



THE UNIVERSITY *of* EDINBURGH

## Edinburgh Research Explorer

### Standard Croatian pitch-accents: fact and fiction

**Citation for published version:**

Pletikos Olof, E & Bradfield, J 2019, Standard Croatian pitch-accents: fact and fiction. in S Calhoun, P Escudero, M Tabain & P Warren (eds), *Proceedings of the 19th International Congress of Phonetic Sciences ICPhS 2019*. Australian Speech Science & Technology Association Inc, Canberra, Australia: Australasian Speech Science and Technology Association Inc., pp. 855-858, 19th International Congress of Phonetic Sciences, Melbourne, Victoria, Australia, 5/08/19. <<https://assta.org/proceedings/ICPhS2019/>>

**Link:**

[Link to publication record in Edinburgh Research Explorer](#)

**Document Version:**

Peer reviewed version

**Published In:**

Proceedings of the 19th International Congress of Phonetic Sciences ICPhS 2019

**General rights**

Copyright for the publications made accessible via the Edinburgh Research Explorer is retained by the author(s) and / or other copyright owners and it is a condition of accessing these publications that users recognise and abide by the legal requirements associated with these rights.

**Take down policy**

The University of Edinburgh has made every reasonable effort to ensure that Edinburgh Research Explorer content complies with UK legislation. If you believe that the public display of this file breaches copyright please contact [openaccess@ed.ac.uk](mailto:openaccess@ed.ac.uk) providing details, and we will remove access to the work immediately and investigate your claim.



# STANDARD CROATIAN PITCH ACCENT: FACT AND FICTION

Elenmari Pletikos Olof and Julian Bradfield

University of Zagreb and University of Edinburgh

epletiko@ffzg.hr, jcb@inf.ed.ac.uk

## ABSTRACT

Standard Croatian is a normatively described high-prestige dialect, which most Croatians in public life attempt to acquire, and which is taught in schools. It has four pitch accents, long/short rising/falling. We present acoustic and perceptual analyses of data from a wide range of speakers from different dialect backgrounds, showing that even for those with closely related native dialects with four accents, the established descriptions do not match productions – for example, rising tones do not rise, and the moraic tonal structure does not agree. There is a wide range of accentuation from a tonal system with four pitch-accented syllables to a stress/dynamic system with one accent which is a short stressed.

**Keywords:** pitch accent, tone, acoustics, Croatian, word prosody

## 1. INTRODUCTION

‘Croatian’ is a group of South Slavic dialects spoken across present-day Croatia. The wider group is called Serbo-croatian, Bosnian-Croatian-Serbian, etc., and language definitions are politically contentious. A distinctive feature of much of this dialect continuum is the use of pitch accents, documented for some five centuries.

Croatian and Serbian have very similar (but not identical) normative standard dialects, established in the late 19th century, and based on a dialect of Eastern Herzegovina, which had a four-accent system, first described by Starčević in 1812. The modern names, phonetic descriptions (following [5]), and dictionary notations of the accents are: short falling (SF), high tone on initial short stressed syllable and low elsewhere ([dóbar] *dòbar* ‘good’); short rising (SR), high tone on short stressed syllable and the following syllable ([dánás] *dànas* ‘today’); long falling (LF), falling tone on long stressed syllable ([dī:van] *dīvan* ‘pretty’); long rising (LR), high tone on long stressed syllable continuing high into the following syllable ([dú:ǎ] *dúša* ‘soul’). The high tone on the post-accentual syllable has long been recognized as a key part of ‘rising’ accents. In the standard, long vowels can also occur (lexically) anywhere after the

accented syllable, but not before. Conflating vowel length with tone is traditional – phonologically it would be usual to view length as a segmental quality, and talk about two accents. However, given the long tradition, and the prescriptive classification, the analysis here is in terms of four accents.

The four tones and other long vowels are marked in Croatian-published dictionaries, both monolingual and bilingual, but not in usual orthography. They are also not marked in school texts, though children are taught about them around age 12–13.

The four-accent system is characteristic of most *Štokavian* dialects, covering 40–50% of Croatians, particularly in Dalmatia and Slavonia. The similarly populous *Kajkavian* dialects include that of the capital, Zagreb, which has a simple dynamic stress accent: as in English, the accent is marked by increased intensity, pitch and duration. Zagreb has also lost distinctive vowel length. The small *Čakavian* dialects are traditionally described with a different three accent system, often including an ‘acute’ [14] single syllable rising tone.

Because of the high prestige of the standard, there is a practice of teaching newsreaders, actors, teachers, etc. to speak it. Speaking the standard involves using the four-accent system with post-accentual length.

However, in practice acquiring the accent system is difficult save for those who have it natively; and the political importance of the capital region results in a strong influence of its native (Kajkavian, dynamic accent) dialect on acceptability judgements. Hence ‘standard Croatian’ as it is actually spoken and accepted varies considerably from the normative prescription. This paper presents acoustic data on the realization of accent in speakers intending to speak standard Croatian.

## 2. PREVIOUS WORK

[5] described the four pitch accents in Novi Sad Serbian (13 speakers) thus: accented syllables are lengthened; the main difference between F and R accents is in pitch, while intensity is redundant; the terms ‘falling’ and ‘rising’ do not match phonetic realization of tonal contours – both F and R accents

can have a rising pitch in the stressed syllable; the main cue for distinguishing F and R is the higher pitch in the post-accentual syllable of R accents; and sentence intonation can influence the pitch enough to neutralize lexical accent differences.

[6] analysed recordings of three pitch-accent speakers of standard Croatian (radio announcer, actor and phonetician) and concluded that the main difference from [5]’s description was that the contour in the accented syllable of F accents is mostly declining, and in R accents is mostly flat, and that the pitch of the postaccentual syllable in R accents is the same as in the accented syllables rather than higher.

[11] analysed productions by 3 Zagreb Croatian and 3 Belgrade Serbian speakers. Belgrade speakers distinguished duration and tone giving four lexical pitch accents, while Zagreb speakers did not have tone, and distinguished length only for some speakers when in narrow focus. For Belgrade speakers late tonal alignment is a cue for R accents, and thus the lexical difference, while for Zagreb speakers it can be a cue for pragmatic conditions and for broad focus or sentence-initial focus, with early alignment for narrow focus and final focus.

[7] conducted a similar study to ours, with a sample of 20 speakers. The results were consistent with our results, though perhaps owing to experimental conditions all vowels were somewhat longer. There was no dialectal analysis of the speakers.

Previous analyses had small sample sizes, and either chose one dialect, or did not distinguish speakers within ‘standard’. [4] argues that the Croatian ‘standard’ is ‘unattainable’ by most Kajkavian speakers, and studies (by his own perceptual evaluation of 16 TV interviews) the accommodations (e.g. stress shift) made by Zagreb speakers ‘speaking standard’.

Standard Croatian accents are taught in elementary schools at age 12–13 [2], which is too late for critical period acquisition. Children with (regional or parental) Štokavian exposure are better at production, but not at perception and recognition [9].

The data and analyses presented here were originally undertaken in the first author’s doctoral dissertation [8], but not published. We have reviewed and revised the analyses for publication here.

### 3. RESEARCH QUESTION

The original hypothesis for which the data was gathered was to test the claim of [10] that modern Standard Croatian has only three accents. Following initial results, the question was broadened to investigate what is the distribution of accent systems in standard Croatian.

## 4. METHODOLOGY

Data is from 89 Croatian speakers, from all regions and all major cities. Most were young females, reflecting the student population. Most had some education in linguistics, phonetics or Croatian studies, with about one fifth from other subjects. Speakers self-evaluated their dialect background using the generally known division of Što-, Kaj- and Čakavian. After adjusting for their main residence, six speakers were mainly Čakavian, with the rest almost equally divided between Što- and Kajkavian.

The task was to read, in ‘standard Croatian’, sentences with exemplars of the four standard accents, with and without post-accentual length. The 41 test words were common, disyllabic with initial accent, and mostly with an open accented syllable. They were balanced in the accented vowel (/a e i o u/; vocalic /r/ was not included). They were also balanced for onset consonant manners of articulation. They were presented in orthography, underlined in a frame thus: Reci dobar sada (say ‘dobar’ now). Speakers were to read as if in a formal public setting such as TV or radio. They were not aware that the topic was accents. Sessions were recorded at 44.1kHz/16bits with standard equipment in an acoustic studio.

Tokens were presented (without the frame) to a panel of four expert accentologists for perceptual evaluation, who classified them as one of the four standard accents, or as ‘other’ with a description.

After classifying tokens, evaluators assigned each speaker to one of the three dialects, or to unclear, with a Likert scale from clearly dialectal to standard. This classification had generally good agreement with the information from self-assessment and biography.

Acoustic analysis was done in Praat [1]. The accentual and post-accentual nuclei were measured for duration, and for intensity and  $F_0$  at each tenth of the vowel duration.  $F_0$  data was normalized relative to each token’s baseline and expressed in semitones. Statistical analysis (with SPSS) is mostly one-way ANOVA to test for differences between groups of data.

## 5. RESULTS

For clarity, we use the terms ‘LR-tokens, R-tokens, rising-tokens’ etc. to mean ‘tokens of words that are normatively LR, have a rising accent’, etc. ‘Tonic’ means ‘normatively accented syllable’, and ‘post-tonic’ means the following syllable. We omit here data for and discussion of post-accentual length.

### 5.1. Overall perceptual analysis by evaluators

Owing to the speakers who did not in fact have the pitch accent system, the evaluators (who were listening for ‘standard’ accents) heard more (121%) ‘short falling’ than just the SF-tokens, as SF is similar to the dynamic stress accent: a slightly lengthened, raised-pitch stressed syllable. Correspondingly, short rising is heavily under-represented at 39% of the number of SR-tokens, as the SR tune of two high pitches is not found in dynamic accents. Likewise 51% for long rising, and 61% for long falling. Around a quarter of tokens were not labelled in the four accent system, being described as half-long, stress, long stress, flat or mixes thereof.

### 5.2. Analysis into accent groups

Following token classification, the first author analysed each speaker for the number of distinct accents they produced. Of the 89 speakers, 36 had a clear four-accent system (the T(onal) group), 30 speakers appeared to have a dynamic accent (the D(ynamic) group), and 23 appeared to be transitional, with two or three accents, always neutralizing the SF/SR distinction (the D/T group). (The three-accent system was claimed by [10] to be the current standard, and he named it ‘Croatian Received Pronunciation’.)

Of the 36 T speakers, 7 were heard as Dalmatian, 20 as Slavonian, and 9 from elsewhere or unclear.

Of the 30 D speakers, only 4 had the Zagreb region system of pure dynamic accent and no length distinction, of whom 3 were from Zagreb. 15 speakers from a range of cities including Zagreb had a clear L/S distinction, but no R/F distinction, and are heard as dynamic accent speakers with a length contrast. 11 speakers were indeterminate.

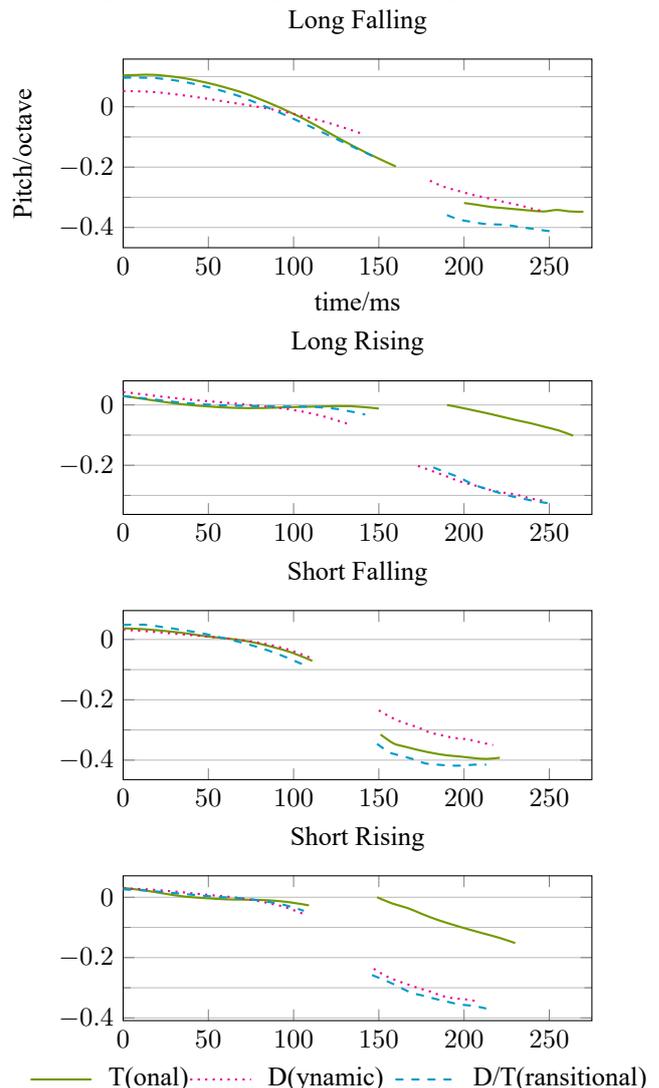
The most interesting group is the 23 transitional speakers, who came from all three major dialects. 7 geographically distributed speakers had a clear 3-accent system, where SR is merged into SF, but the LR/LF distinction is robust. The remaining 16 speakers had a clear L/S distinction, but a LR/LF distinction that was sporadically realized. Moreover, the LR realization is not quite the standard Štokavian accent, but more dynamic than tonal.

### 5.3. Acoustic analysis

An overview of the acoustics is given in Figure 1. This displays the average pitch contours for the four normative accents, as realized by each of the three groups, i.e. the solid line for LR is the average contour over all LR-tokens pronounced by T speakers.

‘Eyeball analysis’ suggests that the only large dif-

Figure 1: Accent productions by speaker group



ference between groups is the clear rising accent in T speakers. However, statistical analysis gives a slightly more nuanced picture.

The T speakers all had the greatest length contrast, averaging 161ms for LF-tokens and 150ms for LR versus 110ms for SF/SR. S-tokens were similar in length for all speakers. For L-tokens, D speakers averaged 140/133ms for LF/LR, but this includes the 4 speakers without a length distinction; nonetheless, D speakers with length have significantly shorter vowels than T speakers. The D/T speakers were exactly intermediate in length on average, but this appears to be due to sporadic realization of length rather than shorter long vowels. For both the T and D/T speakers, the 10ms difference between LF and LR lengths is significant at  $p < 0.001$ . For all speakers and accents, the post-tonic vowel is much shorter, at 70ms. For the T speakers, the post-tonic is slightly but sig-

nificantly ( $p < 0.001$ ) longer for R than for F: 10ms longer for SR, 5ms for LR. For D speakers, this effect is smaller (3ms) and barely reaches significance ( $p = 0.05$ ); and D/T are intermediate.

Turning to the tonal aspect, the T speakers show three different contour patterns: SR and LR have the same shape, differing only in length, whereas the LF falls more on the tonic than the SF does. As expected, D speakers have no distinctions of tonal contour. The D/T speakers display a reduced version of the T pattern, in which the LF has a steeper fall, but LR/SR/SF are not significantly distinguishable in contour. The pitch of the post-tonic varies more (2–3 semitones SD) than the tonic (less than 1 semitone). Post-hoc statistics of dependent variables such as tonal range of the tonic vowel agree, with the difference between SR and LR ranges being only borderline significant at  $p = 0.051$ , while other differences are highly significant ( $p < 0.001$ ). On the other hand, the ratio of the average post-tonic pitch to the average tonic pitch significantly distinguishes between LR, SR, and F, even though the absolute LR/SR difference is small.

A notable feature of the acoustic data is that the R tonics are not only not rising, they are even slightly falling: in the 5-level notation, the R tones are roughly 55.53, SF is 54.21, and LF is 52.11. Previously R tonics have been observed to be barely rising or slightly circumflex ([5, 3]), though [13, 12] report some Serbian speakers with slightly falling R tonics.

For intensity (not graphed), in most cases the post-tonic is about 7dB quieter than the tonic, but for T speakers it is only 3dB quieter in the R accents, a significant difference.

Despite the clear difference between T and D speakers, one may ask whether the ‘standard Croatian population’ as a whole displays enough differentiation to sustain four accents. The T speakers do indeed have enough representation (40–50% of both sample and general population) that an overall average displays the highly significant differences found in the T speakers, albeit with a smaller effect size.

## 6. CONCLUSION

On a substantial sample, we have shown that contemporary ‘standard Croatian’ still has (*contra* [10]) a robust four-pitch-accent system for about a third of its speakers, while another third use a stress accent, and a sizable intermediate population uses a mixed system with two accents similar to the dynamic long and short, plus a distinctive long falling accent taken from the tonal system.

The most controversial statement about ‘standard

Croatian’, as defined by [10], is that the three-accent system is widespread, and consists of SF, LF, LR. Our results confirm the existence of three-accent patterns in transitional D/T systems, but it is not the widest spread, and in words where the standard prescribes the LR, D/T systems have a long accented syllable with a low tone on post-tonic, which is not a LR as in the tonal system, but a long stressed syllable we may call ‘dynamic long’. Dynamic long has the same tonal pattern (H.L) as short falling, but it has a long stressed syllable with a flat high tone.

## 7. REFERENCES

- [1] Boersma, P., Weenink, D. 2007–. Praat: doing phonetics by computer.
- [2] Gusak Bilić, I., Alerić, M., Vlašić Duić, J. 2018. Teaching word stress patterns in primary school. *Croatian Journal of Education* 20(Sp.Ed.2), 21–44.
- [3] Ivić, P., Lehiste, I. 2002. *O srpskohrvatskim akcentima*. Izdavačka knjižarnica Zorana Stojanovića.
- [4] Kapović, M. 2018. The unattainable standard – Zagreb dialect meets Standard Croatian accentuation. *Int. J. Slavic Studies* 7(1), 337–362.
- [5] Lehiste, I., Ivić, P. 1986. *Word and sentence prosody in Serbocroatian*. MIT Press.
- [6] Pletikos, E. 2003. Akustički opis hrvatskih standardnih naglasaka. *Govor* XX(1–2), 321–346.
- [7] Pletikos, E., Vlašić, J. 2007. Acoustic description of Croatian accents. *Studia Phonetica Posnaniensia* 8, 27–49.
- [8] Pletikos Olof, E. 2008. *Akustički Opis Hrvatske Prozodije Riječi*. PhD thesis University of Zagreb.
- [9] Pletikos Olof, E., Vlašić Duić, J., Martinović, B. 2016. Metode mjerenja naglasnih kompetencija. *Metodologija i primjena lingvističkih istraživanja. Zbornik radova s međunarodnoga znanstvenog skupa Hrvatskoga društva za primijenjenu lingvistik u održanoga od 24. do 26. travnja 2015. godine u Zadru*. Srednja Europa 293–307.
- [10] Škarić, I. 2007. Fonetika hrvatskoga književnoga jezika. In: Babić, S., Brozović, D., Škarić, I., Težak, S., (eds), *Glasovi i oblici hrvatskoga književnoga jezika*. Nakladni zavod Globus 17–157.
- [11] Smiljanić, R. 2004. *Lexical, pragmatic and post-tonal effects on prosody in two dialects of Croatian and Serbian: an acoustic study*. Routledge.
- [12] Sredojević, D. 2017. *Fonetsko-fonološki opis akcenta u standardnom srpskom jeziku — od specifičnog ka opštem*. Filozofski fakultet.
- [13] Sredojević, D., Subotić, L. 2011. The neo-Štokavian accent shift and the phonological significance of suprasegmental features in different Štokavian dialects. acoustic and phonetic analysis. *Baltistica Supplement VII*, 227–242.
- [14] Vlašić Duić, J., Pletikos Olof, E. 2014. Akustičke posebnosti akuta u čakavskom, kajkavskom i staroštokavskom govoru. *Sarajevski filološki susreti II : Zbornik radova* 21–44.