A cross-dialect acoustic description of vowels: Peruvian versus European Spanish

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Aims of the present research

• Describe and compare acoustic properties of vowels of European and Peruvian Spanish (ES and PS)
• Further investigate differences between ES and PS vowels
• Test the effect of different consonantal environments on vowels across the two dialects
• Test properties of isolated vowels versus vowels produced in words and embedded in sentences

Method

Materials analyzed in this study were taken from the recordings used by Morrison & Escudero (2007). The methodology of acoustic measurements is adopted from Escudero et al. (submitted).

1. Data collection: production experiment

Participants: 20 speakers from Madrid, 20 speakers from Lima
Materials: CCVe / CVCo. En CVCe y CVCo tenemos V.

2. Acoustic analyses: testing for dialectal differences

- in all contexts together = not considering the contextual variation as in Escudero et al (in prep.)
- in each consonantal context = possible variation obscured by collapsing contexts
- in words and sentences = using the same methodology as for in context tokens (cf. Morrison & Escudero (2007) who analyzed the same data with a different method)

Measure for: Duration, F0, F1 and F2

Formant measurements:
1. a fixed gender ceiling was set (first 5 formants found up to 5500 Hz for F, 5000 Hz for M)
   • turned out to be problematic
2. the ceiling was optimized to the vowel and speaker (see Fig.1)
   • all tokens of each vowel identity of each speaker were analyzed with the same ceiling

Results

Table 1: Differences between dialects (no interaction gender-dialect)

<table>
<thead>
<tr>
<th>Context:</th>
<th>Pooled</th>
<th>Consonant</th>
<th>Sentence</th>
<th>Word</th>
<th>Isolated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration</td>
<td>x</td>
<td></td>
<td>x</td>
<td>x</td>
<td><img src="image" alt="p&lt;0.001" /></td>
</tr>
<tr>
<td>F0</td>
<td>x</td>
<td>x</td>
<td><img src="image" alt="p&lt;0.029" /></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F1</td>
<td><img src="image" alt="p=0.001" /></td>
<td><img src="image" alt="p&lt;0.001" /></td>
<td><img src="image" alt="p=0.001" /></td>
<td><img src="image" alt="p=0.002" /></td>
<td><img src="image" alt="p=0.02" /></td>
</tr>
<tr>
<td>F2</td>
<td><img src="image" alt="p=0.034" /></td>
<td><img src="image" alt="p&lt;0.001" /></td>
<td><img src="image" alt="p&lt;0.001" /></td>
<td><img src="image" alt="p=0.034" /></td>
<td></td>
</tr>
</tbody>
</table>

Figure 1: Analysis of one of the contexts, isolated vowels. Using a fixed gender ceiling (top) and the optimized ceiling method (bottom). The optimized ceiling yields much smaller standard deviation and ‘repairs’ strange cases

Figure 2: Vowel spaces for each sentential context. Dashed line: ES, solid line: PS, large curves: woman, small curves: man.

Figure 3: Duration and F0 for each sentential context.

Conclusions and further research

- The average F1 value of /a/ is higher in ES than in PS (by 7.1% when vowels are embedded in sentences, 5.6% in words, and 9.5% when produced in isolation at the end of a sentence).
- The sVsV context yielded the largest F2 difference; the sentence context yielded the largest dialectal difference.
- The present analysis of isolated vowels yields different results than those reported in Morrison & Escudero (2007). A comparison between studies’ figures shows that the measured vowel spaces are quite different.
- Current research examines the difference between formant measurement methods.
- Additionally, dialectal differences between the /a/-/e/ and /a/-/o/ acoustic distances are being investigated.

References: