Are Quantity and Pitch Contour Independent Distinctive Features in Bosnian Serbian?

Jelena Mandic and Petra Wagner

Institut für Kommunikationsforschung und Phonetik
Germany
Introductory Remarks

- Previous studies: Serbo-Croatian
- Few grammatical differences between Serbian and Croatian, from a linguistic point of view dialects rather than languages
- Languages share accent system
- In Bosnia-Herzegovina three official languages: Serbian, Croatian and Bosnian
- This study: Bosnian Serbian
Overview

• The Accent System of Bosnian Serbian
• Perception Experiment
• Conclusions
The Bosnian Accent System

• Shape of pitch accent meaning distinctive = Pitch Accent language
• Accents not represented in orthography
• Traditional descriptive grammars (starting in the 19th century) distinguish four accents on syllables carrying lexical stress
  • short falling \ 
  • short rising /
  • long falling \:
  • long rising /:
• quantity and accent shape appear independent distinctive features
# The Accent Distribution

<table>
<thead>
<tr>
<th></th>
<th>1(^{st}) syll</th>
<th>2(^{nd}) syll</th>
<th>3(^{rd}) syll</th>
<th>4(^{th}) syll</th>
<th>5(^{th}) syll</th>
</tr>
</thead>
<tbody>
<tr>
<td>mono-syllabic</td>
<td>\ executable</td>
<td>\ executable</td>
<td>\ executable</td>
<td>\ executable</td>
<td>\ executable</td>
</tr>
<tr>
<td>bi-syllabic</td>
<td>\ executable</td>
<td>\ executable</td>
<td>\ executable</td>
<td>\ executable</td>
<td>\ executable</td>
</tr>
<tr>
<td>three-syllabic</td>
<td>\ executable</td>
<td>\ executable</td>
<td>\ executable</td>
<td>\ executable</td>
<td>\ executable</td>
</tr>
<tr>
<td>four-syllabic</td>
<td>\ executable</td>
<td>\ executable</td>
<td>\ executable</td>
<td>\ executable</td>
<td>\ executable</td>
</tr>
<tr>
<td>five-syllabic</td>
<td>\ executable</td>
<td>\ executable</td>
<td>\ executable</td>
<td>\ executable</td>
<td>\ executable</td>
</tr>
</tbody>
</table>
The Accent Distribution

• Monosyllabic words: only falling accents

• Polysyllabic words:
  • All accent types on first syllable
  • Only rising accents on other syllables
  • Accent location anywhere except ultimate

• Quantity contrasts are very frequent, since they may appear almost anywhere

• Rising vs. Falling contrast occurs only on first syllable in polysyllabic words

➢ Hypothesis: Quantity should be the more stable contrast
Some phonetic facts... (Lehiste and Ivic, 1963-1986)

• Falling accents:
  • Peak in middle of accented syllable
  • Higher peaks
  • Short falling: no consistent fall after peak, but low following syllable
  • Long falling: steep fall after peak

• Rising accents
  • Short: peak in accented syllable, usually lower
  • Long: peak at the end of accented or in following syllable
  • Higher following syllable

• Tonal contrasts on short accents very similar

• “tonal contrasts are about to lose distinctiveness” (Lehiste 1961)

➢ Hypothesis: Listeners have problems distinguishing (short) falling/rising
Utterance-Accent Interaction...

- Contrasts between falling and rising tones can be neutralised by phrasal tones.
- Quantity contrasts keep stable in an utterance environment (Purcell 1973).

➤ **Hypothesis:** Listeners have problems distinguishing falling/rising.
Conclusions

• True tonal contrasts occur in few environments.

• Tonal contrasts are phonetically subtle and can be neutralised by utterance intonation.

• Quantity contrasts are frequent and resistant against neutralisation.

• Tonal contrasts are about to lose their meaning distinctive function.

• Maybe, the phonological system of Bosnian Serbian nowadays distinguishes only two tones (long vs. short) with allophonic tonal variations. Tonal variation alone is not meaning distinctive (Brozovic and Ivic 1988).
The Perception Experiment: Hypotheses

• Quantity contrasts most robust – minimal pairs should be clearly identifiable

• Minimal pairs with a quantity plus tonal contrast should be clearly distinguished

• Tonal contrast less robust:
  • minimal pairs should be difficult to distinguish or
  • minimal pairs have become homonyms

• Short tones should be most difficult to identify
The Perception Experiment: Data Preparation

- List of 78 prosodic minimal pairs
- 40 native speakers evaluated the list and determined reliable minimal pairs
  - Unfamiliar words were excluded
  - Highly infrequent words were excluded
- Evaluators did not participate in perception study
- Final list consists of 34 minimal pairs
  - 13 tonal minimal pairs (6 short, 7 long)
  - 12 quantitative minimal pairs (4 rising, 8 falling)
  - 9 complex minimal pairs (6 short rise/long fall; 3 short fall/long rise)
# The Perception Experiment: Examples

<table>
<thead>
<tr>
<th>Quality contrasts</th>
<th>short</th>
</tr>
</thead>
<tbody>
<tr>
<td>falling: para (steam)</td>
<td>rising: para (money)</td>
</tr>
<tr>
<td>long</td>
<td></td>
</tr>
<tr>
<td>falling: mlada (bride)</td>
<td>rising: mlada (young woman)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Quantity contrasts</th>
</tr>
</thead>
<tbody>
<tr>
<td>rising</td>
</tr>
<tr>
<td>short: zavesti (to seduce)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Complex contrasts</th>
</tr>
</thead>
<tbody>
<tr>
<td>short fall: vila (mansion)</td>
</tr>
<tr>
<td>short rise: desna (right, ADV)</td>
</tr>
</tbody>
</table>
The Perception Experiment:
Data recording

• List read and recorded by a male native speaker, 56 years, German resident

• Speaker was provided with orthographic list plus German translation, since accents are not marked in orthography

• Speaker read words in isolation

• Recordings were checked during production for correct pronunciation
The Perception Experiment: Listener Groups

- Listener Group 1: Long term residents in Germany (> 10 years) with good to near native German skills, several bilingual speakers (n=12)

- Listener Group 2: Residents of Bosnia without foreign language skills (n=6)

- Since German is not a pitch accent language but has phonological quantity, Listener Group 1 might have even more difficulties with tonal contrasts.
The Perception Experiment: The Task

• Listening to audio-files via headphones
• Listeners were allowed to listen to each file several times
• Listeners instructed to type either the German translation or a typical example sentence with the word listened to
• Listeners were informed that the words could be proper names, nouns, adverbs, adjectives, verbs and be inflected
• Listeners were informed that the list contained 68 words
• Listeners were informed that words may but do not have to occur twice to exclude any bias against repetitive answers
• Listeners were not given any other help or information
• For each listener, it was written down whether (s)he hesitated or needed several repetitions to get to an answer
The Perception Experiment: Results

• 11 times, listeners claimed not to know/understand a word
• 1213 judgements
• 82 errors, overall error rate: 7.25%
• tonal contrasts: 464 judgements, 48 errors: 10.34%
• quantity contrasts: 425 judgements, 10 errors: 2.35%
• complex contrasts: 324 judgements, 24 errors: 7.4%

➢ tonal contrasts less reliable (hypothesis confirmed), but still identifiable in the vast majority of cases (hypothesis rejected)
➢ quantity contrasts very well identifiable (hypothesis confirmed)
➢ tone/quantity interaction reduces identifiability rather than enhances it (hypothesis rejected)
The Perception Experiment: 
Results

• listeners made significantly less mistakes in quantity contrasts ($\chi^2$, p<0.001)

• no significant differences between tonal contrast and complex tonal/quantity contrasts

• listeners living in Bosnia perform better in all categories, but differences are not significant
The Perception Experiment: Results

- Listeners had not more problems to identify short accents.
- Short accents even show less errors ($\chi^2$, $p<0.05$).
The Perception Experiment: Conclusions

- Listeners can identify contrasts involving tones, but are less confident/secure, probably due to the fact that they are less reliable and can often be neutralised.
- Lack of reliability of tonal contrasts even decreases performance if additional quantity contrasts are present.
- Tonal contrasts are still present in contemporary Bosnian Serbian and can be identified by listeners living in and out of the country.
- No clear evidence that short accents are more difficult to identify.
Conclusion

• Tones and duration are independent phonological features in Bosnian Serbian

• Tonal contrasts are less reliable because they are often neutralised and thus listeners are prone to error if a tonal contrast is present