# Articulation rate and vocal tremor as cues in age perception

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The process of aging has natural consequences on human speech production. This allows a relatively precise age estimation purely based on the perception of the voice [1, 2]. The main influences seem to be fluency (especially speech rate) and speaking fundamental frequency (SFF). Research shows that the faster and higher a person speaks the lower the estimations tend to be [3-5]. Although these tendencies are very consistent the relation between them are not well understood.

Most research regarding acoustic indicators for age perception are based on natural stimuli. Therefore, the indicators are not deliberately varied. A way to do this would be with synthetically manipulated stimuli.

[6] were able to shift the estimations of older voices towards the estimations of younger voices by manipulating fluency measures but not the other way around. Additionally, [7] manipulate one-word-utterances and find a difference of 16.6 years between the slow and the fast variant for male speakers and 17.8 years for female speakers. Manipulating fluency measures therefore seem to have perceptual relevance.

SFF on the other hand is subject to stronger limitations for the synthetical variation since larger changes of f0 tend to make speech samples sound unnatural. This might explain the lack of results concerning this indicator. The restrictions might be too narrow for SFF to have an impact on its own especially because natural speech also varies in SFF depending on the situation.

In addition, changes in voice quality in natural aged speech – which can be seen in measures like jitter and shimmer and more global measures like vocal tremor – could overshadow the impression of a younger voice. [8] and [9] find a rising level of shimmer depending on the chronological age. [10] finds comparable results for jitter in contrast to [11] and [12] who could not find any effects for jitter. For perception especially vocal tremor seems to be a promising indicator. [13] confirms vocal tremor as perceptually relevant for vocal aging in male speakers.

This study examines the question how articulation rate and vocal tremor influence age perception. To answer this question a perception test was designed with 16 stimuli by middle aged speakers (8 male & 8 female, mean age: 53.69, sd: 1.96) and 16 levels of manipulation for each stimulus. The stimuli consisted of the first two intonation phrases the speakers produced while reading Aesop's fable 'Northwind and Sun'. Via an online survey, participants were asked to estimate age and gender of 16 stimuli (with one level of manipulation per speaker). For results an influence of both variables individually is expected as well as in interaction with each other. Every manipulation level should shift the age estimation to a higher value with a greater extend for levels where both variables are manipulated. First analyses confirm these expectations.



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