Temporal and Devoicing Analysis of European Portuguese Fricatives

(Notes)

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Such data are needed in order to do Portuguese speech synthesis.
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- Here is the LX signal.
- Here’s the acoustic signal.
- Point out the boundaries we identified.
The time waveforms of all the corpus words were manually analysed to detect the start of the vowel-fricative (VF) transition, the start and end of the fricative, and the start of the fricative-vowel (FV) transition.

Both the acoustic and laryngograph signals were used to determine the VF and FV boundaries.
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- We see a clear pattern here of voiceless fricatives having a longer duration than voiced, and later we’ll show you results of ANOVAs checking on the significance.

- But one possibility is that the difference is an artifact of the difficulty of segmenting voiced fricatives.

- So we looked at the duration of the transitions on either side as well...
• There is no clear pattern of voiced-voiceless, and so the segmentation cannot explain the differences in duration of the steady-state parts.

• There are slight differences between VF and FV transitions, and so on, and again say that this has all been analysed.
In Corpus 3, for 3 of the 4 subjects (not CFGA) the mean duration of the fricative is greater than that of the VF and FV transitions, and

the mean duration of the VF transition is greater than that of the FV transition.
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• In Corpus 4, the mean duration of the fricatives is greater than the duration of the VF and FV transitions;

• the VF and FV transitions do not differ significantly in duration for any of the speakers.
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- There was a significant effect of the factor speaker on the duration of fricatives /f, s, j/ in both Corpus 3 and 4.

- There was no significant effect for /v, z, ʒ/ in Corpus 3, but in Corpus 4 there was a significant effect.
There was a significant effect of the factor **place** on the duration of fricatives /f, s, ʃ/ and /v, z, ʒ/ in both Corpus 3 and 4.

There was a significant linear trend. In Corpus 3, as the place of articulation moved posteriorly, duration increased proportionately.
There was a significant effect of the factor position in word on the duration of fricatives /f, s, s/ and /v, z, ʒ/ in both Corpus 3 and 4.

There was a significant linear trend, indicating that as the position of the fricative moves from initial, through medial, to final word position, duration increased proportionately.
• Remind people of our definition of total as opposed to partial devoicing.

• Corpus 3 results for all four subjects showed that
  – 55% (70 out of 127) of /v/ tokens,
  – 74% (79 out of 107) of /z/ tokens, and
  – 86% (92 out of 107) of /ʒ/ tokens were totally devoiced.
In Corpus 4,

- 44% (77 out of 177) of /v/ tokens,
- 78% (86 out of 110) of /z/ tokens, and
- 71% (89 out of 126) of /ʒ/ tokens

were totally devoiced.
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- Percentage of total devoicing by position in word, word-initial (I), word-medial (M) and word-final (F), fricatives /v, z, ʒ/ combined. The black portion of each bar in the graph corresponds to fricatives in a stressed syllable and the white portion to fricatives in an unstressed syllable. There are no Portuguese fricatives in final stressed position.
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- In Corpus 3, most word-final fricatives (93% – 55 out of 59) were totally devoiced, and the percentage of devoicing increased as the place of articulation moved posteriorly.

- The Corpus 4 fricatives devoiced mostly word-finally, but less often than in Corpus 3.
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- There was a significant effect of the factor speaker on the voicing of fricatives /v, z, ʒ/ in Corpus 3, but no significant effect in Corpus 4.
• There was a significant effect of the factor place on the voicing of fricatives in both Corpus 3 and 4.

• There was a significant linear trend. In Corpus 3, as the place of articulation moved further back the amount of devoicing increased proportionately.
There was a significant effect of the factor position in word on the voicing of fricatives in Corpus 3, but no significant effect in Corpus 4.

There was a significant linear trend. In Corpus 3, as the position of the fricative moves from initial, through medial, to final word position, the amount of devoicing increased proportionately.