

ACOUSTIC CORRELATES OF FOCUS MARKING IN POLISH

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ABSTRACT

Languages vary in the types of contexts that affect prosodic prominence. This paper reports on a production study investigating how different types of foci influence prosody in Polish. The results show that focus and givenness in Polish are both marked prosodically, with pitch and intensity as the main acoustic correlates. Polish patterns like English in showing prosodic focus marking in a broad range of contexts, and differs in this regard from Romance languages, despite the fact that aspects of the prosodic system of Polish are more similar to Romance. Finally, the results do not support the claim in [7, 8] that word prominence is shifted from the penult syllable to the initial syllable under focus.

Keywords: Polish, Slavic, focus, prominence, secondary stress

1. INTRODUCTION

In Germanic languages, information-structural notions such as focus and givenness have been associated with specific prosodic patterns: focused information typically tends to present a boost in prominence, while given information is prosodically reduced [19, 23, 10, 4]. Not all languages show these prosodic effects, and the precise circumstances under which they occur vary [17]. For instance, Romance languages have been reported to fail to mark focus at least under certain circumstances in which Germanic languages reliably mark it [5, 22, 17, 14].

This paper looks at accentuation patterns in Polish, which have not been the object of detailed phonetic studies so far. More specifically, we are looking at whether, as reported by [7], focus on a non-phrase-final word triggers a prominence shift to the focused word and a pattern of post-focal reduction similar to the one observed in Germanic languages. Using a similar design as [14], we look at different contexts which have been used to differentiate accent patterns in Germanic vs. Romance.

Polish displays a fixed word stress on the penultimate syllable, and a secondary stress appearing on the initial syllable of words containing more than

three syllables [7, 15]. Phrasal primary stress is generally rightmost [6]. The prosody of Polish is hence more similar to Romance than to Germanic languages: Despite crucial differences in word prosody across the Romance family, one consistency is that main word stress always falls on the last foot, and hence within a three-syllable window counting from the end. Even in those Romance languages that show cases of lexically specified unpredictable cases of stress, such as Italian and Spanish, main word stress never falls on a syllable earlier than the antepenult. In Germanic languages, by contrast, initial stress is possible in longer words, and entire feet at the ends of words can and often are skipped and receive only secondary stress. This ‘plasticity’ of word stress in Germanic is sometimes related to the higher plasticity in sentence prominence [17], where similar Germanic languages show more flexibility in placement of main sentence prominence [24]. Polish is thus an interesting test case in that it shows a superficial similarity to Romance languages (as opposed to Germanic, and also other Slavic languages) in its word prosodic system, and provides a test case for whether word prosody and sentence prosody really interrelate in this way.

We were also interested in the precise realization of prosodic focus in Polish. Pitch expansion on the focused word has been claimed to be the main correlate of focus-triggered emphasis [7]. “Emphatic stress” can either fall on the primary stressed (i.e. penultimate) syllable of the focused word, or on the initial, metrically strong, syllable in words of four or more syllables [7]. Interestingly, if focus is marked by stressing the initial syllable, the prosodic reduction of the post-focal material is claimed to start as early as right after the initial syllable of the focused word itself, leading to a switch between primary and secondary stress [7]. This impressionistic description is in line with the results provided by [8] based on an acoustic investigation of focus marking in contexts that correspond to our *wh*-condition.

2. WHY “TYPE OF FOCUS” MATTERS

A strategy often used to manipulate focus is to place it in the context of a *wh*-question:

- (1) *Wh-question and answer*
- a. *Jakie stoły sprzedaje Jan?*
'Which tables does Jan sell?'
 - b. *On sprzedaje KWADRATOWE stoły.*
'He sells square tables.'

The context question makes all material present in the answer given, except the one corresponding to the *wh*-word. If Polish patterned like English, we would expect the focused adjective to receive a prosodic boost (reflected in higher pitch, intensity, and duration), and furthermore a reduction of the given material following the focused word [9, 4].

In English, such prosodic prominence shift away from the end of the sentence in English requires a contextual antecedent that provides an alternative to the focused word and contains the given material following it [21]. How exactly this antecedent is provided is not important in English, but crucially matters in Romance. Our main manipulation is therefore how the potential antecedent for focus marking is introduced into the discourse. For example, the antecedent could instead be provided in a previous claim that the follow-up sentence corrects:

- (2) *Correction*
- a. *Słyszałam, że Jan sprzedaje okrągłe stoły.*
'I heard that Jan sells round tables.'
 - b. *Nie, on sprzedaje KWADRATOWE stoły.*
'No, he sells square tables.'

Or it could be properly contained in a sentence that additionally contains non-overlapping and hence non-given material:

- (3) *Contrast*
- a. *Tomek sprzedaje okrągłe stoły.*
'Tomek sells round tables.'
 - b. *Naprawdę? Jan sprzedaje KWADRATOWE stoły.*
'Really? Jan sells square tables.'

Finally, the antecedent could also be provided in a previous constituent of the same sentence:

- (4) *Parallel*
- a. *Słyszałam, że Jan sprzedaje meble z drewna.*
'I heard that Jan sells wooden furniture.'
 - b. *Tak, sprzedaje okrągłe stoły i KWADRATOWE stoły.*
'Yes, he sells round tables and square tables.'

From the point of view of standard theories of focus including Rooth's [21], how the antecedent is provided should not affect the possibility of a prominence shift. [14] show experimental evidence that French speakers mark focus systematically under corrective focus in acoustically similar ways as En-

glish speakers, but they usually fail to do so under contrastive focus, and they apparently do not mark focus under parallelism. These findings are unexpected under theories of focus and givenness, and confirm earlier observations by [5] and [17].

The question how languages vary in the type of contexts that induce prosodic focus marking can give us important cues to the precise mechanism underlying focus. Our lack of understanding can be illustrated by the fact that for the difference between English and Romance, explanations have been proposed based on pragmatics, syntax, and phonology: [17] considers the type of speech act relevant and assumes that it is important in Romance languages whether a statement is a correction; [14] argue that differences in the syntax and semantics are crucial, and propose that languages vary in the scope possibilities of the focus operator, such that it can only take wide scope in Romance; [12] propose that the relevant factor may be phonological phrasing. In other words, prior research has not even reached agreement on the part of grammar that might be responsible for the differences.

A better knowledge of the cross-linguistic variation of focus marking can help untangle this since particular hypotheses about the nature of the difference can be falsified by looking at which properties co-vary across languages and which do not. It is therefore of interest to extend the study of types of foci to Polish, where these questions have—to our knowledge—not been experimentally tested.

In addition to the four conditions discussed so far, we included two conditions as controls. The first involves a context which does not make the constituents under investigation either given or focused:

- (5) *New (control)*
- a. *Jan sprzedaje meble z drewna.*
'Jan sells wooden furniture.'
 - b. *O tak, sprzedaje okrągłe i KWADRATOWE stoły.*
'Oh yes, he sells square tables.'

The second control condition involved a coordinated adjective. This context should make the adjective contrastive, since it is directly juxtaposed with an alternative, but it should not license a prominence shift away from the noun to the adjective, since the noun is not actually contextually given:

- (6) *Coordinated (control)*
- a. *Słyszałam, że Jan sprzedaje meble z drewna.*
'I heard that Jan sells wooden furniture.'
 - b. *Tak, sprzedaje okrągłe i KWADRATOWE stoły.*
'Yes, he sells round and square tables'

The reason to include the latter condition was twofold: First, we were interested whether the adjective will receive a prosodic boost when it is focused even in cases in which the following constituent is not given, and also whether the following new constituent would be prosodically reduced in these cases [13]. The second motivation was the intuition that the structure in (6) is more natural than the somewhat awkward case of parallelism (4), and we wanted to assess whether the structure might be unacceptable to a point where interpreting the prosodic results would be futile.

3. METHODS

The experimental material consisted of 24 items (due to an error, one had to be discarded). Seven items presented an adjective of four or five syllables (and thus a metrically strong initial syllable carrying secondary stress). Each trial consisted of a pseudo-dialogue: a pre-recorded context was presented auditorily and a scripted response was to be provided “as naturally as possible”. The participants were subsequently asked to evaluate on a 7 point Likert-scale how natural their response was with respect to the proposed context. 31 Polish native speakers (9 male; age 19–44) took part in the elicitation task, which follows the design in [14], except that we only looked at adjective-noun sequences, and added two conditions (cf. (1) and (6)). Each participant saw every condition from every item, but randomization was done such that by taking only the first block of trials of all participants we could analyze the experiment as a Latin-square design with everyone only seeing one condition from each item.

3.1. Analysing the data

We created a word-by-word and syllable-by-syllable alignment of the data using the prosodylab.aligner [11], training on our own experimental data. Measurements on the relevant constituents were obtained using PRAAT scripts [3], crucial here were measures of maximal fundamental frequency, maximum intensity, and duration for both the ADJECTIVE and the following noun, as well as for the initial and penult syllable of adjectives of 4-5 syllables. For relative measures we used the difference in semitones, the difference of the log duration, and the difference in db respectively. We analyzed the data in R [20], using linear mixed effect models with the help of lme4 [2]. We fit maximal models including random intercepts and slopes for items and participants [1], and estimated p-values with the Satterthwaite approximation, with the help of lmerTest [16].

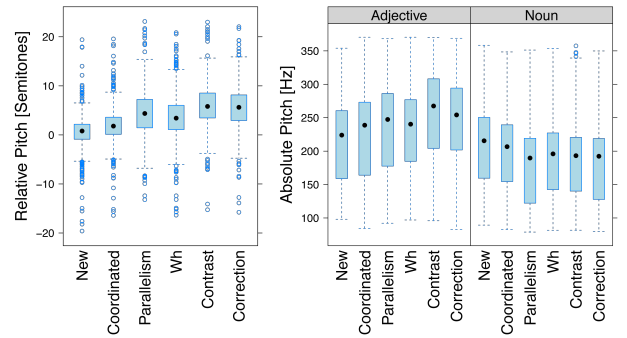
4. RESULTS

We first checked whether our conditions differed in naturalness. The ratings suggest that all conditions were considered acceptable, but as expected, the parallelism condition was rated as least natural. However, given the fact that it was not strongly rejected (it was rated one point on average below the other conditions), we concluded that the prosodic data from this condition would still be meaningful.

4.1. Prominence shift at the phrasal level

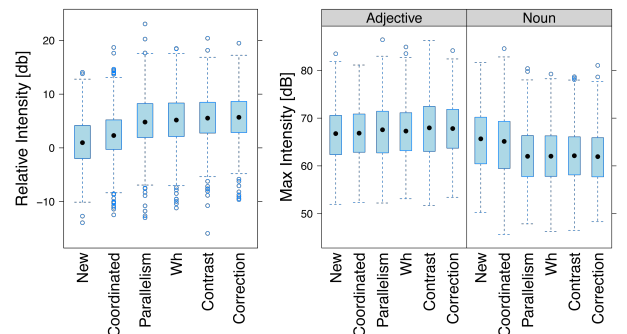
Fig. 1 presents results of relative and absolute pitch across different types of foci. Pitch reliably encodes focus status. The difference in pitch between the adjective and the noun is significantly higher for all types of foci in comparison to the new condition ($p < .001$ for all comparisons).

Figure 1: Pitch in Adjectives and Nouns



Absolute maximum pitch is both higher in focused adjectives and lower in nouns than in the new condition. Interestingly, this is the case in the coordinated condition as well, suggesting that discourse new post-focal words might be reduced too.

Figure 2: Intensity in adjectives and nouns



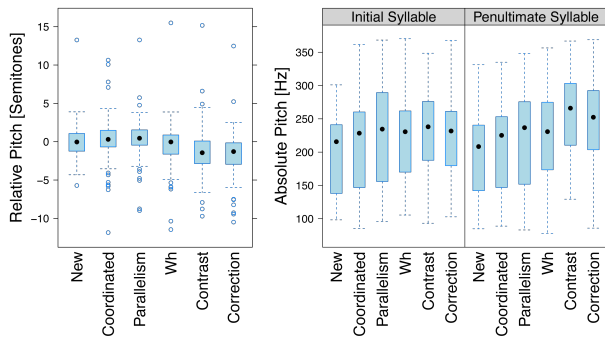
Intensity is also a reliable cue for conveying information structural status (see Fig. 2). The difference in intensity is significantly larger in all focus

types than in the new condition ($p < .003$ for all comparisons). Apart from the coordinated condition, all types of focused adjectives exhibit a much higher intensity than found in the new condition. Conversely, given nouns display a lower intensity than in the new condition.

The differences in duration were also significant ($p < .001$), except in the case of coordinated focus ($p < .07$). For reasons of space, we will not include figures presenting duration measures.

4.2. No Stress Shift to First Syllable within Adjective

Figure 3: Pitch in initial and penult syllables



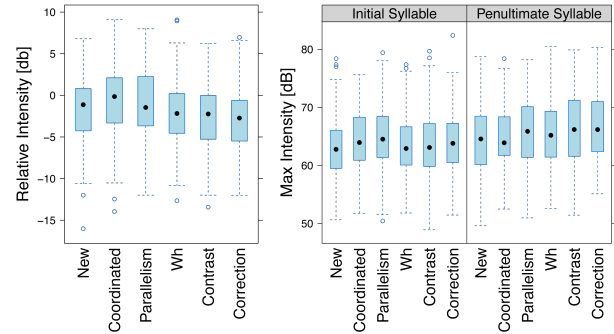
Measures of pitch within the adjective are given in Fig. 3. Adjectives in the coordinated case are the only ones that display an initial syllable with significantly greater pitch than the penult syllable ($p < .05$). Precisely in this condition, though, the adjective is not followed by a given noun. As opposed to [7, 8], no significant difference is found in relative pitch between *wh-* and new condition. More importantly, in the contrastive and corrective conditions, the penult syllable is even significantly more prominent in pitch than the initial syllable ($p < .001$) suggesting that it retains primary stress.

Measurements of absolute pitch provide more insight in pitch differences across focus conditions. They reveal that the initial syllable displays a greater pitch when the adjective is focused ($p < .001$ for all comparisons). Similarly, the penult syllable shows a greater pitch in all conditions (for all comparisons $p < .001$) apart from the coordinated focus.

As far as intensity is concerned, we do not observe a switch between primary and secondary stress either. Only two conditions (contrastive and corrective focus) significantly differ from the new condition ($p < .001$). The pattern of prominence suggests, again, that the penult syllable retains primary stress.

Finally, the observed difference in duration between focused adjectives and adjectives in the new condition (and in fact also in the coordinated condi-

Figure 4: Intensity in initial and penult syllables



tion) is due to increased duration in the penult syllable (contrast, $p < .05$; parallel, *wh-* and correction, $p < .001$), rather than in the initial syllable.

5. CONCLUSION

Our results support the claim in [7] and [8] that in Polish, focus triggers prominence shifts to focused constituents. Polish patterns like Germanic in showing focus marking in a broad range of contexts and not just in corrective contexts, unlike French [14] and other Romance languages [22, 17]. Since Polish word prosody is more similar to Romance (main stress always on final foot), but sentence prosody patterns more like Germanic (showing prominence shifts even under parallelism), our results cast doubt on the idea that there is a close correlation between word-prosody and sentence prosody. With respect to how focus marking is realized, we found F_0 and intensity to be the best correlates. While both focused and given words are affected, the boost on the focused word is more substantial in corrective and contrastive contexts, and the reduction of the given words is more important otherwise. We did not find evidence for a word-internal switch of prominence between primary and secondary word stress, as [7] and [8] did. However, the initial syllable of narrowly focused long words did tend to exhibit greater pitch and intensity than in the new condition. This lends evidence for the presence of secondary word stress in Polish, *contra* [18].

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