

## Phonetic evidence for the phonological association of rising pitch accents in Valjevo Serbian

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Serbian (srp) is a pitch-accent language with “falling” and “rising” pitch contours. Inkelas and Zec (1988) have argued that each word has a lexical H(igh), with stress assigned to the syllable immediately to the left of the H (where falling accents occur when the H is initial), while Smiljanić (2002) argued that falling accents are L+H\* and rising accents are L\*+H. In many dialects, F0 peaks phonetically occur on tonic syllables in falling accents, and on immediately post-tonic syllables in rising accents; however, in Valjevo Serbian, rising F0 peaks often occur in tonic syllables (Zec and Zsiga, 2018), which is suggestive of Smiljanić’s (2002) analysis. In this study, I argue that the H in Valjevo Serbian rising accents is still phonologically associated to the post-tonic syllable despite a lack of phonetic alignment.

I present data from five (4F, 1M) native speakers of Valjevo Serbian, each of whom produced 150 frame sentences in random order with a target word in focus. Target words were formed using a real word (e.g. *mrāmora* ‘marble.GEN’) and varying a syllable onset to create a total of five rhyming words, three with simple onsets (*rāmora*, *lāmora*, *māmora*), and two with complex onsets (*mrāmora*, *mlāmora*). There were three loci of onset variation (Locus): 1. the varied syllable phonologically carries both stress and H (falling: *mrāmora* /'mra<sub>H</sub>mora/); 2. the varied syllable phonologically carries only H (rising, post-tonic variation: *òmladinu* /'omla<sub>H</sub>dinu/); and 3. the varied syllable phonologically carries only stress (rising, tonic variation: *mràvinjak* /'mravi<sub>H</sub>ɲak/).

The varied onsets have distinct durations (VarOnsDur) in all word types, /r/ < /l/ < /m/ < /mr/ < /ml/ (all  $p < 0.0001$ ). However, VarOnsDur only consistently affects the timing of F0 peaks in Locus1 and Locus2 words (i.e., where the H syllable was varied). When comparing just Locus1 and Locus2 words, a linear mixed effects model shows that there is an effect of VarOnsDur on the location of the F0 peak relative to the acoustic left edge of the phonologically H syllable (PeakDelay) ( $\chi^2(1) = 188.69$ ,  $p < 0.0001$ ): peaks occur later when there are longer onsets ( $\beta = 1,034$  ms, SE = 68.1 ms; see panels 1 and 2 of Figure 1). There is no similar effect of VarOnsDur for Locus3 words. Although the addition of VarOnsDur significantly improves on the null model ( $\chi^2(1) = 14.36$ ,  $p = 0.0002$  for a model with Locus3 words only), the effect is fairly small and in the opposite direction as what is predicted ( $\beta = -240.2$  ms, SE = 62.2 ms), i.e., PeakDelay is smaller when the tonic syllable onset is longer (see panel 3 of Figure 1). This suggests that segmental characteristics of the tonic syllable do not drive F0 timing in rising accents.

Using the duration of the H syllable onset (Hsy10nsDur) as the predictor rather than VarOnsDur provides a more consistent analysis for the two rising accents. When comparing just Locus2 and Locus3 words, Hsy10nsDur significantly improves on the null model ( $\chi^2(1) = 81.80$ ,  $p < 0.0001$ ). The addition of Locus also improves this model ( $\chi^2(1) = 10.11$ ,  $p = 0.001$ , likely because Locus2 has a greater range of PeakDelay), but there is no interaction between Hsy10nsDur and Locus ( $\chi^2(1) = 2.25$ ,  $p = 0.13$ ; see Figure 2). This indicates that it is the duration of the H syllable onset that affects the timing of the peak, not the duration of the tonic syllable onset.

This is a particularly interesting finding because in many cases in rising accents, the F0 peak occurs prior to the syllable H is associated to. That is, properties of the post-tonic syllable affect peak timing even when the F0 movement is not phonetically overlapping with that syllable. These effects support Inkelas and Zec’s (1988) proposal and show that simultaneity of a tone and segmental structures is not a necessary condition for phonological association.

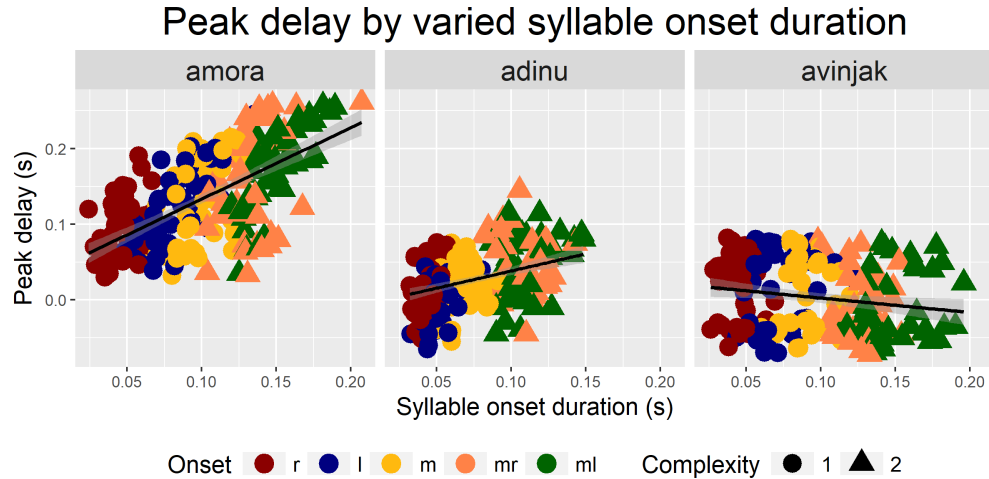


Figure 1: Three scatter plots comparing the relationship between VarOnsDur and PeakDelay in *ämora* (Locus1), *àvinjak* (Locus2), and *adinu* (Locus3) words.

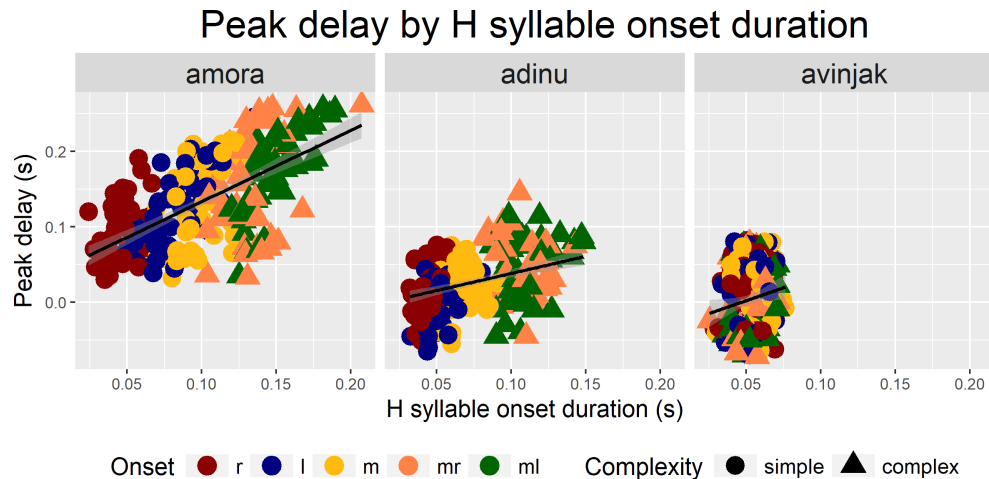


Figure 2: Three scatter plots comparing the relationship between Hsy1OnsDur and PeakDelay *ämora* (Locus1), *àvinjak* (Locus2), and *adinu* (Locus3) words.

## References

- Sharon Inkelas and Draga Zec. Serbo-Croatian pitch accent: the interaction of tone, stress, and intonation. *Language*, pages 227–248, 1988.
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