

Are people as old as they sound? Acoustic, regional and generational effects

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The age of a speaker is part of the various social information which can be indexically signaled in his/her speech (Foulkes & Docherty 2006; Foulkes et al. 2010; Ekert 1997). A recurrent question is whether age should be defined in chronological, social, cognitive or biological terms. Here, we address the question of the relationship between ‘chronological’ and ‘perceived’ age, and the different factors that could explain how and why they differ.

Chronological and perceived age are compared in the speech of 112 speakers of French aged from 50 to 89 y.o., distributed into 4 regional varieties (French (FR), Belgian (BE), Swiss (CH), Quebecois (QC)), 2 sexes and 4 decades (50-59, 60-69, 70-79, 80-89 y.o.). In a forced-choice perception task, 13 young (22-31) and 13 old (70-95) Parisian French listeners estimated the speaker’s age as one of the 4 age classes, listening to the production of one meaningful read sentence per speaker (10 syllables, normalized intensity, 16 speakers in test-retest).

‘Chronological age’ is a fairly reliable predictor of a speaker’s ‘perceived age’ (Pearson correlation $r=.75$). However, we notice a tendency to overestimate the age of the speakers in the [50-59] group and underestimate the age of speakers from 70 y.o. (as found by others e.g. Huntley et al., 1987, Hunter et al., 2016). In other terms, speakers in the 60-69 y.o. group appear to sound closer to their chronological age, but this result is to consider with caution since there is a tendency for responses to converge to the central categories in these tasks. Differences between ‘perceived’ and ‘chronological’ age can be explained by different types of factors, linked either to regional and generational mismatch between listeners and speakers, or to the acoustic characteristics of the speakers’ speech:

i) age estimations are found to depend on the shared origin between speaker and listener (cf. Foulkes et al. 2010, Nagao 2006, but Braun et Cerrato 1999): at a same chronological age, French speakers are rated by the Parisian French listeners as younger than speakers of other dialects (fig. 1). Links between ‘perceived’ and ‘chronological’ age also vary according to the dialectal groups: for Swiss speakers the correlation is higher ($r=.87$) than for other groups (.72 BE, .78 QC, .74FR).

ii) estimations are also found to depend on the age difference between the listeners and the speakers, as found by others (e.g. Lindville & Korabic 1986; Goy et al., 2016). Unexpectedly, the listeners’ age matters more for the estimation of younger speakers: the age of speakers over 70 is equally underestimated by young and older listeners, while speakers under 70 are mainly judged older than their chronological age by the older listeners. This result does not reflect difficulties of the older listeners, whose intra-judge agreement is the same as young listeners.

iii) age estimation depends on acoustical characteristic of the speaker. Among the few temporal and spectral acoustic cues tested so far, speech rate appears to be the best predictor of the speakers’ age, although it accounts for only a small part of age variation. Interestingly, speech rate better predicts perceived ($r=-0.40$) than chronological age ($r=-0.25$), see fig. 2. In line with Harnsberger et al. 2006 and production studies such as Ramig 1983, this result suggests that, at the same chronological age, speakers do not sound equally old based on their speech rate.

Overall, this study shows that a speaker’s age can be estimated from his/her speech, and that this estimation depends both on the acoustical cues in the signal and on individual factors linked to the perceptual process of estimating personal information. Multiple cues indexing age are present in the speech signal and follow-up studies will go beyond the few acoustical cues analyzed here. Results also underline the potential lack of homogeneity within groups when classifying speakers by chronological age, rather than perceived age. This result has strong implications for the constitution of age-matched groups for the study of pathological speech for instance, but also for the understanding of sociophonetic variability.

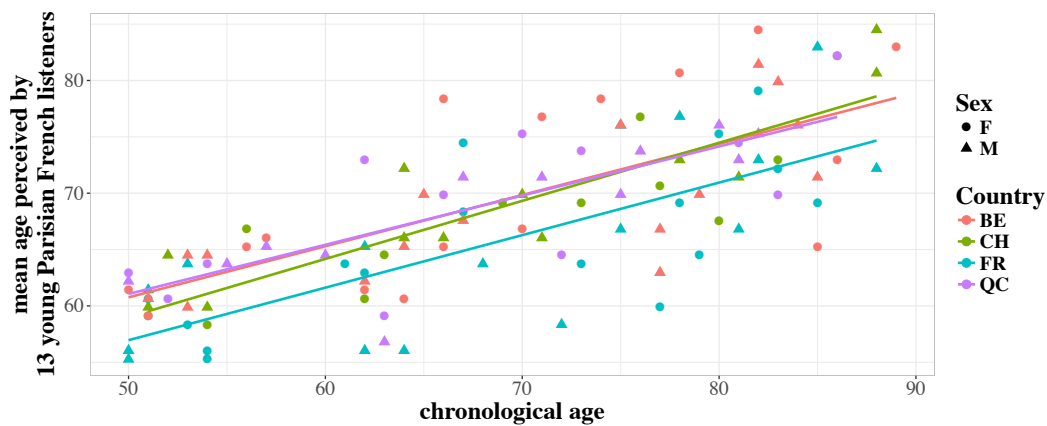


Figure 1. Scatterplot of chronological age vs. age perceived by 13 young Parisian French listeners, for the 112 speakers distributed in 4 countries and balanced between F and M.

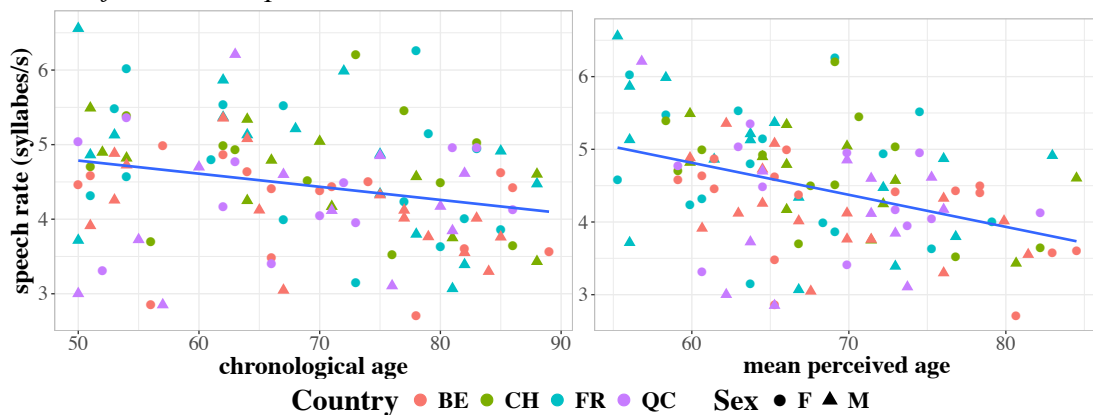


Figure 2. Scatterplot of speech rate as a function of chronological age (left) or age perceived by 13 young Parisian French listeners (right) for the 112 speakers.

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