic robustness (regularity and frequency of a pattern within a paradigm). For a potential *derived* form to become the preferred output it has to have a relatively high score on both of these dimensions. When all competing realizations fail this requirement, gaps arise (e.g., *pylesos'-u* has a low inter-paradigmatic score because other verbs with similar stems alternate in 1p.sg, while *pyleso∫-u* has a low intra-paradigmatic score because no other forms in the paradigm of this verb have the same alternation.) When several competitors do equally well, free variation may arise.

Figure 1: confidence ratings on a 5 point Likert scale. The lines show the means for each group.

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