Competing effects of prominence and vowel shift in Chicago English

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Many factors influence the phonetic realization of phonemes, including sociolinguistic factors and factors related to local context within the utterance. In this paper we examine the interaction of two such factors—regiolectal variation and prosodic context—in the acoustic realization of vowels in Chicago English. Acoustic studies of American English [1,5] show two effects of prominence on primary stressed vowels: hyper-articulation of contrastive frontness/backness, and sonority expansion through vowel lowering. In the Chicago variety, for some stressed vowels these prominence effects are predicted to go against the direction of the recent and ongoing vowel shifts [3,4]. We test the effects of focus-induced prominence in relation to vowel shift in the production of vowels by 18 younger-generation Chicago English speakers (9 male). The Northern Cities Shift reported in Chicago English [4] involves retraction of lax /æ, ɛ, ʌ/ with additional lowering of /ɪ, ɜ/, fronting of /ɑ/ to /a/, backing of /ɔ/ and an extreme fronting and raising of /æ/, which becomes a rising diphthong. Historically, the first of these changes appears to have been the one affecting /æ/, whereas the retraction of /ɪ, ɜ/ is a more recent addition to the shift. As in many other English varieties around the world, /uw/ is also fronting, although this phenomenon appears to be less advanced than in some other varieties.

Participants were asked to produce the same sentences with target words in and out of focus. F1 and F2 values of stressed vowels were examined for all 11 Chicago English vowel phonemes, excluding only ‘true’ diphthongs, to examine how focal prominence affects the acoustic vowel space (a total of 2970 tokens were analyzed). The predicted lowering of /æ/, fronting of /ɪ, ɜ/, and backing of /uw, ʌ/ under prominence are counter to the direction these vowels move under vowel shift (details below). We ask whether in such cases, the effects of focal prominence on vowel production will reverse the effects of vowel shift (the Shift Reversal Hypothesis-SRH), or alternatively, if vowels affected by shift will manifest even greater displacement in the direction of shift when under focal prominence (the Shift Enhancement Hypothesis-SEH), with the result that shifting and non-shifting vowels may exhibit qualitatively different effects due to prominence.

Vowels in target CVC words were measured at 25%, 50% and 75% into the vowel. Figure 1 shows F1 and F2 (in Bark) mean values for all vowels at these three points. Linear mixed-effects regression models were conducted with F1, F2 and duration as dependent measures, Focal Prominence and Final Consonant as fixed factors, and Word and Speaker as random factors (FinCons effects not reported here). Significant results (p < 0.05) are as follows. Vowels under focus are significantly longer and there is a general expansion of the vowel space under contrastive focus. All of the following vowels are significantly lower under focus at midpoint and especially towards the end of the vowel: /ɪ, ʊ, ɛ, ʌ, ow, ɔ, æ, ə/. On the other hand, /ij, ej/ are higher under focus, while /uw/ varies little in height. Under focus there is a significant backing of /uw, ow, ɔ, ʌ/, a very small (though significant) fronting of /ij, ej, ɪ, ɛ, ʌ/, with /e, ʌ/ varying little in the front/back dimension. There was no consistent pattern of correlation between F1/F2 and duration. Our speakers do not produce the highly diphthongal variant of /æ/ that Labov documents for older Chicago speakers, which starts in the region of the high vowels, but this vowel still shows considerable gliding towards a lower and more retracted articulation from beginning to end in both focus conditions.

Under the SEH the greatest shift effects are expected under focal prominence, predicting greater backing of /e, ʌ, ɔ/, greater fronting of /uw, ʌ/, and combined raising and fronting of /æ/ under focus. Instead, our data reveal an opposite effect of backing for /a/ and (even more substantially) /uw/, and almost no front/back variation in /e, ʌ/. And while /æ/ displays a small fronting effect under focus, as predicted by the SEH, it also displays a lowering effect that counters the prediction of this hypothesis.
The backing of /ɔ/ under focus is as predicted, though the SRH predicts the same effect for this vowel. In summary, we do not find evidence that vowel shifts are most extreme under greater degrees of prominence, and therefore we reject the SEH. The SRH fares somewhat better. The observed backing of /uw/ and /ɑ/ under focus ‘reverses’ the fronting of these vowels due to vowel shift, just as the lowering of focalized /æ/ reverses the raising of this vowel due to vowel shift. The general picture is, then, that the effects of focal prominence on vowel production are robust in the face of opposing effects from vowel shift [3], suggesting that the mechanisms underlying these effects are at least partly independent. This is especially true for the lowering (sonority expansion) effect of prominence, which is uniform for all vowels save those in the extreme front, upper region of the vowel space. Yet the absence of the predicted effect of front/back hyper-articulation under focal prominence for /ɛ, ʌ/ points to an interaction between the prominence and vowel shift mechanisms, and suggests that the position of these vowels in the front/back system of contrast may be in flux at the present time, for these speakers.

References

(1) Context: Did you say the mother adopted a loving dog for her family?
Sentence: No, the mother adopted a loving **cat** for her family.  

**Figure 1** Mean F1, F2 values from beginning, middle and end of vowels with and without focal prominence (18 speakers, each point is an average of 270 tokens)