

Tone in Tuvan

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1 Tuvan language and low tone

Tuvan has a tonal contrast on the first syllable of words. This contrast is privative—syllables marked for low tone contrast with those syllables unmarked for tone. This paper provides an OT formalism for this restriction on tone placement. We also analyze a process of tone-deletion that occurs on suffixed forms in young urban speech.

Tuvan is a Turkic language spoken in Tuva (a federal subject of Russia) and small clusters in adjacent federal subjects and northern Mongolia. The map below shows Tuva's location within the Russian Federation.



Figure 1: Tuva within Russia, taken from Wikipedia (2010) (Creative Commons-SA license)

Tuvan vowels are contrastive for length, roundedness, backness and height. Each of these phonological features is binary, resulting in a 16-phoneme vowel inventory. This inventory is given in (1).

- (1) Vowel inventory:
- | | | | |
|---|---|---|---|
| i | y | ɯ | u |
| e | ø | a | o |
- | | | | |
|----|----|----|----|
| iː | yː | ɯː | uː |
| eː | øː | aː | oː |

All of the Tuvan data and the generalizations about Tuvan phonology in this paper come from Harrison 2000. Harrison’s dissertation is on Tuvan morphology and phonology in general, but it includes a chapter (Chapter Two) on low pitch and its phonetic correlates.

In the previous literature on Tuvan that Harrison cites, the contrast has been categorized as pharyngealization, glottalization, creaky voice, or similar types of constricted articulation. Harrison’s research indicates that low pitch is the most reliable cue. Three of his speakers utilized creaky voice in less than 15% of their tokens, while the remaining speakers did not utilize it at all. Low pitch, on the other hand, was utilized by all of the speakers. (Harrison 2000, p. 60)

The use of low tone is somewhat limited, in terms of words that have it. According to Harrison’s estimates, only a few hundred lexical items have low tone in standard Tuvan. There is some amount of variation between varieties of Tuvan—some dialects have many more items with low tone, while other dialects might lack the distinction entirely. (Harrison 2000, p. 56)

The paper is structured as follows. Section 2 describes and formalizes the positional restriction on Tuvan low tone—the tone only appears on word-initial syllables. Section 3 focuses on low tone deletion, a process found in young urban Tuvan. We explore many possible ways to formalize this process. Subsection 3.1 uses deaccenting morphemes in the lexicon as a formalism. The next subsection, 3.2, uses constraint conjunction to achieve the same result but without requiring lexical tagging. Subsection 3.3 explores an anti-faithfulness account of tone deletion. Finally, subsection 3.4 analyzes it using constraints specific to monomorphemic words. Section 4 concludes.

2 Positional faithfulness

As in many languages, Tuvan has an increased set of contrasts made in initial syllables. Based on my limited understanding of Tuvan, there are no prefixes, so “initial” in this sense can refer to the word, stem, or root. The contrast we are most interested in is the following: initial syllables can have low tone, but no other syllable of the word can.

(2) [buduq] ‘ink’ vs [bùduq] ‘twig’ vs *[bùdùq] (Harrison 2000, p. 57)

Because the low tone can only appear once in a word, it is possible to give this a pitch-accent analysis. Words are either accented or unaccented, and accented words realize this as low tone on the first syllable. Alternately, the analysis can use a low tone (L) as the way to mark these special lexical items. The low tone can either be part of the lexical entry of the word (as in a floating tone), or it can be associated with the first syllable. Nothing in this paper crucially hinges on this distinction, so we will use whatever terminology is easiest at the moment. In terms of lexical representations, we assume the case of L being associated with the first syllable of the root, but this is out of convenience and is not necessarily a strong theoretical stance.

The increased number of contrasts in initial syllables is not just limited to tone. Certain vowel qualities are only found in initial syllables—non-high rounded vowels [ø o] are only found there.

Other contrasts can remain anywhere in the word. As stated earlier, vowel length is contrastive in Tuvan, and long vowels are found in non-initial syllables. Length and tone interact in such a way that low tone syllables do not have a length distinction. Phonetically, vowels with low tone are realized differently depending on the length of the word. In monosyllables, low tone vowels have about the same duration as long vowels, while in polysyllabic words, they are in between long and short vowels.

Thus, initial syllables have a three-way contrast when it comes to suprasegmentals: short, long, and low tone. (This restriction is not formalized here.)

- (3) [et] 'leather' vs [èt] 'meat' vs [e:t] 'delta' (Harrison 2000, p. 11)

These facts, taken together, seem to call for a Positional Faithfulness approach (as in Beckman 1998). The root- or word-initial syllable is especially prominent, and therefore certain constraints are sensitive to this position. The intuition is that we must be faithful to the association between the initial syllable and low tone (the positional faithfulness constraint, in this case $\text{MaxTone-}\sigma_1$). However, a constraint against low tone in general (*Low) militates against low tone surfacing in other syllables. Ranked lower than these two constraints is the general faithfulness constraint (MaxTone), which must be dominated by *Low to prevent a tonal contrast in non-initial syllables. This gives us the ranking in (4).

- (4) $\text{MaxTone-}\sigma_1 \gg \text{*Low} \gg \text{MaxTone}$

The proper formulation of Positional Faithfulness constraints is a difficult matter. Even so, the constraints in (5) should be sufficient for our needs.

- (5) a. **MaxTone- σ_1** : The initial output syllable must be associated to a tone if its correspondent in the input is associated to a tone. Assign a violation mark if this is not the case.
 b. **MaxTone**: An output syllable must be associated to a tone if its correspondent in the input is associated to a tone. Assign a violation mark for each such output syllable.
 c. ***Low**: Syllables must not be associated to tones. Assign a violation mark for each output syllable associated with a tone.

An example tableau is given in (6).

(6)

	/bùdùq/	$\text{MaxTone-}\sigma_1$	*Low	MaxTone
a.	☞ bùduq		*	*
b.	bùdùq		**!	
c.	buduq	*!		**

We have listed the underlying representation as /bùdùq/ in order to demonstrate how initial low tone is preserved while non-initial low tone is neutralized. The winning candidate keeps the initial low tone, at the expense of lower ranked *Low . Candidate b keeps both low tones, thereby demonstrating *Low 's usefulness. Candidate c deletes all the tones, making it an excellent choice with respect to *Low , but violating the higher ranked $\text{MaxTone-}\sigma_1$.

Of course, not all candidates are listed. In particular, Positional Faithfulness constraints often have to make crucial reference to output positions. As such, a constraint like $\text{MaxTone-}\sigma_1$ can be avoided by adding or removing segments. For instance, [bdq] and [abuduq] both satisfy the constraints listed above, but they violate segmental versions of Max and Dep. To prevent these “crazy” ways of avoiding Positional Faithfulness violations, MaxSeg and DepSeg must be ranked higher than the three constraints in (5).

This approach has successfully captured the generalization about the appearance of low tone in Tuvan. Moreover, Positional Faithfulness can also help with the distribution of vowel quality. Recall that [ø o] are allowed only in initial syllables. To keep them from appearing elsewhere, we can use the constraint ranking in (7).

$$(7) \quad \text{Ident}(\text{rd})-\sigma_1 \gg *[-\text{hi}, +\text{rd}] \gg \text{Ident}(\text{rd})$$

Length in Tuvan is still contrastive in non-initial syllables, meaning a Positional Faithfulness account for length is unnecessary. The markedness constraint against long vowels (*Long) must be ranked below the corresponding faithfulness constraint, resulting in a grammar that allows length contrast on any syllable.

3 Tone deletion in inflected forms

A footnote in Harrison’s dissertation (p. 57) explains that “in the speech of younger, urban Tuvan speakers” low tone “is often neutralized in inflected forms.” He gives the following example:

Speaker	‘horse’	‘my horse’	‘for the horse’	‘from the horse’
(8) 14 year-old girl	àt	ad-uum	at-ka	at-tan
87 year-old woman	àt	àd-uum	àt-ka	àt-tan

From the data above, it is unclear if tone is preserved only on monosyllables, or on unsuffixed forms. We are taking Harrison’s generalization at face value. Thus, we will attempt to capture the generalization that bare roots keep their low tone (no matter how many syllables they are), and all suffixed forms lose their low tone.

Formally speaking, the older (standard) style of speech is easy to capture: everything from section 2 simply remains the same. Suffixes are treated no differently than non-initial stem syllables. The proper way to formalize the young urban speech is much less obvious. This is the goal of the rest of the paper.

3.1 All suffixes as deaccenting:

One way to capture young urban Tuvan is to say that all suffixes in this variety are deaccenting (or de-toning). As such, any time a suffix is added, the accent/low-tone on the stem is removed. In a derivational framework, this would mean a deaccenting rule applies because of the suffix. Due to this rule, the low tone would not appear on suffixed forms.

- (9) a. Deaccenting rule: When a stem with low tone is combined with a deaccenting suffix, remove the low tone.

- b. /àt/ ‘horse’ + /-ka_{deacc}/ DATIVE → [atka] ‘for the horse’

From a parallel perspective, things are less clear. With a rule, we can simply remove the low tone, but this cannot happen in parallel OT—the low tone is part of the lexical entry for the stem, so it must appear in the input to the entire form. Some constraint must be sufficiently highly ranked to prevent low tone from appearing with a deaccenting suffix. Such a constraint could be formalized as (10).

- (10) ***Low-Deaccenting**: Assign one violation mark for every low tone that surfaces in the same prosodic word as a deaccenting morpheme.¹

	/àt-ka _{deacc} /	*Low-Deacc	MaxTone- σ_1	*Low	MaxTone
(11) a.	atka		*		*
b.	átka	*!		*	

Like the example with the deaccenting rule, (9), the underlying representation for ‘for the horse’ would be /àt-ka_{deacc}/, where the suffix /-ka/ is tagged for deaccenting. In order to get the appropriate generalization, this would mean all suffixes in young urban Tuvan are deaccenting. This places the generalization in the lexicon, as opposed to the OT grammar, and fixing this aspect of the analysis is the subject of the next subsection.

3.2 *Low&*Suffix

If **all** of the suffixes in the language variety are deaccenting, then the tagging in the lexicon appears to reflect a lexical optionality that is not taken advantage of. A relatively complete generalization is instead formalized as a lexical accident. If we want to organize this as part of the grammar, then instead of tagging all the suffixes, we will assert that having a low tone and being suffixed (at all) is marked.

The wording of this guiding intuition naturally leads to a constraint-conjunction situation. Output words are marked if they have low tone (*Low) and if they are suffixed (*Suffix), giving us the conjoined constraint *Low&*Suffix. This constraint looks at the prosodic word, and assigns a violation if there is a suffix AND a low tone in the output.

- (12) ***Low&*Suffix**: Assign one violation mark for each output prosodic word that has a low tone and has any material that corresponds to a suffix.

In terms of its component constraints, only *Low makes much sense. Low tone is marked, in the sense that it is different from modal pitch and in the sense that it only occurs on some lexical items. But *Suffix does not seem to make much sense as an OT constraint. Suffixes, in general, are not marked. They convey morphological information in a satisfactory way. Moreover, it brings up the question of whether we would ever see this constraint on its own, not conjoined to some other constraint. Finally, it is unclear if *Suffix, as worded above, is a markedness constraint or a faithfulness constraint. It appears to be a markedness constraint at first glance, but it is very difficult to formulate output-only related constraints

¹Or, more explicitly, every low tone that surfaces in the same prosodic word as any material that corresponds to a deaccenting morpheme

on morphological structure.²

Regardless of the theoretical drawbacks of such a constraint, it acts exactly like *Low-Deaccenting, except for one crucial difference: *Low&*Suffix does not require that suffixes be listed as deaccenting in the lexicon, just that they be listed as suffixes (which presumably they already have to be).

(13)

/àt-ka _{suffix} /	*Low&*Suffix	MaxTone- σ_1	*Low	MaxTone
a.  atka		*		*
b. átká	*!		*	

In summary, *Low-Deaccenting and *Low&*Suffix both appear to have major flaws. The former simply states the generalization, and relies on all suffixes being marked the same way in the lexicon. The latter uses an unmotivated *Suffix constraint. To try to make this more principled, we will explore an anti-faithfulness analysis in the next subsection.

3.3 Anti-faithfulness

Anti-faithfulness (Alderete 2001) allows the OT grammar to force certain morphologically complex forms to violate certain faithfulness constraints. This appears to be exactly what we need—all suffixed forms need to violate MaxTone with respect to their bare root forms. This is formulated in (14).

- (14) **–OO-MaxTone:** If there is one, delete one tone in the $O_1 \rightarrow O_2$ mapping.
(Adapted from Alderete 2001 p. 133.)

Again, the tableau demonstrating this analysis (15) looks exactly like the previous ones, simply with a differently named constraint and different theoretical implications.

(15)

/àt-ka/ (OO mapped to [àt])	–OO-MaxTone	MaxTone- σ_1	*Low	MaxTone
a.  atka		*		*
b. àtká	*!		*	

For this analysis to be successful, all suffixed forms must be in an output-output relation with their bare forms. Such a requirement is fine from an intuitive point of view—because all these related forms share the root morpheme, it is not out of line to make this assumption, with morphologically complex forms corresponding to the simplex form.

This analysis has the advantage of not stipulating that suffixes are bad, as opposed to the analysis in the previous section. Here, suffixed forms just want to be different from the unsuffixed form, and they do this by violating OO-MaxTone (and satisfying –OO-MaxTone).

There is one possible worry about the anti-faithfulness approach. The inflected forms under consideration are already different from the uninflected form. They express this difference through an added suffix. So, they are violating a faithfulness constraint to be different, when they already have significant segmental material keeping them distinct. Such a worry

²Anie Thompson (p.c., Phonology Seminar Winter 2010) points out that the constraint *Suffix could be helpful in OT morphology. In particular, a non-suffixing language like Mandarin Chinese could be accounted for with *Suffix being highly ranked.

is not too debilitating, however, because Alderete 2001 uses examples of just this kind to motivate his system. For instance, in the voicing alternation example from Luo, final root consonants alternate in voicing even though a suffix /-e/ is attached.

- (16) [bat] ‘arm’ [bed-e] ‘arms’, [luedo] ‘hand’ [luet-e] ‘hands’ (Alderete 2001, p. 7)

Note that the type of anti-faithfulness constraint being used is crucial. The analysis only works because it uses a modification of MaxTone. If the analysis used something like Ident(tone), then inflected forms of non-low stems would get an added low tone, contrary to the facts.

- (17) a. Possible but unattested output of a grammar with \neg OO-Ident(tone)
 b. [buduq] ‘ink’ vs [bùduq] ‘twig’
 c. *[bùduqka] ‘for the ink’ vs *[buduqka] ‘for the twig’

The anti-faithfulness approach outlined here results in the correct forms of young urban Tuvan. In this way, it is quite successful. However, there are still some requirements on the lexicon—somehow the fact that suffixed forms are in an OO-relation with their bare counterparts must be encoded, and this is not done via simple OT constraints. We are going to pursue one more type of analysis in the next subsection, to see if we can capture our intuitions about tone deletion in a slightly more direct way, while utilizing lexical accidents as little as possible.

3.4 Faithfulness to “basic” forms

The intuition that the previous two analyses (in subsections 3.2 and 3.3) have in common is the following: the basic forms (bare roots) are more faithful to the UR than the suffixed forms are. Here, we try to encode this intuition more directly than previous subsections did. The main idea is that the stem is listed in the lexicon, and because of this, a special faithfulness constraint keeps it from straying too far from its lexical entry. The suffixed forms, on the other hand, are not listed in whole in the lexicon. As such, they can deviate from the UR more freely.

Given the tableau in (6), it appears that this “special faithfulness constraint” is a more sophisticated version of MaxTone- σ_1 , which we will call MaxTone- σ_1 -Lex. The bolded part below shows what is different from the formulation of MaxTone- σ_1 in (5-a).

- (18) **MaxTone- σ_1 -Lex:** The initial output syllable must be associated to a tone if its correspondent in the input is associated to a tone. **This constraint assigns violations to only those forms that are in a single input-output correspondence to a lexical entry, per prosodic word.**

This constraint can be seen in action for an unsuffixed form in (19) and a suffixed form³ in (20). Note that MaxTone- σ_1 -Lex **replaces** MaxTone- σ_1 from section 2; it does not simply outrank or supplement MaxTone- σ_1 .

³One caveat: [buduqka] is a constructed form, based on Harrison’s generalization.

	/bùdùq/	MaxTone- σ_1 -Lex	*Low	MaxTone
(19) a.	☞ bùduq		*	*
b.	bùdùq		**!	
c.	buduq	*!		**

	/bùdùq-ka/	MaxTone- σ_1 -Lex	*Low	MaxTone
(20) a.	☞ buduqka			**
b.	bùduqka		*!	*
c.	bùdùqka		*!*	

Tableau (19) looks nearly identical to (6)—all that has changed is the name of the MaxTone constraint. In tableau (20), the difference between MaxTone- σ_1 -Lex and MaxTone- σ_1 can be seen. MaxTone- σ_1 -Lex does not care about a suffixed form like /bùdùq-ka/, because the outputs all correspond to multiple lexical entries.

This approach successfully formalizes the generalization, and it does so by almost directly encoding an intuition that we’ve been trying to get at. Moreover, the only requirement on the lexicon is that basic forms be in a single input-output morphological correspondence and that suffixed forms be in multiple such correspondences. This is a relatively standard assumption, made more explicit when we list the input morphemes in the UR.⁴ MaxTone- σ_1 -Lex takes advantage of the use of multiple morphological correspondence without requiring lexical tagging (for the deaccenting analysis) or without stating output-output correspondence relations (for the anti-faithfulness analysis). In short, more of the generalization is located in the grammar, and less in the lexicon.

While this can be termed a success, it still feels far from a perfect OT analysis of the phenomenon. In particular, the best OT analyses almost always derive interesting results from the interaction of many simple constraints, not from one powerful constraint. MaxTone- σ_1 -Lex is one such powerful and complicated constraint. One way to defend this complicated constraint is to point out that it is a member of several families of constraints.

(21) Max \rightarrow MaxTone \rightarrow MaxTone- σ_1 \rightarrow MaxTone- σ_1 -Lex

The Max family of constraints has been around since the beginnings of Correspondence Theory OT. MaxTone is a simple modification of general Max, with reference specifically to tone. Such a distinction is necessary, as tone deletion often follows very different phonological patterns than segment deletion does. The constraint MaxTone- σ_1 is part of the Positional Faithfulness, defended by Beckman 1998 and others, and argued for in section 2. MaxTone- σ_1 -Lex instantiates the final version, where it is also sensitive to whether the form is a monomorphemic prosodic word or a polymorphemic one. This leads us to predict that there are other constraints that act this way, a family of Lexical faithfulness constraints such that MaxTone- σ_1 -Lex is only one member of it.

⁴On the other hand, an output form like [atka] ‘for the horse’ cannot be in a single input-output correspondence relation with an underlying form (like /atka/). It **must** be in two correspondence relations according to our theory: to /at/ and to /-ka/.

4 Conclusion

The Positional Faithfulness analysis of Tuvan given in section 2 successfully accounts for the generalization—initial syllables are faithful to underlying tone, and all other syllables are not. The four different analyses in section 3 all formalize the deletion of tone in young urban Tuvan suffixed forms in different ways, each with their own implications and drawbacks. The final analysis, utilizing MaxTone- σ_1 -Lex, appears to have the fewest drawbacks, but the implications of adding a family of Lexical faithfulness constraints to OT have not been completely explored. This is the next step in figuring out which approach is the most tenable.

The four competing analyses have demonstrated, however, that a seemingly simple generalization (“delete tone on suffixed forms”) is not necessarily simple or straightforward to formalize in parallel Optimality Theory. This is because OT demands that the analysis explain **why** tone deletes in these situations, as opposed to simply stating that it does.

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