Positional variability of pitch accents in Czech

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Abstract

An analysis of prenuclear accents in read speech is carried out with the aim of finding instances of regularity in their distribution. Significant differences are identified with respect to position within the phrase and phrase length, some of which are correlated with declination and pitch span narrowing. Only a weak interaction is found between nuclear and prenuclear pitch accents. No tendency of using only one type of pitch accents in a phrase could be found. The autosegmental approach seems to be a viable means of analyzing prenuclear intonation in Czech.

Index Terms: Czech, pitch accents, pitch accent distribution

1. Introduction

Intonational models differ with respect to distributional constraints on strings of tonal events. For example, Pierrehumbert (1980: 29) proposes a model of English intonation where any combination of pitch accents, phrase accents and boundary tones is legal, while Ladd (1996: 211) claims that all prenuclear accents tend to be identical in a phrase, and Martin (1975) describes a model of French intonation where the selection of prenuclear contours depends on the nuclear contour as well as on prosodic constituency. We can assign these three approaches the provisional labels "unrestricted", "assimilatory" and "syntax-driven", respectively.

Other distributional constraints are imaginable as well, e.g. dissimilatory tendencies among prenuclear accents or between nuclear and prenuclear accents, positional effects, or correlation with downtrends.

Relatively little research is available in the domain of positional variability of intonational events within the intonation phrase (e.g. Palková 2001 for Czech, Dainora 2006 for English, Le Gac & Yoo 2007 for French, Bishop et al. for Tuscan Italian, marginally Asu & Nolan 2003 for Estonian).

Czech is a Western Slavonic language whose nuclear contours are well documented in literature (e.g. Daneš 1958, Romportl 1973); this is however not the case of prenuclear intonation. Also, autosegmental approaches to Czech intonation are quite novel: in a recent study (Duběda, submitted), five pitch accents are used for the stylization of prenuclear intonation in read speech (L*H, HL*, H*, H*L, S* – see section 4.1 for details). The first two pitch accents are illustrated in Figure 1 ("<" marks an anticipated tone).

Accents occur on the first syllable of almost all content words. Nuclear pitch accents usually take the final position in a phrase; this tendency is favoured by a free word order, and is especially strong in read speech (only a few cases of non-final nucleus occur in our material), while in spontaneous speech, nucleus shifts are more frequent. Prosodic nuclei have the greatest functional load in the phrase in that they signal modality, continuation/finality and expressivity. However, marks of functional contrasts may be present in prenuclear material as well.

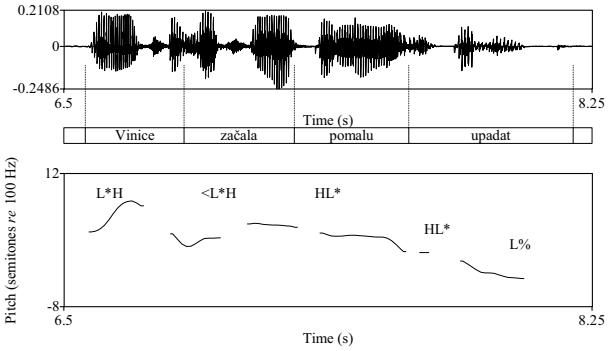

Figure 1: Example of a Czech sentence with f_0 and tonal labels ('The vineyard started to decay slowly.').

2. Aim and hypotheses

The present paper examines distributional behaviour of prenuclear pitch accents in read Czech, building on previous analyses of postlexical intonation in this language.

The hypotheses tested are:

1. The distribution of prenuclear pitch accents varies with their position within the phrase.
2. Their distribution varies with phrase length.
3. Their distribution interacts with the nature of the nucleus.
4. There is no tendency to make all prenuclear pitch accents in a phrase identical.

3. Material and method

The material analyzed are five recordings of a newspaper text read by five semi-professional speakers (3 men and 2 women speaking standard Czech) in a careful yet natural style. The total number of syllables in the recordings was 4,516, and the number of prenuclear accents was 1,508. Intonational transcription was carried out by inspecting the f_0 curve and listening to the sound. The inventory of prenuclear pitch accents used was that of Duběda (submitted).

4. Results

Figures 2–6 give the relative frequency of each of the five prenuclear accents in different positions within phrases containing 2–5 pitch accents. One-pitch-accent phrases do exist in our material, but contain no prenuclear accents. Longer phrases (6–11 accents), making up 18% of the recordings, were not analyzed due to their limited statistical representativeness.

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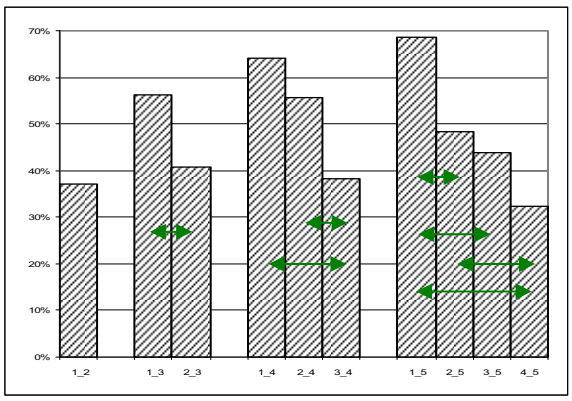


Figure 2. Relative frequency of prenuclear L*H accents in phrases containing 2–5 pitch accents. The first number in the column label indicates the position of the pitch accent in question, and the second number the total number of pitch accent in the phrase. E.g. the third column in the graph reads: 41% of pitch accents which are second in a 3-accent phrase are L*H. Arrows between columns denote differences which are significant (χ^2 test with p threshold = 0.05).

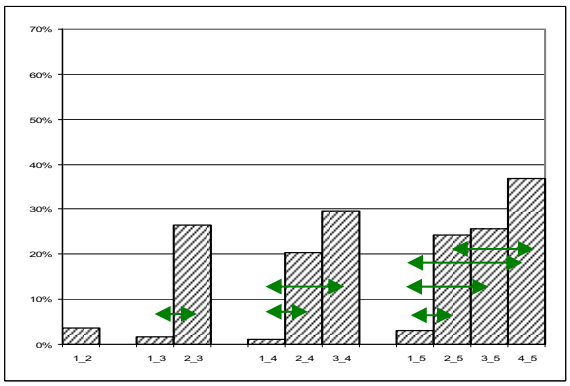


Figure 3. Relative frequency of prenuclear HL* accents in phrases containing 2–5 pitch accents (for more details, see legend of Figure 2).

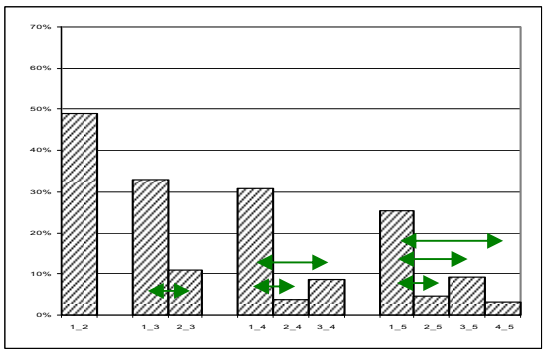


Figure 4. Relative frequency of prenuclear H* accents in phrases containing 2–5 pitch accents (for more details, see legend of Figure 2).

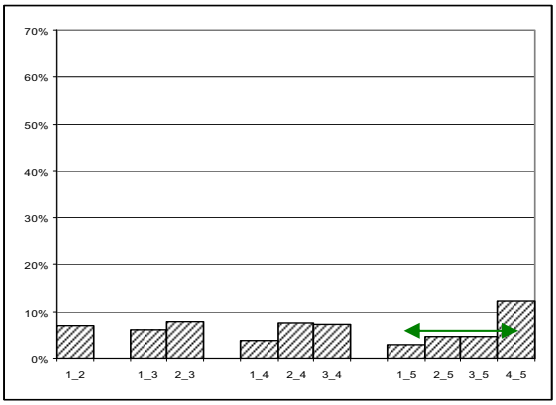


Figure 5. Relative frequency of prenuclear H*L accents in phrases containing 2–5 pitch accents (for more details, see legend of Figure 2).

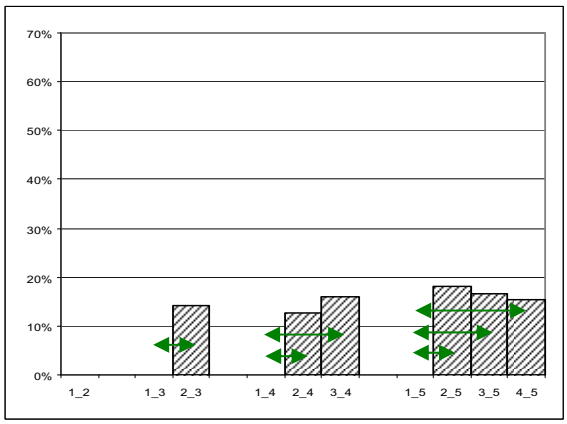


Figure 6. Relative frequency of prenuclear S* accents in phrases containing 2–5 pitch accents (for more details, see legend of Figure 2).

4.1. Position in the phrase

The L*H accent ("post-accentual rise"), by far the most frequent in prenuclear positions, is characterized by a rise between the accented and the following syllable. As it can be seen in Figure 2, it is more frequent in earlier positions than in later positions in a phrase (cf. also Figure 1); the difference ranges from 15% between the first and second position in 3-accent phrases (1_3 and 2_3) to 37% between the first and forth position in 5-accent phrases (1_5 and 4_5). For each phrase length considered, most of the positions are kept apart by significantly different frequency of L*H accents, which follows a monotonic decreasing trend from the beginning till the end of the phrase. It is highly probable that this behaviour is correlated with pitch declination and span narrowing: the post-accentual rise becomes less obvious towards the end of the phrase, where L*H accents are often replaced by HL*, containing no rise (see below).

The HL* accent ("downstepped"), second by order of overall frequency, is by nature rare in phrase-initial position: it can only occur when a pre-accentual syllable, called *anacrusis*, is present. Its probability increases towards the end of the phrase. In this respect, its distribution is in trade-off relation with L*H, of which it can be seen as a "weaker

variant": where declination and span narrowing do not permit to realize the post-accentual rise, the main feature of the accent becomes a downstepped realization (see again Figure 1 for an example). Statistical tests (χ^2) show that for all phrase lengths considered, different positions are characterized by significantly different affinity towards HL* accents. The number of significant differences (marked by arrows) is the same as for L*H.

H* accents ("high") are typical of phrase-initial positions, while in other positions their frequency is not higher than 11%. In these non-final positions, H* may be used as a means of highlighting a word, resulting from semantic structure rather than from positional constraints. For all phrase lengths considered, the only significant difference is that between the initial and all other positions.

H*L accents ("accentual peaks") are distributed rather evenly in all positions, with a certain increasing trend towards the end of the phrase. As in the case of H*, this accent may serve to highlight the word. The only significant difference in frequency is that between the first and fourth position in 5-accent phrases.

S* accents ("flat"), corresponding to perceived prominence with no or almost no intonational change, are excluded *a priori* at the beginning of a phrase (flat configurations in these positions typically receive the H* label). Apart from this restriction, no specific trend has been identified with respect to position. This may seem counter-intuitive, since one would expect a greater frequency of reduced forms of accents towards the end of the phrase, as it is visible in the distribution of L*H and HL*. Despite that, we can hypothesize that S* is, in a way, a weaker form of L*H or HL*.

4.2. Phrase length

When comparing the occurrence of L*H accents in phrases of different length, we can see that their frequency is rather stable in the position left from nucleus (1_2, 2_3, 3_4 and 4_5 show no significant difference when subject to a χ^2 test), and that it increases leftward with increasing length of the phrase. Statistically speaking, the probability of an L*H accent is significantly higher at the beginning of a 3-, 4- or 5-accent phrase than of a 2-accent phrase. Also, it is higher in the second position of a 3-accent phrase than of a 4-accent phrase. These facts indicate utterance planning: the longer the phrase, the stronger the tendency to use L*H at its beginning; this trend is exactly inverse for H* accents (see below).

The HL* accent, which is largely inhibited phrase-initially, is especially likely to occur towards the end of longer phrases. However, no comparable pair of positions (e.g. 2_3 with 2_4, 2_4 with 2_5, 2_3 with 3_4 etc.) exhibits a significant difference in our data.

The distribution of H* accents, typically initial, varies with the length of the phrase in a way which is in trade-off relation with L*H: the longer the phrase, the smaller the chance of starting with H*. The only significant difference is that between 1_2 and all other initial positions.

H*L does not display any significant trend with respect to phrase length. Similarly, the S* accent does not vary with phrase length in a systematic way, except for the phrase-initial inhibition.

4.3. Interaction with nuclear accents

The choice of prenuclear accents may be influenced by the nature of the nucleus. This idea has been explored especially by Ph. Martin (1975) in his syntax-driven theory of French prosody ("contrast of melodic slope"), and is implicitly present in claims about parallel signalling of prosodic functions in nuclear and prenuclear parts of phrases (e.g. differences between statements and questions in overall register – Hirst & Di Cristo 1998).

We tested the frequency of different prenuclear accents for phrases terminated by a rising contour and by a falling contour, respectively. The classification rising/falling was done on the basis of the global shape, independently of the exact alignment of pitch movements. Rising-falling contours were excluded for their low frequency (N = 57). Syntactically speaking, all rising contours are continuation rises in our material, and most falls are finality falls, except for a very limited number of continuation falls.

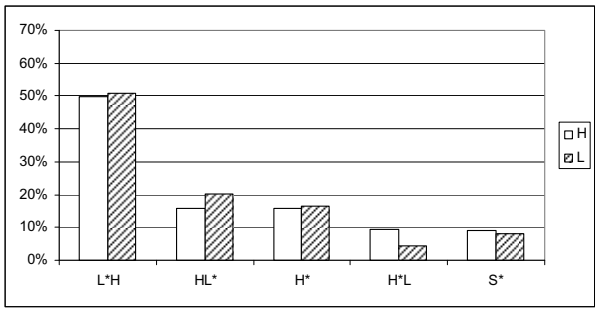
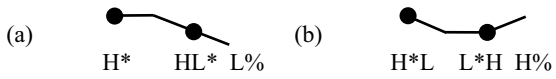


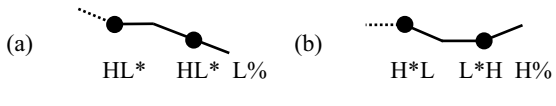
Figure 7. Frequency of prenuclear accents in phrases terminated by a rising nuclear contour (white columns) and a falling nuclear contour (shaded columns).

The values obtained are displayed in Figure 7. Since no difference between adjacent columns is significant, it would be bold to try to define any trends. One of the possible problems is that accents are counted independently of their position in this approach, which can hide some instances of systematic behaviour. To capture at least a part of them in more transparent conditions, we calculated the frequencies for 2-accent phrases only (N = 84), where the interaction between nucleus and the only prenuclear accent could be observed more closely. The results are presented in Figure 8. Two differences are significant: H* co-occur more easily with falling nuclei (a), and H*L with rising nuclei (b):



The observed behaviour may be interpreted as a certain tendency to dissimilation which spreads leftward from the nucleus.

Next we tested the interaction of nuclear contours with immediately preceding accents (2_3, 3_4, 4_5, but not 1_2, where the accent is initial). The results are presented in Figure 9. Two differences were identified as significant: that in HL*, which is more likely to occur in a low-terminated phrase (a), and that in H*L, which almost does not occur in this type of phrase. The latter trend is fully in line with data from Figure 8.



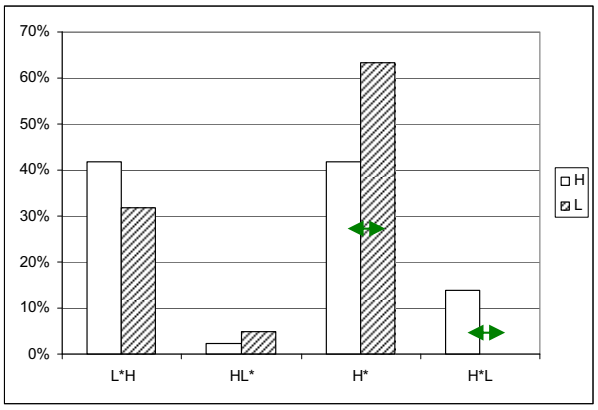


Figure 8. Frequency of prenuclear accents in phrases terminated by a rising nuclear contour (white columns) and a falling nuclear contour (shaded columns) in 2-accent phrases. S* accents do no occur in this position.

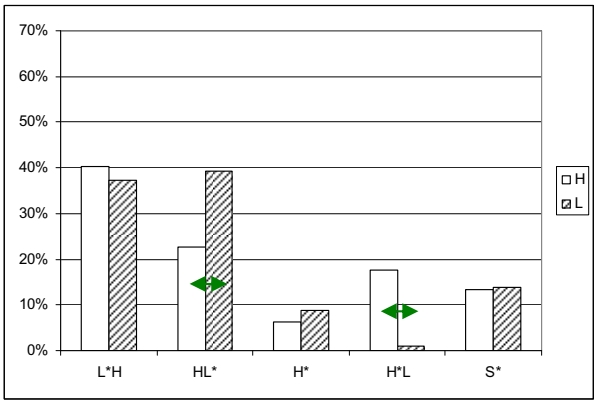


Figure 9. Frequency of prenuclear accents in phrases terminated by a rising nuclear contour (white columns) and a falling nuclear contour (shaded columns) – accents immediately preceding the nucleus only.

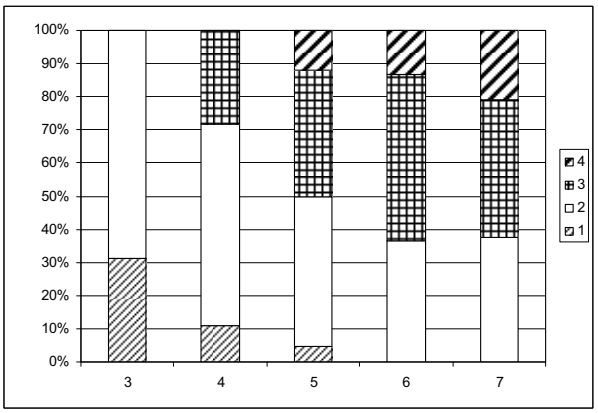


Figure 10. Number of different types of prenuclear accents in phrases containing 3–7 accents.

4.4. Identical pitch accents

Figure 10 represents the number of different prenuclear pitch accents found in phrases of 3–7 accents (2-accent phrases have by definition only one type of prenuclear accent). No assimilatory tendency can be identified: the "standard" seems to be 2 different types of accents for 3-, 4- and 5-accent phrases, and 3 different types for longer phrases.

5. Conclusion

Our data contain clear evidence for Hypothesis 1 (positional variability of pitch accents): L*H accents are more frequent towards the beginning of the phrase, which tendency is compensated by a higher occurrence of HL* accent towards phrase end; these observations are correlated with declination and span narrowing. The distribution of H* accents is strongly linked with phrase beginnings, accent peaks being otherwise untypical of Czech intonation. S* accents are, somehow surprisingly, evenly distributed in all positions where they can logically occur.

Hypothesis 2 (variability with phrase length) finds its confirmation in the fact that the frequency of L*H and H* accents varies significantly with phrase length. Both observations can only be explained by utterance planning.

Interaction between prenuclear and nuclear accents (Hypothesis 3) has only been shown in immediate neighbourhood of the nucleus, where a certain tendency towards dissimilation can be seen. The type of data used (read speech, no questions), however, does not permit to study this aspect in full extent.

There does not seem to be a tendency to use a single type of prenuclear pitch accent in a phrase (Hypothesis 4).

The choice of pitch accents is thus neither "unrestricted", nor is it "assimilatory". Further analysis would be needed to prove whether it is "syntax-driven". Our data suggest that the relevant factors are especially the position within the phrase, followed by phrase length. Last but not least, it is worth noting that the autosegmental approach, which is novel in Czech, has revealed its potential as a viable means of analyzing prenuclear intonational behaviour.

6. Acknowledgement

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7. References

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