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Non-phonological factors of phonological variation
A large scale wug-experiment for Hungarian vowel harmony

Some of the "dark secrets" of Hungarian vowel harmony (Rebrus, Szigetvári, & Törkenczy, 2012) have been heavily studied in recent years. Special attention has been given to *vacillating* stems, such as *hotel* (*hotelnak* ∼ *hotelnek* 'hotel.DATIVE'), with an emphasis on the phonological determinants of this variation. However, non-phonological factors also play a role in suffix choice (cf. Forró, 2013, p. 8 for semantic-stylistic properties).

In the wug-tests of Hayes and Londe (2006), and Hayes, Siptár, Zuraw, and Londe (2009), the subjects ($N = 171$ and $N = 131$, respectively) were given three-sentence-long paragraphs ('frames'). Each sentence contained the nonsensical wug word, the first ones in the singular nominative (non-affixed) form. The third sentence of the frame, completed by the subjects, required the dative case. Both studies analysed how phonological properties of the wug word affected the choice of the dative allomorph.

A remark concerning the frames struck us: "Frames and instructions were composed with the goal of encouraging the subjects to treat the stems as long-forgotten but authentic words of Hungarian, rather than as recent loans" (Hayes & Londe, 2006, p. 70). The intuition of some native speakers would predict that old Hungarian words are more likely to receive back suffixes than recent loans, given the closed class of antiharmonic stems (stems with front vowels suffixed with back allomorphs for historical reasons). Therefore, we posed the question: *can the frame also influence the suffix choice?*

We ran two on-line experiments, reproducing the 2006 experiment with some changes. By deploying the power of social networking that was not available a decade ago, the number of participants ($N = 2999$ and $N = 689$) could be increased by an order of magnitude. This growth in the sample size also enabled us to measure smaller effects.

We used some of the wug words in the 2006 experiment, with minor adjustments to accommodate loanword frames: five among those displaying the highest level of vacillation, and two among those with a strong preference for back suffixes. The seven fillers were based on the wug words that proved in 2006 not to vacillate.

The frames determined the wug words' semantics, and belonged either to the *old Hungarian* (medieval) 'domain', or to the *new foreign* (contemporary) 'domain'. (Filler frames were unclassifiable.) Moreover, the frames belonged to one of seven 'ontological categories', including human, animal, plant, artefact, naturally occurring object, and natural force (e.g. Keil, 1979). Proper nouns formed the seventh category, as they might display a different morpho-phonological behaviour. Hence fourteen (non-filler) frames.

In both experiments, each subject was assigned one frame from each ontological category, with randomized wug words in a randomized order. Three frames belonged to one domain, and four to the other. **Experiment 1** contrasted the two domains. In a matched-pair design, pairs of subjects were presented with exactly the same questionnaire (same combination of wug words and ontological categories, same fillers, same order of presentation), but mirrored for domain. For instance, if a subject was presented with the word *poribit* in the frame "old Hungarian animal", then the matched subject encountered

poribit as a new foreign animal. One observation pair consisted of the dative form in the old Hungarian condition, as opposed to the dative form in the new foreign condition, all other factors (wug word, order, etc.) being equal. The null hypothesis posited the probability of a back suffix be equal under both conditions for each observation pair.

Misspelled answers, and answers not in the dative case were discarded. 2999 participants in Experiment 1 provided us with 9215 valuable suffix-pairs; yet, not with sufficient evidence to reject the null hypothesis (McNemar's Chi-squared test with continuity correction: $\chi^2 = 0.226$, df $= 1$, $p = 0.63$). However, a more detailed analysis revealed that this negative outcome resulted from mutually neutralising significant results. Each wug word presented as a proper noun was more likely to be attached a back suffix in the new foreign domain, than in the old Hungarian domain (cumulated McNemar's test for the seven wug words: $\chi^2 = 10.63$, df $= 1$, $p = 0.0011$). The opposite tendency was observed for naturally occurring objects and artefacts: confirming the native speaker's intuition, their preference for a back suffix is stronger in the old Hungarian domain than in the new foreign one (artefacts: $\chi^2 = 6.11$, $p = 0.0134$; natural objects: $\chi^2 = 11.86$, $p = 0.0006$).

Do these significant differences really stem from the ontological category imposed by the frame, or from something else? **Experiment 2** repeated the first experiment, with some slight changes in the frames. To test for the possibility of sound symbolism, some frames were rewritten to contrast extremely negative, sad, disastrous meanings with positive, joyful ones. Elsewhere, the semantics of the dative was changed, replacing a genitive function with the dative of a *habeo*-construction, or the argument of some verb.

The matched-pair design in the second experiment paralleled the design of the first one, and so did the results regarding personal names, natural objects and artefacts, despite the changes in the frames. Moreover, pairing each of the 689 new subjects with the subject who filled out the same questionnaire in the first test, yielded a new result: negative semantics is more likely to be followed by a back suffix than positive semantics. Present as a tendency for most frames, sound symbolism was highly significant in the old Hungarian natural force condition ($\chi^2 = 12.01$, $p = 0.0005$).

Logistic regression applied to the data revealed a main effect not only for wug words, but also a weaker one for frames. With frames decomposed into domain and ontological category, the former did not prove to be significant, but the effect of various ontological categories were significantly different. The best fit, not significantly different from the observed values, also includes an interaction between semantics and the wug word's pattern, as well as three priming factors: the subject's response to the previous frame, the response to two frames earlier, and the position of the frame in the experiment.

To summarize, we caution anyone running a wug-experiment on Hungarian vowel harmony in the future. While it is surprisingly easy to collect a large amount of data, you should know you are not only measuring the response to the phonological properties of the wug word, but also to the semantics encoded in the frame, and priming effects.

References

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