

Effects of perceived age on perceived dialect strength: A listening test using manipulations of speaking rate and F_0

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This study tested whether estimated speaker age influences estimated dialect strength. Twenty young listeners judged unscripted monologues in terms of speaker age and dialect strength. The speech samples were produced by 3 elderly men, 3 elderly women, 3 young men and 3 young women, all native speakers of the Arjeplog dialect. In addition to the original speech samples, manipulated versions were created in which speaking rate and fundamental frequency (F_0) had been changed in order to simulate age differences. These manipulations 1) increased estimated speaker age by approximately 10 years and 2) increased the estimated dialect strength of these speakers. Thus, estimated speaker age and estimated dialect strength were found to be dependent variables. This suggests that listener responses must be corrected for age effects in experiments involving judgments of dialect strength.

1. Introduction

It is a commonly held belief that men are ‘more dialectal’ than women and that older speakers are more dialectal than younger speakers. In a previous study (Stölten & Engstrand, 2002), the hypothesis that men and older speakers tend to be heard as more dialectal than women and younger speakers was partly supported. The results suggested that the young female speakers were consistently judged to be less dialectal than the remaining speakers (which was in accordance with the hypothesis) and that this judgment was independent of listeners’ estimation of speaker age. However, there was a strong correlation between estimated and chronological age as well as between estimated age and estimated dialect strength. This complicates dialect strength comparisons across age groups since it is hard to assess the contribution of the age factor.

The purpose of this study was to clarify the possible influence of listeners’ judgment of speaker age on their estimation of dialect strength in speakers of the Arjeplog dialect. Speaking rate and F_0 have been claimed to vary with age (e.g., Hollien, 1987; Pegoraro Krook, 1988; Amerman & Parnell, 1992). They may, thus, cue speaker age perceptually (e.g., Linville, 1987; Jacques & Rastatter, 1990). Speaking rate and F_0 were therefore manipulated in order to simulate age differences in a number of dialect speakers.

2. Method

The subjects who participated in the two listening tests (age and dialect judgments) were 20 normally hearing students from the Stockholm area, 10 men and 10 women between 20 and 29 years of age (mean=24.3, std=2.5), and were paid for their participation. The speech material was taken from the SWEDIA 2000 dialect database (e.g., Björsten et al., 1999) and had been used in a previous listening test (Stölten and Engstrand, 2002). The samples (two per speaker) were judged to contain no information about the speakers' age or occupation. One sample was the original (non-manipulated) recording, whereas the other sample had been manipulated in terms of speaking rate and fundamental frequency (F_0). For half of the listeners, the original sample was used for age judgments, and the manipulated sample was used for dialect judgments. For the other half, the samples were presented the other way around. Manipulations of speaking rate and F_0 (carried out using Cool Edit 2000/Syntrillium Software Corporation) consisted in lowering speaking rate for all speakers and raising F_0 for all speakers except the younger females, for whom F_0 was raised. These changes were quasi-proportional to the original parameter values and evaluated in informal listening tests.

The speech samples (16 bits, 16 kHz stereo) were presented by a loudspeaker (Fostex 6301B) to each subject in a random order. The subjects were asked to rate both speaker age and dialect strength on the same four-point scale that had been used in a previous perception test (see Stölten and Engstrand, 2002).

3. Results

Figure 1 shows estimated age plotted against chronological age for the original and the manipulated speech samples of the 12 Arjeplog speakers.

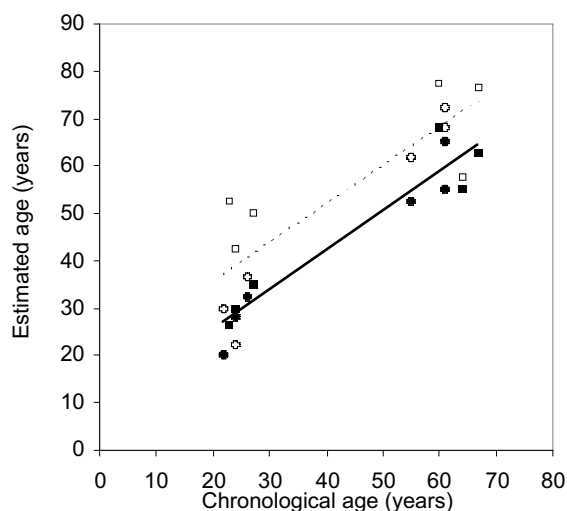


Figure 1. Listeners' average age estimation of 12 Arjeplog speakers' original (thick line) and manipulated (dashed line) samples as a function of chronological age. Circles: women, squares: men.

The figure shows that listeners' average age estimations of the manipulated samples were about 10 years above the estimations pertaining to the original speech samples. For the original samples, listener responses displayed a clear separation of the speaker group judged as younger (with judgments falling between 20 and 35 years as seen along the y axis) from that judged as older (with judgments falling between 50 and 70 years). This pattern was less clear for the manipulated versions, for which the younger group was judged to be between 20-55 years, whereas the older group was judge to be between 60-80 years of age. The difference between the age groups was smaller in terms of estimated age than in terms of chronological age, but this effect was more marked for the manipulated than for the original samples. A significant correlation between chronological and estimated age was found for both the original ($r=0.96$) and the manipulated versions ($r=0.86$). Finally, an almost perfect correlation could be observed for the original samples produced by the young men ($r=0.99$) as well as the young women ($r=0.98$). For the manipulated samples a significant correlation was shown for the older women only ($r=0.92$).

Figure 2 shows listeners' judgments of dialect strength as a function of estimated age for the original and the manipulated samples.

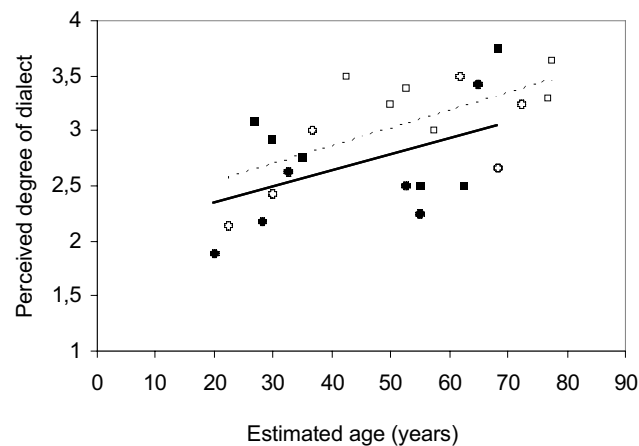


Figure 2. Perceived degree of dialect strength in relation to estimated age of original (thick line) and manipulated (dashed line) speech samples. Circles: women, squares: men.

The manipulated speech samples showed a higher average value of dialectal strength on the four-point scale ($m=3.09$) than did the original versions ($m=2.70$). The young men in both groups tended to be judged as more dialectal than the young women. However, an ANOVA with the factors age (older/younger) and sex (female/male) showed that these tendencies were non-significant or just barely significant for the original ($F(1,4)=8$, $p<0.44$) and for the manipulated samples ($F(1,4)=11$, $p<0.032$). No significant differences between sexes in the older generations were found, neither for the original ($F(1,4)=0$, $p<0.742$) nor for the manipulated samples ($F(1,4)=0$, $p<0.608$).

A significant negative correlation between estimated age and perceived dialect strength was observed for the younger men in both the original ($r=-0.99$) and the manipulated samples ($r=-0.70$). The corresponding correlations for the older men were $r=0.83$ and $r=0.87$. The younger female speakers of both groups showed significant correlations as well ($r=0.95$ and $r=0.98$). In the older generation, only the original samples of the women showed a significant correlation ($r=0.92$). For the speaker group as a whole, the correlation was significant for the

manipulated samples ($r=0.63$), while no significant correlation was found for the original versions ($r=0.47$).

4. Discussion

The results of the listening test indicate that both speaking rate and fundamental frequency may cue perceived speaker age – the speakers behind the manipulated samples were heard to be approximately 10 years older than those behind the original samples. A slower speaking rate has been claimed to be characteristic of older speakers, perhaps due to both physiological and psychological factors (Hollien, 1987; Amerman & Parnell, 1992). F_0 is often raised in older male and female speakers due to "physical changes in the structure of the larynx" (Pegoraro Krook, 1988:87). In this experiment, a combination of lowered speaking rate and raised F_0 in the elderly female, elderly male and young male speakers made these speakers sound older than their chronological age. In the case of the younger females, this effect was obtained by lowering their speaking rate as well as F_0 . This observation is in accordance with findings by Pegoraro Krook (1988) showing a significant F_0 lowering in middle-aged females. The physiological changes responsible for these findings have been explained in terms of a menopause-related increase of the testosterone-oestrogen ratio.

In summary, this experiment has tested effects of changes in F_0 and speaking rate on estimated speaker age and dialect strength. The results show that manipulations of these parameters may increase estimated speaker age by approximately 10 years. At the same time, they made speakers sound more dialectal. It can thus be concluded that perceived age may have a considerable effect on judgments of dialect strength. This finding may suggest that the notion of old people being 'more dialectal' should be taken with a pinch of salt. At any rate, it clearly indicates that listener responses to dialect strength must be corrected for age effects.

5. References

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