

# Reciprocal Transfer Effects of Suprasegmental Features in Serbo-Croatian Heritage Speakers

## An Acoustic Study

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## Heritage Speakers

- heritage speakers = bilinguals who learned a minority language as a L1 (*heritage language*) and a majority language as L2 (*dominant language*) (Polinsky, 2018)
- here L1 = *Serbo-Croatian*, L2 = *German*
- they receive the greatest input in their L1 in early years, later L2 gets more in focus and L1 input decreases
- heritage speakers are further divided into *simultaneous* and *sequential* bilinguals (Polinsky, 2018)
- heritage speakers = unbalanced bilinguals

## Heritage Speakers

- in adulthood they only speak L1 at home, while L2 is used elsewhere
- begin L2 acquisition = begin L1 impairment
- the L1 (*heritage language*) suffers deficits in several linguistic domains (especially regarding lexicon, grammar, morphology and syntax ...)
- while L2 (*dominant language*) replaces the actual L1 and is predominantly used
- especially in phonetics/phonology regarded as more native like than L2 learners (in heritage language) (Polinsky, 2018)

## Suprasegmental Transfer Effects

- transfer = properties from one language are carried over to another
- usually transfer from L1 -> L2 is meant, but transfer from L2 -> L1 can also occur
- *bi-directional transfer (or reciprocal transfer)*
- all types of transfer correlate with age and language experience (Major, 2008)
- two hypothesis about transfer:

## Suprasegmental Transfer Effects

- *Contrastive Analysis Hypothesis* (Lado, 1957):  
aspects that are similar to the L1 are easier required
- *Markedness Differential Hypothesis* (Eckman, 1987)  
marked structures are more likely to be transferred
- generally speaking: a phenomenon is more marked than another, if its presence implies the existence of the other, but not the other way around (Rasier & Hiligsmann, 2008)

## Suprasegmental Transfer Effects

- do suprasegmental features transfer as well?
- if L1 suprasegmental features are acquired early (Ohala, 2008)
- and early acquired structures are less likely to change (Polinsky, 2018):
- language specific prosody-transfer from L1 to L2 is most likely (*Age of Acquisition effect*)
- if we assume that *language experience* is more crucial: transfer from L2 (*dominant language*) to L1 (*heritage language*) is more likely

## Serbo-Croatian Pitch Accent

- Serbo-Croatian = pluricentric south-slavic language spoken in Serbia, Croatia, Bosnia & Herzegovina, Montenegro and Kosovo (Kordić, 2008)
- diaspora in Germany: approximately a million speaker (based on S/C/B/M nationalities living in Germany) (Statistisches Bundesamt, 2018)
- prosodic system consists of falling and rising contour tones, (pitch differences at the lexical level are utilized contrastively) (Lehiste & Ivić, 1986; Inkelas & Zec, 1988; Petrović, 2006; Zsiga (2013)

-> *lexical pitch accent language*

## Serbo-Croatian Pitch Accent

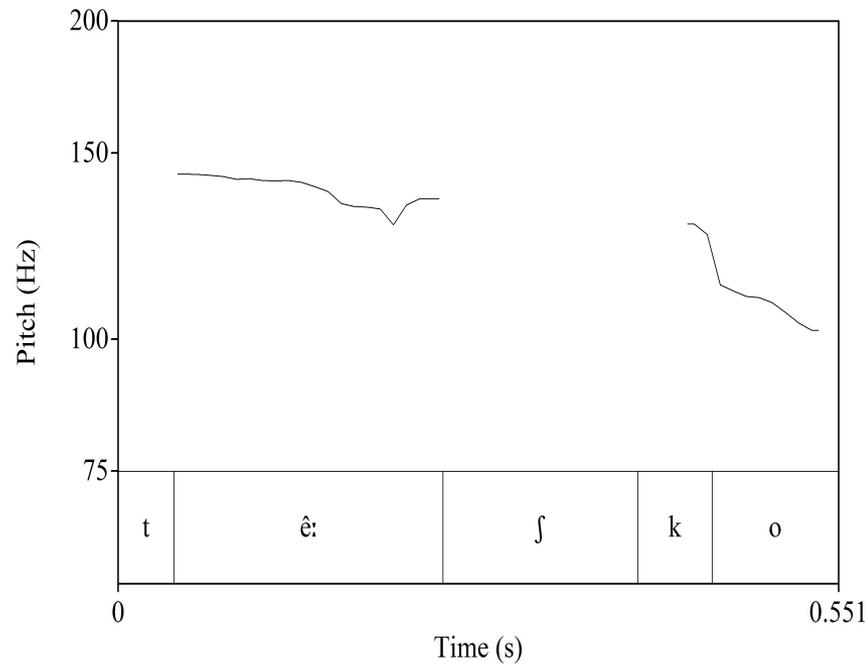
- tone types are acoustically distinguished by their pitch contour (acoustic correlate:  $F_0$ )
- both tones are almost in complementary distribution (Lehiste & Ivić, 1986; Petrović, 2006; Smiljanić, 2006; Zec & Zsiga, 2010; Zsiga & Zec, 2013)
- **Falling: only in monosyllabic words and at the initial syllable in multisyllabic words**
- **Rising: only in multisyllabic words (in initial or medial position)**

## Serbo-Croatian Pitch Accent

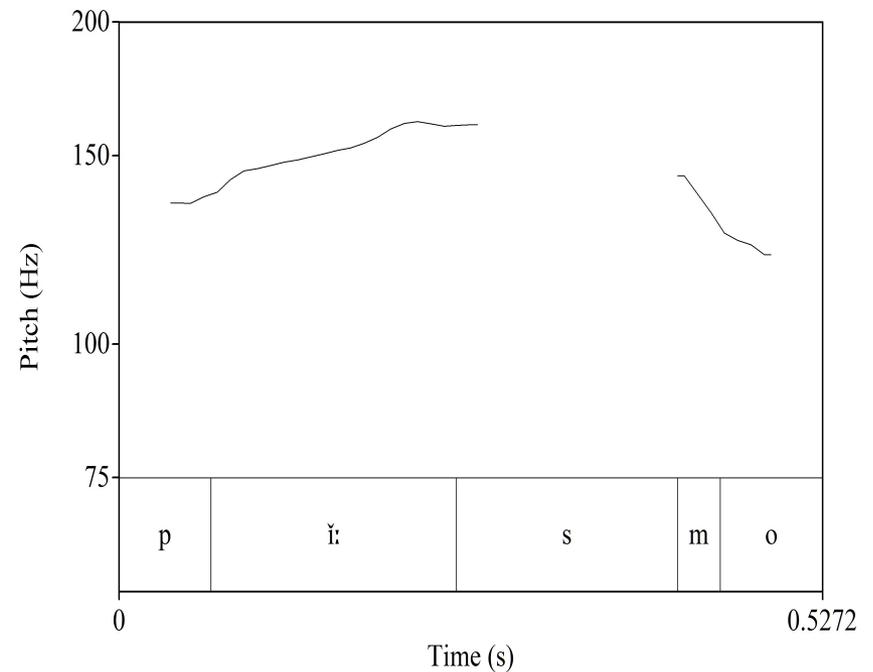
- both tones can be divided into series of short vowels and long vowels, making up a four-way distinction in prosodic features
- falling: /â/, /â:/'
- examples: [sân] 'dream', [mrâ:k] 'darkness', [mâtʃka] 'cat', [zâ:staua] 'flag'
- rising: /ǎ/, /ǎ:/'
- examples: [mǎgla] 'fog'. [xuǎ:la] 'gratitude', [budǎla] 'idiot', [muʃkǎ:rats] 'man'

## Serbo-Croatian Pitch Accent

- long falling contour tone



- long rising contour tone



## Serbo-Croatian Pitch Accent

- examples falling vs rising tone

- 1.  
- 2.  
- 3.  
- 4.  
- 5.  

### Methods

- central question: are reciprocal transfer effects of prosody present in L1 and L2 of Serbo-Croatian heritage speakers raised in Germany?
- two reading experiments: one in Serbo-Croatian, one in German
- heritage speakers (HS) compared between monolingual raised native speakers of each language (Serbo-Croatian = SC, German = GER)
- differences in pitch ( $F_0$ ) between HS and monolingual controls in focus

### Methods: Serbo-Croatian-Experiment

- 40 SC-words selected with help of the SRPSKIJE online dictionary (Hälg, Adžaić & Novković, 2007)
- 20 words with falling contour tones, 20 words with rising contour tones
- balanced in vowel quality and quantity
- Falling: 10 monosyllabic words; 10 multisyllabic words with initial tone distribution
- Rising: 10 multisyllabic words with initially distribution; 10 with medial distribution

### Methods: German-Experiment

- 40 GER-words were selected
- 20 monosyllabic words, 20 multisyllabic with penultimate stress
- vowel quality balanced
- monosyllabic words -> SC-context, were only falling contour tones occur
- multisyllabic words with penultimate stress -> SC-context, were only rising contour tones occur

### Methods: Subjects

- First experiment (Serbo-Croatian):
  - 8 monolingually raised Serbo-Croatian natives (SC), living in Germany (age =  $\emptyset$  47)
  - and 8 Serbo-Croatian Heritage speaker (HS), living in Germany (age =  $\emptyset$  22).
- Second experiment (German):
  - same HS-group from the first experiment
  - 8 monolingually raised German natives (GER), living in Germany (age =  $\emptyset$  35)
  - all groups were balanced in gender

### Methods: Procedure

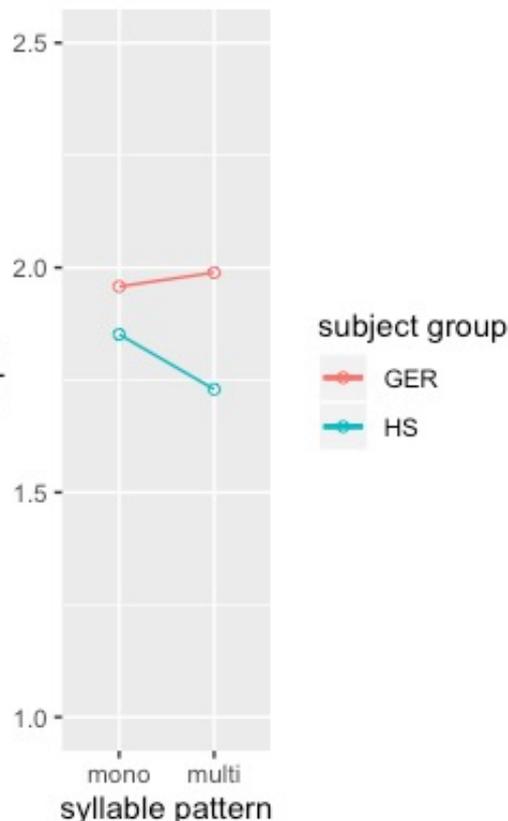
- Items were embedded in a carrier sentence
- *Na tablic riječ X je napisana* (SC)
- *Ich habe X gesagt* (GER)
- and presented to subjects in *powerpoint*
- $F_0$  for tonic syllable and posttonic syllable (SC) and accentuated(stressed) and postaccentuated syllable (GER) was calculated with *Praat* Boersma & Weenink, 2018)

### Results

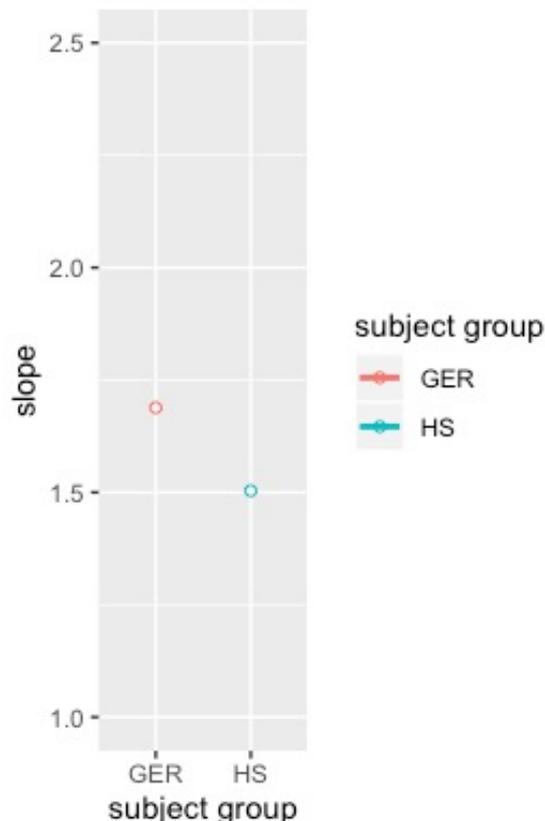
- $F_0$ -slope in semitones as dependant variable
- $F_0$ -slope =  $(\text{LOG}^2(\text{MAXIMUM } F_0)/(\text{MINIMUM } F_0)) * 12$
- *linear mixed effects models* (Kuznetsova, Brockhoff & Christensen (2017) were calculated for tonic and posttonic syllables / accentuated and postaccentuated syllables
- *items* and *participants* as random effects
- relationship between *pitch* ( $F_0$ -slope) and the fixed effects *group*, *tone type* (for Serbo-Croatian), *syllable pattern* (for German) and interaction between both were tested

## Results (German)

accentuated syllables



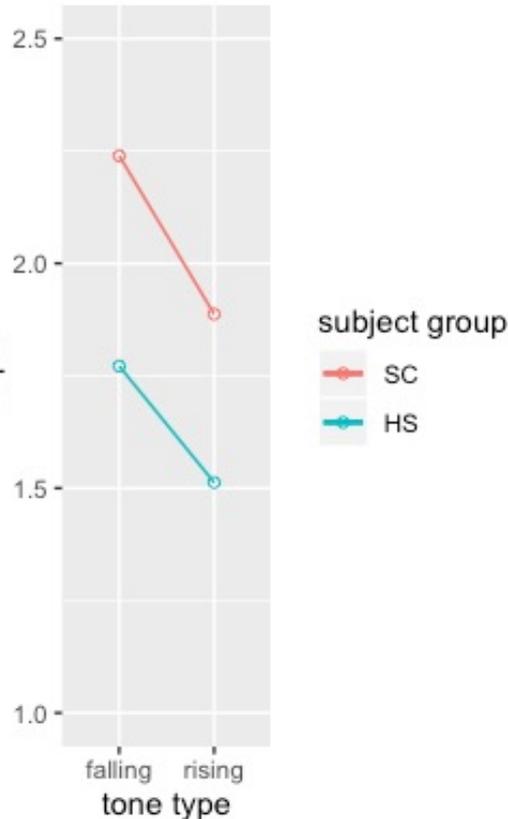
postaccentuated syllables



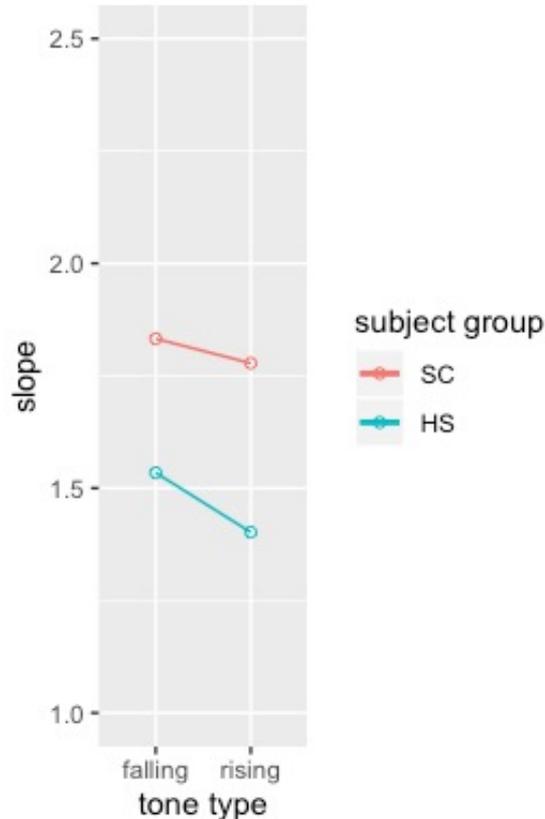
- accentuated: *Group* was **significant** ( $\chi^2(1) = 22.068, p < 0.01$ ), *syllable pattern* non significant ( $\chi^2(1) = 0.175, p = 0.6757$ ) and *interaction* **significant** ( $\chi^2(1) = 3.868, p = 0.04921$ )
- postaccentuated: *Group* was **significant** ( $\chi^2(1) = 13.028, p < 0.01$ )

## Results (Serbo-Croatian)

tonic syllables



posttonic syllables



- Tonic: *Group* was **significant** ( $\chi^2(1) = 123.69$ ,  $p < 0.01$ ) as well as *tone type* ( $\chi^2(1) = 10.265$ ,  $p < 0.01$ ), with *interaction* being non significant ( $\chi^2(1) = 1.7174$ ,  $p = 0.19$ )
- Posttonic: *Group* was **significant** ( $\chi^2(1) = 55.458$ ,  $p < 0.01$ ), with non significant results for *tone type* ( $\chi^2(1) = 1.6429$ ,  $p = 0.1999$ ) and *interaction* ( $\chi^2(1) = 0.5575$ ,  $p = 0.4553$ )

## Heritage speaker showed differences in both languages

- across both experiments, test and control group differed significantly in  $F_0$ -slope
- heritage speakers had lower  $F_0$ -slopes across all conditions (tone type, syllable pattern...) than monolingual counterparts
- in Serbo-Croatian: contrast between falling and rising contour tones was nevertheless maintained (for tonic syllables)
- in posttonic there was no difference between tone types
- in German: heritage speakers differed in  $F_0$ -slopes for monosyllabic and multisyllabic words

## How to interpret these results?

- **most important observation: even if heritage speakers are more dominant in their L2 use, they still do show transfer effects on suprasegmentals**
- this is reflected in the difference between monosyllabic words and penultimate stressed syllables in multisyllabic words
- pattern reflects their realization of falling and rising tones in SC (although to a lesser degree)
- *age of acquisition effects* are present

## How to interpret these results?

- two possible interpretations from here on:
- 1. rising tone has a lower  $F_0$ -slope than falling tone
- but monosyllabic german words have similar slopes for heritage speakers and german monolinguals
- -> only the pattern for rising tones is transferred
- rising tones are mapped on to penultimate stressed words, as they are perceived as similar by heritage speakers

## How to interpret these results?

- *Perceptual Assimilation Model* (Best et al., 1995) might be extended to suprasegmental characteristics
- rising tones are more marked than falling tones (Zec & Zsiga, 2010) and thus are more likely to be transferred
- falling tones are not transferred for monosyllabic words

## How to interpret these results?

- 2. Heritage speakers have a lower  $F_0$ -slope than both monolingual groups in general
- -> further confirmed by lower  $F_0$ -slope in postaccentuated syllables
- similar slopes in monosyllabic syllables between both groups therefore  $\neq$  similar stress realization
- -> both tones are actually transferred to the L2
- lower  $F_0$ -slope in both experiments are difficult to explain

### How to resolve the problems?

- lower  $F_0$ -slope in all conditions: pitch is correlated with age (Volín et al., 2017)
- but:  $F_0$ -slope was used as a variable to normalize measurements
- furthermore: difference between age was high for the Serbo-Croatian experiment ( $\emptyset$  22 vs  $\emptyset$  47), but not as great for the German experiment ( $\emptyset$  22 vs  $\emptyset$  35)
- bilingualism might play a role in general
- for instance: japanese-english bilinguals had a lower pitch span in japanese than in english (Passoni et al., 2018)

## Further research is needed

- other ways to measure pitch contour?
- spontaneous language production instead of reading task?
- are heritage speakers also able to perceive the difference between both tones?
- extending the research to segmental differences between both languages
- final devoicing, vowel space, sibilant PoA...
- further suggestions?

## References

- Best, C. T., McRoberts, G. W., LaFleur, R., & Silver-Isenstadt, J. (1995). Divergent Developmental Patterns for Infants' Perception of Two Non-Native Consonant Contrasts. *Infant Behavior and Development*, 18, 339-350.
- Boersma, P. & Weenink, D. (2018). Praat: Doing Phonetics by Computer [Computer Program]. Version 6.0.43. URL: <http://www.praat.org/> [retrieved 23th march 2018].
- Eckman, F.R. (1987). Markedness and the Contrastive Analysis Hypothesis. In: G. Ioup, G. & Weinberger, S.H (eds). *Interlanguage Phonology: The acquisition of a Second Language Sound System*, 55-69. Cambridge: Newbury House.
- Hälg, R., Adžaić, Đ. & Novković, B. (2007). SRPSKIJE – Wörtbuch deutsch-serbisch / Rečnik nemačko-srpski. URL: <http://www.srpskije.com> [letzter Zugriff: 25.01.2019]
- Inkelas, S., & Zec, D. (1988). Serbo-Croatian Pitch Accent: The Interaction of Tone, Stress, and Intonation. *Language*, 64(2), 227-248.

## References

- Kordić, S. (2008). Nationale Varietäten der serbokroatischen Sprache. In: Golubović, I. & Raecke, J. (eds), *Bosnisch – Kroatisch – Serbisch als Fremdsprachen an den Universitäten der Welt. Die Welt der Slaven, Sammelbände – Sborniki, 31*, 93–102. München Otto Sagner.
- Kuznetsova, A, Brockhoff, P.B & Christensen, R.H.B (2017). ImerTest Package: Tests in Linear Mixed Effects Models. *Journal of Statistical Software*, 82(13), 1-26.
- Lehiste, I., & Ivić, P. (1986). *Word and Sentence Prosody in Serbocroatian*. Cambridge, Mass: MIT Press.
- Passoni, E., Mehrabi, A., Levon, E., & De Leeuw, E. (2018). Bilingualism, pitch range and social factors: Preliminary results from sequential Japanese-English bilinguals. *language*, 12, 13.
- Petrović, D. (2006). Languages in Contact: Standard Serbian Phonology in an Urban Setting. *International Journal of the Sociology of Language*, 2001(151), 19-40.
- Polinsky, M. (2018). *Heritage Languages and their Speakers*. Cambridge Studies in Linguistics. Cambridge: Cambridge University Press.

## References

- Rasier, L. & Hiligsmann, P. (2007). Prosodic transfer from L1 to L2. Theoretical and methodological issues. *Nouveaux Cahiers de Linguistique Française*. 28, 41-66.
- Smiljanić, R. (2006). Early vs. Late Focus: Pitch-peak Alignment in Two Dialects of Serbian and Croatian. *Laboratory Phonology*, 8, 495-518.
- Statistisches Bundesamt, 2018. Statistisches Jahrbuch 2018, Statistisches Bundesamt, Wiesbaden. Online: [https://www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Bevoelkerung/Migration-Integration/Publicationen/Downloads-Migration/auslaend-bevoelkerung-2010200187004.pdf?\\_\\_blob=publicationFile&v=3](https://www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Bevoelkerung/Migration-Integration/Publicationen/Downloads-Migration/auslaend-bevoelkerung-2010200187004.pdf?__blob=publicationFile&v=3) [23.June.2019]
- Volín, J., Tykalová, T., & Boril, T. (2017). Stability of Prosodic Characteristics Across Age and Gender Groups. In *INTERSPEECH* (pp. 3902-3906).
- Zec, D., & Zsiga, E. (2010). Interaction of Tone and Stress in Standard Serbian. *Formal Approaches to Slavic Linguistics* 18, 536–555. Ann Arbor, Mich.: Michigan Slavic Publications.
- Zsiga, E., & Zec, D. (2013). Contextual Evidence for the Representation of Pitch Accents in Standard Serbian. *Language and Speech*, 56(1), 69-104.