

Measuring phonological naturalness: Polish consonant mutations

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The issue of phonological naturalness has been present in generative research since its conception (e.g. Chomsky & Halle 1968, “straitjacket effects”, i.e. the constraining role of synchronic grammars in sifting linguistic patterns and blocking the acquisition of unnatural ones, de Lacy 2006, Kiparsky 2006, Wilson 2003). There is solid evidence that both natural and unnatural patterns are attested and stable in natural languages (Bach & Harms 1972, Blevins 2004). With the advent of Optimality Theory (Prince & Smolensky 2004), it has become a challenge to verify the role of naturalness in mental grammars. Specifically, insofar as the grammar comprises ranked, violable constraints, naturalness competes with other constraints and the output may not always reflect its impact. Therefore, the aim of this paper is to assess the *relative* importance of naturalness with respect to other potential factors. In order to be accepted as a valid synchronic bias, naturalness must be a reliable predictor of the relevant data. If other predictors turn out to be more useful, the role of naturalness in the grammar must be called into question.

Polish consonant mutations that meet the articulatory requirements of palatalization (palatal articulation before a front vowel or a palatal consonant, non-palatal articulation before a back vowel or a non-palatal consonant) are classified as natural. An output that does not meet these requirements is considered unnatural (Kochetov 2011). We examine the mutations resulting from concatenation of vowel- and consonant-initial suffixes. The effects of 27 suffixes have been analyzed: 9 of them beginning with [i] (or [ɪ]), 7 with [ɛ], 8 with [a] and 3 with a consonant. 32 base-final consonants have been considered. A dictionary search has been performed and *all and only* the attested mutations have been investigated.

Out of the 604 mutations 396 are natural (65.6%) and 208 (34.4%) unnatural. These numbers, however, offer a simplified account of the facts. We test the hypothesis that the palatality of the target depends on the following trigger – the suffix-initial segment, that is, V_{suffix} or C_{suffix} . We also examine the role of the target, that is the quality of the base-final consonant, C_{base} . The relevant independent variables are given in (1).

- (1) *Suffix*: suffix used after the target: *-em* instr.sg., *-arz* agent nouns, etc. (27 levels)
SuffixSegment: suffix-initial segment: [i ɪ ɛ a C C̄] (6 levels)
SuffixBack: front vs. back suffix-initial segment: [-back] vs. [+back] (2 levels)
Consonant: base-final consonant: [p p̄ b b̄ m m̄ f f̄ v v̄ ...] (32 levels)
Place: place of articulation of the base-final consonant: labial, coronal, dorsal (3 levels)

In order to find out whether there is a significant association between palatality and various aspects of triggers and targets, a series of random forests using R's party package (Hothorn et al. 2006) were run on the data, with palatality as the dependent variable and the independent variables given above. In the dotplot in Figure 1 the predictors have been arranged from the most to the least important. These results suggest that the palatality of output consonants overwhelmingly depends on the specific suffix-initial vowel (or consonant), as well as on the base-final consonant. Both these factors make reference to individual segments in Polish, indicating that palatality is segment specific, including suffix-initial and base-final segments. Morphological factors also contribute: palatality significantly depends on the following suffix. Crucially, both factors referring to single phonological dimensions, that is, *SuffixBack* and *Place*, contribute relatively little and hence cannot be used as reliable predictors of palatality. We conclude that phonological naturalness, defined as agreement in the feature [\pm back] in CV (and CC) sequences, fails to predict the result of mutations. The latter is more

accurately predicted by the specific vowel that follows, the specific suffix and the specific consonant undergoing a mutation. This discussion provides evidence for a model of grammar comprising multiple morpheme-specific cophonologies (Inkelas 2014).

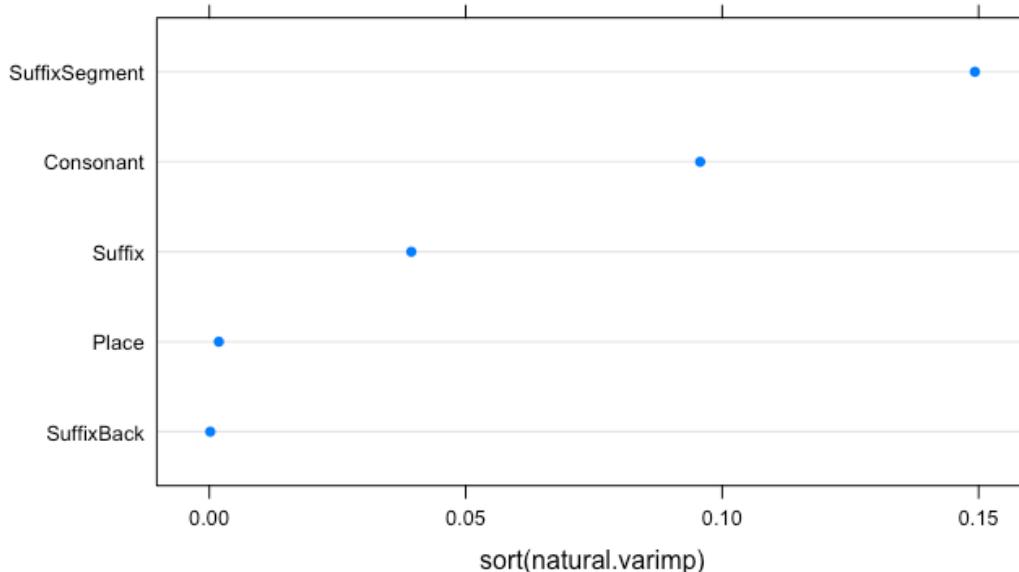


Figure 1. Variable importance of factors from random forests for predicting palatality of output consonants

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