

PHONETIC EXPLANATIONS FOR DEVOICING OF HIGH VOWELS

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It has been well established (Greenberg 1966, Jaeger 1978) that high vowels devoice more frequently than low vowels. Ohala (1975) suggested two explanations on the basis of a model of speech aerodynamics. The model predicted that oral air pressures would be higher for high than for low vowels, thus reducing the pressure drop across the glottis necessary for voicing; and that air velocity would be greater at the place of maximum constriction for high than for low vowels, resulting in more noticeable frication. A further hypothesis is that the transfer function of the vocal tract results in greater fricative noise for high than for low vowels. Measurements from one speaker suggest that the pressure differences between high and low vowels cannot be the explanation, since those pressures, averaged over three environments, are essentially equal:

/i/	.40 cm H ₂ O
/u/	.54 cm H ₂ O
/ɔ/	.51 cm H ₂ O
/æ/	.43 cm H ₂ O

The hypothesis that the transfer function is responsible for the greater noisiness of high vowels was tested with a computer vocal tract model which produced random noise at the place of maximum constriction for three modeled Russian vowels. The output of the model was subjected to a Fourier analysis, which did not yield relevant differences in fricative amplitude. It is clear from this study that the explanation must lie in the narrower constriction and greater air velocity for high than for low vowels.

References

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