Voice patterns associated with age and gender of speakers across the lifespan

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The voice characteristics of speakers are proven to be influenced by various factors, like age and gender due to anatomical, physiological, and social reasons among others [e.g., 1, 2, 3, 4]. Although the presence of these differences are universal due to the anatomical and physiological backgrounds, voice parameters were revealed to have significant differences across languages [e.g., 5, 6, 7]. The present study aims to reveal further data and possible patterns on Hungarian speakers in a cross-sectional study. Our aim is to concentrate on inter- and intraspeaker specific variability.

We hypothesized that (i) and that f0 would show higher values in men's speech and lower values in women's speech of older ages than in the younger speakers' speech. (ii) Mean values and variability of jitter, and shimmer were assumed to be higher with the speakers' age irrespective of their gender, while HNR-values were hypothesized to appear with lower values in elder speakers. (iii) We also assumed that the voice measures in question show gender-specific distributions.

150 healthy speakers (half of them were females) were selected from the BEA database [8]. The ages of the participants ranged from 20 years up to 79 years. 10 men (age: 20, 27, 33, 46, 64, 70 ys) and 4 women (age: 22, 32, 35, 62 ys) were smokers, and 2 men (22, 35 ys) gave up smoking. The database includes various information on the subjects (like age, gender, smoking, weight, etc.), but does not include medicational information (e.g., contraceptives). The material consisted of 25 simple and complex Hungarian sentences to be read aloud by the participants who had ample time to get acquainted with the sentences. All speakers' readings were recorded under the same conditions. The speech samples were segmented into pause-to-pause intervals using the Praat [9]. Measurements of f0, jitter (local), shimmer (local), and HNR were carried out by automatic voice analysis in Praat. The standard settings of f0 range were adjusted according to gender: 50 Hz–350 Hz for males and 75 Hz–450 Hz for females. The values were extracted using a window length of 100 ms with 50 ms overlaps. Linear mixed models were run to analyse the effect of gender, age, and their interaction, while Pearson correlation was used to analyse the age related variance of the measures. Smokers are analysed also whether their results are less specific in their age groups.

The preliminary results (fig. 1) are introduced on a subset of 95 speakers. All parameters confirmed significant differences depending on gender while diverse patterns were found depending on age. The f0 values of female speakers decreased with age while no significant correlation was found with males. The jitter values showed higher values in elder females while no significant difference appeared in male subjects. The values of either shimmer or HNR did not yield any significant correlation with age irrespective of gender.

The expected differences in voice parameters across the lifespan were partly confirmed by our preliminary results. The f0 and jitter values varied along the life span in women, but not in men (see [2]), while the preliminary results for shimmer and HNR were not found to show correlation with age in the present cross-sectional study. The final results on a large database may contribute to mapping the variance of voice parameters.

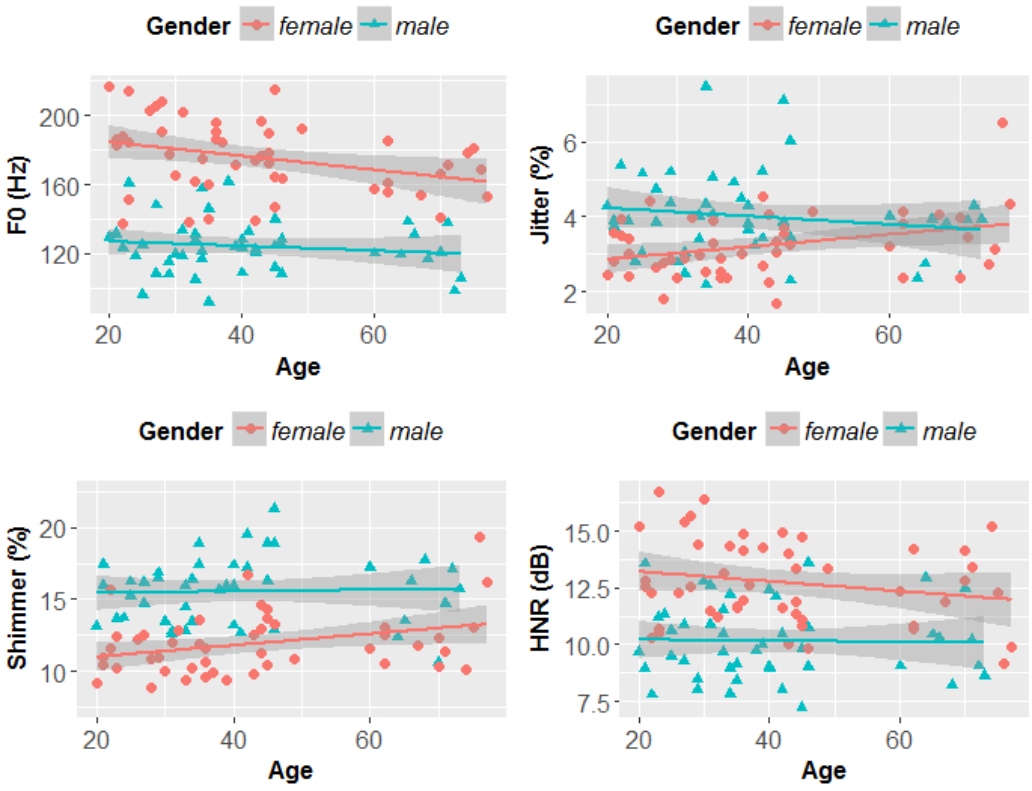

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Figure 1. *The average values of f0, jitter, shimmer and HNR across age.*

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