

Phonological Adaptation of Loanwords into M̀àd̀á: An Optimality Theory Account

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Abstract

This paper, using Optimality Theory (OT) as a framework, investigates the phonology of loanwords in M̀àd̀á, a Benue-Congo language spoken in Nasarawa state, North Central Nigeria (Williamson & Blench, 2000). Data for the study were obtained from two sources: M̀àd̀á-English dictionary and audio recordings of relevant corpus from three native speakers of M̀àd̀á. The standard OT view of loanword phonology assumes that it is the host language grammar that acts on the foreign words by selecting the right output form from a vast majority of candidates. The paper examines the strategies that M̀àd̀á adopts in the process of adapting words borrowed from other languages into it as well as the constraints hierarchy preferences. The results show that the phonological changes which foreign words undergo when borrowed into M̀àd̀á are evident in a range of phonological processes such as vowel deletion, coda simplification, cluster simplification, structure preservation, and syllable deletion. In all, it is observed that, to a large extent, the loanwords violate the syllable structure and M̀àd̀á phonotactics; but in order to preserve its structure, M̀àd̀á uses constraints that require the output material to be independent of input.

Keywords: *M̀àd̀á, loanwords, optimality Theory, constraints*

Introduction

Haspelmath (2009) defines a loanword as a word that at some point in the history of a language entered its lexicon as a result of adoption from another language that may or may not be related to the receiving language. This phenomenon is traditionally known as *borrowing*. But since borrowing has other semantic connotations like ‘taking and returning something’, other terms such as ‘transfer’ or ‘copying’ are used to refer to the same phenomenon.

In loanword phonology, loans are required to conform to the host language grammar and still remain faithful to the donor language. This is especially difficult when the structure of the host language and the donor language are very different. Loans are meant to agree with the segmental and phonotactic constraints of the host language. The interplay between the conformity to host grammar and faithfulness to the donor language results in conflicting forces. In an attempt to resolve this conflict, Kenstowicz (2005:1) observes that “a model of input-output mapping that formalizes the resolution of conflicting forces, driving the input towards specific output targets

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seems a priori better suited to model this aspect of linguistic competence than the ordered-rule framework of traditional generative phonology". This paper, therefore, uses Optimality Theory (OT) to investigate the phonology of loanwords in Mada, a Benue-Congo language spoken in Nasarawa state, North Central Nigeria (Williamson & Blench, 2000).

Mada borrowed extensively from Hausa and English, with a few loans from Shugbu and Yoruba. Mada loanwords have been documented in a Mada-English dictionary, thus providing an easily accessible wealth of material for this analysis. Additional data on loanwords were elicited from three native speakers of Mada.

The rest of the paper is organized as follows: Section Two presents the review of related literature on loanword phonology with particular attention paid to the works that use Optimality Theory in their analysis of loanwords. For a better understanding of how loanwords are adapted into Mada, Section Three sifts through Mada phonology. In Section Four, the data for this study, Mada borrowings, are presented. Section Five focuses on the analysis of the data. Section Six gives a summary of the findings, and some unresolved issues that could lead to further research.

Some Previous Studies on Loanword Phonology

There is no existing literature on Mada loanword phonology, to our knowledge. However, a large body of literature on loanword phonology in other languages exists. Haspelmath and Tadmor (2009) is a book on loanwords in different language families of the world. The closest languages discussed in the book are Hausa (Chadic) and Kanuri (Saharan) by Ari Awagana, H. Ekkehard Wolff and Doris Löhr. Burenhult's (2001) research sifts through the phonological treatment of loanwords in Jahai. The phonological changes in Jahai loanwords are organized into four categories: phonetic adaptation such as preposition of word-final nasals, nasalisation of word-initials, and palatalisation of /s/; phonemic replacement such as substitution of a final syllable /a/, and a word-final glottal stop; reorganisation of syllable structure such as closure of syllables, and reinterpretation of word-medial vowel sequences; and relocation of stress.

Golston and Yang (2001) study the loanword phonology of White Hmong using OT. The research reveals the following: exact borrowings, which they attribute to the faithfulness constraints MAX and DEP (McCarthy & Prince, 1995); structure preservation such as the replacement of the French [ʁ] and the English [ɹ] by Hmong [ɺ]; satisfaction of the constraint 'ONSET' by the insertion of the glottal stop [ʔ]; and satisfaction of NO CODA by consonant deletion. Yip (2002) looks into the nature of Cantonese loanword phonology from OT viewpoint. The paper has two sections. The first section reviews consonant adaptation, in which excess consonants are either salvaged by epenthesis or deleted. Yip adds MIMIC, a faithfulness constraint specific to loanword adaptation, to the usual OT view of loanword adaptation. MIMIC is the OT instantiation of active loanword incorporation, and enforces faithfulness to the percept (Yip, 2002:2). The second section of the paper looks at vowel adaptation, and explores the extent to which acoustic similarity determines the choice of vowels. Some of the findings include: [a:] or [e:] are found in the obligatorily long open output syllables, and before nearly all nasals. Before stops, the vowel is always short and the reflex is usually [ɪ], with one [ɛ] before the only [t]. There is also one [ɪ] before

[m]. Aziza and Utulu (2003), commenting on the phonological nature of Urhobo and Yoruba (Benue-Congo languages) loanwords from English, identify vowel lengthening as a strategy through which Yoruba adapts English words. Oyebade (2006), using OT, agrees with Aziza and Utulu, but reveals that the motivation for Yoruba's vowel lengthening in words of English provenance is Yoruba's desire to preserve the prosodic structure of the syllable(s) of such word(s) as they come from their source. Akinlabi's (2008) proposal on Yoruba loanword phonology has the following points of interest: The primary prosodic changes are onset simplification, coda simplification, and the syllabification of diphthongal glides as onsets. The strategies for these simplifications include cluster reduction, vowel epenthesis, and [h] epenthesis. In addition, codas are also deleted and diphthongs are "assimilated". Phonologically, the preference is for retaining the original place of articulation in consonants and changing the manner of articulation to conform to the Yoruba inventory. Stress is approximated to a falling tone, with the high tone on the stressed vowel and the following vowels bearing low tones. If stress does not occur on the initial syllable in the source word, all syllables before the stressed syllable may also be assigned low tones.

From this review it is very clear that OT can account for loanwords. It is, therefore, more relevant to the present study than rule-based phonology is.

Màdá Phonology: An Overview

Consonants

Màdá uses only pulmonic consonants. Unlike many Central Nigerian languages, it does not have implosives or ejectives. There are twenty-six consonants in Màdá. They include: ten plosives, three nasals, six fricatives, three affricates, one trill, and three approximants. Their places of articulation are: bilabial, labiodental, alveolar, postalveolar, palatal, velar, labiovelar, and glottal. Màdá consonant phonemes are presented in Table 1 below.

Table 1: Màdá Consonant Chart

	Bilabial	Labiodental	Alveolar	Post alveolar	Palatal	Velar	Labiovelar	Glottal
Plosive	p b		t d		c ɟ	k g	kɸ gb	
Nasal	m		n			ŋ		
Fricative		f v	s z	ʃ				h
Affricate			ts	tʃ dʒ				
Trill			r					
Lateral			l					
Approximant					j		w	

Vowels

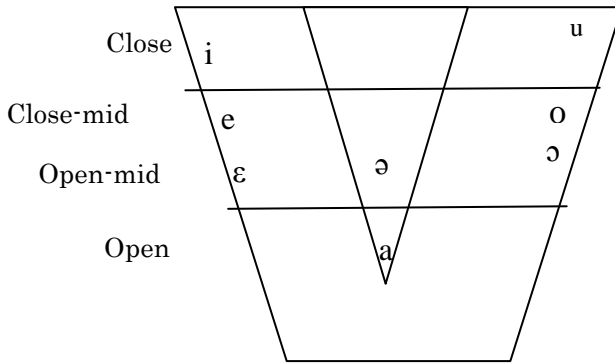


Figure 1: Mada Oral Vowel Chart

Mada vowels are distinguished by height, fronting as well as nasality. There are thirteen vowels in Mada: eight oral /i e ε u o ɔ ə a/, and five nasalized /ĩ ε̃ ũ ɔ̃ ã/ vowels.

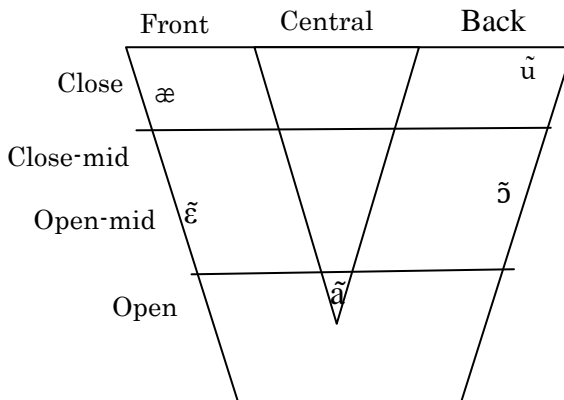


Figure 2: Mada Nasalized Vowel Chart

Tone

Mada is a register tone language because it uses tone contrastively on lexical items. It is a three-tone language with the syllable as the tone-bearing unit. Price (1989) identifies two irregular contour tones in the language, in addition to the three basic ones. Mada tones are represented below using the popular convention in the language:

		Example	Gloss
High	=	<i>l d́d́l</i>	'market'
Mid	=	unmarked	<i>l t́j́í</i>
Low	=	<i>l b w á l</i>	'to pour out'
Rising	=	<i>l f é l</i>	'to maltreat someone'
Falling	=	<i>l j é l</i>	'instead'

Instances of tonal permutations in M̀ad́á words are as shown below:

	Example	Gloss
(1)	a. <i>l d́j́á l</i> b. <i>l d́j́á l</i>	'to rebuke a younger person' 'not completely ripe'
(2)	a. <i>l k ə d è l</i> b. <i>l k ə d é l</i>	'like' 'something remaining'
(3)	a. <i>l m f á l</i> b. <i>l m f ə l</i>	'hunger' 'foam'
(4)	a. <i>l r é l</i> b. <i>l r ə l</i>	'thirst' 'front of the house'

M̀ad́á Syllable Structure

The M̀ad́á syllable structure is schematized below.

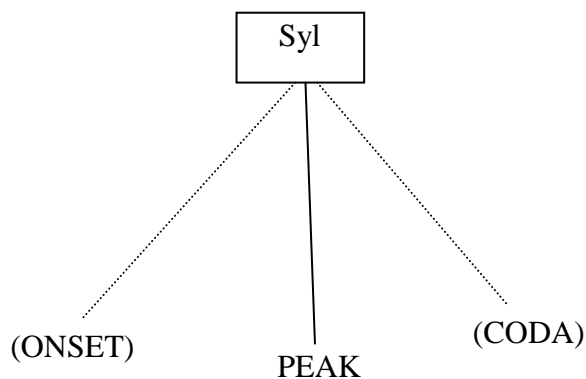


Figure 3: M̀ad́á Syllable Structure

The use of dotted lines shows that the onset (ONS) and the coda are optional, while the thick line depicts the obligatory nature of the peak in every Mada syllable. The peak is usually a vowel but it may be a syllabic nasal in some restricted environments. Basic syllable types in Mada are: V, CV, and CN.

The V Syllable Type

This syllable type is found only in word initial position in some bi/multisyllabic words. It occurs in a few monosyllabic functional words such as in prepositions, and conjunctions, as the example below indicates:

	Example	Gloss
(5) a.	[ã] <i>an</i>	'and'
b.	[ə] <i>ə</i>	'ate'
c.	[ẽ] <i>en</i>	'yes' (in response to a question)

The CV Syllable Type

This is the most common syllable type. Some examples are listed in (6) below:

	Example	Gloss
(6) a.	/tso/	'to vomit'
b.	/jɪ/	'leprosy'
c.	/gal/	'shoulder'
d.	/sel/	'transplant'
e.	/tol/	'to crow'

The CN Syllable Type

The onset of the CN syllable is one of the labio-velar plosives. The nucleus is a syllabic nasal, represented as /m/, as in in (7) below.

	Example	Gloss
(7) a.	/kpm/	'kapok tree'
b.	/gbm/	'canoe'

Borrowings in Mada: The Data

The largest body of data is from Hausa and English loans into Mada, though a few loans from Shugbu and Yoruba are also analysed in this paper. These loans come from two sources: the Mada-English dictionary and recordings from three native speakers of Mada. The loanwords are organized into six categories.

Exact Borrowings

Here, the sounds of the loanwords are the sounds that Mada and the donor language(s) share. Examples are presented in Table 2 below.

Table 2: Examples of Exact Borrowings

Màdà form	Source form	Source language	English gloss
<i>bèlèbèlè</i>	<i>bèlèbèlè</i>	Hausa	cattle egret
<i>bì</i>	<i>bì</i>	Shugbu	cobra
<i>cinci</i>	<i>cinci</i>	Hausa	fried sweet dough
<i>cundzàma</i>	<i>cundzàma</i>	Hausa	chief of people
<i>kalàba</i>	<i>kalàba</i>	Hausa	bottle
<i>kùka</i>	<i>kùka</i>	Hausa	baobab
<i>kwakwà</i>	<i>kwakwà</i>	Hausa	coconut
<i>wàndo</i>	<i>wàndo</i>	Hausa	trousers
<i>tàki</i>	<i>tàki</i>	Hausa	fertilizer
<i>lāmùka</i>	<i>lāmùka</i>	Hausa	typhoid

All the sounds in the loanwords above are found in Màdà.

Initial Vowel Deletion

Initial vowel deletion is observed in some loanwords. The initial vowels of some source words are deleted when they are adapted into Màdà. Instances of vowel deletion are given in Table 3.

Table 3: Examples of Initial Vowel Deletion

Màdà form	Source form	Source language	English gloss
<i>dǎ</i>	<i>adǎ</i>	Hausa	cutlass
<i>kàrà</i>	<i>akàrà</i>	Yoruba	bean cake
<i>kwàtì</i>	<i>akwàtì</i>	Hausa	box
<i>lèbàsa</i>	<i>alèbàsa</i>	Hausa	onion
<i>lède</i>	<i>alède</i>	Hausa	pig
<i>gogo</i>	<i>agogo</i>	Hausa	wrist watch
<i>mānuèlu</i>	<i>Imə'nuel</i>	English	Emmanuel
<i>lèsəbàto</i>	<i>Ilizə'biθ</i>	English	Elizabeth

Final Vowel Insertion or Consonant Deletion

Màdà simplifies coda either by vowel insertion or consonant deletion. The vowel insertion or consonant deletion could be seen in the words in Table 4.

Table 4: Examples of Final Vowel Insertion or Consonant Deletion

Mada' form	Source form	Source language	English gloss
<i>mānuēlu</i>	<i>Imə'nuel</i>	English	Emmanuel
<i>lēsəbato</i>	<i>Ilzə'biə</i>	English	Elizabeth
<i>sitəfonu</i>	<i>'stɛfɪn</i>	English	station
<i>bosu</i>	<i>bʌs</i>	English	bus
<i>kokusu</i>	<i>'kɔkəs</i>	English	caucus
<i>bentʃi</i>	<i>bentʃ</i>	English	bench
<i>nazareti</i>	<i>nazərəθ</i>	English	Nazareth
<i>sida</i>	<i>'sɪdər</i>	English	cedar
<i>poli</i>	<i>pə'lis</i>	English	police
<i>kaseti</i>	<i>kə'set</i>	English	cassette
<i>fonu</i>	<i>fəʊn</i>	English	phone
<i>ofisi</i>	<i>'ɒfɪs</i>	English	office
<i>otomati</i>	<i>ɔtə'mætɪk</i>	English	automatic

Cluster Break-up

In Mada', consonant clusters are salvaged by vowel insertion. Vowels are inserted in order to break up consonant clusters in loans. The clusters could be either at the onset or coda of a syllable. The examples in Table 5 illustrate this phenomenon.

Table 5: Examples of Cluster Break-up

Mada' form	Source form	Source language	English gloss
<i>kubbu</i>	<i>klʌb</i>	English	club
<i>kilasi</i>	<i>klas</i>	English	class
<i>buroʃi</i>	<i>brʌʃ</i>	English	brush
<i>sitovu</i>	<i>stəʊv</i>	English	stove
<i>digiri</i>	<i>dɪ'gri</i>	English	degree
<i>tebulu</i>	<i>'teɪbl</i>	English	table

Structure Preservation

In an attempt to preserve Mada' phonology, loanword sounds that are lacking in Mada' phoneme inventory are replaced with the ones that exist in the language. For instance, the following sounds do not exist in Mada': /au æ əʊ ɪ aɪ eɪ θ ʌ ʒ/. /au/ is represented by /ə/; /əʊ/ is represented by either /o/, /ə/, or /a/ as the case may be; /aɪ/ and /eɪ/ are represented by /e/; /ɪ/ is represented by /i/; /θ/ is represented by /t/; /ʌ/ is represented by either /ɔ/ or /o/; and /ʒ/ is represented by /dʒ/. Let us consider the examples in Table 6.

Table 6: Examples of Borrowings Involving Structure Preservation

Mada' form	Source form	Source language	English gloss
<i>dəro</i>	<i>dauro</i>	Hausa	millet
<i>məngoro</i>	<i>mæŋgəʊ</i>	English	mango
<i>mato</i>	<i>məʊtə</i>	English	motor
<i>mɪʃɔn</i>	<i>'mɪʃən</i>	English	mission
<i>se</i>	<i>saɪ</i>	Hausa	until
<i>lēsəbato</i>	<i>Ilzə'biə</i>	English	Elizabeth

Màdá form	Source form	Source language	English gloss
<i>kubbu</i>	<i>klʌb</i>	English	club
<i>dʒuelu</i>	<i>ʒoel</i>	English	Joel
<i>kilasi</i>	<i>klas</i>	English	class
<i>dʒosefu</i>	<i>ʒozef</i>	English	Joseph
<i>burofi</i>	<i>brʌʃ</i>	English	brush
<i>dʒakbu</i>	<i>ʒækɒb</i>	English	Jacob
<i>sitovu</i>	<i>stəʊv</i>	English	stove
<i>digiri</i>	<i>dɪ'gri</i>	English	degree
<i>dɒla</i>	<i>'dɒlə</i>	English	dollar
<i>tebulu</i>	<i>'teɪbl</i>	English	table

Syllable Deletion

It is observed that Màdá deletes some syllables in certain loanwords, while trying to adapt the words. This deletion could be at the Syllable Initial Position, Syllable Medial Position or Syllable Final Position. It is not clear what motivates this deletion, but it seems to follow a general economy tendency in languages. It could be likened to vowel and consonant deletions which are common features of natural languages. Syllable deletion in Màdá loanwords is evident in the words in Table 7 below.

Table 7: Examples of Borrowings Involving Syllable Deletion

Màdá form	Source form	Source language	English gloss
<i>da</i>	<i>dama</i>	Hausa	lead
<i>bà</i>	<i>tabà</i>	Hausa	to touch
<i>be</i>	<i>rube</i>	Hausa	rotten
<i>bà</i>	<i>zuba</i>	Hausa	to pour out
<i>dʒì</i>	<i>dʒì ra</i>	Hausa	to wait
<i>ladi</i>	<i>lahadi</i>	Hausa	Sunday
<i>riri</i>	<i>siriri</i>	Hausa	slender person
<i>zinari</i>	<i>zinari`ja</i>	Hausa	silver
<i>karántá</i>	<i>makarántá</i>	Hausa	school

Constraint-based Account of Màdá Loanwords: The Analysis

Optimality Theory (OT), first introduced by Prince and Smolensky (1993) and developed by McCarthy and Prince (1994), is a constraint-based phonological system that allows violable constraints in deriving output surface forms from underlying forms. OT assumes that linguistic items are restricted by a set of universal, mutually inconsistent and violable constraints from which an optimal surface output will be selected. Oyebade (1998), quoting McCarthy and Prince (1993), summarizes the basic assumptions and principles of the theory this way:

Optimality Theory assumes that the role of a grammar is to select the right output form from among a very wide range of candidates, including at least all of the outputs that would be possible in any language whatsoever.... Language-particular rules or procedures for creating representations have no role at all in the theory and

the...burden of accounting for the specific patterns of individual languages falls on the well-formedness constraints (McCarthy & Prince, 1993:4).

McCarthy and Prince (1994:336) present five basic principles of Optimality Theory; the three most important ones are:

- a. **Universality:** UG provides a set CON of constraints that are universally present in all grammars.
- b. **Violability:** Constraints are violable; but violation is minimal.
- c. **Ranking:** The constraints of CON are ranked on a language particular basis; the notion of minimal violation is defined in terms of this ranking. A grammar is a ranking of the constraint set.

McCarthy (2008) further stipulates how OT constraints should be formulated. According to him, OT provides the tools for investigating constraints which could be violated. It simply states that the constraints are of two types: markedness and faithfulness. The ranking of these constraints is language specific and ranking determines the variations seen in languages.

We adopt a constraint-based approach, Optimality Theory, because the constraints that comprise the native phonology can be used to understand how loanwords are nativized. This paper assumes the following constraints, which are relevant to the nativization processes in Mada. The constraints are arranged according their ranking in Mada loanword phonology, starting from the highest ranked to the lowest ranked. The rationale for the ranking of each constraint is explained.

1. **STRPRES (structure preservation)** (Kiparsky, 1982). Only contrastive sounds of the language are allowed. This is the highest ranked constraint because only Mada phonemes are allowed in the loanwords.
2. **Complex onset** (McCarthy, 2002). Consonant clusters are prohibited in the onset of a syllable. This constraint is highly ranked in Mada because the language never allows consonant clusters. This constraint paves the way for vowel insertion.
3. **Complex coda** (McCarthy, 2002). Consonant clusters are prohibited in the coda of a syllable. This constraint is highly ranked as well because Mada does not allow consonant clusters. This constraint also paves the way for vowel insertion.
4. **No coda** (Prince & Smolensky, 1993). Syllables end with vowels. This constraint is highly ranked in Mada because closed syllables are not found in it. Even though there are a few cases of CN syllables as shown in the discussion of 'Mada syllable structure' above, the N is syllabic, and therefore behaves like vowels.
5. **Onset** (Prince & Smolensky, 1993). Syllables begin with consonants. This constraint is high on the ranking because the CV syllable structure is the most common in Mada. However, there are some V syllables in the language, which makes the ranking of ONSET not too high.
6. **IDENT: IO** (McCarthy and Prince, 1995). The output material must be identical to that of the input. This constraint has an intermediate ranking in

Màdá because even though there are loanwords, in which the input (source form) is the same as the output (Màdá form), there are many more that are different.

7. **MAX-SYL** (McCarthy & Prince, 1995). No syllable deletion. This constraint is also at the intermediate ranking because syllable deletion may or may not occur in Màdá loanword phonology.
8. **MAX-C,-V** (McCarthy & Prince, 1995). No consonant or vowel deletion. This is similar to IDENT IO. This constraint is low on the ranking because Màdá allows consonant and vowel deletion.
9. **DEP-C,-V** (McCarthy & Prince, 1995). No consonant or vowel insertion. This constraint is the lowest on the ranking because Màdá always allows vowel insertions to break up consonant clusters.

With these constraints, the adaptation of loanwords in Màdá can be well accounted for. Let us now examine the constraints involved in the different types of borrowings using one example from each group. The relevant constraints are determined by the possible competing candidates. These constraints are ranked in line with the ranking of the constraints in Màdá loanword phonology stated above.

Exact Borrowings

e.g. *taki* from Hausa *tàki* ‘fertiliser’

Table 8: Exact Borrowings

NO CODA > >ONS >> IDENT-IO >> DEP-SYL >> DEP-SYL

	NO CODA	ONS	IDENT-IO	DEP-C, -V
<i>at.a.ki</i>	*!	*	*	*
☞ <i>ta.ki</i>				
<i>ta.kit</i>	*!		*	*
<i>a. ta.ki</i>		*!	*	*

ta.ki violates no constraint and therefore emerges as the winning candidate.

Initial Vowel Deletion

e.g. *gogo* from Hausa *agogo* ‘wrist watch’

Table 9: Initial Vowel Deletion

NO CODA >> ONS >> IDENT-IO >> DEP-C >> MAX-V

	NO CODA	ONS	IDENT-IO	DEP-C	MAX-V
<i>a. go. go</i>		*!			
<i>ga. go. go</i>			*	*!	
☞ <i>go. go</i>			*		*
<i>a. go. gog</i>	*!	*	*	*	

Although *go.go* violates the faithfulness constraints – IDENT-IO, and MAX-V, it still emerges as the optimal candidate because the contending candidate *ga.go.go* violates a higher ranked constraint DEP-C, which *go.go* does not violate. The deletion of /a/ is attributed to the presence of a constraint requiring syllables to begin with consonants. *a.go.go* violates a higher ranked constraint – ONS (ONSET).

Vowel Insertion

e.g. *sitefonu* from English *steɪfn* ‘station’

Table 10: Vowel Insertion

COMP ONS >> COMP CODA >> NO CODA >> IDENT-IO >> DEP-V

	COMP ONS	COMP CODA	NO CODA	IDENT-IO	DEP-V
<i>steɪfn</i>	*!	*	*		
<i>ste.fon</i>	*!		*	*	*
☞ <i>si.te.fo.nu</i>				*	***
<i>ste.fo.nu</i>	*!			*	**

Complex onset is a worse violation than DEP-V; therefore, *si.te.fo.nu* emerges as the optimal candidate, even though it violates DEP-V thrice.

Coda Deletion

e.g. *otomati* from English *ɔtəmætɪk* ‘automatic’

Table 11: Coda Deletion

STRPRES >>NO CODA >> IDENT-IO >> MAX-C

	STRPRES	NO CODA	IDENT-IO	MAX-C
<i>ɔ.tə.mæ.tɪk</i>	**!	*		
<i>ɔ.tə.mæ.tɪ</i>	**!		*	*
☞ <i>o.to.ma.ti</i>			*	*
<i>o.to.ma.tɪk</i>		*!	*	

The relevant higher ranked constraints, namely STRPRES, and NO CODA, are violated by the other three candidates. This strikes out the other candidates and *o.to.ma.ti* emerges as the winning candidate.

Cluster Break-up at the Onset

e.g. *burofi* from English *brʌʃ* ‘brush’

Table 12: Cluster Break-up at the Onset

STRPRES >> COMP ONS >> NO CODA >> IDENT: IO >> DEP-V

	STRPRES	COMP ONS	NO CODA	IDENT-IO	DEP-V
<i>brʌʃ</i>	*!	*	*		
☞ <i>bu.ro.fi</i>				*	**
<i>bu.rof</i>			*!	*	*
<i>bro.f</i>		*!	*	*	

burofi, the winning candidate, satisfies the highly ranked constraints – STRPRES, COMP ONs, and NO CODA. This results in its selection as the optimal candidate.

Cluster Break-up at the Coda

e.g. *tebulu* from English *teIbl* ‘table’

Table 13: Cluster Break-up at the Coda

STRPRES >> COMP CODA >> NO CODA >> IDENT: IO >> DEP-V

	STRPRES	COMP CODA	NO CODA	IDENT-IO	DEP-V
<i>teI.bl</i>	*!	*	*		
<i>te.bl</i>		*!	*	*	
☞ <i>te.bu.lu</i>				*	**
<i>te.bul</i>		*!	*	*	*

te.bu.lu is the right output candidate.

Structure Preservation

e.g. *dʒuelu* from English *dʒoel* ‘personal name’

Table 14: Structure Preservation

STRPRES >> NO CODA >> ONSET >> IDENT-IO >> DEP-V

	STRPRES	NO CODA	ONSET	IDENT-IO	DEP-V
<i>dʒoel</i>	*!	*			
<i>dʒo.el</i>	*!	*	*		
☞ <i>dʒu.e.lu</i>			*	*	*
<i>dʒu.el</i>		*!		*	

STRPRES and NO CODA are higher ranked constraints in Mada. Therefore, their violations by the three other candidates make *dʒu.e.lu* the optimal candidate.

Summary of Findings and Directions for Future Research

Summary

This paper has shown that Mada has borrowed extensively from Hausa and English. In the process of nativizing the loanwords, different phonological processes such as deletion and cluster break-up by insertion or deletion are involved. The paper has used the OT universal constraints to account for these various nativisation processes. The ranking of the constraints, which is language specific, is done according to the natural phonology of Mada. The constraints that are ranked highest are the ones that apply to Mada phonology, while those that are ranked lowest are the ones that do not apply to Mada phonology. Based on the Mada ranking of the constraints, the nativisation processes such as exact borrowings, initial vowel deletion, vowel insertion, coda deletion, cluster break-up at the onset, cluster break-up at the coda and structure preservation are well accounted for.

Unresolved Issues

There are certain areas in Mada' loanwords which this study cannot claim to have given adequate account of. For instance, voicing deletion is observed in the word *kanga*, which is borrowed from Hausa *ganga* 'barrel-drum'. This adaptation violates the faithfulness constraint – MAX VOI. Similarly, the word *boki*, which is borrowed from English *pocket*, violates another faithfulness constraint – DEP-VOI by adopting the voiced counterpart of the voiceless bilabial plosive /p/. However, these words and others have not been dealt with in this study. Instead, they have been left for future research. Secondly, there are instances of segment substitution as shown in Table 15.

Table 15: Some Instances of Segment Substitution

Substitute s	Mada' form	Source form	Donor language	English gloss
dʒ < z	<i>dʒəgulu</i>	<i>zagal</i>	Hausa	horse reddish tree
l < r	<i>ləga</i>	<i>riga</i>	Hausa	shirt
	<i>ləgu</i>	<i>rogo</i>	Hausa	cassava
p < f	<i>pələpəlu</i>	<i>filafili</i>	Hausa	oar

Similar instances of segment substitution mentioned above were pointed out in Golston and Yang (2001), but theirs was a case of lack of those segments in White Hmong's phonology. Mada's case is quite different because these substituted segments (z, r, f) exist in Mada'. It is therefore not clear why these segments should be substituted in Mada'.

Thirdly, the assignment of tone to Mada' loans from English pays no attention to the location of the stressed syllable in the English words. Tone loans from tone languages (Shugbu, Hausa, and Yoruba) were retained. It is hoped that models of tonogenesis will help to account for the tones found in loanwords.

Fourthly, OT constraints have no way of accounting for syllable deletion in Mada' loanwords. The deletion can be word initial, as in: *rube* (Hausa) *be* (Mada'), word medial, as in: *lahadi* (Hausa) *ladi* (Mada') or word final, as in: *dama* (Hausa) *da* (Mada'). The source forms violate no constraint in Mada' loanword phonology, yet syllable deletion occurs. It is not clear why syllables are deleted in such forms.

This study aligns with Golston and Yang's (2001:26-27) assertion that "[w]e are left with the impression that loanword phonology still poses formidable challenges to models of grammar. Although constraint-based analyses do substantially better at modeling loanword phonology in some areas (syllables and segments), they fail to provide much insight in others (such as tones)." However, this study whets an appetite for future research.

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