Non-templatic Plural Reduplication in Tohono O’odham

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1. Introduction

In this paper we argue for a non-templatic infixation analysis of reduplicated plurals in the Uto-Aztecan language Tohono O’odham (formerly known as Papago) in the framework of Harmonic Serialism (McCarthy, 2000 *et seq.*). Tohono O’odham exhibits several patterns of plural reduplication in which the size and position of reduplicated material varies depending on phonological, lexical and semantic factors (see Hale, 1965; Hill & Zepeda, 1992, 1998; Riggle, 2006; Fitzgerald, 2012). Here we identify a superficially diverse subset of these patterns and show that they yield to a unified analysis given a constrained and independently-motivated set of theoretical apparatus. Specifically, we treat forms with C-infixation (*kótwa* ~ *kóktwa*), CV-infixation (*háʔa* ~ *háhaʔa*), cluster simplification in the reduplicant (*tɭógi* ~ *tɭóɭgi*), and double reduplication in loanwords with exceptional stress patterns (*paɭóoma* ~ *papɭóɭoma*). We propose that the exponent of the plural morpheme is not a template but a basic operation of GEN, COPY(SEGMENT), and that constraint interaction accounts for the position and size of the reduplicated material.

Empirically, our analysis provides a unified account of a number of seemingly distinct reduplicative patterns in Tohono O’odham. Theoretically, it demonstrates the utility of a dynamic, process-oriented treatment of reduplication when the reduplicant does not surface with a consistent prosodic shape. This paper constitutes an extension of the analysis in Anderson & Smith (in press) and draws on process-oriented approaches to the phonology-morphology interface in which operations of GEN may serve as exponents of morphemes (Kimper, 2009; Wolf, 2008). Finally, this account builds on and improves previous Optimality-theoretic approaches to reduplication in Tohono O’odham (Fitzgerald, 1999, 2000, 2012; Riggle, 2006) through its greater empirical coverage and exclusive use of general, non-reduplication-specific constraints.

In §2 we present the data. In §3.1 we provide an overview of Harmonic Serialism, which sets up the analysis in §3.2 and §3.3. In §4 we discuss previous treatments of plural reduplication in Tohono O’odham and conclude.

2. The Data

2.1. Stress & Phonotactics

Primary stress in Tohono O’odham consistently surfaces on the first syllable of native words, as in (1) (Hale, 1965)[1].

(1)	a.	kótwa	‘shoulder’	d.	ʔókokoi	‘mourning dove’
	b.	tóki̥	‘cotton’	e.	bítokoi	‘Pinacate beetle’
	c.	kóa	‘forehead’	f.	háhawaɲ	‘crows’

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[1] All data in this paper are drawn from Fitzgerald (2012), Hill & Zepeda (1998), Riggle (2006), Munro & Riggle (2004), and Mathiot (1973).

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However, Tohono O'odham preserves non-initial stress in some loanwords, as in (2) (Hill & Zepeda, 1998; Hale, 1965). Note that secondary stress also surfaces on the initial syllable of these forms (Munro & Riggle, 2004).

(2)	a.	pàɹóoma	'dove'
	b.	kàdóodi	'marble'
	b.	ʔìskóowa	'chisel'
	c.	ʔàɹivháana	'elephant'

Non-initial stress always co-occurs with vowel length (Fitzgerald, 2012; Munro & Riggle, 2004). In native words, Tohono O'odham restricts true long vowels of the form V: to the initial syllable; however, the language syllabifies VV-sequences together as diphthongs, which can occur in any position (Fitzgerald, 2012). The loanwords in (2) may contain true non-initial long vowels and thus constitute exceptions to this pattern. Alternatively, they may be best analyzed as identical, tautosyllabic VV-sequences. We will adopt the latter analysis below.

Returning to stress, Fitzgerald (2000) observes that the language assigns stress to odd-numbered syllables counting from the left edge. The leftmost syllable bears primary stress and subsequent odd-numbered syllables receive secondary stress,[2] with the notable exception of loandwords like those in (2). This motivates a foot-based analysis of Tohono O'odham stress in which syllabic trochees are aligned with the left edge of the word (Fitzgerald, 2000 *et seq.*). Moraic trochees are also available to the language, as evidenced by the existence of a bimoraic minimal word requirement (Hill & Zepeda, 1992).

In the next section we introduce the relevant plural reduplication patterns, which are analyzed in §3.

2.2. Plural reduplication

Consider the nouns with initial stress and simple word-initial onsets in (3). The plural forms exhibit reduplication in which a copy of the initial consonant of the word appears immediately to the right of the first vowel of the stem. When the initial syllable contains a tautosyllabic VV-sequence, as in (3.d,e), the reduplicated consonant surfaces between the vowels, splitting them into two syllables.

(3)		*Singular*	*Plural*	*Gloss*
	a.	kótwa	kóktwa	'shoulder'
	b.	tóki̥	tótki̥	'cotton'
	c.	síkuɹ	sískuɹ	'younger sibling'
	d.	ʔóaga	ʔóʔaga	'brain, nerve'
	e.	kóa	kóka	'forehead'

However, Tohono O'odham prohibits laryngeal codas (Fitzgerald, 2012; Riggle, 2006); if the initial consonant of the word is laryngeal ([h] or [ʔ]), then the initial CV-sequence of the word is copied immediately to the right of the first vowel, as in (4).

(4)		*Singular*	*Plural*	*Gloss*
	a.	háʔa	háhaʔa	'bottle'
	b.	hík	híhik	'navel'
	c.	ʔókokoi	ʔóʔokokoi	'mourning dove'
	d.	háwaɲ	háhawaɲ	'crow'

In words with initial stress but complex word-initial onsets, only the second consonant of the cluster appears to the right of the first vowel, as in (5).

(5)		*Singular*	*Plural*	*Gloss*
	a.	tɹógi	tɹóɹgi	'truck'
	b.	kɹávo	kɹáɹvo	'nail'

[2] In underived words, the final syllable does not receive secondary stress; in derived words, however, final syllables may be secondarily stressed (Hill & Zepeda, 1992; Yu, 2000).

Finally, in words with non-initial stress, copied material surfaces in two locations: after the first vowel of the stem and after the primary stressed vowel, as in (6). In words with non-laryngeal initial consonants, a copy of the first consonant of the word appears to the right of the first vowel, as in (6.a,b). In words with an initial laryngeal consonant, a copy of the first CV-sequence of the word appears to the right of the first vowel, as in (6.c,d). There is no such asymmetry in the reduplicant that surfaces after the stressed vowel (Fitzgerald, 2012); instead, a copy of the onset of the primary stressed syllable always surfaces to the right of the stressed V of the tautosyllabic VV-sequence, splitting the vowels into two syllables in the same way that the reduplicant splits diphthongs in (3.d,e).

(6)		*Singular*	*Plural*	*Gloss*
	a.	pàɹóoma	pàpɹóɹoma	‘dove’
	b.	kàdóodi	kàkdódodi	‘marble’
	c.	ʔìskóowa	ʔìʔiskókowa	‘chisel’
	d.	ʔàɹivháana	ʔàʔaɹivháhana	‘elephant’

In summary, a number of generalizations can be drawn from the reduplicated plurals in (3)-(6). Copied material always surfaces after the first vowel of the stem, which typically coincides with the primary stressed vowel. If the initial and primary stressed vowels do *not* coincide, copied material appears immediately to the right of both. With respect to the size of the reduplicants(s), either a C- or CV-sequence surfaces after the initial vowel, where CV-copying occurs just in case C-copying would result in a phonotactically ill-formed laryngeal coda. When stress is non-initial and associated with the first vowel of a tautosyllabic VV-sequence, C-copying occurs immediately to the right of the first, stressed vowel of that sequence; since the consonant is always copied into a syllable onset, there is no phonotactic pressure for CV-copying in this position. In the next section we argue for a unified analysis of these superficially distinct patterns of plural reduplication in Tohono O’odham in terms of non-templatic infixation.

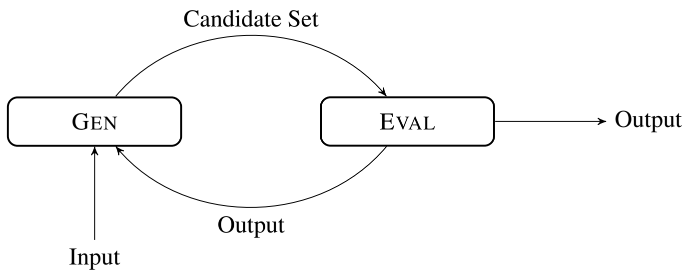
3. Analysis

3.1. Harmonic Serialism

Harmonic Serialism (HS) is a variant of Optimality Theory with serial derivations (see McCarthy, 2000 *et seq.*). Similar to parallel versions of OT, GEN takes an input and produces a candidate set. However, HS restricts GEN to producing candidates that differ from the input by the application of at most one basic operation. GEN submits this finite candidate set to EVAL, which consists of a constraint hierarchy. Each basic operation of GEN has a corresponding faithfulness constraint in EVAL that penalizes any candidate to which that operation has applied.

On each iteration, EVAL selects the optimal candidate in the normal way and resubmits it to GEN as an intermediate input. The derivation iterates in this manner, selecting the locally optimal candidate in each iteration, as in (7). When EVAL selects its input as the locally optimal output, monotonic improvement is no longer possible and the derivation terminates, or *converges*.

(7)



What counts as a basic operation of GEN is an ongoing area of research in Harmonic Serialism. McCarthy (2008) argues that building a prosodic word entails building its head foot, since prosodic hierarchy theory requires every prosodic word to contain at least one foot. Following this precedent, we will assume that building a prosodic word and a single head foot counts as a single basic operation.

Independent of the insertion of a prosodic word, Pruitt (2010) has argued that footing is strictly gradual, i.e. an iteration can build a single foot but may not delete or modify an existing one. This is based on the observation that an HS derivation will not select a non-optimal footing on any iteration, so modifying an existing foot should never improve harmony. While we will assume building a foot counts as a basic operation, we will note an instance in our analysis in which the modification of an existing foot can improve harmony because a morphologically-motivated process has applied and rendered a previous footing sub-optimal.

In the next section we analyze plural reduplication in words with initial stress. This will set up the analysis of reduplication in words with non-initial stress in §3.3.

3.2. Single reduplication in words with initial stress

In this section we develop an analysis of reduplication in stress-initial words in Tohono O'odham. While we draw on the analysis outlined in Anderson & Smith (in press), we depart from it in two important ways. First, we argue that the Stress-to-Weight Principle plays a central role in determining the size of the reduplicant in both single and double reduplication[3]. Second, we pursue an account of 'cluster simplification' in words with initial consonant clusters in terms of Syllable Contact (Rose, 2000) and Sonority Sequencing (Selkirk, 1984; Clements, 1990; Riggle, 2006).

With respect to the position of the reduplicant, copied material always surfaces after the first vowel of the stem. There does not appear to be a phonological motivation for this position. However, it is a well-attested infixation site in the literature (Ultan, 1975; Yu, 2003). On this basis, we analyze the plural morpheme as an infix positioned according to a prosodic subcategorization frame defined in (8), following previous alignment-based analyses of infixation (see McCarthy & Prince, 1993).

(8) ALIGN(PL,V_1,R)
Assign one violation mark if a phonological exponent of the plural morpheme is not aligned with the right edge of the first vowel of the stem.

While the position of the reduplicant is constant, its segmental form is not. There may be a consistent prosodic target (a bimoraic initial foot), but defining a fixed prosodic template is complicated by the doubly reduplicated forms in (6), which not only contain two reduplicants but appear to have different preferences for the form of those reduplicants (a heavy syllable in the first reduplicant provided that it is phonotactically well-formed but a sequence of two light syllables in the second reduplicant). Given these considerations, we propose that the exponent of the plural morpheme is not a template; instead, it is a basic operation of GEN, COPY(SEGMENT), defined in (9). This follows previous work in Harmonic Serialism proposing that operations of GEN can serve as the exponents of morphemes (Kimper, 2009; Wolf, 2008).

(9) COPY(SEGMENT):
An operation of GEN that creates a copy of a *string* of segments and places the copied string anywhere, incorporating it into existing prosodic structure (McCarthy et al., 2012:179).

Because the operation manipulates strings, it can copy any number of contiguous segments in one application. So GEN can apply COPY(SEGMENT) to in input /PL + *kotwa*/ 'shoulder (pl)' and produce the outputs *koktwa*, *kokotwa*, *kokotwatwa*, *kotwakotwa*, and so on.

In Harmonic Serialism, every operation of GEN has a corresponding faithfulness constraint; the relevant one here is *COPY, defined in (10).

(10) *COPY:
Assign one violation mark for every application of the COPY(SEGMENT) operation (McCarthy et al., 2012:180).

Because copying occurs in reduplicated plurals, some constraint must override *COPY. We will employ a general approach to the phonology-morphology interface that builds the pressure to express

[3] This is a formalization of Fitzgerald (2012)'s observation that many of the reduplicative patterns in Tohono O'odham seem to 'strengthen' the initial, metrically prominent syllable.

morphological contrasts phonologically into the HS derivation in the form of constraints. Specifically, we will assume that every morphosyntactic feature ϕ stands in correspondence with its phonological exponent ϕ' and a family of MAX constraints demands that every instance of ϕ in the input correspond to an instance of ϕ' in the output (Wolf, 2008). The relevant MAX constraint is defined in (11).

(11) MAX(PL)
For every instance of the plural morpheme in the input, assign a violation mark if there is not an instance of the *exponent* of the plural morpheme in the output.

If MAX(PL) ≫ *COPY, copying will occur to express the plural morpheme regardless of the resulting violation of *COPY. Also, because MAX(PL) can be ordered with respect to phonological constraints, the ranking in EVAL will determine the order in which phonological and morphological processes are interleaved in the serial derivation. This in turn can account for the fact that plural reduplication refers to stress, as evidenced by double reduplication in words with non-initial stress. Specifically, if LX≈PR, a constraint that requires the grammar to parse morphosyntactic words into prosodic words as in (12), outranks MAX(PL), the derivation will build a prosodic word and its head foot prior to the insertion of the plural exponent[4].

(12) LX≈PR:
The left and right edges of every lexical word must coincide respectively with the left and right edges of some prosodic word (Prince & Smolensky, 2004).

Given these constraints and rankings, the first iteration of the derivation for /PL + kotwa/ 'shoulder, pl.' proceeds as in (13)[5].

(13) *Ranking arguments from the first iteration:* LX≈PR ≫ MAX(PL), AL(PL,V_1,R)

/PL + kotwa/	LX≈PR	MAX(PL)	AL(PL,V_1,R)	*COPY
PL + kotwa	1 W	1	1	
☞ PL + |(kótwa)|		1	1	
koktwa	1 W	L	L	1 W
kokotwa	1 W	L	L	1 W
kokotwa	1 W	L	1	1 W

Here, the bottom three candidates exhibit an application of the COPY(SEG) operation, satisfying MAX(PL). However, none of these candidates succeed because they all violate LX≈PR, which outranks MAX(PL).

The second iteration favors a candidate in which copying occurs to express the plural. Note that *COPY penalizes the copying of a string of segments regardless of the length of that string; other constraints must condition the size of the reduplicant. Previous work has noted that the prosodic morphology of Tohono O'odham exhibits various stress-to-weight effects (Fitzgerald, 2012), indicating that the Stress-to-Weight Principle (Prince, 1990) is active in the language.

(14) STRESS-TO-WEIGHT (SWP):
Assign one violation mark for every stressed syllable that is not heavy.

SWP will favor C-copying over CV-copying because the latter places a consonant in coda position, creating a heavy stressed syllable. Additionally, the bimoraic minimal word requirement in Tohono O'odham (Hill & Zepeda, 1992) motivates the constraint FOOTBINARITY, defined in (15).

(15) FOOTBINARITY (FTBIN):
Feet must be binary at some level of analysis (Prince & Smolensky, 2004).

[4] We denote prosodic word boundaries with | | and foot boundaries with ( ).

[5] We employ Prince (2002)'s combination format in our tableaux; violations are indicated with numerals. In rows with losing candidates, an L indicates that the constraint prefers the losing candidate over the winning candidate. A W indicates that the constraint prefers the winning candidate over the losing one.

FTBIN will also favor C-copying over CV-copying because the former maintains a disyllabic foot while the latter creates a trisyllabic foot, as in (16).

(16) *Ranking arguments from the second iteration:* MAX(PL), AL(PL,V_1,R) ≫ *COPY

PL + |(kótwa)|	MAX(PL)	AL(PL,V_1,R)	FTBIN	SWP	*COPY
PL + |(kótwa)|	1 W	1 W			L
☞ |(kóktwa)|					1
|(kokotwa)|			1 W	1 W	1

Though not shown, FTBIN and SWP must outrank NOCODA for |(kóktwa)| to succeed over |(kókotwa)|. Because codas surface in the language generally, MAX and DEP must outrank NOCODA as well. Therefore, neither deletion nor epenthesis strategies for repairing the violation of NOCODA will improve harmony and the derivation will converge on the next iteration.

So far we have derived C-copying in stress-initial words with simple, non-laryngeal onsets. Next, we consider the derivation of initially stressed words with laryngeal onsets, which exhibit CV-copying after the first vowel. So *háʔa* becomes *háhaʔa* (**hahʔa*). The first iteration builds prosodic structure to satisfy LX≈PR, as in (17).

(17) *Ranking arguments from the first iteration:* LX≈PR ≫ MAX(PL), AL(PL,V_1,R), SWP

/PL + haʔa/	LX≈PR	MAX(PL)	AL(PL,V_1,R)	FTBIN	SWP
PL + haʔa	1 W	1	1		L
☞ PL + |(háʔa)|		1	1		1
PL + |(há)ʔa|		1	1	1 W	1
hahaʔa	1 W	L	L		L

Similar to the derivation of *kóktwa* in (16), the second iteration will favor a candidate in which the violation of MAX(PL) has been repaired by applying the COPY(SEG) operation. The current constraint ranking predicts C-copying, which results in the form **háhʔa* instead of the attested *hahaʔa*. Recall, however, that laryngeal codas are totally absent in the language, motivating a highly ranked phonotactic constraint like (18).

(18) *LARYNGEALCODA (*LARCODA):
Laryngeal Codas are dispreferred (Riggle, 2006; McCarthy, 1998).

If *LARCODA outranks FTBIN and SWP, CV-copying will occur at the expense of gaining a ternary foot and maintaining a light stressed syllable, as in (19).

(19) *Crucial ranking in the second iteration:* *LARCODA ≫ FTBIN, SWP

PL + |(háʔa)|	MAX(PL)	AL(PL,V_1,R)	*LARCODA	FTBIN	SWP
PL + |(háʔa)|	1 W	1 W		L	1
☞ |(háhaʔa)|				1	1
|(háhʔa)|			1 W	L	L

At this point the derivation could converge, since there is no harmonically improving way to repair the lingering violations of FTBIN and SWP without allowing GEN to modify existing foot structure. This situation arises because we have interleaved phonology and morphology in the derivation, allowing a morphologically-motivated process to render a previously optimal footing sub-optimal. However, if foot repair constitutes a basic operation of GEN, a third iteration will repair the violation of FTBIN, as in (20). In this case, the derivation converges on the fourth iteration.

(20) *Third iteration repairs violation of* FTBIN

|(háha͟ʔa)|	FTBIN	SWP
|(háhaʔa)|	1 W	1
☞ |(háha)ʔa|		1
|(há)haʔa|	1 W	1

Next we provide an account for reduplication in words with initial consonant clusters in which the second consonant of the cluster reduplicates and surfaces after the first vowel of the stem. Consider the derivation of *tɺóɺgi* 'trucks' from *tɺógi*. As in previous derivations, the first iteration (not shown) will build a prosodic word and binary head foot, outputting PL + |(*tɺógi*)|. The second iteration favors a candidate in which COPY(SEG) has applied and the copied string to the right of the first vowel of the stem, satisfying MAX(PL) and ALIGN(PL,V_1,R), as in (21).

(21) *Second iteration; current ranking produces a tie*

PL + |(tɺógi)|	MAX(PL)	FTBIN	SWP
PL + |(tɺógi)|	1 W		1 W
☞! |(tɺótgi)|			
☞! |(tɺótɺgi)|			
☞ |(tɺóɺgi)|			
|(tɺótɺogi)|		1 W	1 W
|(tɺóɺogi)|		1 W	1 W

First notice that the candidate *|(*tɺotogi*)| will not be produced by GEN, since it requires copying a non-contiguous string of segments; by definition, COPY(SEGMENT) can only manipulate strings of *contiguous* segments (McCarthy et al., 2012). Second, note that both FTBIN and SWP favor candidates in which only consonants have been copied, effectively excluding |(*tɺótɺogi*)| and |(*tɺóɺogi*)|. However, without invoking additional constraints, the candidates |(*tɺótɺgi*)|, |(*tɺótgi*)| and |(*tɺóɺgi*)| tie.

Note that the words containing initial consonant clusters in (5) conform to a strict sonority profile in which the initial consonant is low-sonority and the second consonant is high-sonority, suggesting that sonority plays a role in syllable well-formedness in Tohono O'odham. To account for this generalization and break the tie between the remaining candidates, we will employ two sonority-related constraints, defined in (22) and (23).

(22) SYLLABLECONTACT (SYLLCON):
The first segment of the onset of a syllable must be lower in sonority than the last segment in the immediately preceding syllable (Rose, 2000:401).

(23) SONORITY SEQUENCING PRINCIPLE (SSP):
Sonority must decline towards the syllable margin; plateaus and reversals are not allowed (Riggle, 2006:12).

SYLLCON excludes |(tɺótgi)| because [t] is lower in sonority than the following onset, [g]. SSP excludes |(tɺótɺgi)| because of the sonority reversing coda cluster [tɺ]. Incorporating these constraints into EVAL correcty selects the candidate |(*tɺóɺgi*)|, as in (24). The derivation converges on the next iteration.

(24) SYLLCON *and* SSP *break the tie in the second iteration*

PL + |(tɺógi)|	SYLLCON	SSP
|(tɺótgi)|	1 W	
|(tɺótɺgi)|		1 W
☞ |(tɺóɺgi)|		

To recap, we have analyzed the preference for C-copying in stress-initial words as a Stress-to-Weight effect that can be overridden by phonotactic restrictions on coda well-formedness. Apparent cluster simplification in the reduplicant falls out from constraints on the sonority profile of syllables. In the next section we extend our analysis to words with non-initial stress, which exhibit double reduplication.

3.3. Double reduplication in words with non-initial stress

As established in §2.2, loanwords with non-initial stress exhibit reduplication in two locations: after the first vowel of the word and after the primary stressed vowel. This indicates that the plural morpheme is subject to two positional pressures, which we model with an additional subcategorization frame, defined in (25).

(25) ALIGN(PL,V́,R)
Assign one violation mark if a phonological exponent of the plural morpheme is not aligned with the right edge of the primary stressed vowel.

Stress initial words conflate the influence of ALIGN(PL,V́,R) and ALIGN(PL,V_1,R), since the stressed vowel coincides with the first vowel. However, in words with non-initial stress, the derivation will not converge until both positional requirements have been met. For space reasons, we will combine the two alignment constraints under the umbrella constraint ALIGN(PL); the violation marks assigned by ALIGN(PL) will equal the sum of the violation marks accrued by the two component constraints. This does not constitute a theoretical claim but merely a notational abbreviation.

Consider the derivation of *pàp̲.ɹó.ɹ̲oma* ‘doves’, which we assume contains a lexically-specified stressed foot[6]. The high-ranked LX≈PR again enforces the building of a prosodic word in the first iteration, despite the fact that it creates violations of EXHAUSTIVITY(WORD), a constraint that penalizes syllables that are direct dependents of the prosodic word (Itô & Mester, 1992).

(26) *Ranking argument from the first iteration:* LX≈PR ≫ EX(WD), MAX(PL), ALIGN(PL)

	/PL + pa(ɹóo)ma/	LX≈PR	EX(WD)	MAX(PL)	ALIGN(PL)
	PL + pa(ɹóo)ma	1 W	L	1	2
☞	PL + |pa(ɹóo)ma|		2	1	2
	pap̲(ɹóo)ma	1 W	L	L	1 L
	pa(ɹóɹ̲o)ma	1 W	L	L	1 L

In the second iteration, the high-ranked EX(WD) favors a candidate in which one of the peripheral syllables is footed. All else being equal, the constraint ALL-FOOT-LEFT, defined in (27), will favor creating a foot at the left edge, modelling the fact that the initial syllables of the data in (6) bear stress but the final syllables do not.

(27) ALL-FOOT-LEFT:
For each foot in a word, assign one violation mark for every syllable separating it from the left edge of the word.

(28) *Ranking arguments from the second iteration:* EX(WD) ≫ MAX(PL), ALIGN(PL), FTBIN

	PL + |pa(ɹóo)ma|	ALL-FT-L	EX(WD)	MAX(PL)	ALIGN(PL)	FTBIN
	PL + |pa(ɹóo)ma|	1	2 W	1	2	L
☞	PL + |(pà)(ɹóo)ma|	1	1	1	2	1
	PL + |pa(ɹóo)(mà)|	2 W	1	1	2	1
	|pap̲(ɹóo)ma|	1	2 W	L	1 L	L
	|pa(ɹóɹ̲o)ma|	1	2 W	L	1 L	L

6 McCarthy & Pruitt (2013) argue that foot structure, and thus all stress, is universally absent in underlying representations. Instead, they handle cases of lexical stress using phonetically uninterpretable diacritic accents to force deviations from default stress patterns. Though we employ lexical stress in our representations, we believe our analysis could be translated into McCarthy & Pruitt (2013)’s approach with relatively trivial changes.

The third iteration will select a candidate in which COPY(SEG) has applied; SWP will favor a candidate in which a single consonant is copied to the right of the first vowel of the stem, as in (29).

(29) *Third iteration*

PL + |(pà)(ɺóo)ma|	MAX(PL)	ALIGN(PL)	FTBIN	SWP
PL + |(pà)(ɺóo)ma|	1 W	2 W	1 W	1 W
☞ |(pàp)(ɺóo)ma|		1		
|(pàpa)(ɺóo)ma|		1		1 W
|(pà)(ɺóɺo)ma|		1	1 W	1 W

Recall that we modelled the alternation between C- and CV-copying in stress-initial words with the ranking *LARCODA ≫ FTBIN, SWP. The same ranking will favor CV-copying here just in case the initial consonant of the word is laryngeal. For example, the third iteration of the derivation of *ʔiʔiskókowa* 'chisels' will select |*(ʔìʔi)(skóo)wa*| rather than *|*(ʔìʔ)(skóo)wa*|. A fourth iteration will satisfy the remaining violation of ALIGN(PL,V́,R) by copying the onset of the primary stressed syllable and placing it immediately to the right of the stressed vowel. This splits the identical, tautosyllabic VV-sequence into two syllables. Note that ALIGN(PL,V́,R) (under the guise of our umbrella constraint ALIGN(PL)) must outrank SWP, since C-copying occurs despite the fact that it creates a light stressed syllable. The derivation converges on the next iteration.

(30) *Ranking argument from the fourth iteration:* ALIGN(PL) ≫ SWP

|(pàp)(ɺóo)ma|	ALIGN(PL)	SWP
|(pàp)(ɺóo)ma|	1 W	L
☞ |(pàp)(ɺóɺo)ma|		1
|(pàp)(ɺóoɺ)ma|	1 W	L

In sum, we have accounted for double reduplication by positing an additional positional constraint on the plural morpheme and anlyzing the stressed 'long' vowels in loanwords with non-initial stress as tautosyllabic VV-sequences that behave in the same way as diphthongs. This analysis demonstrates that single and double reduplication represent a coherent process of non-templatic infixation in Tohono O'odham.

4. Previous analyses & conclusion

Previous work has analyzed Tohono O'odham plural reduplication as the prefixation of a CV-template accompanied by syncope in the base unless that would result in an ill-formed coda (Hale, 1965; Hill & Zepeda, 1992; Fitzgerald, 2000). On this analysis, the reduplicant is more faithful to the input than the base is, motivating Input-Reduplicant (IR) faithfulness and a distinction between Input-Output and Input-Base faithfulness in Correspondence Theory (McCarthy & Prince, 1999). However, Riggle (2006) notes that the prefixing account is unable to explain cluster simplification in reduplication of words with complex onsets (the *tɺógi* → *tɺóɺgi* case). Riggle (2006) proposes an infixation analysis in which an ANCHOR constraint forces a templatic C-infix to surface after the first vowel. The template can be expanded to a CV to avoid phonotactically illicit codas. Cluster simplification emerges by ranking *COMPLEXONSET below MAX-IO but above MAX-BR. Since syncope is no longer necessary to account for the lack of a vowel in the base, the infixation analysis eliminates the need for IR faithfulness.

Fitzgerald (2012) replies to Riggle, citing forms with non-initial stress that exhibit double reduplication (i.e. *pàpɺóɺoma* 'doves') and noting that they appear to exhibit mandatory CV-copying after the stressed vowel despite the lack of phonotactic motivation, an objection based on the assumption that the long vowel of forms like *paɺóoma* are underlyingly short. Fitzgerald argues that these facts are inconsistent with an infixation analysis and instead support the CV-prefix + syncope account of Tohono O'odham plural reduplication.

Here we have argued for an infixation analysis somewhat similar to Riggle's account. However, we depart from it in two crucial ways. First, we argued that the plural exponent is not a template but rather the COPY(SEGMENT) operation, which positions copied material according to two prosodic subcategorization frames. The preference for C-copying over CV-copying falls out from the Stress-to-Weight principle, which prefers stressed syllables to be heavy. Second, we incorporated the supposedly problematic doubly reduplicated forms, showing that the apparent asymmetry between the size of the reduplicants after the first and stressed vowels emerges as an epiphenomenon of the representation of non-initial 'long vowels' in the language. Thus, the doubly reduplicated forms actually support an infixation analysis of Tohono O'odham plural reduplication.

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