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Solving Chuvash stress with sonority-sensitive feet

This paper suggests a novel approach to motivate the sonority-sensitive default-to-opposite stress pattern in Chuvash. This single-ranking account utilizes sonority-sensitive feet to induce rightmost word-level stress and a high-ranking INITIALPROMINENCE constraint to account for default leftmost word-level prominence. This distinction between rightmost word-level stress and leftmost word-level prominence reflects the phonetic distinctions between these two types of prominence. Reordering the standard constraint ranking produces the patterns found in middle and lower Chuvash dialects. This account is both simpler and accounts for more of the data than the alternative quantity-insensitive approach (Kenstowicz 1996).

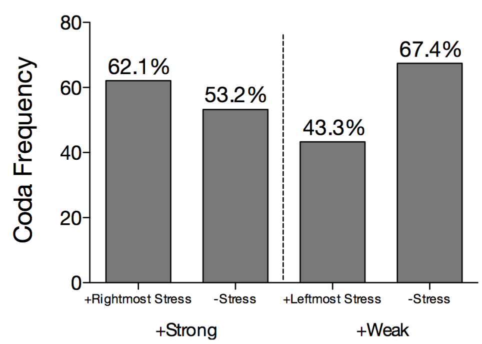
The Chuvash stress system has traditionally been described as DEFAULT-TO-OPPOSITE, whereby stress falls on the rightmost prominent syllable, else leftmost. Prominent syllables ($_s\sigma$) contain strong vowels (/i y ʉ u e ɑ/), while non-prominent syllables ($_w\sigma$) contain weak vowels (/ø ɔ/). Thus, in a word with at least one strong vowel, stress is predicted on the rightmost strong vowel (1a-c). In a word with only weak vowels, stress is predicted on the leftmost syllable (1d).

However, Dobrovolsky (1999) revealed that rightmost stress on strong vowels (1a-c) is correlated with longer vowel duration and higher intensity, while leftmost stress on weak vowels (1d) is instead characterized by greater pitch. Crucially, this pitch peak is associated with every initial syllable, whether or not it is stressed. Consequently, words with stress in non-initial position (1a,b) will also have prominence (↗) on the first syllable. This peak is more consistent with phonetic prominence (as a boundary tone) than phonological stress (as a pitch-accent). The words in (1) are more accurately transcribed in (2).

(1) a.	$_s\sigma.{}_s\sigma.$ˈ$_s\sigma$	ju.lɑ.ˈnut	(2) a.	↗$_s\sigma.{}_s\sigma.$ˈ$_s\sigma$	↗ju.lɑ.ˈnut	‘horse’
b.	$_s\sigma.$ˈ$_s\sigma.{}_w\sigma$	ɕy.ˈle.vøɕ	b.	↗$_s\sigma.$ˈ$_s\sigma.{}_w\sigma$	↗ɕy.ˈle.vøɕ	‘lynx’
c.	ˈ$_s\sigma.{}_w\sigma.{}_w\sigma$	ˈmɑ.kɔ.rɔtʲ	c.	↗ˈ$_s\sigma.{}_w\sigma.{}_w\sigma$	↗ˈmɑ.kɔ.rɔtʲ	‘moo (3sg)’
d.	ˈ$_w\sigma.{}_w\sigma.{}_w\sigma$	ˈɔ.rɔm.ɕɔ	d.	↗$_w\sigma.{}_w\sigma.{}_w\sigma$	↗ɔ.rɔm.ɕɔ	‘sorcerer’

Leftmost prominence and rightmost stress also differ phonologically. Stressed strong vowels are more likely to have a coda than “stressed” weak vowels, see Figure 1. Syllables with rightmost stress attract more material than unstressed syllables. This trend flips for weak vowels, suggesting initial prominence is phonetic not phonological.

Figure 1: Coda frequency across syllable types



Rightmost stress occurs word-finally if the vowel is strong (/i y ʉ u e ɑ/) but shifts leftward if the vowel is weak (/ø ɔ/). Strong and weak vowels are not distinguished by height, backness, roundness, or length. A production experiment shows that both vowel classes cross-cut these features (Tables 1-2, Author 2014).

Table 1: Chuvash vowel features

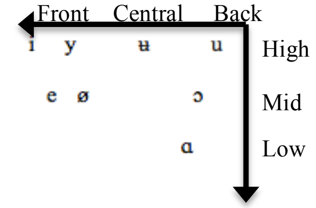
	Front		Central	Back	
	-Round	+Round	+R	-R	+R
High	/i/	/y/	/ʉ/		/u/
Mid	/e/	**/ø/**			**/ɔ/**
Low				/ɑ/	

Table 2: Normalized Vowel Length Means
*Calculated by dividing vowel length by length of preceding /s/.

Vowel	Normalized Vowel Length*	Vowel	NVL*
/ɑ/	.749	/u/	.641
/ʉ/	.747	**/ø/**	.599
/y/	.735	**/ɔ/**	.590
/e/	.655	/i/	.572

The /ø ɔ/ vowels are unique in that they occupy the most central part of the vowel space (Figure 2), and are fully central when unstressed (Degtjarjov 2012). The other vowels /i y ʉ u e ɑ/ occupy the periphery and do not reduce when unstressed (Degtjarjov 2012). This differentiation between peripheral and central vowels is indicative of a sonority-sensitive system.

Figure 2: Chuvash vowel space



In my analysis, stress pattern where every word receives word-initial prominence and rightmost strong-sonority vowels receive word-level stress is motivated by the constraint rankings in Box 1, defined in Box 2, and shown in Table 3. A reordering of the interactions between these six constraints produces eight possible languages (OT-Help, Staubs et al. 2010). Five are represented by Chuvash dialects.

Box 2: Constraint Rankings

1. FootSonority » Culminativity
2. InitialProminence » FinalProminence
3. Stress-to-Sonority » Align-Right (Stress, PWd)

Box 1: Constraint Definitions

Init(Fin)Prominence	Every prosodic word has an initial (final) peak.
Stress-to-Sonority	Strong sonority syllables are stressed.
Align-R (Str, PWd)	Stress right-aligns with the prosodic word.
FootSonority	Feet contain at most one strong sonority syllable.
Culminativity	Every word has at least one stressed syllable.

Table 3: OT Tableau for Standard Chuvash Ranking

/pulɑslɔχ/ 'future'	InitialProm	FtSon	Str-to-Son	Align-R (Str, PWd)	Culm	FinProm
☞ a. ↗(pu).(ˈlɑs).lɔχ			*	*		*
b. (pu).(ˈlɑs).lɔχ	* W		*	*		*
c. ↗(ˈpu).(lɑs).lɔχ			*	** W		*
d. ↗(pu).(lɑs).(ˈlɔχ)		* W	** W	L		*
/nørsørløχ/ 'abnormality'						
☞ e. ↗nør.sør.løχ					*	*
f. nør.sør.løχ	* W				*	*
g. (ˈnør).sør.løχ		* W			L	*

An alternative quantity-insensitive approach is Kenstowicz' unbounded foot model (1996). It accounts for stress by ranking Align-Right (Foot, Word), Align-Left (Stress, Foot) and *Trough/ $_{s}\sigma$, higher than Align-Left (Foot, Word).

Kenstowicz' unbounded foot model and my sonority-sensitive foot model assume different syllables to be footed or unfooted. Consequently, these accounts make different phonetic/phonological predictions, for example which syllables can carry word-level stress, attract codas and allow vowel elision. This paper shows that Dobrovolsky's (1999) phonetic experiment, original phonotactic data and new stylistic vowel deletion data all suggest that the sonority-sensitive foot model's predictions align best with the actual data.

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