The influence of f0 on the perception of alcoholic intoxication

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We report three perception tests concerning the ability of listeners to perceive alcoholic intoxication solely from the speech signal. Speech samples are taken from the German Alcohol Language Corpus (ALC)[1], a publicly available corpus with recordings of sober and intoxicated speech of 162 speakers. An earlier study (Baumeister et al., 2012) revealed that the majority of these speakers[2] (79.1%) increase their fundamental frequency (f0) while intoxicated. This study is concerned with the question whether f0 is also a relevant cue for the perception of intoxication. We tested (1) the general ability of listeners to discriminate between sober and intoxicated stimuli pairs of the same speaker, (2) f0 compensated stimuli pairs to see if the discrimination rate decreases, and (3) sober speech stimuli with manipulated f0 to see if we can elicit the same effect as in real intoxicated speech.

Method and Results

All three tests are forced-choice discrimination tests where one pair of stimuli of the same speaker was presented at a time, and listeners were asked to pick the intoxicated stimulus. To compensate f0 effects in the stimuli for experiment (2), f0 of the intoxicated stimulus was adjusted in median f0 and range of f0 to the sober stimulus by up- or down-shifting and stretching or compressing the f0 contour. In the third experiment two sober stimuli of the same speaker were presented, but the f0 contour of one stimulus was up-shifted and stretched by 5%.

The mean discrimination rate of the basic discrimination test (1) is 61.8%, which is above chance. In a control group (two sober stimuli) listeners chose randomly as expected (49.2%). The mean discrimination rate in the compensation experiment (2) is 61.6% which - contrary to our expectations - does not differ significantly from (1). The average discrimination rate in experiment (3) is 52.5% and therefore slightly higher than chance ($p<0.1$).

The results suggest that f0 is not a relevant perceptual cue for listeners, although as shown in Baumeister et al. (2012) it seems to be a promising feature for the automatic detection of intoxication. Listeners seem to rely on other (maybe para-linguistic) features. Only if such other features are missing (as in experiment 3), a slight tendency to choose the stimulus with higher f0 can be observed. One possible explanation is that f0 is influenced by many other speaker states (such as stress, emotions) in a similar way as intoxication, and is therefore not reliable enough to reveal a speaker's intoxication.

References

Baumeister, B., Heinrich, C., Schiel, F. (2012). The influence of alcoholic intoxication on the fundamental frequency of female and male speakers. *Journal of the Acoustical Society of America,* **132**, 442-451.

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1   For a detailed description of the ALC see Schiel et al. (2012)
2   Only 148 speakers with a blood alcohol concentration higher than 0.05% were part of this study

Schiel, F., Heinrich, C., Barfüßer, S. (2012). Alcohol Language Corpus: The first public corpus of alcoholized German speech. *Language Resources and Evaluation* **46(3)**, 503-521.

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