

# The interaction of word, stress and accent domains in Polish

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Phonological approaches to Polish stress agree that main stress falls on the penultima and secondary stress on the initial syllable, if a word consists of more than three syllables. Despite this consensus, it remains unclear which acoustic correlates encode the prominences and how these may differ with respect to primary and secondary stress positions and in relation to phrase level stress.

We present a study of acoustic correlates of word boundary, lexical stress, phrasal accent and intonational phrase boundary in Polish. We aim to 1) verify claims in the literature regarding the phonetic and phonological status of lexical stress, especially secondary stress (S2) in Polish (Dogil 1999, Malisz and Wagner 2012, Newlin-Łukowicz 2012, Łukaszewicz 2015, Hamlaoui et al. 2015) and 2) contribute to a better understanding of prominence and boundary related strengthening (Cho and McQueen, 2005; Cho and Keating, 2009).

We designed a set of 4-5 syllable long word stimuli with six target syllable forms: /pa/, /ta/, /ka/, /ba/, /da/, /ga/ differentiating lexical stress positions: primary (S1) (*tuliPAny*), secondary (*papieROsy*) and unstressed (*kopaLIny*). Stimuli were embedded in sentences in positions of -focus and +focus and at onset and offset of an intonational phrase boundary, as well as phrase internally. Sentences were elicited via a simulated question-answer task with twenty native speakers of Polish (N=2222). We investigated the following acoustic parameters: duration, pitch, intensity and spectral emphasis as a function of stress, focus and boundary.

Our results show that S1 robustly affects vocalic duration and spectral emphasis in the /a/ vowel portions of the target syllables. Fundamental frequency is a robust correlate of focus:  $f_0$  peaks do not differ across word stress conditions in -focus. If pitch accent is present, only S1 syllables significantly depart in pitch from all others. Similar conclusions can be drawn with respect to average intensity peaks over syllables. These findings support the notion that  $f_0$  is not the primary acoustic cue of Polish word stress but of intonation structure with S1 syllables serving as landing sites for pitch accents (Dogil 1999, Malisz and Wagner 2012). Both S1 and S2 significantly affect overall syllable duration, relative to unstressed syllables, also out of focus. The accumulated, syllable lengthening import may come from vowels for S1 and perhaps, from onsets for S2. However, we do not find systematic acoustic evidence for S2.

Given that our results did not differentiate between the potential initial word boundary effect and S2 position effect on syllable onsets (White 2014), we are currently conducting a study in the same paradigm that includes 3- syllable long words in which S2 is not predicted to occur to separate the effects of word boundary and S2. We also add word-initial fricatives to the target word set. This way we aim to generalize over various types of consonants, as well as benefit from usually more precise segmentation of fricative noise in word-initial syllable onsets.

Finally, we present findings on how prominence relations interact with boundary cues and relate the acoustic-phonetic results with a perceptual study of Polish phrasal and word stress (PLM2015, submitted).

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