

THE PHONETICS OF REDUCED VOWELS IN CHUVASH: IMPLICATIONS FOR THE PHONOLOGY OF TURKIC

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ABSTRACT

In this paper, I suggest that vowel systems with non-high rounded vowels provide a challenge to speaker-listeners in both the production and perceptual domains. This challenge seems to be particularly marked for non-high front rounded vowels. I then relate the problem presented by the existence of such vowels to morphophonemic alternation patterns in three Turkic languages.

THE CHUVASH LANGUAGE

Chuvash is a unique Turkic language spoken in the Chuvash Republic, Russia, which extends inland mostly along the south and west shores of the Volga river where it turns southward some 600 kilometers east of Moscow. There are about 1.7 million Chuvash speakers (both bi- and monolingual), a number of whom live in neighboring republics.

Certain dialect variation aside, literary Chuvash—a composite of features of the two principal dialects—shows a “Turkic” underlying eight-vowel system ranged along front-back and high-low axes, with unrounded and rounded pairs in each phonological corner. The Chuvash analogs of the non-high rounded vowels are traditionally referred to as “reduced” or “weak” vowels and are typographically represented (both in Cyrillic and Latin transcription) as unrounded vowels with superscript breves. Adapting Krueger [1], I will initially use the following symbols: /i y e ĕ u u a ä /.

The two “reduced” vowels of Chuvash are set apart from the other vowels of the system in that they are shorter in connected speech, subject to deletion in rapid speech and metrics, and yield to the full vowels with respect to stress assignment, which is, broadly put: “stress the last full vowel of a word; when there are only reduced vowels in a word, stress the first vowel”. But see Dobrovolsky [2] for a sketch of some factual and theoretical problems with this view

A PHONETIC PROBLEM

Data from the vowel systems of the world’s languages demonstrates the relative lack of exploitation of non-high rounded vowels, especially non-back ones ([3] and [4]). I hypothesize that the presence of non-high rounded vowels creates a phonetic challenge that must be resolved in some linguistically acceptable way. This problem is multifold and arises from the linking up of a number of variables. In what follows, I coordinate a number of facts about the nature of non-high rounded vowels, especially front ones

Rounding and spectral fitness

Lip spreading renders front vowels more spectrally fit in that it serves to reinforce the height of their second and third formants. Conversely, lip rounding in front vowels can be thought of as rendering them less spectrally fit by lowering these same formants, thus contradicting their frontness. This effect appears to be particularly strong on the non-high front rounded vowels, to judge from the vowel inventories referred to above. One way to deal acoustically with this lessened fitness is to create a more distinct acoustic effect between non-high front unrounded and non-high front unrounded vowels by moving the latter to an acoustically more central position in vowel space. The ongoing conflation of /ø/ and /œ/ in Modern French and their continuing merger with schwa is one example of this path. It follows that Chuvash /ĕ/ is a prime candidate for this kind of acoustic adjustment. The non-high back rounded vowel /ä/, however, is already acoustically fit in that the lowering of the upper formants by lip rounding serves to emphasize its backness. Centralization of this vowel might be expected to result from other factors.

Articulation

Acoustic data and articulatory data suggests that the term “reduced”, is appropriately used to mean “raised and/of

centralized”. The well-known facts of vowel neutralization in Russian illustrate this claim; its five vowel system /i e a o u/ manifests as /i a u/ in unstressed position. Russian unstressed /e/ neutralizes upwards to /i/ while unstressed /o/ tends to neutralize downward to /a/. But this phonemic description is misleading, as unstressed /a/ is manifested phonetically as central [ʌ] and [ə] depending on the segment’s nearness to a stressed vowel.

Wood and Pettersson [5] have made a convincing case that reduction of open vowels in Bulgarian is related to three articulatory factors, (i) a lessening of jaw lowering, (ii) a lessening of lip rounding or spreading, and (iii) a lessening of pharyngeal narrowing. I suggest that the reduction of Chuvash /ä/ falls out of Wood and Petterson’s factor (i), a lessening of jaw lowering. There is no compelling acoustic reason to deround/centralize the non-high back rounded vowel if there is no other non-high rounded back vowel in the system. However, it may well be that in contexts that deliberately contrast non-high rounded and unrounded vowels the acoustic centralizing effect will be more pronounced. This appears to be the case with some preliminary analysis of a word list containing such contrasts that I have recently made but will not report on here.

Stress/non-stress

Lack of stress may be equated with less precision in vowel articulation. This lack of precision in articulation is characterized by, among other things, a general reduction of articulator movement. A general centralizing tendency for vowels in the outcome.

Thus, articulatory and acoustic variables conspire to have an inevitable perceptual effect, namely, a lack of distinctiveness within respective sets of non-high vowels. I also speculate that the combination of greater jaw lowering and rounding requires articulatory effort that is non-optimal. If jaw lowering is compromised, a reduced vowel results. If rounding is compromised, a merger with the unrounded non-high vowels is threatened. Centralization of the merging vowel maintains its distinctiveness. The

synergy of effects demands a phonological resolution.

SOME CHUVASH DATA

I report now on the spectrographic analysis of Chuvash vowels reported by Kotleev [6] for some 300 tokens of vowels “in various combinations and positions” from four speakers of the literary dialect and on other material collected by me during a two week stay in Chuvashia in July 1994. Four speakers—two females (ages: mid-twenties and early forties) and two males (ages: early thirties and mid-sixties)—were recorded in their homes or in a university residence using a Sony Walkman Professional WM-D6C and Realistic Electret tie-pin microphone 33-1063. None of the speakers had the literary dialect as their childhood speech, though all were to varying extents influenced by it. Each speaker came from a different area of Chuvashia and showed slightly different base dialect features: NW (Jadrenskij Rajon), N. Central (Cheboksarskij Rajon), E. Central (Marbosatskij Rajon) and S. (Batyrevskij Rajon). The data was elicited from a prepared word list in question-answer sessions using Chuvash and Russian. (In some cases the speaker used a different word in his or her dialect, so there are some gaps in the lists). For the purposes of this paper, some five tokens of each of the eight vowels were analyzed for each speaker (there are gaps in the number of vowel tokens reported here, notably, and inexplicably, /a/!). Spectral analysis was carried out using the LPC method on GW Instruments SoundScope/8 1.31 one-channel analyzer. All attempts were made to record formant frequencies from those areas of the vowels that appeared to be least affected by consonant transitions on either side.

VOWEL FORMANTS

Figure 1 plots the F1 and F2 formant frequency averages reported by Kotleev *op cit*. It appears that the reduction of /ĕ/ for his speaker is manifested as raising and a slight centralization of the vowel paralleling the centralization of /y/. The non-high back rounded vowel appears to be somewhat centralized as well.

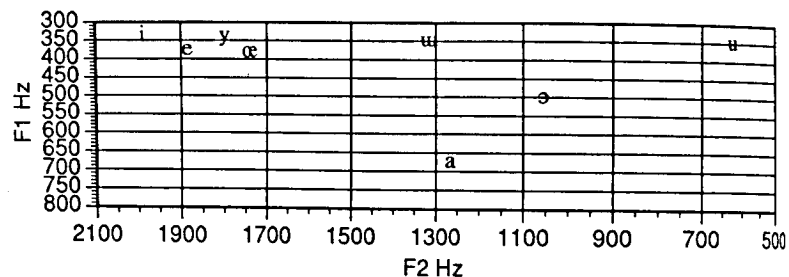


Figure 1. Average F1/F2 for Chuvash speakers reported by Kotleev 1979.

For purposes of comparison with Kotleev, Figure 2 plots the F1 and F2 formant frequency averages for the four speakers recorded by me. A stronger trend towards centralization of the non-

high front rounded vowel is evident. The non-high back rounded vowel appears to occupy the acoustic space transcribable as [ɔ], which was certainly the auditory impression it frequently gave.

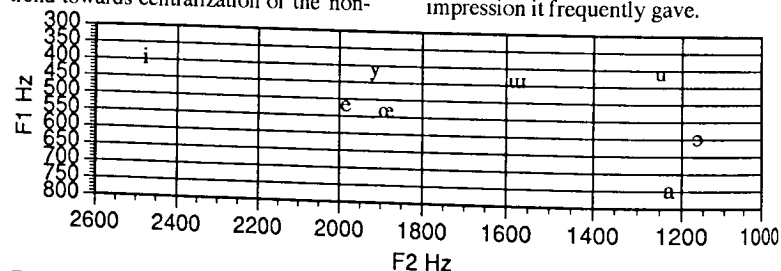


Figure 2. Average F1/F2 for Chuvash speakers gathered for this study.

RESOLUTIONS IN TURKIC

Given that the presence of non-high rounded vowels provide the germ of a perceptual/articulatory problem that will seek to find a level of resolution that makes its way into the linguistic system as a whole (a.k.a. "language change"), I present three "solutions" from three languages along the vast continuum of the Turkic family.

Chuvash: reduction

The data from Chuvash presented above has already demonstrated what the historical resolution of the non-high rounded vowel problem in Chuvash (Possibly under the influence of neighboring Uralic languages like Mari). Non-high front rounded /ɛ/—more appropriately symbolized as underlying /æ/, which in my experience is its primary phonetic manifestation when stressed—in particular has become more centralized (or raised) and shorter. Non-high back rounded /a/, better represented as /ɔ/, shows less centralization. But

these developments are far from complete. In stressed position, especially in contrastive monosyllables, the two vowels are still distinctive phonetically from each other and from all other vowels.

The well-known predictions of Liljencrants and Lindblom [7] regarding the shape of vowel systems are borne out in Chuvash: they predict that six-vowel systems exploit the high central area and seven-vowel systems add the high front rounded area. Their predictions for eight-vowel systems do not include a low front unrounded vowel. The proposed revision to Liljencrants and Lindblom in Crothers *op cit* still does not include a low front rounded vowel, but does, unlike Liljencrants and Lindblom, predict a schwa. Though the Turkic eight-vowel system in general confounds both predictions, it is worthwhile noting that Chuvash reduction appears to be moving in the direction both references expect, at least phonetically. Crothers p. 111,

however, lists Chuvash as a system showing "an extreme typological deviation" in having two "interior" vowels, by which I assume he means /ɛ/ and /ä/. Recall, however, that the formant data reported on earlier suggests that /ä/ is not heavily centralized.

Turkish: restriction

Modern Standard Turkish shows another response to the presence of non-high rounded vowels. Here, these vowels are restricted to initial syllables in the native vocabulary. The high vowel suffixes of Turkish participate in a four-way harmonic alternation: /i ~ y ~ u ~ ʊ/. The non-high suffix vowel alternations are restricted to /e ~ a/, eliminating one possibility for the non-high rounded vowels to occur in non-initial syllables. The presence of an anomalous suffix like the *-ijor* progressive remains marked by the /o/'s opacity: it never alternates. This restriction of non-high rounded vowels to initial syllables may be viewed as the outcome of neutralization in non-stressed position if we accept the often stated proposal that Ur-Turkic stress was word-initial.

Yakut: expansion

As one moves eastward in Central Asia, there is increasing assimilation of both consonants and vowels irrespective of language. Yakut, spoken in the Saxa (Yakut) Republic in NE Siberia, is no exception to the areal pattern—rounding harmony is endemic. Krueger [8], p. 50, shows the high rounded vowels /y/ and /u/ followed in the next syllable by a high rounded vowel/diphthong or a low unrounded vowel, but non-high rounded /ø/ and /o/ followed only by a high rounded vowel/diphthong or low rounded vowel (front/back harmony applies as well). The suffix alternations among low vowels that are restricted to /e ~ a/ in Turkish thus show the full range of non-high rounded vowels in Yakut: /e ~ ø ~ a ~ o/, with /ø/ followed only by /ø/ and /o/ by /o/ among the low vowels. I suggest that the persistence of low vowel rounding improves the perceptual fitness of these vowels in longer forms.

CONCLUSION

There are several reasons for the evolution of Turkic vowel sequences,

doubtless including language contact. I have suggest that phonetic theory provides some explanations for patterns of non-high rounded vowels in several Turkic languages. It is important to emphasize again that a phonetic "problem" like the existence of non-high rounded vowels is multidimensional and that there is not an inevitable common resolution along a teleological one-way street. Of course, how such apparently unattractive vowel systems arise constitutes another problem in its own right. Indeed, they exist, but as widely known and cited as the Turkic eight-vowel system is, Maddieson *op cit*, p. 127, notes that of the 317 languages in the UPSID database, only 24 (7.6%) have eight-vowel systems.

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