Construction-based inflection tone patterns in Choguita Rarámuri

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Abstract

Through examination of the inflectional tone marking properties of Choguita Rarámuri (Tarahumara), a Uto-Aztecan language spoken in Northern Mexico, this paper assesses the benefits of a construction-morphology approach, compared to an autosegmental morphemic tone approach. Choguita Rarámuri is a prosodically complex language with both stress-accent and a three-way lexical tonal contrast (with H, L and HL tones). Tone distribution is dependent on stress-accent, which is in turn morphologically governed. As a result, many tonal patterns in this language are predictable based on the lexical tone properties of roots and affixes and the distribution of stress. In addition, tone also serves a morphological role in the language, via patterns of grammatical tone, morphologically conditioned tonal effects and paradigmatic distribution of tonal melodies, all of which may trigger overwriting of lexical tones. Based on data obtained through field research, this paper shows that a construction-based analysis captures several properties of inflectional tone in this system, including: (i) arbitrary relationship between tone patterns of related forms, (ii) heterogeneous nature of morphosyntactic classes expressed by tone melodies, and (iii) overwriting/avoidance of lexical tone by grammatical tone.

Index Terms: inflectional tone, construction morphology, tonal overwriting, Uto-Aztecan

1. Introduction

The study of tone has largely focused on lexical properties, phonetic implementation and interaction between tone and other prosodic phenomena (such as stress and intonation), but the morphological role of tone is still under-documented cross-linguistically [1]. What kind of morphological information may tone convey cross-linguistically? And what mechanisms regulate the outcome when there are morphological tonal assignments in conflict?

In terms of lexical-grammatical tone interaction, grammatical tone may be (i) **input-preserving** (often analyzed as a floating tone that docks on an adjacent Tone Bearing Units (TBU)) or (ii) **non-input preserving** ('replacive' in the Africanist literature). In the latter case, a lexical tone is replaced by a grammatically-controlled melody [2]. Cases of tonal replacement are frequently explained through **morphemic types of analyses**, where grammatical tone patterns are derived phonologically, e.g., through autosegmental rules [3], [4] or sub-tonal features in underspecified phonological representations [5]. An alternative is presented in **construction-based** approaches [6], [7], where grammatical tone patterns result from satisfaction of constructional schemas or co-phonologies, output-oriented statements where morphological constructions impose surface tonal melodies at the word level.

In this paper, I address these analytical possibilities through examination of inflectional tone patterns of Choguita Rarámuri, a Uto-Aztecan language spoken in Northern Mexico by an estimated 85,000 to 100,000 people [8], [9]. I propose that a construction-based analysis captures the following properties of this system: i) the arbitrary relationship between tone patterns of related forms; ii) the heterogeneous nature of morphosyntactic classes expressed by tone melodies, and iii) the overwriting/avoidance of lexical tone by inflectional tone.

The structure of this paper is as follows. In §2, I address inflectional tone patterns in Choguita Rarámuri, which includes: (i) grammatical tone, where tone is the sole exponent of a morphological category (§2.2); (ii) morphologically conditioned tone, where specific inflectional morphemes condition tonal changes in the bases to which they attach (§2.3); and (iii) paradigmatic tone, where surface tonal melodies of morphologically complex words are coextensive with different morphological classes (§2.4). In §3, I provide a construction-based analysis that captures these inflectional tone patterns, including the morphomic distribution of paradigmatic tone. In §4, I address a competing morphemic tonal analysis that has been proposed for the Choguita Rarámuri data. I conclude in §5.

2. Inflectional tone in Choguita Rarámuri

2.1. Choguita Rarámuri lexical tone

Choguita Rarámuri (Tarahumara; henceforth CR) is a prosodically complex language with three lexical tones (H, L and HL) as well as stress-accent. The TBU is the mora and tone is dependent on stress in its distribution, i.e., there is one tone per prosodic word and stressless syllables are toneless [10]. Stress-accent in CR is complex, restricted to an initial three-syllable window, with stress on the first, second or third syllable of the prosodic word. Stress-accent is highly dependent on morphological factors, in a system that resembles patterns that are analyzed as dominant/recessive accent in other languages [11]: morphological constructions are either **strong** or **weak**, depending on whether they condition stress shifts or not, respectively. Roots, on the other hand, are either unstressed or stressed, with unstressed roots undergoing stress shifts and other morphophonological changes in strong morphological contexts, while stressed roots have fixed stress across paradigms [12]. Table 1 exemplifies the stress properties of stressed and unstressed roots in strong and weak contexts, where shading highlights the stress shifts.[1]

Table 1: *Morphologically conditioned stress-shifts*

	Verbal roots	Weak (PST -*li*)	Strong (COND-*sa*)
Stressed Roots	ˈtô ˈbury' tʃĩˈhà 'spread' muˈrú 'carry'	ˈtô-li tʃĩˈhà-li muˈrú-li	ˈtô-sa tʃĩˈhà-sa muˈrú-sa
Unstressed Roots	ˈtò 'take' uˈkú 'rain'	ˈtò-li uˈkú-li	to-ˈsâ uku-ˈsâ

Stressed roots are underlyingly H, L or HL-toned, while unstressed roots are either H or L toned, i.e., there are no unstressed HL-toned roots. Suffixes of the 'Strong' class may be stressed, while suffixes of the 'Weak' class may not be stressed.

Since lexical tones must be realized in stressed syllables, there are morphological distributions of tone that result from the lexical properties of roots and affixes. This results in tonal stability in weak constructions (where inflectional tone is largely inert) and tonal alternations in strong constructions: as shown in (1), unstressed roots undergo tonal neutralization after a stress shift in strong morphological contexts. In these cases, the formerly stressed syllable becomes toneless and a newly stressed suffix syllable exhibits its own underlying lexical tone (HL (1a), L (1b) or H (1c)).

(1) a. ˈtò-li   to-ˈkâ
        take-PST   take-IMP.SG
        'S/he took it' 'Take it!'

    b. ˈtò-li   to-ˈsì
        take-PST   'take-IMP.PL'
        'S/he took it' 'You all take it'

    c. uˈkú-li   uku-ˈnále
        'to.rain-PST'   'to.rain-DESID'
        'It rained'   'It looks like it will rain'

In contrast, and as exemplified in (2), if the newly stressed syllable is part of the stem, this syllable will have a HL tone after the stress shift, regardless of what the lexical tonal properties of the root and suffix are:

(2) a. roˈsówa-li   rosoˈwâ-ma
        cough-PST   cough-FUT.SG
        'S/he coughed'   'S/he will cough'

    b. roˈsówa-i   rosoˈwâ-si
        cough-IMPF   cough-IMP.PL
        'S/he used to cough' 'You all cough! '

    c. naʔˈsòwa-li   naʔsoˈwâ-ma
        stir-PST   stir-FUT.SG
        'S/he stirred it' 'S/he will stir it'

    d. naʔˈsòwa-i   naʔsoˈwâ-si
        stir-IMPF   stir-IMP.PL
        'S/he used to stir it' 'You all stir it!'

The tonal patterns in the strong morphological constructions in (2) (future singular and imperative plural)

marker; PASS - passive; PERF – perfect; POT – potential; PL - plural; PROGR – progressive; PST – past; SG – singular.

result from a phonological process of default HL tone insertion, whereby a stressed syllable that lacks a tone or where the underlying tone has become delinked due to a stress shift acquires a default HL tone. Further evidence for this default tone insertion process is found in loanwords from Spanish, which are consistently incorporated into CR with a HL tone in their stressed syllable [13]. This is exemplified in (3) (Spanish stressed syllables are underlined).

           Spanish   *CR*
(3) a. Da<u>niel</u>   [raˈniêri]   'Daniel'
    b. To<u>más</u>   [toˈmâʃi]   'Thomas'
    c. man<u>za</u>na [maˈsâna]   'apple'
    d. <u>sá</u>bado   [ˈsâbuto]   'Saturday'

There is also evidence that CR has post-lexical pitch targets, including H% boundary tones in declarative sentences. Lexical tones interact with phrase-level tones, and the three-way level lexical tone contrast is preserved in these interactions [14], [15].

2.2. Tone as realizational morphology (grammatical tone)

Tone in this language may also be the sole exponent of a morphological category. The relevant construction is the imperative singular, which has three allomorphs: -*sa*, -*ka* or a L tone that replaces lexical HL tones in stem stressed syllables (4a-c). This L allomorph vacuously applies to L-toned roots (4d), while H-toned roots block the application of imperative singular L tone (4e).

                    IMP SG
(4) a. maˈtô   maˈtò   'Carry it (shoulders)!'
    b. suʔuˈnî suʔuˈnì 'Finish doing it!'
    c. tiˈsô   tiˈsò   'Walk with a cane!'
    d. seˈmè   seˈmè   'Play the violin!'
    e. saˈkú   saˈkú   'Dry it in the sun!'

As shown in the contrast between (4a-c) and (4d), HL and L lexical tones are neutralized in the imperative singular construction.

2.3. Morphologically conditioned tone

Another inflectional tone pattern in CR involves a morphologically conditioned effect: two suffixes, the imperfective -*i* suffix and the present progressive -*a* suffix, impose a L tone on the stressed syllable of the stem to which they attach without triggering a stress change. These effects are not attested with other similar types of morphemes (those of weak morphological environments), but are specific to these two suffixes, a result of a recent diachronic change.[1] The replacement of lexical tone occurs only with roots that lack lexically specified stress, i.e., stressed roots do not undergo any tonal changes with these suffixes. These effects are shown in (5a-c), which contrast the imperfective -*i* and present progressive -*a* suffixes vs. the past -*li* suffix, another weak construction suffix that does not condition a tonal change.

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[1] Both the imperfective suffix and the present progressive suffix have recently developed from stress shifting suffixes with low tone that have lost a palatal glide onset (-*i* < *-ˈjè* and –*a* < *-ˈjà*, respectively), as evidenced from comparative data from related language varieties [16], [17], and as attested in the speech of native CR speakers with command of these varieties.

		PST	IMPF	PRS PROGR	
(5)	a.	aˈwí-li	aˈwì-i	aˈwì-a	'dance'
	b.	riˈwá-li	riˈwà-i	riˈwà-a	'find'
	c.	raˈrá-li	raˈrà-i	raˈrà-a	'buy'

The examples in (6) show stressed roots with no tonal changes in the same morphological contexts.

		PST	IMPF	PRS PROGR	
(6)	a.	muˈrú-li	muˈrú-i	muˈrú-a	'carry (in arms)'
	b.	hiˈrâ-li	hiˈrâ-i	hiˈrâ-a	'bet'
	c.	iʔˈtʃâ-li	iʔˈtʃâ-i	iʔˈtʃâ-a	'plant'

Given that there are no HL-toned unstressed roots in CR, the overwriting tonal pattern of imperfective and present progressive only neutralizes the contrast between H-toned and L-toned unstressed roots in these morphological environments.

2.4. Paradigmatically distributed tone

A third pattern of inflectional tone in CR involves paradigmatically distributed tone: a subset of stressed roots has a HL tone in strong morphological contexts and a L tone in weak contexts. This tonal distribution, shown in (7), is not dependent on stress alternations nor any other surface phonological factor.

		PST	FUT SG	
(7)	a.	ˈpà-li	ˈpâ-ma	'bring'
	b.	naˈwà-li	naˈwâ-ma	'arrive'
	c.	biʔˈwà-li	biʔˈwâ-ma	'to clean'
	d.	aʔˈwà-li	aʔˈwâ-ma	'swallow'

There is no phonological predictability about this tonal distribution, but it is relevant to ask whether this distribution is **morphosyntactically** motivated. This is in fact the assumption in the Uto-Aztecanist literature, which attributes the weak/strong contrast to a distinction between 'non-future' (e.g., past, perfective, imperfective) vs. future or 'unrealized' categories (e.g., irrealis, imperative, potential) [18]. This account fails in CR given mismatches (e.g., past passive patterns with the 'unrealized' class), as well as morphological categories that cannot be characterized in these terms (e.g., valence changing morphology). The strong/weak distinction in CR is thus not morphosyntactic, but **morphomic** (as defined in [19]). Paradigmatic tonal alternations are associated with a heterogeneous class of morphological constructions.

3. A construction-based analysis of Choguita Rarámuri tone

I propose all lexical tones in CR are underlyingly specified and that there are two inflectional classes in this language. In one class, **Class 1** verbs, tonal alternations are phonologically predictable:[1] lexical tones emerge in stressed syllables and toneless roots receive a default HL tone after stress-conditioned tonal neutralization. The patterns of grammatical tone (imperative singular L tone replacing lexical HL tones) and morphologically conditioned tonal overwriting (imperfective and present progressive conditioned L tone replacing lexical H tones of unstressed roots) are dependent on

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[1] The stress properties of a CR complex word depend on the prosodic properties of the root and the first layer of suffixation (i.e., outer suffixes are irrelevant for stress/tone assignment). We only address words with roots plus one layer of inflection.

underlying tonal and/or stress properties of roots. In a second inflection class, **Class 2** verbs, composed exclusively of stressed roots, L and HL tones realize paradigmatic information in patterns that cannot be predicted by tone, stress nor any other phonological property.

We can formalize the tonal properties of Class 2 inflected verbs using **output-oriented schemas**, which represent that language users make generalizations based on sets of existing complex words. These schemas can thus account for holistic properties of morphologically complex words that cannot be derived from their constituent parts [20]. These construction-based tone patterns realizing paradigmatic tone can be formalized as in (8a) and (8b), where '≈' represents a paradigmatic association between strong and weak morphological constructions, respectively:

(8) a. $[HL]_{FUT.SG} ≈ [HL]_{COND} ≈ [HL]_{IMP.PL} ≈ [HL]_{PST.PASS}\cdots$
    b. $[L]_{PST} ≈ [L]_{IMPF} ≈ [L]_{PRS.PROGR} ≈ [L]_{PST.EGO}\cdots$

These schemas represent that verbs inflected for, e.g., future singular, conditional, imperative plural, etc. (strong morphological constructions) acquire the HL tone of other, paradigmatically related forms (8a), while weak morphological constructions (e.g., past, present progressive, etc.) share the property of requiring a L tone in their stressed syllable (8b). There is no correlation between type of tone and morphological context, and lexical tone does not determine grammatical tone. Stress and tone are thus orthogonal dimensions in CR word prosody.

In sum, CR exhibits complex interactions between lexical, post-lexical and several inflectional tone patterns. Lexical tonal contrasts are preserved when in conflict with post-lexical tones, and inflectional tone may overwrite lexical tones. Crucially, there is an asymmetry in the behavior of different types of tone: lexical HL tones may be replaced by grammatical L tone (imperative singular) (e.g., *niˈtʃô* 'she hit it', *niˈtʃò* 'hit it!'), but paradigmatic HL tones of Class 2 verbs may not be overwritten (e.g., *biʔˈwà-li* 'she cleaned it', *biʔˈwâ-ma* 'she will clean it', but *biʔˈwâ* 'clean it!', not **biʔˈwà*). A hierarchy of tonal strength in CR is schematized in (9).

(9) Paradigmatic >> Grammatical >> Lexical >> Post-lexical

Class 1 roots that receive a HL tone by default after stress shifts are also impervious to tonal overwriting. This is exemplified in (10).

(10)	a.	raˈʔitʃa-li	speak-PST	'she talked'
	b.	raʔiˈtʃa-ma	speak-FUT.SG	'she will talk'
	c.	raʔiˈtʃâ	speak.IMP.SG	'speak!'
	d.	*raʔiˈtʃà	speak.IMP.SG	'speak!'

The contrast between (10a) and (10b) shows that the trisyllabic root *raˈʔitʃa* is an unstressed root, exhibiting a stress shift in strong morphological constructions (10b). Example (10c) shows that the imperative singular, a strong morphological construction that triggers a stress shift, does not impose the grammatical L tone melody as in (4) above, but rather the default HL tone assigned after stress shifts. Default HL tones and paradigmatic HL tones therefore exhibit the same behavior in overwriting. This suggests that the phonologically predictable HL patterns of class 1 unstressed roots have been generalized to strong morphological contexts, where stems must have HL tones in these environments.

4. Alternative morphemic tonal analysis

In contrast to the analysis proposed here, purely phonological analyses of asymmetric tone behavior in different morphological contexts require positing different underlying phonological representations for the morphological tonal melodies documented in any given language (see, for instance, the analysis proposed in [5]). An alternative compositional morphological analysis of CR inflectional tone is available in the auto-segmental model proposed in [21], which assumes that: (i) segmental contrastive features are hosted by X-slots; (ii) prosodic contrastive features are hosted by prosodic (π-)nodes; and (iii) a process ('F-linking') associates prosodic features to π-nodes. In this analysis, morphological distribution of tone results from these general phonological properties and process.

In this analysis, all lexical tones in CR are underlyingly specified and roots and affixes are lexically accented or accentless (corresponding to the strong vs. weak distinction). Stressed roots are assumed to have a π-node linked to the accented vowel's X-slot, and unstressed roots lack a π-node in their underlying form. Unstressed roots undergo a default π-node-insertion process that targets the second syllable of the root, after which its underlying floating prosodic features may associate to this node. Unaccented ('weak') suffixes lack lexical tone, while accented ('strong') suffixes are assumed to possess a floating π-node in their underlying representation. Words containing stress-shifting (strong) suffixes are assumed to dock their floating tonal features through the linking process described in (11) (2016:113).

(11) Suffix π-node linking (π-link)

If the leftmost suffix contains a floating π-node and there is no docked π-node in the word, link the suffixal π-node to the third vocalic X-slot of the word

This process accounts for stress-shifts in the absence of lexical stress in roots, and an additional HL-default tone insertion process accounts for HL tones in roots after a stress-shift.

Finally, in order to account for what I term the paradigmatic distribution of tone in CR, this morphemic analysis posits that the roots that exhibit alternating tonal patterns independent of stress changes have prosodic features that are not linked to the π-node. Thus, the surface tones in these words are analyzed as resulting from the lexical tonal properties of accented suffixes. A sample derivation of the π-link process in a complex word containing an "accented" suffix (future singular –ma) is provided in (12).[1]

(12) Association of lexical tone of accented (strong) suffix

[na'wáma]
'will arrive'
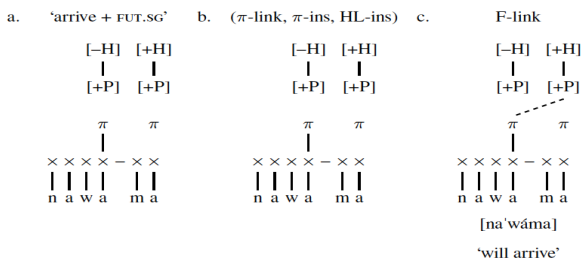
In this sample derivation, the suffix tone is the one that surfaces given that the root L tone is not linked to the prosodic

π-node. This analysis, however, makes an incorrect prediction in cases where these roots are combined with accented suffixes with other tonal properties (e.g., -sì IMP.PL, as exemplified in (1)): in these cases, it is expected that the underlying prosodic features of the suffixes are realized in the root's node. However, and as exemplified in (7) above, the tone of the stressed syllable in these contexts is not predictable on the basis of the underlying tone of specific suffixes, but rather there is a HL tone systematically attested in these contexts (e.g., na'wâ-si 'you all arrive!', not the unattested *na'wà-si if the underlying L tone of the suffix were to emerge in the inflected word).

In sum, this autosegmental, morphemic analysis seeks to explain grammatical tone patterns in exclusively phonological terms. The only morphological information available are morpheme boundaries, and morphological distributions of tone are explained through representational differences and different processes of association between prosodic features and prosodic nodes. While the formal machinery posited in this model may derive most of the surface patterns, and it would be possible to amend it to yield the full set of correct surface patterns, we should ask whether this is desirable over an analysis that recognizes the role of tone as a building block of inflectional paradigms.

5. Conclusions

In this paper, I have analyzed the grammatical tone patterns of CR in terms of Construction Morphology, a framework which assumes the following: (i) morphology is word-based; (ii) morphological patterns are interpreted as constructions (form-meaning pairs); (iii) constructional schemas specify output forms; and (iv) paradigmatic relationships are key in structuring lexical and grammatical knowledge. I show that the full range of inflectional tone patterns and complex tonal interactions in CR follows from an analysis that incorporates construction-specific tonal patterns as output-oriented schemas. While a morphemic analysis can derive the same surface tonal patterns, this kind of analysis resorts to abstract representational differences and complex interactions of morphologically conditioned phonological (autosegmental) rules. I argue here that construction-based analyses of grammatical tone capture the morphological contribution that tone may have in tonal languages that have developed grammatical tone. Crucially, and as noted in [1], comprehensive documentation of tonal languages requires addressing in detail the tonal properties of morphologically complex words, documenting the prosodic properties of full paradigms, as well as complex prosodic interactions.

6. Acknowledgements

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[1] In this analysis, HL tones are represented as H.

7. References

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