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A pitch accent for contrastive emphasis in Danish?

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Danish intonation

According to Grønnum's (2022) model of Danish intonation based on read speech, contrastive emphasis is signaled by

- more extensive F0 contours associated with the stress group in emphasised words
- often a reduction of the contour in surrounding stress groups in the same utterance
- otherwise qualitatively the same contour in emphasised and non-emphasised words

This has been empirically verified in spontaneous speech. (Dyhr 1995; Tøndering 2003)

In other languages, contrastive emphasis may be signaled by a qualitatively different pitch contour. (Gussenhoven 2004:86-7)

The present study

This exploratory study is based on data collected for a different purpose, comprising sentences contrasting two phrases in an interrogative frame following the mould of "Did you verb **X** or **Y**?" (following Kirby & Ladd 2016)

These utterances invite the speaker to contrast the utterance medial word **X** with the utterance final word **Y**.

Following Grønnum's (2002) model, this construction could potentially elicit a higher degree of prominence on **X**, but should not elicit a difference in F0 contour shape.

However, listening to the recordings gave the impression that speakers occasionally placed emphatic stress on **X**. Here, we test whether this impression is related to differences in F0 contour shape.

Materials and analysis

12 speakers of Greater Copenhagen Danish read 132 constructed alternative question sentences of the type

Er det dine eller er det mine?
(Eng: Are they yours or are they mine?)

prompted using SpeechRecorder in a sound-attenuated booth at University of Copenhagen.

Pitch was extracted from 790 suitable tokens using `wrassp:mhsF0` in R with

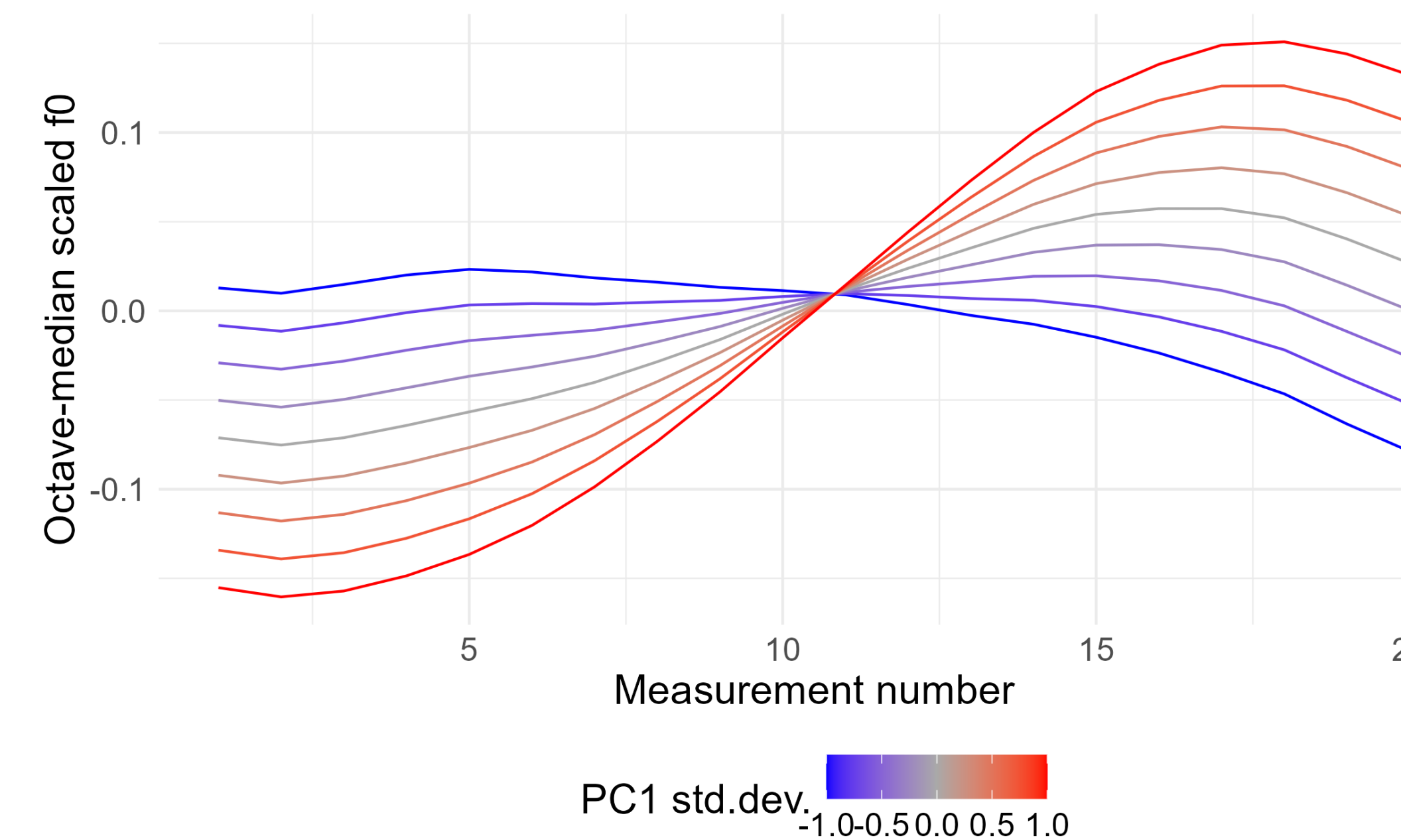
- pitch floor = 75 Hz
- pitch ceiling = 500 Hz
- 20 time-normalized steps

Contours were normalized using octave-median scaled F0 by speaker

Functional PCA

We analyzed the principal modes of F0 variation in utterance medial position with functional PCA using `fdapace` in R.

- 3 PCs account for 95% of the variance in F0 contour shape.
- PC1, related to the position of the F0 peak, accounts for ~72% of variance.

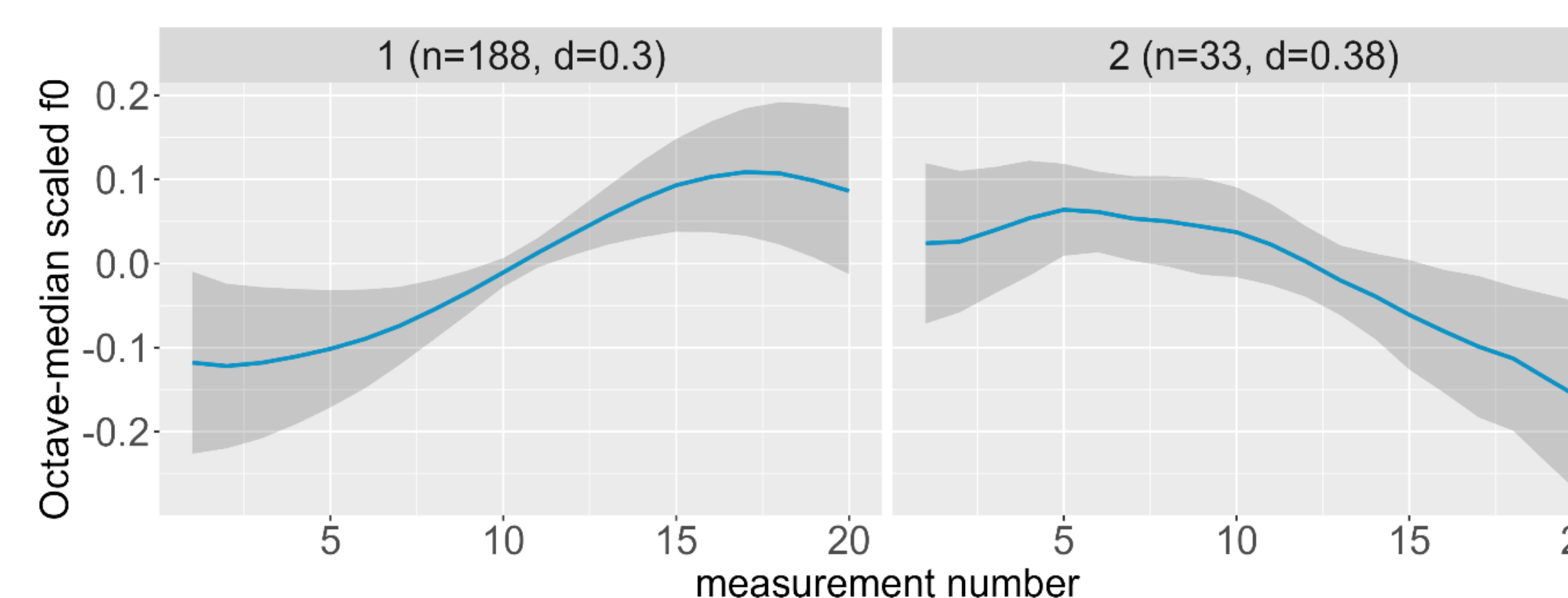


Contour clustering

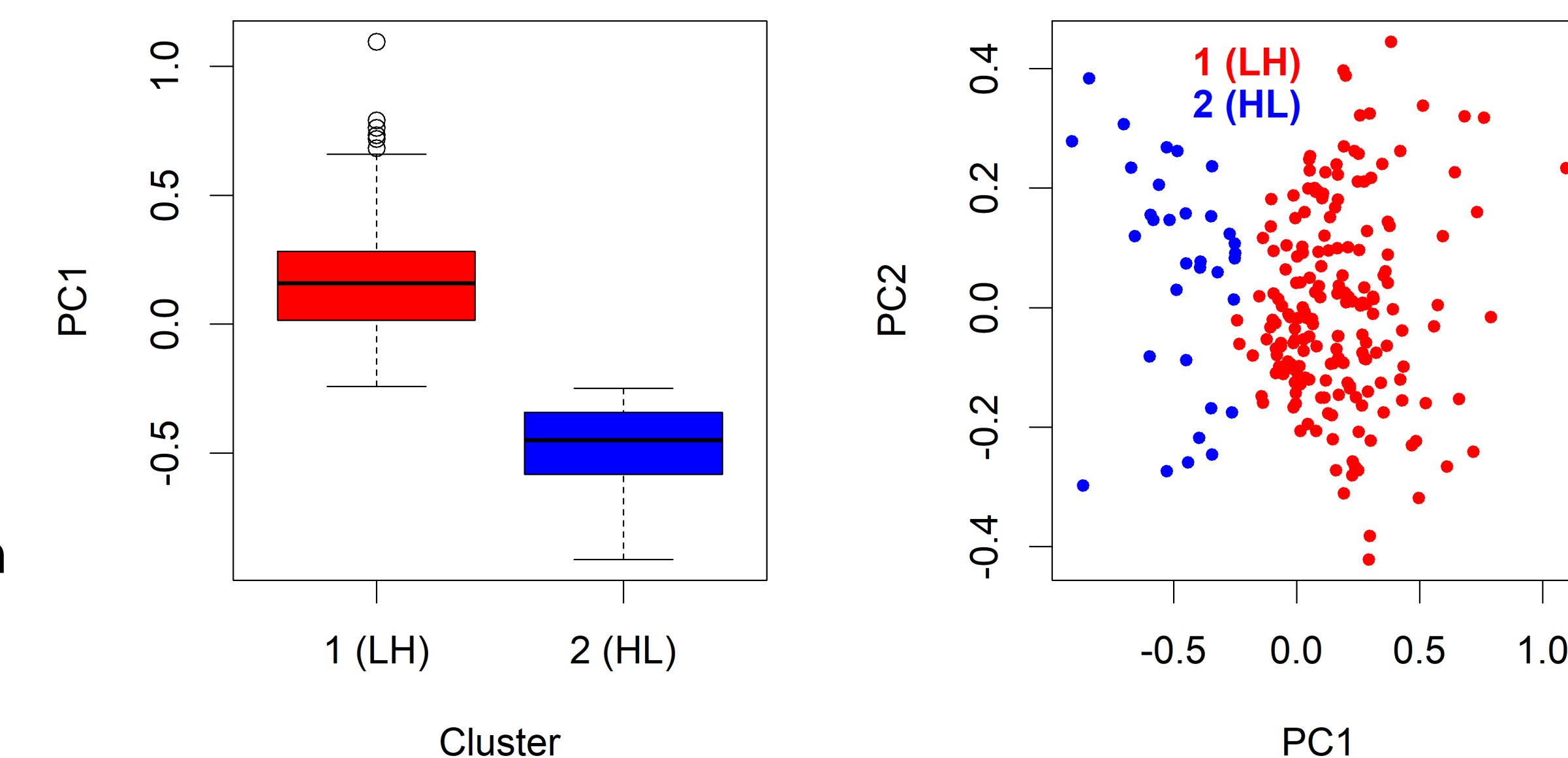
Medial position

The utterance medial contours were further analyzed by means of hierarchical agglomerative clustering using `contour_clustering_gui`.

- 221 contours were eligible for cluster analysis after removal of level contours
- Stepping down from 25 possible clusters, the final analysis revealed just 2 distinct clusters

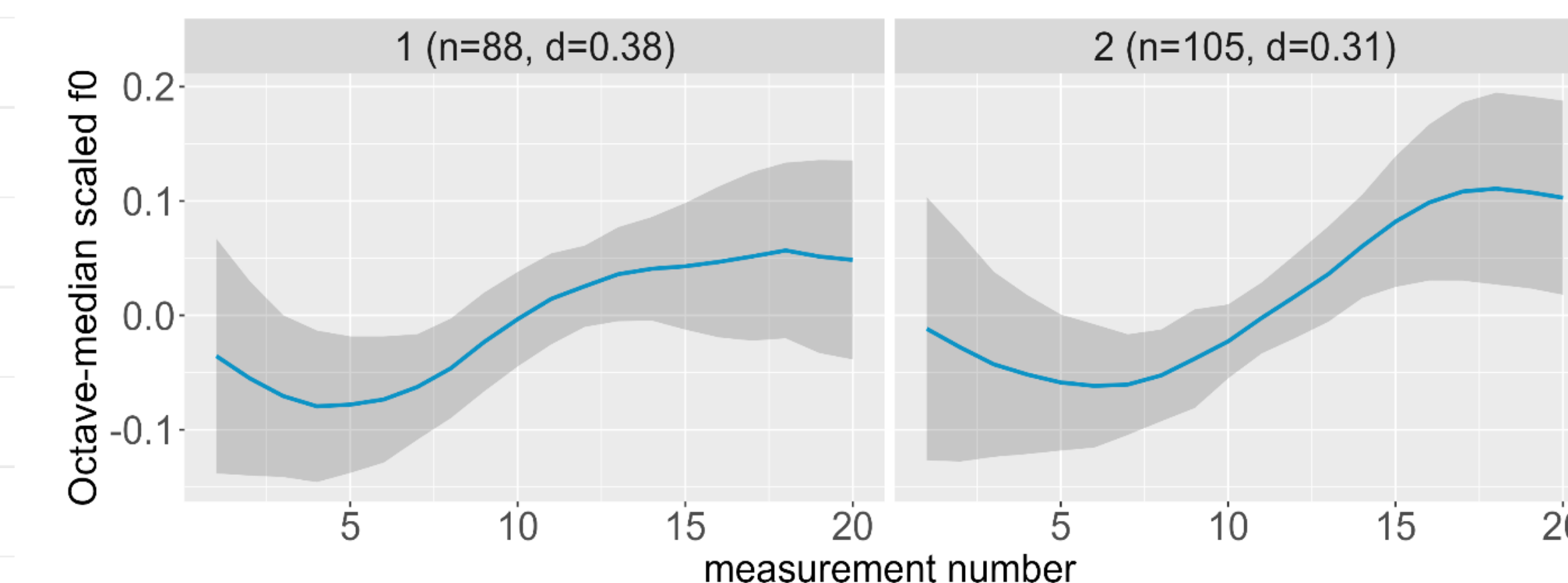


The 2 clusters correspond near-perfectly to the variance captured by PC1.



Final position

The utterance final contours (n = 193) were analyzed in the same way.



Discussion

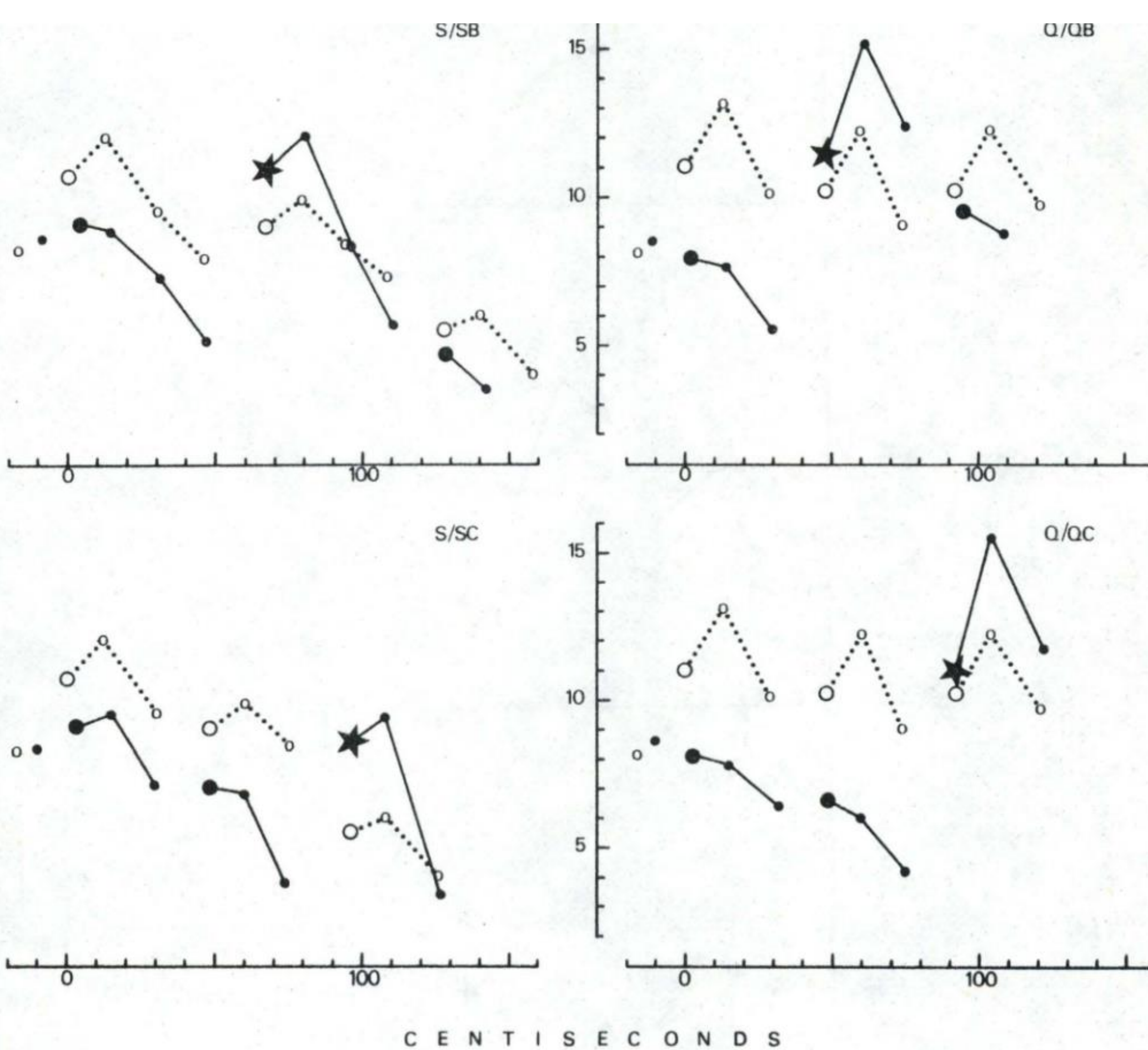
Medial position in alternative question sentences prompt 2 main types of F0 contour:

- Rise from a low tone on the accented syllable, i.e. the expected pattern (following Dyhr 1995, Grønnum 2022)
- High tone on the accented syllable followed by a fall to the post-tonic, i.e. the opposite pattern

This variation is *not* found in final position, suggesting a specialized HL contour for contrastively emphasised words.

In a small perceptual verification test, 4 / 5 phonetically trained listeners confirm hearing HL as emphatic.

Only 6.7% (n = 33) of the analyzable contours have the HL pattern. 3 speakers never use it, and no speakers use it exclusively. In other words, it is at most an optional way to prosodically mark emphasis. The results **suggest the possibility of a previously unattested pitch accent for contrastive emphasis developing in Danish.**



(Reproduced from Grønnum 1980)

-----○----- Neutral utterances
-----★----- Utterances with emphatic stress