The influence of f0 on the perception of alcoholic intoxication

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Research questions

- Are listeners able to discriminate between sober and intoxicated speech?
- Is fundamental frequency a relevant cue?
- Do listeners perform worse if the influence on f0 is compensated in intoxicated speech?
- Is discrimination influenced by simulated f0 effects in sober speech?

Speech data

Alcohol Language Corpus (ALC):

- recordings of intoxicated and sober speech of 162 German speakers
- speech styles: read, spontaneous, command and control (C&C)
- 20 speakers as a control group: recorded sober twice

Stimuli:

- 8 stimuli pairs of read speech
- 8 stimuli pairs of spontaneous speech (manually cut, average length 5s, matched according to content across intoxicated and sober speech, slips of the tongue and laughter avoided)
- 8 stimuli pairs of C&C speech

→ 24 discrimination pairs per speaker

Perception test

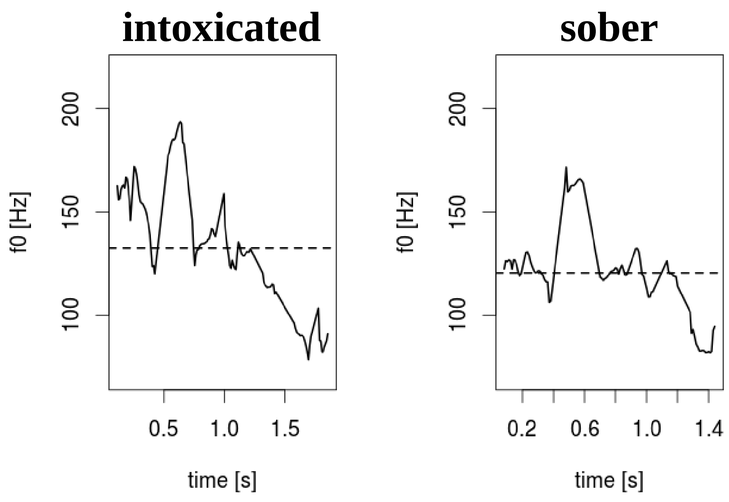
- forced choice discrimination tests

„In which of these recordings was the speaker intoxicated?“

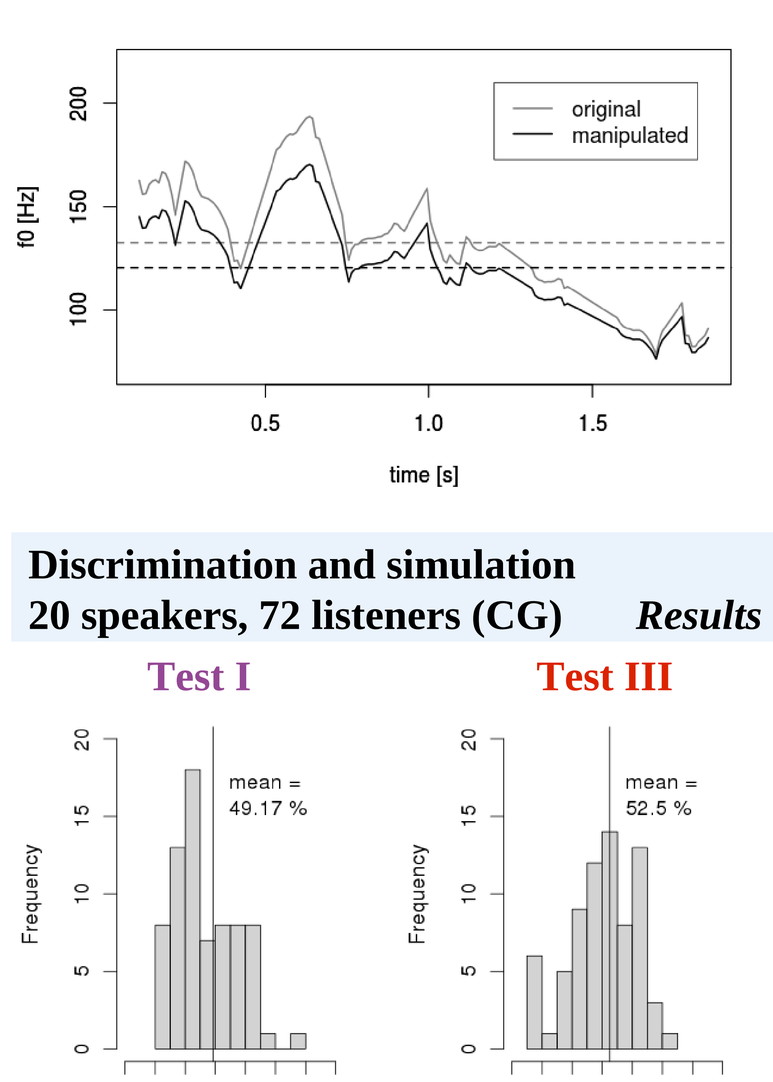
Perception test

- Test I: **general ability**
  → original stimuli
  → control group (CG) of 20 speakers (two sober stimuli)
- Test II: **compensation of f0 effects**
  → f0 of the **intoxicated** stimulus was adjusted in median and range to the **sober** stimulus
  → by up- or down-shifting and stretching or compressing the f0 contour
- Test III: **simulation of f0 effects**
  → 2 **sober** stimuli of the same speaker
  → the f0 contour of one stimulus was up-shifted and stretched by 5%.

F0 contours



Change of f0 in speech data

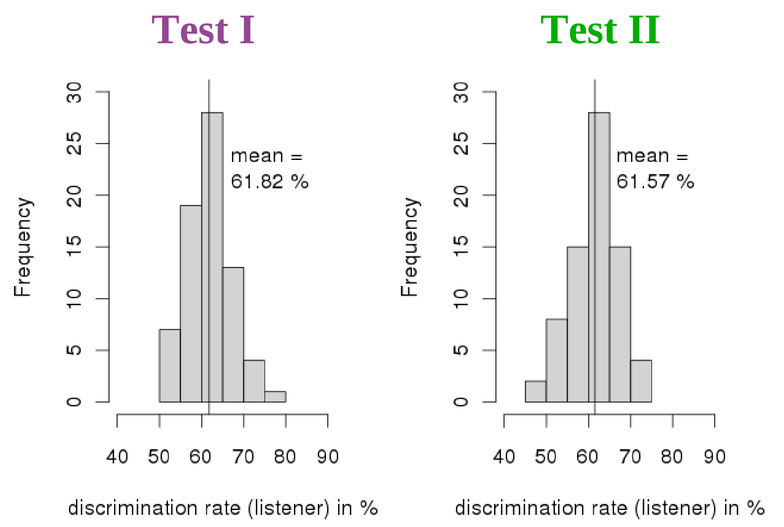


- f0 medians were higher for intoxicated speech for 81,4% of the speakers
- f0 was raised on average by 4%

- a tendency for better detection rates (in test I) for speakers who show a bigger change in f0, though the correlation is weak (r = 0.23)

Compensation

Discrimination and compensation
132 speakers, 72 listeners — *Results*



- mean discrimination rates are above chance
- performance of listeners in test II does not differ significantly from that in test I

Discrimination and simulation
20 speakers, 72 listeners (CG) — *Results*

- in the control group of test I (two sober stimuli) listeners chose randomly
- mean discrimination rate of test III is slightly above chance ($p<0.1$)

Conclusion

- even if differences in f0 are eliminated, listeners perform the same in test I and test II
  → seems to indicate that f0 does NOT function as a cue in sober/intoxication discrimination
  → other (acoustic, linguistic or para-linguistic) features play the major role
- possible reason: listeners do not rely on f0 as a cue for intoxication because f0 is also prone to changes caused by other speaker states

- listeners show a tendency to choose the stimulus with the altered f0 to be intoxicated in test III
  → listeners might use f0 as a 'fall-back' feature, if no other features of intoxication can be detected
- f0 still seems to function as a promising feature for automatic detection (more than 80% of the speakers use higher f0 in intoxicated condition)