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Peak alignment properties of narrow-new focus in Serbian¹

✦ **Кључне речи:**
peak alignment, focus, Serbian, prosody.

У раду се истражују тонске особине фокусираних речи у иницијалној, медијалној и финалној реченичној позицији у изјавним реченицама у српском језику. Износе се резултати експерименталне студије у којој је анализирано место тонског врхунца у двосложним и тросложним речима.

1. INTRODUCTION

Focus, one of the basic information structural units, denotes the part of an utterance which the speaker presents as being important and/or which the speaker assumes to be most informative for the listener (Lambrecht 1994, Baumann et al. 2007). From a prosodic point of view, focus is analysed in two levels: in the first level referring to focus scope, focus is divided into broad and narrow focus (Ladd 1996). While domain of

broad focus usually extends over whole utterance, domain of narrow focus is restricted to a single constituent. In the second level, narrow focus is partitioned into narrow-new and contrastive focus. Regarding discourse functions, narrow-new focus presents an extension of the topic in a discourse, while contrastive focus corrects rather than augment a certain part of the topic (Toepel ve Alter 2004). As pointed in Toepel and Alter,

1) This study is adapted version of a part of doctoral dissertation *Bürün, bilgi yapısı ve sözcük dizilişi etkileşimi: Türkçe-Sırpça örneği* (Prosody, information structure and word order interaction: examples from Turkish and Serbian), Department of Linguistics at Ankara University.

this tripartition of focus into broad, narrow-new, and contrastive is useful to capture the interactions of semantic-pragmatic, phonological and phonetic aspects of focus in discourse.

In accordance with the above definitions, broad focus sentence in this work is regarded as an answer to a preceding “What happened?” question; narrow-new focus is concerned with a constituent that is new in a discourse and an answer to a preceding wh-question; and contrastive focus is associated with a constituent that is in contrast with the set of alternatives in a sentence. For example,

Broad focus: What happened?

[I went home]_{FOC}

Narrow-new focus: Who went home?

[I]_{FOC} went home.

Contrastive focus: Did Susan go home?

No, [I]_{FOC} went home.

According to Focus Prominence Theory proposed by Truckenbrodt (1995, 1999) and Selkirk (2004), prosodic encoding of focus is language specific. Languages mostly make use of pitch (fundamental frequency) in company with duration and loudness (intensity) to express focus. In Serbian, a language investigated here, fundamental frequency (*F₀*) and duration, and to a lesser degree, intensity are acoustic means utilized in expression of focus (Ivošević 2011).

The present study investigates *F₀* peak alignment properties of narrow-new focused words in sentence-initial, -medial, and -final position in simple declarative sentences. Peak alignment indicates a relative place of pitch peak in a stressed syllable, and it is the most important acoustic cue in determining lexical pitch accent types in pitch accent languages. For example, *rising* and

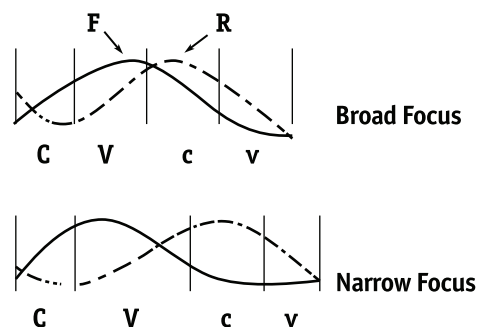


Figure 1. Peak alignments of sentence-initial words in broad and narrow focus conditions (Smiljanić 2004)

falling accents in Serbian differ according to their peak alignment properties: while peak alignment of falling accent is realized within a tonic syllable, peak alignment of rising accent is placed later in the tonic, or onto the posttonic syllable (Ivić ve Lehiste 1986, Gođevac 2000, Smiljanić 2004). Smiljanić found that difference in peak alignment between rising and falling accents become exaggerated in sentence-initial focused words; that is, peaks of rising accent are protracted (placed further onto the posttonic syllable), and peaks of falling accents retracted (realized earlier on the stressed syllable). Figure 1 shows the difference in peak alignment between sentence-initial words in broad and narrow focus conditions.

According to Smiljanić, peaks of both rising and falling accents in sentence-final position are retracted. In spite of that, peak of rising accent is still realized later, and lexical contrast is maintained. Smiljanić assumes that lexical contrast is only diminished in final position of broad focus sentences because there are no visible peaks in this condition. Figure 2 shows peak alignments of sentence-initial and sentence final words.

Different from Smiljanić's study in which tonal properties of contrastive focus

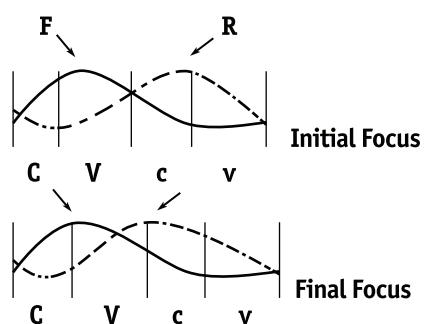


Figure 2. Peak alignments of sentence-initial and sentence final words (Smiljanić 2004)

in sentence-initial and –final position have been examined, this study deals with tonal properties of narrow-new focus in sentence-initial, –medial and –final position. In what follows we will present results of the experiment in which peak alignments of focused words in different sentence position has been examined.

2. METHOD

In the experiment focused words in different sentence positions are examined. Target words consist of two and three syllables with long falling, long rising, short falling or short rising accent on the first syllable:

Two-syllable words:

- rising: Vlada [vlâ:da] *proper name*, zmiija [zmîja] *snake*²

- falling: ždrebe [ždrê:be] *foal*, mama [mâma] *mum*

Three-syllable words:

- rising: delila [dê:lila] *served out*, livadu [livadu] *meadow*
- falling: videla [vîdela] *saw*, doneo [dône-o] *brought*

Carrier sentences used in the experiment are declarative sentences with simple syntactic pattern and different word orders. In the example below *Vlada je doneo ribu* (*Vlada brought the fish*) target words are marked in *italic* and accented first syllable in capital letters³:

Sentence-initial:

*VL*Ada je doneo ribu. *DO*neo je Vlada ribu.
*VL*Ada je ribu doneo. *DO*neo je ribu Vlada.

Sentence-medial:

Doneo je *VL*Ada ribu. Vlada je *DO*neo ribu
 Ribu je *VL*Ada doneo. Ribu je *DO*neo Vlada.

Sentence-final:

Doneo je ribu *VL*Ada. Ribu je Vlada *DO*neo.
 Ribu je doneo *VL*Ada. Vlada je ribu *DO*neo.

Seven female native speakers of Serbian took part in the study. They were from different cities: three from Belgrade, one from Ruma, two from Rijeka (Croatia), and one from Herceg Novi (Montenegro).⁴ Average age of the participants was thirty.

- 2) Instead of traditional denotation, IPA transcription is used to mark pitch accents in order to simplify the reading.
- 3) Other carrier sentences were *Zmija je videla žabu* (*Snake saw a frog*), *Ždrebe je sanjalo livadu* (*Foal was dreaming about meadow*), and *Mama je delila sladoled* (*Mum served out an ice-cream*).
- 4) Participants from Rijeka have been living in Belgrade for twenty years. Diverse from speakers of Zagreb Croatian examined in Smiljanić (2004), in speech of these subjects difference between rising and falling accent is always preserved. A participant from Herceg Novi who

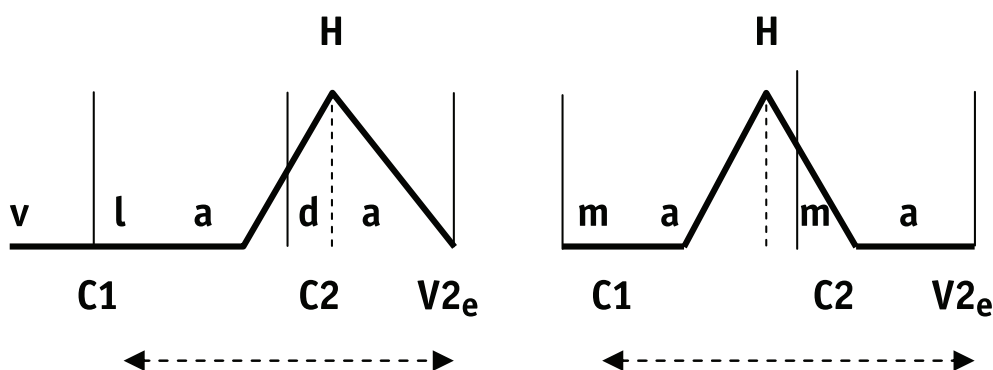


Figure 3. Peak alignment measurement scheme for words with rising (Vlada) and falling accent (mama)

The recordings were carried out in a quiet room with the experimenter reading out the questions (i.e. *What happened?*, *Who brought fish?*, *What did Vlada do with the fish?*) and subjects giving the answers written on a computer screen. They were asked to read the answers as natural as possible. Sentences were recorded directly to a computer at sampling rate of 44100 HZ using *Shure SM58* microphone. They were analyzed using the acoustic speech analysis software *Praat 5.1.25*. (Boersma & Weenink 2007).

Analysis was conducted in a number of steps. In the first step, the sentences were segmented manually using a combination of listening, and the inspection of *F₀*-tracks, and spectrogram. After that, segmentation of syllables in target words was done. Peak alignment was measured with respect to

the the onset of the stressed syllable and end of the posttonic syllable. Four points were located:

- C1 – onset of the stressed syllable (ms)
- C2 – onset of the posttonic syllable (ms)
- V2_e – end of the vowel of posttonic syllable (ms)
- H – timing of pitch maximum (ms)

On the basis of the above points, duration values between C1 and V2_e, C1 and H, C1 and C2 were found (Figure 3).⁵

Following Schliesser (2009), peak alignment in this study is expressed in terms of the alignment ratio. The alignment ratio of the pitch peak is computed as the relative time of occurrence of the pitch maximum between C1 and V2_e. That is to say, time

has also lived in Belgrade for ten years used different accent for the word *ždrebe* (instead of long falling, short falling accent was used). Except this, no other difference is noticed in this speaker's use of pitch accents.

- 5) Smiljanić (2004) presented peak alignment data with respect to the *'VC*-boundary (the boundary between the end of the stressed vowel and the onset of the following syllable). In this work different method for presenting peak alignment data is used because it was found that *F₀* peaks can be located earlier on the onset of the stressed syllable, or further at the end of the vowel in posttonic syllable.

of the pitch maximum in the two-syllabled constituent is divided through the length of the constituent.⁶

The maximum value of the alignment ratio is 1; this indicates that the peak is located at the end of the posttonic syllable. The minimum of 0 is found if the peak is in the very beginning of the stressed syllable. In other words, higher alignment ratio denotes later peaks, and a lower alignment ratio indicates earlier peaks. This kind of normalization is important for capturing variations arising from speech-rate and segment-induced pitch peak positions (Schliesser 2009).

3. RESULTS

3.1. Sentence-initial focus

Target words in sentence-initial position were examined regarding their lexical accent type; mean alignment ratio results are presented in *Table 1*.

As can be seen from *Table 1*, peak alignment (H) in rising accents is realized on posttonic ($H > C_2$), while alignment of falling accents occurs within stressed syllable ($H < C_2$).⁷ According to the Bonferroni-adjusted comparison, there is significant difference between all words with rising and falling accents. Due to a lack of space these results are not presented here.

Onset of the posttonic syllable (C_2) is about 0.60 for both rising and falling accents. When we concentrate just on results concerning rising accents, we can see that

	Rising		Falling		
	H	C ₂	H	C ₂	
Vla:da	0.84	0.62	ždre:be	0.36	0.55
zmija	0.71	0.64	mama	0.53	0.60
de:lila	0.92	0.57	videla	0.56	0.59
livadu	0.77	0.58	doneo	0.52	0.62

Table 1. Mean alignment ratio of sentence-initial words

	MD	S	p
Vla:da – zmija	0.127	0.032	0.011
zmija – de:lila	-0.211	0.033	0.000
de:lila – livadu	0.148	0.045	0.033

Table 2. Results of Bonferroni-adjusted comparisons between words with long and short rising accents

	MD	S	p
Ždre:be – mama	-0.150	0.045	0.038
Ždre:be – videla	-0.198	0.043	0.003
Ždre:be – doneo	-0.188	0.054	0.026

Table 3. Results of Bonferroni-adjusted comparisons between words with long and short falling accents

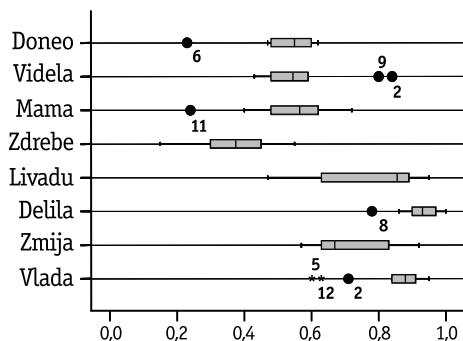
peak alignment of long rising accents has been realized later than in short ones. Results of Bonferroni test are presented in *Table 2*.

Considering just falling accents, we can see that alignment of long falling accents is realized earlier in the stressed syllable when compared to the short ones. Results of Bonferroni-adjusted comparisons are presented in *Table 3*.

- 6) Onset of the posttonic syllable (C_2) is also calculated using this method. Namely, time of the onset of the C_2 in the two-syllabled constituent is divided through the length of the constituent.
- 7) Despite of the results indicating that pitch maximum is not realized on the tonic syllable, listeners still consider tonic syllable as the accented. According to Smiljanić (2004), reason for this can be found in duration of accented syllable.

Peak alignment of sentence-initial words in narrow-new focus and broad focus conditions (*Vlada, zmija, ždrebe, mama*)⁸ were compared, and no difference was found between them. On the other side, Smiljanić (2004) found the difference between alignment of words in narrow (contrastive) focus and broad focus conditions in sentence-initial position: as mentioned above, in narrow focus conditions peak alignment of rising accents is realized later on the posttonic syllable, while peaks of falling accents are placed earlier within accented syllable when compared to broad focus readings. Results of this study show that speakers do not make an extra effort to highlight focused word in sentence-initial position and the pitch range compression after the focused word is the main indicator of narrow-new focus.⁹

In box plots below, alignment ratio values of the focused words in sentence-initial position across the speakers were presented.



Graph 1. Alignment ratio values of the focused words in sentence-initial position

As Graph 1 shows, in words with falling accents *doneo, videla, mama* and *ždrebe* peak is aligned earlier than in words with rising accents *livadu, delila, Vlada* and *zmija*. Each word has been analyzed separately and the results are presented below:

- In the trisyllabic word with short falling accent *doneo* in 75 percent of cases peak was placed at the end of the first syllable, and in 25 percent on the boundary between V1 and C2 (between 0.48 and 0.61). Median (a line across the box) indicates that there is a tendency among speakers to place *Fo* maximum at the end of the stressed syllable.
- In the trisyllabic word with short falling accent *videla* results are similar to those in the word *doneo*: in all examples peak was realized within stressed syllable between 0.41 and 0.59. Median shows that peak is usually placed at the end of stressed syllable.
- In the two-syllable word with short falling accent *mama* data are more heterogeneous distributed: in 75 percent of cases peak was placed at the end of the first syllable (between 0.46 and 0.62) and in 25 percent of cases at the onset of the posttonic syllable (between 0.62 and 0.68). Position of median indicates that peak is usually placed at the end of the stressed syllable.
- In the two-syllable word with long falling accent *ždrebe* in all examples peak was realized within stressed syllable. In 25 percent of cases peak was realized at the onset of accented

8) Broad focus sentences: *Vlada je doneo ribu, Zmija je videla žabu, Ždrebe je sanjalo livadu, Mama je delila sladoled.*

9) *Fo* maximum values of sentence-initial words in broad focus condition are higher than those in narrow focus.

syllable (between 0.15 and 0.29), in 50 percent of cases in the middle of the accented syllable (between 0.29 and 0.45), and in 25 percent at the end of accented syllable (between 0.45 and 0.53).

- In the trisyllabic word with short rising accent *livadu* data are quite spread: In 25 percent of cases peak was realized at the end of first syllable (between 0.47 and 0.60), and in 75 percent of cases *F₀* maximum is located within posttonic syllable (between 0.60 and 0.93). In this word median approaches upper quartile which means that pitch peak is usually placed on the vowel of the posttonic syllable.
- In the trisyllabic word with long rising accent *delila* in all examples alignment is realized on the vowel of the posttonic syllable (between 0.89 and 1.00).
- In the two-syllable word with short rising accent *zmija* in 25 percent of cases peak is aligned at the boundary between the two syllables (between 0.57 and 0.62), and in 75 percent of cases within the posttonic syllable (between 0.62 and 0.90). Median approaches the first quartile, and this indicates that *F₀* maximum is usually realized at the consonant of the posttonic syllable.
- In the two-syllable word with long rising accent *Vlada* peak in almost all cases is placed on the vowel of the posttonic syllable (between 0.80 and 0.95).

3.2. Sentence-medial focus

Results for pitch alignment in focused words in sentence-medial position regarding pitch accent types are presented in *Table 4*:

	Rising			Falling	
	H	C ₂		H	C ₂
Vla:da	0.68	0.60	ždre:be	0.31	0.55
zmija	0.51	0.62	mama	0.34	0.60
de:lila	0.88	0.56	videla	0.39	0.52
livadu	0.64	0.49	doneo	0.39	0.63

Table 4. Mean alignment ratio of sentence-initial words

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As can be seen from *Table 4*, results for peak alignment (H) for rising accents show diverse tendencies: in the two-syllable word with long rising accent *Vlada* pitch maximum is placed on the posttonic syllable's consonant (H>C₂); in the two-syllable word with short rising accent *zmija* *F₀* peak is realized within stressed syllable, near 'VC-boundary (H<C₂); in the trisyllabic word with long rising accent *delila* peak is located on the posttonic vowel (H>C₂); *F₀* peak in three-syllable word with short rising accent *livadu* is placed on the posttonic syllable (H>C₂).

On the other side, results for falling accents show similar tendencies across all words: peaks are realized before syllable boundary, this is, on the tonic syllable (H<C₂).

The results above concerning rising and falling accents in sentence-medial position show that peaks of all words are realized earlier when compared to the same words in sentence-initial position (results of statistic analysis are shown in *Table 7*); however, contrast between two accent types is preserved.

Peak alignment of sentence-medial words in narrow-new focus and broad conditions *delila* (*Mama je delila sladoled*), *videla* (*Zmija je videla žabu*), *doneo* (*Vlada je doneo ribu*) were compared, and no difference was found between them. However, analysis in Ivošević (2011) shows that *F₀* maximum values of

narrow focused words are raised in this position. So, according to this result, speakers did not use peak alignment to highlight a focused word but rather raised pitch.

In box plots below, alignment ratio values of the focused words in sentence-medial position across the speakers were presented.

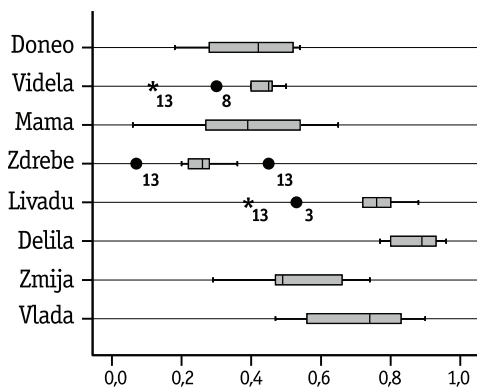
It can be seen from *Graph 2* that, similar to the results concerning sentence-initial position, in sentence-medial focused words with falling accents peak is aligned earlier than in words with rising accents. Each word has been analyzed separately and the results are presented below:

- In the trisyllabic word with short falling accent *doneo* in all cases peak was placed within the accented syllable. In 25 percent of cases peak is placed on the first consonant (between 0.15 and 0.26), and in 75 percent on the first vowel (between 0.26 and 0.53). Median indicates that there is tendention among speakers to place *F₀* maximum at the end of the stressed syllable. Peak of *doneo* in sentence-medial position has been retracted when compared

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with the same word in sentence-initial position.

- In the trisyllabic word with short falling accent *videla* results are similar to those in the word *doneo*: in all of the cases peak was realized within stressed syllable (between 0.39 and 0.53). Median shows that peak is usually placed at the end of stressed syllable. Peak alignment of *videla* in sentence-medial position has been retracted when compared the same word in sentence-initial position and the data are spread more homogenous.
- In the two-syllable word with short falling accent *mama* data are more heterogeneous distributed: in 75 percent of cases peak was aligned within tonic syllable (between 0.04 and 0.51), and in 25 percent of cases on the 'VC-boundary (between 0.51 and 0.63). Position of median indicates that peak is usually placed in the middle of tonic syllable. Similar to the above results, peak alignment of *mama* in sentence-medial position has been retracted when compared the same word in sentence-initial position.
- In the two-syllable word with long falling accent *ždrebe* in all examples peak was realized early on the stressed syllable (between 0.21 and 0.36). Median approaches upper quartile and that means that there is a tendency to place *F₀* peak in the middle of tonic syllable. In this case peak alignment is not retracted when compared with the same word in sentence-initial position but data are spread more homogenous.
- In the trisyllabic word with short rising accent *livadu* in most of the cases peak is placed on the vowel of the posttonic syllable (between 0.72 and



Graph 2. Alignment ratio values of the focused words in sentence-medial position

0.86). In this case peak alignment is not retracted when compared with the same word in sentence-initial position and data are spread more homogenous.

- In the trisyllabic word with long rising accent *delila* in all examples peak is aligned on the vowel of the posttonic syllable (between 0.77 and 0.96). Peak alignment of *delila* in sentence-medial position has been retracted when compared the same word in sentence-initial position.¹⁰
- In the two-syllable word with short rising accent *zmija* in 50 percent of cases peak is located on the 'VC-boundary (between 0.47 and 0.66); in 25 percent of cases within the tonic syllable (between 0.29 and 0.47), and in 25 percent of cases at the onset of the posttonic syllable (between 0.66 and 0.71). Median approaches the first quartile, and this indicates that *F₀* maximum is usually realized at the end of the tonic syllable. Highly retracted peak of word *zmija* in this position when compared to the same word in sentence-initial position indicates that rising pitch accent in this word approaches to the "area" of falling accents.
- In the two-syllable word with long rising accent *Vlada* in 75 percent of cases peak is placed on the 'VC-boundary and within the posttonic syllable (between 0.54 and 0.88), and in 25 percent of cases at the end of tonic syllable (between 0.47 and 0.54). Peak alignment of *Vlada* in sentence-medial position has been retracted when compared wuth he same word in sentence-initial position.

10) We assume that slight retraction of peaks in words *livadu* and *delila* is due to the number of syllables in these words.

	Rising			Falling	
	H	C ₂		H	C ₂
Vla:da	0.65	0.60	ždre:be	0.14	0.52
zmija	0.47	0.60	mama	0.19	0.55
de:lila	0.77	0.54	videla	0.28	0.50
livadu	0.54	0.48	doneo	0.20	0.63

Table 5. Mean alignment ratio of sentence-initial words

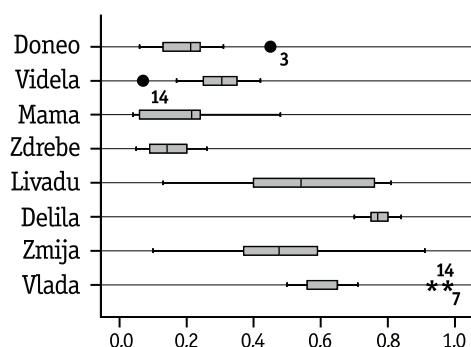
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3.3. Sentence-final focus

Results for pitch alignment in focused words in sentence-final position regarding pitch accent types are presented in *Table 5*:

As mentioned before, it is assumed that lexical contrast is only diminished in final position of broad focus sentences because there are no visible peaks in this condition (Lehiste & Ivić 1986, Smiljanić 2004). It was seen in this work that in some cases, particularly in cases of short rising accents of focused words, contrast between lexical accents can also be endangered in sentence-final position. Short rising accent always preserved its tonal properties only in speech of subject from Ruma. In the speech of this subject, peak alignment of rising words is realized later on the posttonic syllable even in the sentence-final position. Also, this speaker also prolonged duration of the sentence-final focused word much more than other speakers (Ivošević 2011). This result indicates an impact of the Šumadija-Voyvodina dialect on the speech of this subject.

In box plots below, alignment ratio values of the focused words in sentence-final position across the speakers were presented.



Graph 3. Alignment ratio values of the focused words in sentence-final position

It can be seen from Graph 3 that, similar to the previous results, in sentence-final focused words with falling accents peak alignment is realized earlier than in words with rising accents. Each word has been analyzed separately and the results of the analysis are presented below:

- In the trisyllabic word with short falling accent *doneo* in all cases peak was placed within the accented syllable (between 0.06 and 0.38). Median approaches the upper quartile and indicates that there is tendention among speakers to place *F₀* maximum in the middle of the stressed syllable. Peak alignment of *doneo* in sentence-final position has been retracted when compared the same word in sentence-initial and –medial positions.
- In the trisyllabic word with short falling accent *videla* in all cases peak was realized within stressed syllable (between 0.18 and 0.42). Median shows that peak is usually placed in the middle of the stressed syllable. Peak alignment of *videla* in sentence-final position has been retracted when compared the same word in sentence-initial and –medial positions.
- In the two-syllable word with short falling accent *mama* in 75 percent of cases peak was located on the consonant of the tonic syllable (between 0.04 and 0.24), and in 25 percent on the vowel of the same syllable (between 0.24 and 0.48). Position of median indicates that peak is usually placed in the middle of tonic syllable. Similar to the above results, peak alignment of *mama* in sentence-final position has been retracted when compared the same word in sentence-initial and –medial positions.
- In the two-syllable word with long falling accent *ždrebe* in all of the cases peak was realized early on the stressed syllable (between 0.05 and 0.26). Median approaches lower quartile and taht means that there is a tendency to place *F₀* peak on the onset of the tonic syllable. In this case peak alignment is retracted when compared with the same word in sentence-initial and –medial positions.
- In the trisyllabic word with short rising accent *livadu* in 50 percent of cases peak is placed at the end of the tonic and the onset of the posttonic syllable (between 0.39 and 0.76); in 25 percent of cases within the tonic syllable (between 0.13 and 0.39); and in the 25 percent within the posttonic syllable (between 0.76 and 0.81).
- In the trisyllabic word with long rising accent *delila* in all cases alignment is realized on the vowel of the posttonic syllable between 0.70 and 0.84. Peak alignment of *delila* in sentence-medial position has been slightly retracted when compared the same word in sentence-initial and –medial positions.

- In the two-syllable word with short rising accent *zmija* data are heterogeneously spread and show diverse tendencies: in 50 percent of cases peak is located at the end of the tonic syllable (between 0.34 and 0.59), in 25 percent of cases early on the tonic syllable (between 0.10 and 0.34), and in 25 percent of cases within posttonic syllable (between 0.59 and 0.88). As we saw before, sentence position has the largest impact on this is word.
- In the two-syllable word with long rising accent *Vlada* in 50 percent of cases peak is placed on the 'VC-boundary (between 0.55 and 0.66), in 25 percent of cases at the end of the tonic syllable (between 0.50 and 0.55), and in 25 percent of cases on the onset of the posttonic syllable (between 0.66 and 0.71). Median shows that peak is usually placed within the posttonic syllable. Peak alignment of *Vlada* in sentence-final position has been retracted when compared the same word in sentence-initial and -medial positions.

	Rising			Falling			
	H ₁	H ₂	H ₃	H ₁	H ₂	H ₃	
Vla:da	0.84	0.68	0.65	ždre:be	0.36	0.31	0.14
zmija	0.71	0.51	0.47	mama	0.53	0.34	0.19
de:lila	0.92	0.88	0.77	videla	0.56	0.39	0.28
livadu	0.77	0.64	0.54	doneo	0.52	0.39	0.20

Table 6. Mean alignment ratio of words in sentence-initial, -medial and -final positions

In the Table 6, mean alignment values of words in three different sentence positions are presented:

As can be seen from Table 6 focused words with both rising and falling accent on the stressed syllable have lowest alignment values in sentence-final position (H₃). As focus approaches intonation boundary, peak alignment is realized more earlier. Table 7 shows results of Bonferroni-adjusted comparisons:

According to the results in Table 7 peaks of the falling accents are more retracted as word is positioned later in a sentence when compared to words with rising accents.

Rising Accents	MD	S	p	Falling Accents	MD	S	p
Vlada ₁ – Vlada ₂	.161	.048	.020	Ždrebe ₁ – Ždrebe ₂	.068	.040	.351
Vlada ₁ – Vlada ₃	.198	.053	.010	Ždrebe ₁ – Ždrebe ₃	.244	.030	.000
Vlada ₂ – Vlada ₃	.037	.057	1.00	Ždrebe ₂ – Ždrebe ₃	.176	.051	.016
Zmija ₁ – Zmija ₂	.199	.036	.000	Mama ₁ – Mama ₂	.175	.062	.044
Zmija ₁ – Zmija ₃	.238	.042	.000	Mama ₁ – Mama ₃	.348	.035	.000
Zmija ₂ – Zmija ₃	.038	.040	1.00	Mama ₂ – Mama ₃	.172	.040	.003
Delila ₁ – Delila ₂	.045	.018	.081	Videla ₁ – Videla ₂	.181	.036	.001
Delila ₁ – Delila ₃	.156	.020	.000	Videla ₁ – Videla ₃	.288	.031	.000
Delila ₂ – Delila ₃	.111	.021	.000	Videla ₂ – Videla ₃	.107	.039	.052
Livadu ₁ – Livadu ₂	.129	.070	.273	Doneo ₁ – Doneo ₂	.132	.047	.046
Livadu ₁ – Livadu ₃	.237	.086	.050	Doneo ₁ – Doneo ₃	.313	.038	.000
Livadu ₂ – Livadu ₃	.108	.079	.579	Doneo ₂ – Doneo ₃	.181	.055	.019

Table 7. Results of Bonferroni-adjusted comparisons of peak alignment of same words in different sentence positions.

Except from the word *ždrebe*, in all other examples significant difference between the foci in sentence-initial and –medial positions is found. In other words, words with falling accent that are focused sentence-initially, have peaks aligned later in the tonic syllable. Significant difference is found between peak alignment of falling accents in sentence-initial and –final positions. There is also significant difference between sentence-medial and –final position, except from the trisyllabic word *videla*, where the difference approaches significance ($p = .052$).

Results for words with rising accents are more complex: significant difference is found between peaks in the sentence-initial and –medial focused *Vlada* and *zmija* ($p = .020$; $p = .000$), where peaks in sentence-initial position are realized later; but no difference is found between the sentence-initial and –medial focused trisyllabic words *delila* and *livadu* ($p = .081$; $p = .273$). Significant difference is found between peak alignment of rising accents in sentence-initial and –final positions, except from the trisyllabic word *livadu*, where the difference approaches significance ($p = .050$). Except from the trisyllabic word *delila* (where $p = .000$), there is no difference found between peaks of rising accents in sentence-medial and –final positions. Absence of difference between peaks of rising accents in sentence-medial and –final positions shows that tonal properties of rising accents are preserved in sentence-final position.

It is assumed that peak alignment retraction on both falling and rising accents results from tonal repulsion, i.e. the closeness of the intonation phrase boundary tones leads to temporal readjustments of peak location (Silverman ve Pierrehumbert 1990). Similar to Smiljanić (2004), the results above show that, in spite of tonal repulsion, tonal contrast is usually preserved in all sentence positions.

4. CONCLUSION

In this study no difference in peak alignment is found between sentence-initial words in narrow-new focus and broad focus conditions. On the other side, Smiljanić (2004) found the difference between alignment of words in contrastive focus and broad focus conditions in sentence-initial position: in narrow focus conditions peak alignment of rising accents is realized later on the posttonic syllable, while peaks of falling accents are placed earlier within accented syllable when compared to broad focus readings.

Similar to findings of previous studies it is found that difference between rising and falling accents is more prominent in long accents, than in short ones.

Results regarding sentence-medial focused words show that, despite of peak retraction in both rising and falling accents, tonal diversity between two accent types has been preserved in this position. It is found that peaks of the falling accents are retracted more than those of rising accents.

Results regarding sentence-final focused words show that in some cases, particularly in cases of short rising accents, contrast between lexical accents can be endangered. Short rising accent consistently preserved its tonal properties only in speech of the subject from city of Ruma. In the speech of this subject, peak alignment of rising words is realized later on the posttonic syllable even in the sentence-final position, and this is considered to be a dialect-specific property.

Peaks of the focused words in sentence-final position are retracted when compared to those in sentence-initial and –medial positions. It is assumed that this retraction, observed in both accent types, could be explained by tonal repulsion. It is found that falling accents retract more than rising ones,

and this shows that tonal contrast are usually preserved even in this position. Also, it is found that peaks of trisyllabic words retract less than peaks of disyllabic words.

summary

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The present study investigates *F₀* peak alignment properties of narrow-new focused words in sentence-initial, -medial, and -final position in simple declarative sentences in Serbian. The study reports results of an acoustic experiment conducted with seven native speakers of Serbian. It is found that there is no difference in peak alignment of sentence-initial words in narrow-new focus and broad focus conditions. Peaks of the focused words in sentence-final position are retracted according to those in sentence-initial and -medial positions. It is found that peaks of falling accents retract more than peaks of rising accents, and that peaks of trisyllabic words retract less than those of disyllabic words.

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