Voice onset time (ms)

Figure 3: Voice onset-time measured for voiced and voiceless stops in recordings of 4 generations of Tokyo speakers from Takada’s (2011) apparent-time study and in recordings from 2 generations of Tokyo speakers in two experiments in Kong, Beckman, & Edwards (2012).

Cross-generation differences suggest sound changes in progress

- Tokyo speakers show an even more extreme cross-generational shift in distribution of VOT values for voiceless stops.

- Among the older Tokyo speakers in Takada (2011) [top row in Fig. 4 below], women produce proportionally more tokens with strong pre-voicing.

- Among the middle-aged Tokyo speakers in Takada (2011) [middle row], women produce about as many tokens with pre-voicing as do the men.

- Among the young adult speakers in Kong, Beckman, & Edwards (2012) [bottom row], women produce very few tokens with pre-voicing (and the same is true for Kong et al. (2012) experiment 2 [not shown]).

Women are now leading the Tokyo sound change


- Among the middle-aged Tokyo speakers in Takada (2011), VOT values are more useful for gender identity. The more masculine VOT values, mark more masculine-sounding voices for young adult men.

- Among the young adult speakers in Kong, Beckman, & Edwards (2012), VOT values are more useful for gender identity. The more masculine VOT values, mark more masculine-sounding voices for young adult men.

- Analysis of the gender-biased block of the perception study [Fig. 5 below] shows that more conservative VOT values, as well as more tense voice quality values, mark more masculine-sounding voices for young adult men.

- At the time shift is in progress, women’s productions are more ambiguous, in the phoneme-identification block of the same perception study, more responses to the women’s voiced stops mis-identify the target as voiceless (red diamonds).

- In the middle-aged and older Tokyo speakers [top and middle rows in Fig. 4], most data points for women have high positive values, indicating a generally breathy (or ‘lax’) voice quality.

- An associated change in the function of voice quality?

- Voice-onset-time (VOT) as a function of voice quality:

- A difference between 1st and 2nd harmonics [H1-H2] (in a spectrum estimated over a 25 ms window beginning at voice onset) is a measure of voice quality.

- The VOT maximized for voiceless stops.

- Middle-aged and older Tokyo speakers show an even more extreme cross-generational shift in distribution of VOT values for voiceless stops.

- Among the middle-aged Tokyo speakers in Takada (2011) [middle row], women produce about as many tokens with pre-voicing as do the men.

- Among the young adult speakers in Kong, Beckman, & Edwards (2012) [bottom row], women produce very few tokens with pre-voicing (and the same is true for Kong et al. (2012) experiment 2 [not shown]).


- Among the middle-aged Tokyo speakers in Takada (2011), VOT values are more useful for gender identity. The more masculine VOT values, mark more masculine-sounding voices for young adult men.

- Among the young adult speakers in Kong, Beckman, & Edwards (2012), VOT values are more useful for gender identity. The more masculine VOT values, mark more masculine-sounding voices for young adult men.

- Analysis of the gender-biased block of the perception study [Fig. 5 below] shows that more conservative VOT values, as well as more tense voice quality values, mark more masculine-sounding voices for young adult men.

- At the time shift is in progress, women’s productions are more ambiguous, in the phoneme-identification block of the same perception study, more responses to the women’s voiced stops mis-identify the target as voiceless (red diamonds).