

Do lexical frequency and speech tempo influence phonetic realization of boundaries?  
The case of prefix-stem juncture in Polish complex words

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Gradient effects have been gaining more and more attention in recent phonological research, including quantitative studies on such issues as phonotactic generalizations, variation, allomorphy, lexical diffusion or analogy. In this paper, we ask whether phonetic and lexical gradient characterizes the behaviour of the prefix/stem juncture in Polish.

Special properties of the Pword-like boundary between the prefix and the stem in Polish have been discussed in a number of works, e. g. Bethin 1992, Kraska-Szlenk 2003, Rappaport 1988, Rubach 2000, Szpyra 1992. The issue is somewhat problematic, because external sandhi effects are observed with respect to some phonological rules, but not others, which makes the prefix/stem juncture different from a stem/affix boundary and from a word/word boundary. We follow some of the earlier researchers in assuming that the mixed behaviour of prefixes is explainable if they are analysed as clitics, i.e. they attach to Pwords without having a status of Pword themselves, e.g. [z[identyfikować]<sub>Pw</sub>]<sub>Pw</sub> ‘to identify’, [nad[aktywność]<sub>Pw</sub>]<sub>Pw</sub> ‘hyperactivity’. Such an analysis complies with the fact that true clitics, i.e. prepositions, share similar phonological behaviours and are analysed in a similar fashion, cf. [z+[identyfikacja]<sub>Pw</sub>]<sub>Pw</sub> ‘with identification’, [nad+[aktywnością]<sub>Pw</sub>]<sub>Pw</sub> ‘over activity’.

In some cases, the boundary effects seem to be weaker than in others, and in the case of high frequency and lexicalization, they are not found at all. Therefore, we pose the question how the Pword boundary in complex words is phonetically realized and what parameters may influence this realization. In our experimental study, we focus on three parameters: (i) lexical frequency, (ii) speech rate and (iii) (sentence) focus. In order to test the impact of these parameters on the phonetic realization of Pword boundary, we conducted an experimental study in which 51 Polish complex words were under examination.

The words were divided in sets of (i) very frequent, (ii) frequent and (iii) infrequent use. Frequency of use has been obtained from the frequency dictionary and the electronic corpus of Polish. We take into account the absolute frequency of use of the prefixed words as well as their relative frequency with respect to their less complex bases/stems. Generally, with the exception of few lexicalized items, prefixed words are much less frequent than their bases, which makes them more dependent on them phonologically and less autonomous in lexical access. We also consider phonotactic probability criteria as a factor in morphological segmentation of prefixed words. This factor turns out to be quite indecisive, which complies with the necessity of marking the prefix/stem boundary with phonetic cues.

The acoustic analysis reveals that the prefix-stem boundary in complex words is marked by speakers in various ways:

- (i) devoicing of the prefix-final consonant
- (ii) glottal stop insertions
- (iii) glottalization of the stem-initial vowel
- (iv) strengthening of the prefix-final consonant (2-3 bursts, aspiration)
- (v) combination of cues, e.g. (i) and (iii)

The preliminary results obtained from the analysis of two speakers reveal that we are faced with gradient effects influenced by lexical frequency. The boundary in frequent words as e.g. [nad[opiekunczy]<sub>Pw</sub>]<sub>Pw</sub> ‘overprotective’ is considerably less marked than in [nad[olbrzym]<sub>Pw</sub>]<sub>Pw</sub> ‘hypergiant’. Whereas in the former case we observe a slightly devoiced [d], in the latter case speakers make use of a combination of cues to mark the boundary, i.e. devoicing of [d], strengthening of the burst and glottal stop insertion. Our results indicate that very frequent words show almost no boundary effects. The prefix-final consonant is frequently syllabified as an onset of the following vowel of the stem, e.g. [po.d-u.szka]<sub>Pw</sub> ‘pillow’. In our interpretation such words are accessed by speakers as complete items (without any internal boundary). Furthermore, the results show that high speech tempo reduces boundary marking effects at least to some extent. Finally, a sentence focus position appears to be more marked by boundary cues than a non-focus position.

In summary, the results show that the Pword boundary between the prefix and the stem is a gradient phenomenon sensitive to such factors as frequency, semantic autonomy, speech rate and focus position.

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