Lexical and Pragmatic Effects on Pitch Range and Low Tone Alignment in Two Dialects of Serbian and Croatian

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1 Introduction

Experimental investigation of the intonation systems of various languages and language varieties has informed us about the extent to which languages or language varieties can vary in their prosodic characteristics. The results suggest that traditional models of intonation and research on prosodic typology which were often concerned with one, usually a standard, language variety, have led to oversimplified ideas about linguistic typologies and about the role of the observed variation which is often disregarded as irrelevant (Grabe et al., 2000; Grabe, 2002; Hualde et al., 2002; Grice et al., to appear, etc.). Furthermore, experimental investigation can answer important phonological questions such as how is the conflict between using the same acoustic cues (e.g., pitch alignment) to express phonemic contrasts and pragmatic information (e.g., narrow focus) resolved. In languages without lexical pitch contrasts, in addition to the expansion of the pitch range, pitch alignment is often manipulated in narrow focus. For instance, Spanish, Greek and European Portuguese align pitch peaks more strictly with the accented vowel/syllable in narrow focus (Botinis, 1998; Face, 2002 Frota, 2000). Maekawa (1997), has shown that pitch alignment in Japanese, on the other hand, is not used to express narrow focus presumably because it is used lexically to differentiate between accented and unaccented words. Instead, pitch range is greatly expanded. Unlike either Spanish or Japanese, Swedish, with lexical pitch contrasts, introduces an additional sentential H tone in narrow focus (Bruce, 1977). Therefore, it seems that the presence or absence of lexical pitch contrasts determines the strategies adopted by languages in the expression of prosodic narrow focus. Finally, detailed experimental investigation of pitch alignment has shown that tonal targets align precisely with the segmental string and these observations have led to positing linguistic representations (e.g., pitch accent categories) based on the measurable physical data (Bruce, 1977; Pierrehumbert, 1980; Arvaniti et al., 1998, Grice et al., to appear, etc).

The present study adds to this growing body of research by looking at prosodic variation of relatively understudied language varieties of Serbian and Croatian (S/C). Additionally, this paper investigates the role of dialectal/prosodic variability in the expression of pragmatic narrow focus. More specifically, it investigates the interplay between lexical and pragmatic factors in determining the role of the pitch range and the alignment of F0 valleys preceding and following the accentual peaks in two dialects of S/C: the Belgrade dialect with the lexical pitch contrast and the Zagreb dialect without such contrast.
2 Serbian and Croatian

Although Serbo-Croatian has traditionally been described as a pitch-accent language, Smiljanić and Hualde (2002) have argued that certain dialects of S/C are better described as belonging to a stress language with a lexical contrast in the alignment of pitch-contours (Lehiste and Ivić, 1963, 1986 etc.). These dialects, then, are typologically more similar to Swedish rather than to e.g., Tokyo Japanese (a prototypical pitch-accent language). The lexical pitch contrast is between ‘rising’ (R) and ‘falling’ (F) pitch contours which can be realized on the initial long and short accented vowels/syllables (non-initial syllables can only bear a R accent although there is some dialectal variation in this respect).

Experimental evidence has shown that the lexical contrast between R and F accents is largely expressed through pitch peak alignment (Lehiste and Ivić, 1986; Smiljanić and Hualde, 2000; Smiljanić 2002). Smiljanić and Hualde (2000) and Smiljanić (2002) have shown that the R accents are characterized by ‘late’ peaks, i.e., peaks aligned with the posttonic syllable while the F accents are characterized by ‘early’ alignment, i.e., peaks aligned with the tonic vowel/syllable. However, such lexical tonal distinctions are not present in all dialects. The contrast is found in the Belgrade dialect but is absent for some speakers in the Zagreb dialect.

Peak alignment changes as a function of pragmatic focus in both dialects (Smiljanić and Hualde, 2000; Smiljanić, 2002). The nature of the alignment change reflects the differences in the prosodic characteristics of these two dialects. In Belgrade, the lexical contrast is enlarged. This is achieved through an asymmetric manipulation of R and F peaks. In narrow focus the ‘early’/F peaks are retracted and, therefore, aligned even earlier within the accented vowel while the ‘late’/R peaks are somewhat protracted and, therefore, aligned even later into the posttonic syllable. In this way the distance between the lexically determined ‘early’ and ‘late’ peak alignment is increased and the lexical category distinction is made more salient (similar results were reported for Swedish where vowel lengthening under focus enlarged lexical vowel length distinction; Heldner and Strangert, 2001). In Zagreb, without lexical pitch contrast, peak alignment change conveys pragmatic information. All peaks are uniformly retracted from the posttonic syllable to the tonic syllable in narrow focus. This makes the accented syllable/word even more prominent in the discourse. Similar focus induced peak retraction patterns have been reported for a variety of languages, among them Spanish and Greek (Face, 2002; de la Mota, 1997; Botinis, 1998). Both Belgrade and Zagreb peak alignment patterns are independent of vowel lengthening induced by narrow focus. Although vowels are longer in narrow focus, the amount of alignment manipulation is greater than the amount of lengthening. Iconic presentation of peak alignment in both broad and narrow focus for Belgrade (top panel) and Zagreb (bottom panel) speakers is given in Figure 1:
These results show that prosodic variation between two related varieties of a language can be as great as that found between languages (e.g., Swedish vs. Spanish). Furthermore, they show that peak alignment is determined by a combination of lexical and pragmatic factors in both dialects. Finally, the presence of a lexical contrast limits the use of the same acoustic cue in the expression of narrow focus in such a way that the existing contrasts are enlarged.

3 Experiment
The present experiment addresses several questions. First, are there acoustic correlates other than peak alignment of accent types and of narrow focus? For instance, Lehiste and Ivić (1986) suggest that the peaks for the F accents are higher than the peaks for the R accents. This would suggest that peak height is lexically determined. Second, in case that there are other correlates of lexical pitch accents, will there be the same type of contrast enlargement as was seen with the peak alignment? In other words, would the F peaks be even higher and the R peaks lower in narrow focus thereby increasing the distance in Hz between

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1 Position in the prosodic phrase additionally conditions peak alignment (see Smiljanić, 2002 and Smiljanić, submitted).
the two accent types. Third, does the use of an acoustic cue in conveying lexical information limit its use in expression of pragmatic narrow focus? Would the expansion of pitch range be compromised/limited given the (potential) use of peak height to differentiate lexical accent types? Fourth, the patterns of L alignment could reveal the composition of the pitch accents (whether L targets are parts of complex pitch accents)? These questions were investigated through close examination of the pitch range and tonal alignment of F0 valleys preceding (L1) and following (L2) the accentual peaks in two dialects of S/C. The alignment of L targets with respect to the beginning of the accented syllable (L1) and the end of the target word (L2) as well as the height of L1, pitch peak (H) and L2 (in Hz) was measured from F0 traces, spectrograms and sound waves obtained with PRAAT. Figure 2 is a schematic representation of the measurement targets:

![Figure 2: Schematic representation of the L1, H and L2 targets.](image)

Sample target words (bolded with accented syllables in capitals) with an initial long rising (LR) or long falling (LF) accents in a carrier sentence and with a non-initial long rising accent are given in 1:

(1)  

<table>
<thead>
<tr>
<th>Word</th>
<th>Sentence</th>
<th>Annotation</th>
</tr>
</thead>
<tbody>
<tr>
<td>MarA</td>
<td>Mara je jela bananu</td>
<td>‘Mara (LR) ate a banana.’</td>
</tr>
<tr>
<td>MalI</td>
<td>Mali je jeo bananu</td>
<td>‘A kid (LF) ate a banana.’</td>
</tr>
<tr>
<td>banA</td>
<td>baNAna je bila na stolu</td>
<td>‘Banana (LR) was on the table.’</td>
</tr>
</tbody>
</table>

Broad focus reading was elicited by a prompting question ‘What happened yesterday?’ to which the subjects responded by reading the answer from index cards. Narrow focus reading was elicited by a prompting question, e.g., ‘Did the girl eat a banana?’ for the answer ‘The kid (masc.) ate a banana.’ The sentences were randomized within each block (broad and narrow focus) and repeated 5 times for a total of 180 sentences with the word-initial accent and 60 sentences with the word non-initial accent per speaker. Three native speakers of each dialect were recorded onto a DAT recorder in a soundproof booth in the Phonetics Lab at UIUC (sampling rate 44.1 kHz, resampled at 16kHz). The sentences were analyzed using PRAAT (Boersma, 1992).

3 Results
3.1 Pitch Range
3.1.1 Belgrade
ANOVAs for H height with accent (F vs. R) and pragmatics (broad vs. narrow) as fixed factors were performed for each subject separately. The results show that there is no main effect of accent on H height for any of the Belgrade speakers: B1: $F(1,152) = 4.152, p = .043 \text{ ns.}$; B2: $F(1,162) = .466, p = .496 \text{ ns.}$; B3: $F(1,156) = .679, p = .411 \text{ ns.}$ There is a significant main effect of pragmatics on H height for all three speakers: B1: $F(1,152) = 33.888, p < .000$; B2: $F(1,162) = 192.018, p < .000$; B3: $F(1,156) = 13.250, p < .000$. None of the interactions were significant. Additionally, ANOVAs for L1 and L2 height with pragmatics (broad vs. narrow) as a fixed factor were performed for each subject separately. For two out of three speakers, there is a main effect of pragmatics on L1 height: B1: $F(1,152) = 20.667, p < .000$; B2: $F(1,162) = 19.174, p < .000$; B3: $F(1,156) = .159, p = .691 \text{ ns.}$ There is a significant main effect of pragmatics on L2 values only for speaker B3, who did not have significantly different L1 values in two pragmatic conditions: B3: $F(1,156) = 63.750, p < .000$; B1: $F(1,152) = .767, p = .383 \text{ ns.}$; B2: $F(1,162) = 7.944, p = .005 \text{ ns.}$ The patterns of tonal target height manipulation for all three speakers can be seen in Figure 3:

Figure 3: Mean height values (in Hz) for L1, H, and L2 tonal targets in two pragmatic conditions for three Belgrade speakers.

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2 Since numerous ANOVAs were performed, in all statistical analyses alpha level was adjusted to .001 for each individual test to ensure against committing Type I Error.

3 The height of L targets as correlates of accent types is not investigated here. Smiljanić 2002 shows that there is no effect of accent on either L1 or L2 height.
The results of the present study show that pitch range is not used to differentiate accent types. Pitch range is used in the expression of narrow focus. Although different speakers employ somewhat different strategies, the expansion of pitch range is mostly achieved through raising of the peaks. Additionally, B1 and B2 lower L1 while B3 and B2 (only marginally) lower L2 as well. The net result of these strategies is that pitch range is larger over the narrow focused words.

3.1.2 Zagreb
Since none of the Zagreb speakers have a lexical pitch contrast, the comparisons for pitch range was done only across the two pragmatic conditions and not across accent types\(^4\). ANOVA results show that there is a main effect of pragmatics on H values for Z1 and Z3: Z1: F(1,173) = 57.888, p < .000; Z3: F(1,170) = 700.217, p < .000; Z2: F(1,165) = 2.447, p = .120 ns. There is a main effect of pragmatics on L1 height for Z2 and Z3: Z2: F(1,165) = 21.920, p < .000; Z3: F(1,170) = 51.029, p < .000; Z1: F(1,172) = 2.062, p = .153 ns. Finally, all three speakers have significantly different L2 height in two pragmatic conditions: Z1: F(1,173) = 151.770, p < .000; Z2: F(1,165) = 123.652, p < .000; Z3: F(1,170) = 35.822, p < .000. The patterns of tonal target height manipulation can be seen in Figure 4:

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\(^4\) See Smiljanić (2002) for more detail about the absence of lexical pitch contrasts in Zagreb (these findings confirm and expand on earlier findings and observations by Smiljanić and Hualde, 2000; Magner, 1966).
The results indicate that, similar to Belgrade speakers, Zagreb speakers show varied strategies for expanding pitch range to express narrow focus. Speakers Z1 and Z3 raise the peaks in narrow focus. Z2 who doesn’t raise the peaks, lowers L1 while Z3 slightly raises L1. All three speakers lower L2. The common result of these varied strategies is that, for all three speakers, pitch range is expanded in narrow focus.

3.1.3 Discussion

Pitch-range results show that unlike H-alignment and vowel length, F0 minima at L1 and L2 and F0 maxima at H, are not used for lexical purposes in Belgrade (counter Lehiste and Ivić, 1986). Pitch range is expanded in narrow focus in both dialects similar to, e.g., Spanish and Japanese (Face, 2002; Maekawa, 1997). Table I gives mean pitch range in broad and narrow focus for each speaker in both Hz and semitones. Mean pitch range was calculated as the difference between the lowest (either L1 or L2) and highest (H) mean F0 points in the contour over the target word. The semitone scale converts absolute frequency into a ratio value and therefore allows for more meaningful comparisons across talkers with different fundamental frequencies. Δpitch range gives the amount of pitch range expansion in narrow focus (narrow focus pitch range minus broad focus pitch range).

<table>
<thead>
<tr>
<th></th>
<th>B1</th>
<th>B2</th>
<th>B3</th>
<th>Z1</th>
<th>Z2</th>
<th>Z3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean pitch range-broad (Hz/semitones)</td>
<td>35/5.9</td>
<td>75/5.6</td>
<td>71/5.35</td>
<td>49/6.37</td>
<td>26/3.19</td>
<td>30/3.45</td>
</tr>
<tr>
<td>Mean pitch range-narrow (Hz/semitones)</td>
<td>45/7.22</td>
<td>101/6.93</td>
<td>97/7.42</td>
<td>73/8.76</td>
<td>49/6.45</td>
<td>106/8.7</td>
</tr>
<tr>
<td>Δpitch range (Hz/semitones)</td>
<td>10/1.31</td>
<td>26/1.4</td>
<td>26/2.08</td>
<td>24/2.4</td>
<td>23/3.25</td>
<td>76/5.32</td>
</tr>
</tbody>
</table>

Table I: Mean pitch range in broad and narrow focus and the amount of pitch range expansion in narrow focus (Δpitch range) for all Belgrade (B) and Zagreb (Z) speakers expressed in Hz and semitones.

The amount of pitch range expansion (Δpitch range) varies among the speakers. However, they all consistently show a wider pitch range in narrow focus. Although there was some variation between the subjects in how this expansion of the pitch range was achieved there were common tendencies as well. L1 was kept fairly stable possibly as an ‘anchor’ point or reference against which F0 maxima and the speaker’s overall pitch range are evaluated by listeners (Gussenhoven et al., 1997). Focal peaks were raised similar to Japanese and unlike Spanish where only non-initial peaks are raised presumably since in the initial position peak

5 Lehiste and Ivić (1986) measured the height/alignment of the rising peaks within the accented vowel. These data show that the rising peaks are very consistently aligned with the posttonic (as are prenuclear peaks in numerous other languages, such as Spanish and Greek). The highest point within the tonic for the rising accents does not necessarily coincide with the absolute accentual peak (see Smiljanić 2002 for more details).
alignment change is a more salient cue to narrow focus (Maekawa, 1999; Face, 2002). Finally, L2 was lowered for some speakers. L2 lowering in narrow focus seems to delimit the focused word more from the rest of the sentence/discourse whereas a higher L2 in broad focus indicates the continuation and a more integrated target word with the discourse. It is important to note that all of the above strategies accompany the change in peak alignment and duration patterns present in narrow focus as shown by Smiljanić and Hualde, 2000, Smiljanić, 2002, and Smiljanić, (submitted). The expansion of pitch range can therefore be seen as a strategy that facilitates the perception of narrow focus even further. Similar expansion of pitch range is found in speech directed towards infants and in clear speech directed towards older people, children with learning disabilities, etc. (Grieser and Kuhl, 1988; Bradlow et al., 2003). Such ‘listener’ oriented speech can facilitate perception and language processing (Lindbloom, 1990). However, none of the observed acoustic patterns in this study can be automatically assumed to be significant for the listeners. Therefore, testing these findings in perception is needed to confirm some of the claims made in this paper.

3.2 L alignment
3.2.1 Belgrade
For all three speakers there is a significant main effect of accent type on L1-alignment (F0 valley preceding the accentual peak): B1: F(1,152) = 90.445, p < .000; B2: F(1,162) = 15.672, p < .000; B3: F(1,156) = 142.349, p < .000. There is a significant main effect of pragmatics on L1-alignment only for B2: F(1,162) = 31.109, p < .000; B1: F(1,152) = 1.431, p = .233 ns.; B3: F(1,156) = .536, p = .465 ns. For none of the speakers is the two-way interaction significant. L1-alignment with respect to the beginning of the accented vowel (0 on x-axis) for both accent types for the three Belgrade speakers can be seen in Figure 5 (negative numbers indicate the alignment before the accented vowel, i.e., within the onset and positive numbers indicate the alignment within the accented vowel):
Overall, L1-alignment for the R accents is later than for the F accents. This is a similar distribution that was seen for H targets (R peaks are ‘late’ and F peaks are ‘early’) suggesting an accentual LH unit.

A comparison of L1-alignment across the broad and narrow focus conditions shows no effect of pragmatics for B1 and B3. There is a main effect of pragmatics on L1-alignment for B2. However, for this speaker, the effect of pragmatics does not enlarge the contrast between the L and R accents. All L1 targets are aligned earlier in narrow focus than in broad focus. A marginal distinction between the R and F accents in L1-alignment in both pragmatic conditions for B2 is maintained.

It is possible that L1 retraction is a strategy for expressing narrow focus that is not implemented by B1 and B3 due to the lack of segmental material (all accented CV syllables are utterance initial). Alternatively, it could be that the retraction strategy by B2 is not as consistent as, for example, peak retraction in indicating narrow focus. Additional evidence about the behavior of L1 targets comes from the words with non-initial accented syllables (e.g., banana) as seen in Figure 6. In these words only R accents occur. None of the speakers retract L1 in narrow focus despite the availability of segmental material preceding the accented vowel.
Combined, these patterns of L1-alignment suggest that the initial L target is largely determined by accent type and constitutes a part of the accent gesture.

L2, a valley following the accentual peak, is considered next. L2 shows a more complex pattern of alignment. For all three Belgrade speakers there is a significant main effect of both accent (B1: $F(1,152) = 150.892, p < .000$; B2: $F(1,162) = 170.463, p < .000$; B3: $F(1,156) = 107.788, p < .000$) and pragmatics (B1: $F(1,152) = 68.769, p < .000$; B2: $F(1,162) = 206.032, p < .000$; B3: $F(1,156) = 102.25, p < .000$). In addition, for all three speakers the interaction between pragmatics and accent was significant: B1: $F(1,152) = 49.8, p < .000$; B2: $F(1,162) = 140.186, p < .000$; B3: $F(1,156) = 81.711, p < .000$). Figure 7 shows L2-alignment with respect to the end of the target word (0 on the x-axis) in two pragmatic conditions:

Figure 7: L2-alignment with respect to the end of the target word (0 on x-axis) for F and R accents in two pragmatic conditions for three Belgrade speakers.

Careful examination of Figure 7 suggests that there is no apparent distinction between the F and R accents in broad focus. For both F and R accents, L2 is aligned beyond the end of the target word in broad focus (after 0 in the graphs in Figure 7). In the test materials, all target words were followed by a clitic (in almost all sentences, the target word was followed by the clitic je 'to be--3rd

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6 The absence of the contrast is shown statistically in Smiljanić, 2002.
person Sg.’). Together with the target word, the clitic forms a phonological word and L2 seems to take the whole phonological word as its domain in broad focus. The distinction in L2-alignment between the R and F accents arises only in narrow focus. In narrow focus, L2 is aligned earlier for the F accents and later for the R accents for all three speakers. A possible explanation is that the contrast becomes robust only under a more salient pragmatic condition, such as narrow focus. L2-alignment patterns thus resemble (at least in narrow focus) H and L1-alignment patterns which would suggest that L2 is a part of the accentual gesture as well. However, the dual effect of accent and pragmatics on L2-alignment requires us to look more closely into L2-alignment. It can be seen in Figure 7 that L2 is retracted only for the F accent. L2 for the R accent is not significantly retracted in narrow focus. It remains aligned with the end of the clitic (as in broad focus) rather than with the end of the target word. Recall that R peaks in narrow focus are aligned furthest into the posttonic syllable. Therefore, a tonal clash situation is created (two tonal targets, accentual peak and the following L2 tone, would have to be realized in close proximity, i.e., on the posttonic) which precludes L2 retraction in narrow focus for this accent type. This alternative account suggests a possibility that L2 is an intermediate phrase (ip) boundary tone (L-) or a word boundary tone rather than a trailing tone of a complex pitch accent. The domain of this boundary tone would be the end of the phonological word in broad focus and the edge of the narrow focused word (precluded in these data due to tonal clash situation). More data should be collected in order to examine the role of L2 in more detail.

3.2.2 Zagreb
The results show that for all three Zagreb speakers the alignment of L targets is changed in narrow focus. ANOVA results with pragmatics as a fixed factor indicate that there is a significant main effect on both L1-alignment: Z1: F(1,172) = 80.739, p < .000; Z2: F(1,165) = 10.978, p = .001; Z3: F(1,170) = 93.560, p < .000 and L2-alignment: Z1: F(1,172) = 182.522, p < .000; Z2: F(1,165) = 14.942, p < .000; Z3: F(1,170) = 157.345, p < .000. The alignment patterns of L1 and L2 targets can be seen in Figure 8 (θ indicates the beginning of the stressed/accented vowel in the left hand side graph and the end of the target word in the right hand side graph):
Figure 8: L1-alignment with respect to the beginning of the stressed/accented vowel (0 on x-axis) and L2-alignment with respect to the end of the target word (0 on x-axis) in two pragmatic conditions for three Zagreb speakers.

For all three speakers L1 is aligned earlier in narrow than in broad focus. This is the same pattern of retraction that was observed in peak alignment for all three Zagreb speakers. For all three speakers, there is a main effect of pragmatics on L2-alignment. L2 is aligned after the end of the target word in broad focus while it is either at the edge or within the target word in narrow focus (0 indicating the end of the target word in the graph on the right in Figure 8). All L2s are retracted in narrow focus similar to all H and L1 targets as well. L2 targets in broad focus are more ‘tightly’ clustered around the end of the clitics which follow all target words. This alignment, similar to the Belgrade results, suggests that in broad focus L2 targets the end of the phonological word, which includes a clitic. In narrow focus it aligns with the end of the target word. The patterns of retraction suggest that L2 is an ip boundary tone, rather than a trailing tone of the complex pitch-accent7.

3.2.3 Discussion
L1-alignment is determined largely by the accent type in Belgrade. Similar to the peak alignment patterns, L1 is earlier for the F accents and later for the R accents. Patterning of L1 targets together with H targets suggests an accentual unit. L1 tends to be mostly aligned within the accented vowel for the R accents and within the onset of the accented syllable in the F accents. Furthermore, L1 aligns with the accented vowel in words with non-initial R accents, i.e., it ‘moves’ away from the edge of the word onto the non-initial stressed syllable. A possible phonological account of these data would be that L1 tone in R accents is a ‘starred’8 tone while it is a leading tone in F accents (L*+H vs. L+H*).9

L1-alignment in Zagreb, on the other hand, is entirely determined by pragmatics (later in broad focus and earlier in narrow focus). It was argued that L1 in this dialect as well constitutes a part of the pitch accent gesture. The alignment patterns suggest the tonal category of L*+H for broad focus. In this way, both Zagreb and Belgrade (R accents) have similar prenuclear accent categories in broad focus as many other languages such as Greek, Spanish, German, Dutch, etc.

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7 For correlations between L and H tonal targets and L2 targets and word durations see Smiljanić 2002.

8 The ‘starred’ tone indicates the alignment with the accented vowel while leading or trailing tones precede or follow at some time interval (Pierrehumbert, 1980).

9 Smiljanić, 2002 and Smiljanić (submitted) argues in more detail for L*+H and L+H* analysis of R and F accents respectively. For a different analysis see Godjevac, 1999.
Belgrade F accents and Zagreb narrow focus could be analyzed as L+H* similar to narrow focus in Spanish, Greek, Italian, etc. (Face, 2002; de la Mota, 1997; Botinis, 1998; D’Imperio, 1999, etc.).

Interestingly, there was no enlargement of the lexical contrast for L1 in narrow focus as was seen for the peak alignment in Belgrade. In other words, the distance between L1 for R accents and L1 for F accents is not larger in narrow focus than in broad focus. One possible explanation is that there was no room for such exaggeration given that all target words/syllables were absolute sentence-initial. It is left for further research to see if such enhancement would occur with more segmental material available for L1-alignment (e.g., words in utterance non-initial position or with consonant clusters as onsets or with proclitics preceding target words, etc).

Finally, L2-alignment in both dialects is changed in narrow focus, i.e., L2 is retracted. Because of L2 retraction onto the target word and its high correlation with the word duration (phonological word in broad focus, i.e., target word+clitic, and the target word only in narrow focus), it was argued that L2 is a boundary tone (L-) rather than a part of the pitch accent. L2-alignment in Belgrade is additionally determined by H-alignment. This could be due to the potential tonal clash on the posttonic syllable where H for the R accents is placed.

4 Conclusion
Zagreb and Belgrade are prosodically different: Belgrade has lexical pitch contrasts while in Zagreb such contrasts are absent. Both dialects express narrow focus in similar ways suggesting some universal tendencies. Both Belgrade and Zagreb speakers manipulate peak alignment and lengthen accented vowels/syllables. They also expand pitch range over the narrow focused word mostly through raising accentual peaks (additionally, pitch range following narrow focused words is reduced). Zagreb places a large rise-fall (with peaks on the accented syllable) contour over the stressed syllable. Belgrade maintains F vs. R distinction with peak alignment but signals narrow focus by making larger pitch contours, i.e., by expanding the pitch range. In addition, the narrow-focused word is made even more prominent for some speakers in both dialects by lowering L2 and by its retraction away from the clitic onto the focused word. The end result is that larger pitch contours are more tightly overlaid on the lengthened (slowed down) accented syllables, thus, making accented syllables more salient and more easily perceived. These strategies can be seen to arise from the Effort Code as described by Gussenhoven (2002). The two dialects differ in the expression of narrow focus in that Belgrade speakers manipulate vowel length and peak

10 This does not mean that in all these languages the accentual category is implemented identically (see Atterer and Ladd, 2002 and Smiljanić, 2003 for more details).
alignment in asymmetric ways whereby the lexical contrasts are enlarged. However, not all acoustic cues used for lexical accentual distinctions are manipulated in the same way (e.g., contrast in L1-alignment is not enlarged).

These results show that experimental investigation is crucial in determining phonological categories and that the presence of a lexical contrast can limit the use of some acoustic cues for pragmatic purposes. Furthermore, this research has implications for both the general study of prosodic typology and the study of dialectology for varieties of this language.

References


Smiljanić, R. (submitted). Early vs. late focus: pitch-peak alignment in two dialects of Serbian and Croatian. *Papers in Laboratory Phonology 8;* Yale University and Haskins Laboratories, USA.