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More on Perceptions of /a/ Fronting

Nearly 50 years ago, Ladefodged and Broadbent (1957) pointed out that phonetic information and sociolinguistic information are conveyed jointly in the speech signal, giving rise to the potential for interactions. We have been investigating a perceptual interaction regarding the Northern Cities Chain Shift (NCCS), as it is realized in Michigan. Speakers from Lower Michigan (region LM) generally front their productions of /a/ thereby shifting its formants, especially F2 (Labov, Yeager et al. 1972). Speakers from Michigan's Upper Peninsula (region UP) do not make this vowel shift. Plichta and Rakerd (2002) reported preliminary evidence indicating that LM listeners are sensitive to this dialectical difference and take it into account when perceptually interpreting synthetic formant frequency patterns that can be heard as either /a/ or /ae/. (UP listeners do not show this sensitivity.) Specifically, they reported that a group of LM listeners shifted their perceptual boundary along an /a/ - /ae/ vowel continuum depending on whether the vowels were presented at the ends of sentences spoken by an LM talker or at the ends of sentences spoken by a UP talker. This paper presents further results and analysis regarding this phenomenon and does so with particular focus on issues regarding speech processing.

A detailed study of individual subjects' psychometric functions and /a/ - /ae/ cross-over points has revealed a high level of inter-subject agreement regarding response preferences for this task. Agreement is strong both among LM listeners, who show the dialectically driven /a/ - /ae/ boundary shift in the aggregate, and among UP listeners who do not. We take this result to indicate that extended experience with the LM dialect is needed to develop a representation of the shifted vowel space that can then mediate a listener's vowel perceptions.

There is evidence that the NCCS perceptual effect is both robust and general. We find that the effect is strongly manifest for each of four sentential precursors and for each of two synthetic word series that we have tested to date. A notable finding regarding the latter is that there is a significant word-level influence on the /a/ - /ae/ perceptual boundary. Specifically, the boundary for a "sock"-sack" word series occurs 0.7 step further along the synthetic continuum than does the boundary for a "hot"-"hat" series. This word-level effect combines additively with the NCCS effect. An analysis of subjects' own speech productions shows acoustic correlates that are consistent with this perceptual result.

Finally, an analysis of decision reaction times provides evidence regarding the processing that underlies subjects' perceptual judgments. Reaction times are fastest for stimuli that fall clearly within the /a/ or /ae/ categories. Times are slowed at category boundaries, presumably reflecting added perceptual decision-making time. Listeners, especially LM listeners, show a distinct boundary difference for precursor sentences spoken by LM and UP talkers and for the "hot"-"hat" and "sock"-sack" word series.

References

Labov, W., M. Yeager, et al. (1972). A Quantitative study of sound change in progress. Philadelphia, U.S. Regional Survey.

Ladefoged, P. and D. E. Broadbent (1957). "Information conveyed by vowels." J. Acoust. Soc. Am.(29): 493-499.

Plichta, B. and Rakerd, B. (2002). "Perceptions of /a/-Fronting in Two Michigan Dialects." Paper presented at NWAV Conference, Stanford, CA, October, 2002. *Presentation available at <http://bartus.org/papers/intro.sw>*

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