Chapter 27 | Paul de Lacy

Maximal Words and the Maori Passive

Editor's Note

There was a time – indeed, there may still be a time – when every phonology student on the planet had seen Hale's (1973) famous problem of the Maori passive. It was deeply perplexing, since the obvious solution that every good student was expected to find was arguably not the way that Maori speakers had internalized their knowledge.

This chapter revisits the Maori passive and proposes an analysis that may be the last word on the problem. The analysis is connected deeply with the proposals in chapters 24 and 26 about the relationship between prosodic and morphological constituents.

1 Introduction

Many languages exhibit Minimal Word conditions: restrictions on the smallest possible Prosodic Word (PrWd) in a language (McCarthy & Prince 1986). In this paper, I propose that there are also restrictions on the maximum size of PrWds – i.e. 'maximal word' effects. Since very little has been written about maximal word conditions, one of the two aims of this paper is to show that such restrictions exist. The other aim is to show that upper bounds on PrWd size reduce to general constraints on prosodic structure.

The empirical focus of this paper is the Polynesian language Māori [má:ɔɾi], spoken in New Zealand. I show that PrWds in this language are allowed to contain at most one trochaic foot and no other unfooted footable sequences. This restriction allows bimoraic and trimoraic PrWds – {(húka)}, {(táŋa)ta}, {ku(rí:)} – and four-mora PrWds with a medial foot – {ta(mái)ti} – or an initial uneven trochee – {(kó:re)ro}. However, it bans all other PrWd types, such as those with four light syllables or two light syllables and a heavy.[1]

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Since there is pressure for PrWd and root edges to coincide, the restriction on PrWds translates into severe limitations on root and word size in Māori. The PrWd limits are also argued to be responsible for a famous problem of allomorphy – the many realizations of the Māori passive suffix (Hohepa 1967, Hale 1968, Kenstowicz & Kisseberth 1979: 171–4, McCarthy 1981). Representative examples are given in (1).

(1)

	Active (root)	*Passive*	*Gloss*
a.	horo	horo-a	'fall in fragments'
b.	kopou	kopou-a	'appoint'
c.	hoka	hoka-ia	'run out'
d.	mahue	mahue-tia	'put off'
e.	arihi	arihi-tia	'chop'

The short forms of the passive *-a* and *-ia* are shown to appear only when they can form an acceptable PrWd with the root. For example, {(hóro)a}, {ko(póu)a}, and {ho(kái)a} are within the maximal word limit: they contain only one foot and no other footable sequences. In contrast neither of the short forms could appear with a longer root in the same PrWd: both *{(ári)hi-a} and *{(ári)(hì-a)} are unacceptable since the former contains an unfooted footable sequence and the latter has too many feet. In such cases, the passive is forced to form a PrWd on its own, with attendant consonant epenthesis: {(ári)hi} {(tía)}.

The maximal word limit is argued to be the primary factor in controlling the passive's realizations. I will argue that other forms of the passive follow from general conditions on Māori phonology. A number of new observations about the data are also presented.

The theoretical aim of this paper is to show that the maximal word limit observed in Māori follows from general constraints on prosodic structure. This proposal ties in with McCarthy & Prince's (1994a) Generalized Template Theory – a reductionist approach to templatic restrictions.

Section 2 presents an outline of the theoretical approach and identifies the primary constraints used to effect the maximal word limits. The theory is applied to Māori's PrWd size restrictions in section 3. Typological predictions of the theory are discussed in section 4, and conclusions in section 5.

2 Theory

The theory of maximal word effects proposed in this paper is a reductionist one: no special devices effect maximal word limits. Instead, maximal word limits appear when general prosodic constraints outrank faithfulness constraints.

The work that is most relevant for present concerns is found in McCarthy & Prince (1994b). The authors argue that there is no need for constraints that baldly state reduplicant form, such as 'RED = CVCV'. Instead, the emergent effect of prosodic constraints determines reduplicant shape. They illustrate with an analysis

of Diyari reduplication, showing that the constraints ALLFTL and PARSE-σ ensure that reduplicants are maximally bimoraic in this language.

(2) PARSE-σ "Every syllable belongs to a foot."
ALLFTL "Every foot appears at the left edge of a PrWd." (McCarthy & Prince 1993b)

These constraints outrank MAX-BR, a constraint that requires reduplicants to contain their base's material. The reduplicant is underlined in the candidates below; foot boundaries are not marked because they have no bearing on the result.

(3)

/RED+ŋandawalka/	ALLFTL	PARSE-σ	MAX-BR
a. {(ŋanda)(walka)}{ŋandawalka}	* *		
b. {(ŋanda)wa}{ŋandawalka}		*!	* * *
☞ c. {(ŋanda)}{ŋandawalka}			* * * * *

Despite the fact that (c)'s reduplicant is the least faithful copy of the base, it forms the most unmarked PrWd. The other candidates are ruled out because they are relatively more marked – (a) contains too many feet while (b) has a stray syllable.

Such size limits apply not only to reduplicants: Ito & Mester (1992, 1994) point out that Japanese loanword truncations place upper limits on their size, and Mester (1994) argues that cretic shortening in Latin may be seen as an imposition of a word size limit.

Since Optimality Theory allows free ranking permutation, analyses like that in (3) imply that prosodic constraints can limit the size of other morphological elements, not just reduplicants. If MAX-IO (every input segment is preserved in the output) replaces MAX-BR, all morphemes will be maximally bimoraic or split between PrWds. In such a language, the root /takapa/ would surface as {taka}, {kapa}, or be split into two PrWds – the faithful {takapa} would fatally violate one of the foot-related constraints. In the following sections I argue that this prediction is borne out in Māori; its maximal word limit is produced by ranking constraints on footing above faithfulness constraints.

Apart from the constraints already mentioned, the following footing constraints will be employed:

(4) LAPSE_{FT} "Adjacent unstressed moras must be separated by a foot boundary." (Green & Kenstowicz 1995, Prince 1983, Selkirk 1984)
*FT- "Incur a violation for every non-head foot."

LAPSE_{FT} is violated when a footable sequence is not parsed into feet. *FT- bans every foot except for the head foot, effectively preventing PrWds with more than one

foot. The constraints in (4) together favour small PrWds – ones that contain a single foot and no unfooted but footable sequences.

3 The Māori Passive

In this section I show that there is an active restriction on the maximum size of PrWds in the Polynesian language Māori. While the main focus of this section is the passive suffix, some background to Māori phonology will first be presented.

Māori has the consonant phonemes /p t k f/ ɸ h m n ŋ ɾ w/ and vowels /i e a o u i: e: a: o: u/. Syllable structure is (C)V(V). Syllable rhymes may contain either a long vowel or a diphthong. In all diphthongs the second vowel is equally or less sonorous than the first: i.e., [ai ae ao au eo ei oe ou iu ui].[2] Other vowel sequences (e.g., [oa io]) form separate syllables.

Bimoraic syllables contain either a long vowel or a diphthong. For present purposes, it is enough to say that stress falls on a bimoraic syllable, otherwise the initial.

(5) [táma] 'boy'
[táŋata] 'man'
[maráe] 'meeting area'
[kurí:] 'dog'

Content words – nouns, verbs, and adjectives – are minimally bimoraic. In foot terms, Māori employs trochaic feet and aims to have them at the left edge of the PrWd if possible (i.e., {(táŋa)ta}, *{ta(ŋáta)}).

Every bimoraic root or affix is contained inside its own PrWd. Standard diagnostics for PrWd boundaries are syllabification and stress (Nespor & Vogel 1986). For example, the compound /taka afe/ 'circuitous' ('go'+ 'encircle') is stressed as [tákaáfe], not *[taká:fe], indicating that there is a PrWd break – and therefore a syllable break – between the medial [a]'s: [{táka}{áfe}]. Similarly, the prefix *taki-* (numeral modifier) forms its own PrWd: [{táki}{íwa}] 'by nine', *[{takí:wa}].

Monomoraic affixes appear inside the PrWd of their root. For example, the monomoraic prefixal reduplicant clearly falls inside the same PrWd as its root since it bears the stress: e.g., {híhiŋa} 'fall in a large amount' (< híŋa 'fall').

The affixes that are of most interest in this paper are those that have both bimoraic and monomoraic realizations – i.e., the passive and gerund. Their varying realizations will eventually be argued to be conditioned by the maximal word limit. The first step, though, is to identify the size restrictions on Māori PrWds.

3.1 Maximal words

Māori roots may contain two, three, or four moras. Four-mora roots only come in two types: with an initial heavy syllable followed by two light syllables (HLL) and with a medial heavy syllable surrounded by two light syllables (LHL).

(6) (a) Bimoraic roots: LL, H

[tá.ma]	'boy'	[héu]	'eaves'
[ú.a]	'be rained upon'	[ú:]	'bite, gnaw'
[kái]	'food'	[pá:]	'fortified village'

(b) Trimoraic roots: LLL, HL, LH

[ká.ra.ŋa]	'sing'	[káu.ri]	'type of tree'
[á.mi.o]	'roam'	[te.káu]	'ten'
[á:.mi]	'gather'	[ku.rí:]	'dog'

(c) Four-mora roots: HLL, LHL; *LLLL, *LLH, *HH

(i) HLL		(ii) LHL	
[má:.o.ri]	'Maori, normal'	[ta.mái.ti]	'child'
[kó:.re.ro]	'tie'	[ta.rái.wa]	'driver'
[pá:.ke.ha]	'Caucasian'	[ma.ná:.ki]	'show kindness'

Many of the LHL roots are historically derived from bimorphemic forms (e.g., *tamaiti* 'child' < *tama* 'boy' + *iti* 'small'). Nevertheless, they are now single roots, with meanings that are often unrelated to their (historically) component morphemes. It is clear that four-mora roots are a recent addition to Māori, and it is likely that they were once prohibited. In fact, the earlier restriction will be shown to persist in modern Māori, though in a covert way – while four-mora PrWds are tolerated, they are avoided when possible.[3]

I propose that the limits on root shape are due to restrictions on the size of PrWds: PrWds may contain only one foot and no unfooted but footable sequences. This requirement affects roots because each root is required to be contained inside a single PrWd.

As mentioned above, feet are trochaic; they may consist of one heavy syllable ($\acute{\sigma}_{\mu\mu}$), two light syllables ($\acute{\sigma}_{\mu}\sigma_{\mu}$), or a heavy–light sequence ($\acute{\sigma}_{\mu\mu}\sigma_{\mu}$). The constraints introduced in section 2 (*FT- and LAPSE_{FT}) are used here to require only one foot per PrWd. Either one or both of these constraints are violated by PrWds that contain more than one foot or have unfooted sequences of moras. For example, the four-mora PrWd {karaŋata} cannot help but contain a non-head foot {(kára)(ŋàta)} – violating *FT- – or an unfooted sequence {(kára)ŋata}, so violating LAPSE_{FT}.[4]

The two foot-related constraints conflict with the requirement that root material be preserved: MAX_{Root} (McCarthy & Prince 1994b). With this ranking, roots are forced to truncate if they get too large.

(7) LAPSE_{FT}, *FT- ≫ MAX_{Root}

/karaŋata/	*FT-	LAPSE_{FT}	MAX_{Root}
a. {(kára)ŋata}		*!	
b. {(kára)(ŋàta)}	*!		
☞ c. {(kára)ŋa}			*

The faithful candidates (a) and (b) fail because they violate one of the footing constraints. Candidate (a) manages to avoid violating *FT- by having one foot, but in doing so it ends up with two unfooted syllables, fatally violating LAPSE_{FT}. Candidate (b) satisfies LAPSE_{FT}, but can do so only by fatally violating *FT-. In short, four-mora roots of this type will inevitably violate a footing constraint, dooming them to loser status.

The same ranking rules out almost all other roots with four or more moras. The two exceptions are PrWds with a medial foot, as in {ta(mái)ti}, and those with an initial uneven trochee {(kó:re)ro}. Neither of these forms violate *FT- or LAPSE_{FT} since both contain a single foot and no unfooted footable sequences. The following tableau illustrates this situation with *ko:rero*. As shown, the winning form (a) must contain an uneven trochee; those with even trochees – (b), (c) – violate one of the foot constraints.

(8)

/ko:rero/	*FT-	LAPSE_{FT}	MAX_{Root}
☞ a. {(ko:re)ro}			
b. {(kó:)rero}		*!	
c. {(kó:)(rèro)}	*!		
d. {(kó:)re}			**!

The following section shows that the PrWd size restrictions are not just a historical accident, but are active in the phonology of Māori.

3.2 The passive: Introduction

The Māori passive has received a great deal of attention (Williams 1971[1844]; Biggs 1961; Pearce 1964; Hohepa 1967; Hale 1968, 1973, 1991; Kiparsky 1971; Kenstowicz & Kisseberth 1979: 171–4; McCarthy 1981; Sanders 1990, 1991; Harlow 1991; Bauer 1993; Blevins 1994; Kibre 1998). The key data are the following:

(9)

Active	*Passive*	*Gloss*
afi	afitia	'embrace'
hopu	hopukia	'catch'
aru	arumia	'follow'
mau	mauria	'carry'
kite	kitea	'see, find'
hoka	hokaia	'run out'
tahu	tahuna	'light'

Hale (1968) pointed out that the data allow for two types of analysis. A purely morphological analysis would have a large number of passive allomorphs: *-kia*, *-mia*,

-ria, *-tia*, and so on; each root would specify which passive allomorph it took. In contrast, a phonological analysis would have consonants be part of the root: i.e., *hopu* is /hopuk/, and the passive is /ia/. The final consonant would delete when the root appears on its own because codas are banned (i.e., /hopuk/ → [hopu]), but the consonant can appear when it is an onset – i.e., with the passive: /hopuk+ia/ → [hopukia].

Here, I aim to show that the passive's realization is determined by the PrWd size limit. Certainly, some other conditions do influence the output form of the passive, but these will be shown to reduce to general prosodic restrictions that are visibly active in other processes in Māori. In short, a basically phonological approach is viable and does not require any devices that find their sole support in the passive's alternations.

3.3 Generalizations

This section presents a brief statement of the passive's various realizations. The following sections will analyze different aspects of the description. I must note that the following generalizations made about the data do not entirely agree with previous descriptions. The generalizations presented below were based on an exhaustive search of two Māori dictionaries – Williams (1971) and Ngata (1993). I also checked the forms with my consultants.[5]

The table in (10) summarizes the generalizations. One example form is given for each root shape; further examples are given in the following sections when appropriate. The number of examples that support each generalization are given after the gloss.

Since the prosodic form of the output proves significant, stress, syllable, and PrWd boundaries are marked in the examples. Evidence that forms such as {ínu}{mía} and {tápuhi}{tía} form separate PrWds comes from stress placement and intonation; specifically, the H* of the declarative tune falls on the rightmost PrWd's stressed syllable, and the pitch rise occurs over the passive suffix in just these words.

(10)

Root shape	*Root*	*Passive*	*Root+Passive*	*Gloss*	*Num.*
(a) C-final					
/an/-final	/epan/	ina	{e.pái.na}	'throw'	22
other n-final	/taon/	a	{táo.na}	'cook in oven'	54
other C-final	/inum/	ia	{í.nu}{mí.a}	'drink'	137
	/koharak/		{ko.ha.ra}{kí.a}	'split open'	
(b) Bimoraic V-final					
(C)i:	/pi:/	a	{pí:.a}	'bathe'	6
other (C)V:	/pu:/	ia	{pú:.i.a}	'bundle'	12
(C)V(C)a	/hika/	ia	{hi.kái.a}	'plant'	41
other (C)V(C)V	/horo/	a	{hó.ro.a}	'fall down'	434
(c) Larger V-final					
HL	/taute/	a	{táu.te.a}	'consider'	13
LH	/kopou/	a	{ko.póu.a}	'appoint'	13
LLL	/tapuhi/	tia	{tá.pu.hi}{tí.a}	'sort out'	81
LHL, HLL	/ko:rero/		{kó:.re.ro}{tí.a}	'talk, say'	

One other realization of the passive is found with 26 roots: these lengthen their initial syllable as well as suffixing a passive form (e.g., /kume/ → [ku:mea] 'be angry, fight'). I have discussed this pattern elsewhere, so I will leave it aside here (de Lacy 1999; also see Harlow 1991).

One important issue relates to the claim that trimoraic and four-mora vowel-final forms take *-tia*.[6] Evidence for this claim comes from two sources. One is that trimoraic and longer loanwords take *-tia* in the passive (Hale 1968, Blevins 1994: 41). The other is that no trimoraic form takes *-ia* or *-a*.[7] Since the majority of trimoraic roots take *-tia*, it is therefore difficult to imagine that V-final trimoraic forms take anything but this form of the passive.

The following analysis takes the underlying form of the passive to be /ia/; arguments for this proposal are provided in section 3.7.

3.4 Maximal words and the passive

The realizations of the passive are primarily controlled by the maximal word limit. If it is possible to create the least marked PrWd – a trimoraic one – the passive will truncate from /ia/ to [a] to do so: /horo+ia/ → {hóroa}. Failing that, the aim will be to create an admissible four-mora PrWd: e.g., /kopou+ia/ → {ko(póu)a}. When truncation cannot produce the right result, the passive is placed in its own PrWd, with attendant epenthesis: /mahue+ia/ → {máhue}{tía}.

I will start by showing that the passive truncates when necessary, and that the PrWd size limit determines when this truncation takes place. Evidence comes from trimoraic roots that contain a heavy syllable; such roots take *-a* in the passive:

(11) *Trimoraic roots with a heavy syllable*

(i) $\sigma_{\mu}\sigma_{\mu\mu}$ roots

horoi	{ho(rói)a}	'clean'
kopou	{ko(póu)a}	'appoint'
tapae	{ta(páe)a}	'present'
tapi:	{ta(pí:)a}	'mend'

(ii) $\sigma_{\mu\mu}\sigma_{\mu}$ roots

keue	{(kéue)a}	'move'
haere	{(háere)a}	'go over/for'
a:mi	{(á:mi)a}	'gather'
hu:hi	{(hú:hi)a}	'cover'

The reason that these roots take *-a* is because the more faithful alternative [ia] violates the maximal word limit: e.g., *{ko(póu)ia}, *{(háere)ia}. So, the passive will truncate if doing so is the only way to form an admissible PrWd:

(12) Truncation under duress

/kopou+ia/	*Ft-	Lapse$_{FT}$	Max
☞ a. {ko(póu)a}			*
b. {ko(póu)ia}		*!	
c. {ko(póu)(ia)}	*!		

The alternative realization – *-tia* – is ruled out because it contains an epenthetic consonant [t]. The constraint against consonant epenthesis – DEP-C – outranks MAX, so banning the form *{ko(póu)}{(tía)}. The *-tia* realization and epenthesis will be discussed in more detail in section 3.6.

3.5 The emergent maximal word

The maximal word limit that affects affix form is more stringent than the one imposed on roots. While four-mora roots are tolerated in Māori, they are avoided in affixed forms. Specifically, the passive will truncate to form a three-mora PrWd in order to avoid a four-mora one. Such truncation takes place with bimoraic roots that end in a non-low vowel.

(13) *Bimoraic V^{-low} roots*

hori	{hória}	'cut'
huke	{húkea}	'excavate'
moe	{móea}	'marry, beget'
miro	{míroa}	'twist'
ehu	{éhua}	'bail'
hau	{háua}	'strike'

The alternative to the trimoraic output forms above is a four-mora PrWd: e.g., *{hu(ké-i)a}. The avoidance of such PrWds is due to the constraint ALLFTL (see (2)). With ALLFTL outranking MAX, the passive will truncate to avoid four-mora PrWds with the form $\{\sigma_{\mu}(\sigma_{\mu\mu})\sigma_{\mu}\}$.

(14) Avoidance of {LHL}

/huke/	ALLFTL	MAX
☞ a. {(húke)a}		*
b. {hu(kéi)a}	*!	

Importantly, the constraint MAX_{Root} outranks ALLFTL; since MAX_{Root} specifically preserves root material, it keeps roots like *tamáiti* from being eliminated:

(15) LHL roots

/tamaiti/	MAX_{Root}	ALLFTL
☞ a. {ta(mái)ti}		*
b. {(táma)}	***!	

With the ranking $\text{MAX}_{\text{Root}} \gg$ ALLFTL $\gg$ MAX, the ban on four-mora PrWds only emerges in affixation. In other words, the most desirable PrWd is bi- or trimoraic, with four-mora PrWds only possible under duress.

3.6 The last resort

So far I have argued that the maximal word limit forces the passive to truncate when necessary. However, there is one situation where truncation does not achieve the right result. With trimoraic roots that consist entirely of light syllables, neither *-a* nor *-ia* will form an acceptable PrWd: e.g., /mahue+ia/ → *{mahu(é-i)a}, *{(máhu)ea}. In this situation, there is only one remaining option: the passive must appear inside its own PrWd, resulting in {(máhu)e}{(tía)}.

The reader will no doubt have noticed that a [t] appears in the output form; the passive is not *{(máhu)e}{(ía)}. The appearance of the [t] relates to an independent restriction in Māori: if an affix starts a PrWd, that PrWd must begin with a consonant. The effect of this restriction is seen in two facts: (i) all prefixes begin with consonants and (ii) prefixal reduplicants cannot reduplicate vowel-initial words (Keegan 1996: 36).[8] So, *{máhue}{ía} is ruled out by the affix restriction; the only way for an affix to appear in its own PrWd is for a consonant to be epenthesized, hence {máhue}{tía}.

Consonant epenthesis violates the constraint DEP-C. Since avoidance of a maximal word violation is clearly preferable to avoiding epenthesis, *FT- and LAPSE_{FT} must both outrank DEP-C:

(16) Epenthesis as a last resort

/mahue+ia/	*FT-	LAPSE_{FT}	DEP-C
☞ a. {(máhu)e}{(tía)}			*
b. {mahu(éi)a}		*!	
c. {(máhu)(èa)}	*!		

In short, placing the passive in its own PrWd with attendant epenthesis is a last resort; it only takes place when truncation cannot satisfy the maximal word limit.

The fact that /kopou+ia/ surfaces as {kopóua} and not *{kopóu}{tía} shows that DEP-C outranks MAX. With this ranking, even admissible four-mora PrWds are more harmonic than epenthesis.

(17) $\{\sigma_{\mu}\sigma_{\mu\mu}\sigma_{\mu}\}$ is preferable to epenthesis

/kopou+ia/	DEP-C	MAX
☞ a. {ko(póu)a}		*
b. {ko(póu)}{(tía)}	*!	

While this concludes the discussion of the primary effects of the maximal word limit, there are still several realizations of the passive that require further comment. These include the forms found with C-final roots, [a]-final roots, and long vowels.

3.7 Epenthesis and the last resort

Epenthesis forms an important part of the analysis presented above: it is the constraint against epenthesis – DEP-C – that renders the *-tia* realization least harmonic. So, the form *{kopóu}{tía} is not rejected because it has two PrWds, but rather because it has an epenthetic consonant. In fact, epenthesis is the only reason that the *-tia* realization is ruled out in this situation; apart from epenthesis, output forms with *-tia* satisfy all the other constraints, obeying the maximal word limit.

This approach makes an important prediction: if *-ia* can appear in its own PrWd without epenthesis, no constraint will prevent it from surfacing faithfully. This prediction is borne out in C-final roots: these all end up with *-ia* in a separate PrWd:

(18) *C-final roots*

Underlying form	*Passive*	*Gloss*
inum	{ínu}{mía}	'drink'
monok	{móno}{kía}	'prepare food'
fauf	{fáu} {fía}	'tie'
nekeh	{néke}{hía}	'move'
ku:ŋ	{kú:}{ŋía}	'nip'
apur	{ápu}{ría}	'heap upon'
koharak	{kóhara}{kía}	'split open'
manakoh	{mánako}{hía}	'accept'
matakur	{mátaku}{ría}	'be feared'

The competing form is one with a single PrWd and the realization *-a* (e.g., *{(móno)ka}). This form is ruled out by MAX since the passive's [i] is deleted. In comparison, forms with the passive in a separate PrWd do not violate any of the constraints identified so far: {(móno)} {(kía)} does not violate LAPSE_{FT} or *FT-, and does not violate DEP-C. The latter fact is crucial – it shows that the {tia} realization is not avoided because it appears in a separate PrWd, but because it has an epenthetic consonant.

The form {(móno)} {(kía)} gives some insight into requirements on root–PrWd containment. Some constraint must require roots to appear inside a single PrWd – this is dubbed WRAP(Root, PrWd) after Truckenbrodt (1995). This constraint requires every vocalic element of a root to be contained inside the same PrWd, preventing roots from forming two separate PrWds to satisfy the maximal word limit: i.e. /karaŋata/ → *{(kára)} {(ŋáta)}. WRAP(Root, PrWd) must at least outrank MAX_{Root}.

(19) WRAP ≫ MAX_{Root}

/karaŋata/	WRAP(Root, PrWd)	MAX_{Root}
☞ a. {(kára)ŋa}		*
b. {(kára)}{(ŋáta)}	*!	

In the present analysis, WRAP(Root, PrWd) must only apply to the vocalic members of roots, otherwise [{mono}{kia}] would be banned.

The C-final forms are important in determining the input's form. I have assumed that the passive is underlyingly /ia/. The alternative – that it is /a/ – incorrectly predicts that /inum+a/ should surface as *{(ínu)ma}. This form does not violate the maximal word conditions, so it is difficult to see what would rule it out in favour of {ínu}{mía}, a form that (at least) violates DEP-V.

3.8 Violability

The preceding sections have argued that the maximal word limit is imposed by constraints on footing, and not some independent templatic requirement. If the limit is truly imposed by constraints, though, one would expect these to be violable. The violability of the maximal word limit is shown in three realizations of the passive. In these cases, the form of the passive that is most harmonic in terms of the maximal word limit is ruled out by higher ranking constraints.

One case involves the OCP (Goldsmith 1976). The OCP bans adjacent identical elements within the same PrWd in Māori, ruling out $[V_i:V_i]$ sequences (e.g., *[a:a]). The OCP also influences the passive's realization with bimoraic long-vowel roots. Although most roots of this shape take the passive form [ia], those with an [i:] take *-a*.

(20) Roots with long vowels

(i) [(C){e,a,o,u}:]

ko:	{kó:.i.a}	'dig with kō'
a:	{á:.i.a}	'drive, urge'
pu:	{pú:.i.a}	'make into bundle'

(ii) [(C)i:]

hi:	{hí:.a}	'raise'
ki:	{kí:.a}	'mention'
pi:	{pí:.a}	'bathe'

The reason that non-[i:] long vowels take *-ia* follows from the ranking presented so far. The candidate {(kó:.i).a} does not exceed the maximal word limit, nor does it violate ALLFTL. Its competitor {(kó:)a} fatally violates MAX, and {(kó:)}{(tía)} violates DEP-C:

(21) The HLL output

/ko:+ia/	DEP-C	MAX
☞ a. {(kó:i)a}		
b. {(ko:)a}		*!
c. {(kó:)}{(tía)}	*!	

However, *-ia* is not the most harmonic form for [(C)i:] roots: i.e., *{(pí:i)a}. The reason is that the output clearly violates the OCP.

(22)

/pi:+ia/	OCP	MAX
a. {(pí:i)a}	*!	
☞ b. {(pí:)a}		*

The OCP also affects roots that end in [a]. While most bimoraic roots take *-a* as their passive form (see (13)), those that end in [a] take *-ia*.

(23) [a]-final bimoraic roots

hika	{hikáia}	'plant'
pona	{ponáia}	'tie'
tia	{tiáia}	'paddle vigorously'

The alternative would have adjacent [a]'s: *[hi.ka.a]. Again, the OCP can be used to rule this form out:

(24)

/hika+ia/	OCP	ALLFTL
☞ a. {hi(kái)a}		*
b. {(híka)a}	*!	

One other candidate deserves further comment: the form *{hi(ká:)}, with a long vowel, does not violate the OCP and so should be the winner.[9] I suggest that such forms are ruled out by a constraint that requires the passive to have some unique output exponent. Such a constraint is proposed by McCarthy & Prince (1995) – MORPHDIS prevents all the passive's melodic elements from coalescing, as is the case in **hiká:*.

In any case, a similar constraint is needed to explain why the passive does not delete entirely with trimoraic forms. Given the input /mahue +ia/, the output form

{máhue} – where the passive has deleted entirely – wins out over {máhue}{tía} since the latter violates DEP-C while the former only violates the lower-ranked MAX. Some constraint that requires the passive to have an output exponent must therefore outrank DEP-C.

Another case involves /n/-final roots. Such roots do not behave like other C-final roots; roots that end in /an/ metathesize the /n/ with the passive's [i], while other /n/-final roots take *-a*, not *-ia*.

(25) /an/-final roots [22 forms]

/epan/	{e(pái)na}	'throw'
/huan/	{hu(ái)na}	'determine'
/weran/	{we(rái)na}	'burn'

/n/-final roots [54 forms]

/akon/	{(áko)na}	'learn'
/takin/	{(táki)na}	'stick in'
/wao/	{(wáo)na}	'part combatants'

To deal with [n]'s behavior, I suggest that there is a constraint against [ni] sequences, which I will call **ni* here. Admittedly, this constraint is ad hoc; I expect that the real reason behind avoidance of [ni] can be related to the plethora of cooccurrence conditions found in Māori (Kawasaki 1990, de Lacy 1998). However, developing this line of research would go beyond the scope of this paper. For present purposes, it is enough that some constraint that bans [ni] sequences at least outranks MAX:

(26)

/takon+ia/	*ni	ALLFTL	MAX
a. {(táko)}{(nía)}	*!		
☞ b. {(táko)na}			*
c. {ta(kói)na}		*!	

As for the metathesized candidate, it is as if the [n] did not exist: the OCP sees right through it, effectively banning [a(n)a] sequences:

(27)

/epan+ia/	*ni	OCP	ALLFTL
a. {(épa)}{(nía)}	*!		
☞ b. {e(pái)na}			*
c. {(épa)na}		*!	

Of course, more must be said about these roots. For example, why does only /n/ undergo metathesis? An adequate response would need to invoke separate constraints

on order preservation (i.e., LINEARITY), a step that is unfortunately beyond the scope of the present work.

Despite the remaining questions about the /n/-final forms, it is clear that the maximal word condition still determines the outcome of passivization of these forms. In fact, the *ni constraint acts much like the OCP: it bans the most harmonic form in terms of the maximal word limit. Even so, the footing constraints are still crucial in picking the winning form.

4 Typology

This section aims to identify general properties of prosodic constraints that have a bearing on maximal word restrictions. One is minimality: markedness constraints generally militate against proliferation of structure. The other is binarity: prosodic constraints often promote binary structures, as for feet (e.g., FTBIN) and often in stressed syllables.

Apart from constraints requiring binarity – discussed below – markedness constraints prefer less structure over more. For example, the constraint ALLFTL can only be satisfied if a PrWd contains a single foot. Since a PrWd size limit comes about when a prosodic constraint outranks a faithfulness constraint and prosodic constraints promote the minimum structure, size restrictions must therefore promote some prosodically minimal structure.

For example, the Māori maximal word limit requires the minimum number of feet in a PrWd. Similarly, it minimizes the number of unfooted sequences: none are allowed. Other maximal word limits support the idea that maximal word limits must promote prosodic minimality. For example, Ura – spoken in Vanuatu – allows only two- and three-mora roots (Crowley 1999: 116–17). Ura's restriction can also be seen as minimizing the number of feet in a word, but to a slightly stricter extent than in Māori. The maximal word limits that emerge in many reduplications impose an even stronger minimality requirement: root reduplicants are maximally bimoraic, minimizing both feet and stray syllables.

The minimization effect of prosodic constraint rules out many types of PrWd size restriction. For example, no maximal word limit can allow PrWds with three feet but prohibit larger ones since there is no imaginable sense in which a tri-podal PrWd is prosodically minimal or unmarked.

On the other hand, some prosodic constraints promote increased structure, though in a very restricted way. FTBIN, for example, favors bimoraic feet over monomoraic ones. Similarly, ONSET prefers a bisegmental $[CV]_\sigma$ syllable over a monosegmental $[V]_\sigma$ one.

Binarity requirements could also produce maximal word effects. For example, Ito & Mester (1992, 1994) argue that there is a size restriction on the output of Japanese loanword truncation. The condition allows binary branching PrWds, but no larger; they can contain a single foot and an unfooted syllable or two feet, but no other structure. In terms of binarity, this structure is unmarked and so can potentially be an upper bound on PrWds. Similarly, Selkirk & Tateishi (1988) have argued that Major Phrases in Japanese are maximally binary.

So, there are two general properties of prosodic constraints that can affect maximal word limits: minimality and binarity. Together, these predict that maximal word limits will place a rather strict upper bound on PrWd size. In effect, maximal word conditions will require PrWds to be prosodically minimal or maximally binary. Finally, as in Māori maximal word limits may vary in their domain of application. For example, root-faithfulness may be ranked so highly that roots are unaffected by maximal word conditions; in such a case, maximal word effects may only emerge in affixation or reduplication.

5 Conclusions

The aims of this paper were to show that maximal word limits exist and that such conditions reduce to general prosodic constraints. To that end I showed that PrWd size limits control the Māori passive suffix's realizations.

The analysis of the passive also showed that the maximal word limit is effected by several separate, violable constraints. The most important part of the analysis, though, was that the constraints make no mention of PrWd size; they are general prosodic constraints, requiring footing (LAPSE$_{FT}$, *Ft-) and foot alignment (ALLFTL). In short, maximal word limits can be subsumed under the general enterprise to reduce all size-related restrictions to general properties of CON, providing a single theory to cover reduplication, truncation, and templatic morphology.

Notes

1 . marks syllable boundaries, ( ) foot boundaries, { } PrWd boundaries, and - indicates morpheme breaks.

2 The status of [iu] and [ui] as diphthongs varies across dialects; in any case, they are rare and do not prove to be significant in the following discussion.

3 Many names are exceptions to the generalizations made above. These are either morphologically complex or onomatopoeic. For example, the name {tú:i:} 'parson bird' consists of two heavy syllables, and derives from the sound of its call. This fact is unsurprising: even English names exhibit prosodic structures not found in other words (Liberman & Prince 1977).

4 The candidate {ka(ráŋa)ta} is ruled out by constraints requiring initial stress, also responsible for initial stress in {(táŋa)ta}, *{ta(ŋáta)}.

5 My consultants were unfamiliar with a number of the forms from Williams. In those cases, I asked them to comment on the naturalness of the passive termination.

6 Blevins (1994), citing Ray Harlow, reports that some dialects have *-hia* and some *-ŋia* as the default passive form.

7 There are about 21 apparent exceptions to this claim: e.g., *kohuki~kohukia* 'impel', *tapahi~tapahia* 'stamp (foot), disobey'. However, Williams points out that most of these forms end in a fossilized suffix, *-i*. I suggest that this suffix is still recognized as distinct from the root, so *tapahi* is underlyingly /tapah-i/. In passivization, the fossilized suffix is eliminated and the passive concatenates as expected: /tapah-ia/ → {tapa}{hia}. Support for this approach comes from the gerund: /tapahi + aŋa/ appears as [tapahaŋa], not *[tapahiŋa] (cf. /hoki+aŋa/ → [hokiŋa] 'return').

8 This restriction can be analyzed as due to the emergent effect of ONSET, outranked by (i) a condition on root contiguity – ruling

out root-medial epenthesis – and (ii) PrWd–root alignment, ruling out epenthesis at the left edge of roots.

9 In fact, I found 12 [a]-final forms that take *-a* (e.g., raŋa~raŋa: 'charge', tara~tara: 'gossip'). However, all the forms are from Williams' dictionary alone, and he offers alternative forms with *-ia* or *-ina* for six of them. For the seven forms for which Ngata provided the passive, all were recorded as taking *-ia* or *-ina*, not *-a*. So, the *-a* termination for [a]-final roots is very marginal.

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Study and Research Questions

1 One of the main reasons that Hale (1973) adopted a morphological analysis (see the text below (9)) is that [-tia] shows up in passives with suspicious frequency and in diverse circumstances. How does the analysis in this chapter account for [-tia]'s special status?

2 Analyze the OCP effect (section 3.8) using the proposal in chapter 20.

3 Through ranking permutation, could languages show word-size limits that are different from Maori's? What are the predicted possibilities?

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