New developments in the Polish sibilant system!
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1. Introduction

Sibilant system of contemporary Standard Polish

<table>
<thead>
<tr>
<th>颚</th>
<th>ئ</th>
<th>ɲ</th>
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**GOAL of the paper:**
to report on a new development in sibilants observed in the pronunciation of young Polish women who instead of the alveolo-palatal /ɕ/ and /ʃ/ produce their more fronted version, probably palatalized [ɕ] and [ʃ].

2. Acoustic experiment

2.0 Hypothesis:
The Standard Polish alveolo-palatal /ɕ/ and /ʃ/ and their new variants [ɕ] and [ʃ] are pronounced differently by young women from central Poland.

2.1 Experimental design

2.2. Material: /ɕ/ /ʃ/ appearing in bisyllabic words stressed on the first syllable

Position: word-initial / și / word-medial / ș / ĺ

Examples: /soko/ /s/ other / ș / ĺ

the words were put into:
frame sentences: Powiedz mi, do czyjego a test passage in a non-focus position 'She said ... to you'
13 sentences 3 repetitions of each sentence 3 repetitions of the text

Informants:
• 9 native speakers of Standard Polish from central Poland, women aged 19-23.
• incl. 6 speakers with the new development and 3 speakers with standard pronunciation (control group).

2.3 Acoustic analysis

• sampling rate = 44.1 kHz, spectra from 10Hz to 11kHz
• further analysis with PRAAT and Matlab
• at the midpoint of the phoneme we computed Multitaper spectra, allowing for higher spectral precision during short durations (see Blacklock 2004, Loisudawa, Jesus & Pape 2012 for more details).

2.3.1 Parameters

Using Multitaper spectra, the following acoustic parameters have been investigated at the midpoint of the frication:
• the highest spectral peak of the complete spectrum ($p_0$),
• the highest peak in the frequency range from 3-6kHz (p3-6kHz),
• the spectral moments according to the Prat formula (v. 5.2): Centre of gravity (CGS), Standard Deviation of the spectrum (STD), Skewness, Kurtosis, of the spectral moments M1, M2, M3, M4 according to Forrest et al. (1988),
• the spectral slopes m1 and m2 (Jesus & Shadle 2002).

2.3.2 Statistical analyses

• conducted in R environment (R Development Core Team 2010).
• Linear mixed effects models for the dependent variables:
  the highest spectral peak, the highest spectral peak in 3-6kHz, COG, STD, Skewness, Kurtosis, M1, M2, M3, M4, spectral slopes m1 and m2

studied as an effect of SOUND (Standard Polish, new variant), SPEECH STYLE (Word, Text), POSITION (word-initial, word-medial). SUBJECT and ITEM were taken as random effects.
The time models were run for [ɕ] and [ʃ] separately. Only significant effects are presented below.

2.3.3 Results

Fig. 2: The highest spectral peak (left) and the highest spectral peak from 3-6kHz (right).

Fig. 3: M1 (left) and M2 (right) according to Forrest et al. (1988).

Fig. 4: Spectral moments M3 (left) and M4 (right) according to Forrest et al. (1988).

Fig. 5: All Multitaper spectra for /ɕ/ (green) and overlaid mean spectra (black) for each speaker. The last row represents the control group.

Fig. 6: Mean Multitaper spectra for /ɕ/ for each speaker (green) and spectral slopes m1 and m2 (black).

3. How can we explain the change?

• Jesus & Zygis (2010), Zygis & Padge` (2010)
• non-optimal contrast $\mathbf{a}$ $\mathbf{o}$ Input (Old Polish)
• optimal contrast $\mathbf{a}$ $\mathbf{e}$ Output (Standard Polish)
• new sound

4. Summary

• The Standard Polish alveolo-palatal /ɕ/ /ʃ/ undergo a change: they are pronounced differently (with higher tonality) by young female students from central Poland.
• Several acoustic parameters, i.e., the highest peak in the spectrum, the highest peak in the range 3-6kHz, CGS, M1, M2, M3, M4, are significantly different for /ɕ/ when produced by the female students and the control group.
• Additional perceptual study is needed in order to see if the change can be explained in perceptual terms.

References


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