The Aging Voice:
an Acoustic, Electroglottographic and Perceptive Analysis
of Male and Female Voices

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Central questions of this study

- Acoustic features:
  - What are the acoustical cues of aging voices?

- Features of the EGG waveform:
  - Can EGG improve understanding of age-related phonation?

- Perception of speakers age:
  - How is accuracy of age recognition related with stimulus type?
• **Data**
  – 56 female speakers - 20 to 87 years old
  – sustained German vowel /a/, /i/, /u/ (onset and stationary), read and spontaneous speech

• **Methods**
  – measurement of 33 acoustical parameters with MDVP
  – calculation of the *perceived age* per stimulus (mean estimation of 15 listeners)
  – calculation of correlation coefficients between the acoustic measurements and chronological as well as perceived age
• **Summary of the acoustical Parameters**
  – higher correlations of acoustics with perceived age than with chronological age
  – decreasing $f_0$ is a predictor for increasing age in female voices
  – increasing amplitude perturbation is a better indicator for age than frequency perturbation

• **Best predictors dependent from stimulus type:**
  – **sustained vowels:** frequency tremor intensity index, independent of vowel quality
  – **read speech:** $f_0$
  – **spontaneous speech:** shimmer, $f_0$
• **Data**
  – 24 female and 26 male speakers differing in age (grouped young vs. old)
  – sustained German vowel /a/

• **Methods**
  – calculation of perceived age by estimations of 18 listeners
  – qualitative evaluation of EGG signals
  – qualitatively evaluate the corresponding LTAS measurements
Qualitative results of LTAS measurements (male speakers)

Perceived as young

Perceived as old
Results of age perception depending on stimulus type

Correlation coefficients between chronological and perceived age

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- sustained vowels: /i/ (red ellipse) correlates better than /a/ and /u/
- read/ spontaneous speech (blue ellipse): best estimation possible
- Stimuli with vowel onset correlate better than the corresponding stimuli without onset!
What are the acoustical cues of aging voices?

– in spontaneous speech the best indicator of age is amplitude perturbation (preferably averaged over 20-250 ms)
– dependent of stimulus type good predictors of age are frequency tremor intensity index and fundamental frequency
Can EGG signals improve understanding of age-related phonation?
– in male voices stimuli with more sinusoidal EGG signals are perceived as older
– there seems to exist a relation between the sinusoidal shape of the EGG and the spectral damping between 2 and 4 KHz in the LTAS of male voices.

How is accuracy of age recognition related with stimulus type?
– vowel onset seems to encode age related informations