

## Tutoriat, Seminar Sprachproduktion (P9.1) Measuring voice quality.

**Aims:** For three different voice qualities (“modal”, “behaucht” and “gepresst”)

- (1) Get values for the harmonics-to-noise ratio (using Praat’s command ‘To Harmonicity’)
- (2) Measure H1-H2 by hand in the spectrum, i.e. the difference in amplitude of the first two harmonics (H1 corresponds to f0).

### Background

See handout “Akustische Analyse der Stimmqualität”, and the handout from Klatt & Klatt (1990).

### Procedure

Logon as user matlab, open a terminal window, then enter

```
cd akustikfort/vq  
praat
```

In the Praat Objects window Praat > Open Praat script, then select vqspectrum\_script.txt

For each speaker in the folder there are three files, e.g.

evi\_modal.wav, evi\_behaucht.wav, evi\_gepresst.wav

Load a sound, e.g. evi\_modal.wav, and open it in an edit window.

Select a segment of about 0.2 seconds in a stable part of the vowel, and extract it to the object list with

```
Extract sound selection (time from 0).
```

Rename the sound to evi\_modal\_x.

In Praat’s picture window, choose the Pen menu and set the colour to red.

In the script window, set the variable mysound\$ to evi\_modal\_x and run the script.

(A number of new objects, that are used by Praat for calculation and display, will appear in the object list.)

Praat’s note window should now print the harmonics-to-noise ratio for this sound.

Enter this in the table below.

The spectrum should have been drawn in the picture window and opened in a new edit window. In the edit window the main task is to use the cursor to measure the **amplitude** (in dB) of the first two harmonics (H1 and H2).

It may be helpful to zoom in on the frequency axis.

Also, it is advisable to have a rough idea what the pitch of the speaker’s voice is in order to choose the right peaks.

The frequency of H2 should be double the frequency of H1. If not, you may be looking at the wrong peaks in the spectrum.

Record the frequencies and amplitudes of H1 and H2 in the table below, and calculate (in dB) H1\_amplitude - H2\_amplitude.

Repeat this procedure for the “behaucht” and “gepresst” versions of the speaker you are analyzing.

When analyzing “behaucht” be sure to set the pen colour in the picture window to green.

When analyzing “gepresst” be sure to set the pen colour in the picture window to blue.

To get a clear overlay of the three spectra in the picture window it may be necessary to experiment with the `dblow`, `dbhigh` settings in the script.

Here is an example of results for speaker Lia :

	Harmonics to noise	H1-H2
<code>lia_modal_x</code>	22.2	+10
<code>lia_behaucht_x</code>	8.1	+17
<code>lia_gepresst_x</code>	19.9	-2

The results for H1-H2 (in the second column) come out as expected, i.e. largest positive values for “`behaucht`”, smallest positive values (or slightly negative values) for “`gepresst`”. [Based on Klatt & Klatt H1-H2 is closely related to the glottal open quotient, which will definitely be largest for “`behaucht`” and smallest for “`gepresst`”.]

For harmonics to noise, “`behaucht`” has the lowest value. This again is as expected: Klatt & Klatt link the overall strength of the harmonics in the spectrum to the abruptness of vocal fold closure. For “`behaucht`”, closure can definitely be expected to be much less abrupt than for modal or “`gepresst`”. It is less clear whether one should expect more abrupt closure for “`gepresst`” than modal (in the modelling experiments of Klatt & Klatt this is not the case). In the example here the harmonics-to-noise ratio is actually slightly smaller for “`gepresst`” than modal. This could be because “`gepresst`” may have some irregularity in pitch period duration, which will tend to lower the harmonics to noise value (this irregularity can be huge in clearer examples of creaky voice).

Do as many more speakers as time allows.

Before starting a new speaker, reset the Picture window with `Edit > Erase all` and remove all objects from the object list in the Object window.

## Additional measures

### (1) Bandwidth

Concatenate the three extracted sounds to make one new sound.

Open it in an edit window.

Turn on the formant display, and make sure that the formant settings are appropriate.

Experiment with the dynamic range (and perhaps also window length) in the spectrogram settings so that the formants are easy to see in the sonagram.

Use the formant menu to extract the **bandwidth** of the first and second formants at a typical part of each of the three voice qualities.

It is often the case that a creaky or pressed voice quality has more sharply defined formants (i.e. lower bandwidth) than a breathy voice. This is probably because the longer glottal closure reduces losses to the subglottal region, and perhaps also because of overall more tension in the vocal tract.

### (2) Jitter

Praat reports the results of jitter measurements with the `Voice report` item of the `pulse` menu of the Edit window. For the voice report to work, `show pulses` must be activated in the pulse menu; moreover, an appropriate pitch range for the speaker must be set in the Pitch menu (see `Pitch > Pitch settings`; here the analysis method should also be set to “`cross-correlation`”).

