Labial Dissimilation in Shona

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Abstract

This paper examines labial dissimilation in Shona, a Bantu language spoken in Zimbabwe. Labial consonants cannot appear next to each other. The repair strategies of the labial sequence depend on what consonants follow each other. This paper presents labial dissimilation patterns using passive form derivation. The analysis will be presented in a constraint-based theory, namely Optimality Theory (OT).

1 Introduction

This paper examines labial dissimilation in Shona, in which labial consonants cannot appear next to each other. There are four repair strategies for avoiding the labial sequence depending on the adjacent consonants. This paper analyzes how labial dissimilation happens focusing on the derivation of the passive form of verbs.

The examples in (1) and (2) demonstrate how passives are formed. The "Active" column indicates the active forms of the verbs and "Passive" column indicates the passive forms, and "English" column shows the translated meanings in English. As shown in (1), the passive morpheme *w* is affixed to a verb stem with non-labial consonant.

(1) Shona passives with non-labial finals in verb roots

	Active	Passive	English
a.	enda	endwa	'be got going'
b.	tangisa	taŋgiskʷa	'be repeated'

As the passive form in (1a) show, the passive morpheme is *w* and is infixed between the verb stem and the final vowel *a*.

(2) Shona passives with labial finals in verb roots

	Active	Passive	English
a.	tapa	tapɣa	'be captured'
b.	nuwa	n̪uwiwa	'be stinked'

In (2), the passive morpheme *w* is affixed to a verb stem with a labial consonant, and then, labial dissimilation occurs. In (2a), the passive morpheme *w* would be affixed right after [p], a sound which has a labial feature. As Shona does not allow labial sounds appearing in a row, this /pw/ sequence is avoided by dissimilating the sounds. /pw/ is realized as [pɣ] when the voiced labio-velar approximant /w/ appears as a voiced velar fricative [ɣ]. Shona shows other various ways of avoiding the sequence depending on the adjacent consonants.

The next section introduces previous studies. Section 3 introduces more data, and Section 4 presents a detailed analysis. Some remaining points are discussed in Section 5.

2 Background Information

2.1 *Labial Dissimilation in Xitsonga* Lee and Burheni (2014) present the labial dissimilation using both a rule-based analysis and a constraint-based analysis. Xitsonga, a Bantu language spoken in South Africa, also has labial dissimilation as Shona. Lee and Burheni (2014) examine phonological processes in Xitsonga diminutives. In Xitsonga, diminutives are derived by circumfixing ʃi(ʂi)-ana to the root nouns as follows.

(3) The circumfix template for the Xitsonga diminutive:
xi-ROOT.NOUN-ana [ʃi-] 'CL7-a small ROOT NOUN' (singular or count nouns)
swi-ROOT.NOUN-ana [ʂi-] 'CL8-small ROOT NOUN(s)' (plurals or mass nouns)

After this affixation, when the root has a vowel, a vowel sequence would appear. Since Xitsonga does not allow vowel hiatus, root final vowels are deleted or alternated to labial glide [w] depending on the roundedness. If the root final vowel were a rounded vowel (i.e., [o], or [u]), glide formation occurs, and if the root final consonant has a labial feature, a labial sequence appears. Xitsonga does not allow labial sequences, and therefore, labial dissimilation occurs by velarizing the labial nasal [m] or deleting vowels after the labial continuants [f], [pf], [bv] or [w].

2.2 *Labial Dissimilation in Zulu* Labial dissimilation is also observed in Zulu, a Bantu language spoken in South Africa. The passive affix in Zulu is /w/, and labial dissimilation occurs when this passive morpheme is infixed to the adjacent position to a labial consonant, as in Shona. The labial dissimilation is realized as palatalization as shown in (4).

(4) Labial dissimilation in Zulu
a. /t'ap'-w-a/ → [t'atʃ-wa] (/p'/ → [tʃ']; Khumalo 1987)
'collect (pass.)'
b. /elapʰ-w-a/ → [elaʃ-wa] (/pʰ/ → [ʃ]; Khumalo 1987)
'treat medically (pass.)'
c. /ᵐp'aᵐp'-w-a/ → [ᵐp'aⁿtʃ'-wa] (/ᵐp'/ → [ⁿtʃ']; Doke 1927)
'flutter (pass.)'
d. /lum-w-a/ → [luɲ-wa] (/m/ → [ɲ]; Doke 1927)
'bite (pass.)'
e. /ɬaɓ-w-a/ → [ɬatʃ'-wa] (/ɓ/ → [tʃ']; Doke 1927)
'stab (pass.)'
f. /gub-w-a/ → [gudʒ-wa] (/b/ → [dʒ]; Khumalo 1987)
'dig (pass.)'
g. /kʰoᵐb-w-a/ → [kʰoⁿdʒ-wa] (/ᵐb/ → [ⁿdʒ]; Khumalo 1987)
'point (pass.)'

As previous studies demonstrate, Bantu languages seems to have labial dissimilation. This paper will analyze the labial dissimilation in Shona using the constraint-based analysis.

3 Shona Data

3.1 *Description of Data* The data below are examples of Shona verbs. The examples are elicited from a native speaker of Manyika Shona[4].

For the verbs in (5), labial sequences are not observed; therefore, labial dissimilation cannot be observed. (5a) and (5b) have alveolar consonants in the penult position of the infinitive form, and (5c~e) have velar consonants in the infinitive form.

(5) Shona passives with a non-labial final

	Active	Passive	English
a.	enda	endwa	'be got going'
b.	tangisa	taŋgiskʷa	'be repeated'
c.	pɣaŋa	pɣaŋwa	'be destroy'
d.	tʃeka	tʃekʷa	'be cut'
e.	feka	fekʷa	'be wore'

Verbs in (6) show various ways of labial dissimilation. There are four different repairing strategies.[5]

[4] One of the dialects in Shona.
[5] The absence of /ɓ w/ and /pʰ w/ in the data set might be an accidental gap.

(6) Shona passives with labial finals

	Active	Passive	English
velarization			
a.	ripa	ripɣa	‘be payed a fine’
b.	tapa	tapɣa	‘be captured’
c.	dzipa	dzipɣa	‘be choked’
d.	fa^{m}ba	fa^{m}bɣa	‘be walked’
e.	ta^{m}ba	ta^{m}bɣa	‘be played’
w-deletion			
f.	ʐi^{m}ba	ʐi^{m}ba	‘be swelled’
g.	g^{w}a^{m}ba	g^{w}a^{m}ba	‘be frozen’
velarization + click formation			
h.	guma	guŋʘa	‘be finished’
i.	sima	siŋʘa	‘be planted’
j.	bvuma	bvuŋʘa	‘be agreed’
i-insertion			
k.	pfuwa	pfu(w)iwa	‘be kept stock’
l.	ʂowa	ʂowiwa	‘be glided off unseen’
m.	nuwa	n̪uwiwa	‘be stinked’
n.	bvuma	bvumiwa	‘be accepted’

In (6a~e), since the consonants in the penult position of the infinitive forms are labial sounds, a bilabial sequence would appear when the passive morpheme *w* is infixed. To avoid this labial sequence, a labial approximant [w] is changed to a voiced velar fricative [ɣ]. For example, (6b) *tapa* ‘capture’ becomes *tapɣa* ‘be captured’, and (6e) *ta^{m}ba* is realized as *ta^{m}bɣa* in the passive form.

(6f) and (6g) demonstrate another type of labial dissimilation. As an example, (6g) *g^{w}a^{m}ba* ‘be frozen’, which is the passive form of *g^{w}a^{m}ba* ‘freeze’ takes the same form as the infinitive. This dissimilation is explained by the deletion of the passive morpheme *w* after its insertion.

For (6h~j), the consonant in the penult position in the infinitive form is [m], and thus, the labial sequence /mw/ appears when the passive morpheme *w* is inserted between the verb stem and the word-final vowel. Since Shona disallows the labial sequence, /mw/ becomes [ŋʘ] in the passive forms. For example, (6h) *guma* ‘finish’ becomes *guŋʘa* ‘be finished’. In this case, Shona avoids having /mw/ sequence by changing both labials into /ŋ/ and a bilabial click.

In the examples (6k~n), the labial dissimilation is realized as i-insertion. Since these words already contain a labial approximant [w], /ww/ sequence would emerge when the passive verb is formed. To avoid having the sequence, a syllable which consists of a vowel [i] is inserted between the labial sequence. For instance, (6k) *pfuwa* ‘keep stock’ is realized as *pfuwiwa* (or *pfuiwa*) ‘be kept stock’. (6k) also indicates that the deletion of the verb root consonant [w] seems to be optional. At the same time, however, (6n) shows the same pattern even though the labial sequence is /mw/. This paper deals this pattern as an exception.

To summarize these observations, there are four repair strategies when labial sequences (/pw/, /^{m}bw/, /mw/, and /ww/) are formed, as in (7).

(7) Phonological process for dissimilating labial sequence
- a. Velarization
- b. /w/-deletion
- c. Bilabial click formation
- d. /i/-Insertion

In (7), velarization, bilabial click formation, and /i/-insertion are respectively applied to /pw/, /mw/, and /ww/ sequences. /^{m}bw/ sequence accepts velarization and glide deletion. The table (8) shows representative examples for each pattern.

(8)

Sequence	Active	Passive	English	Process
/pw/	tapa	tapɣa	'be captured'	Velarization
/mw/	guma	guŋƟa	'be finished'	Bilabial click formation
/ww/	nuwa	n̪uwiwa	'be stinked'	/i/-Insertion
/ᵐbw/	taᵐba	taᵐbɣa	'be played'	Velarization
/ᵐbw/	gʷaᵐba	gʷaᵐba	'be frozen'	Glide deletion

3.2 *Proposal* This paper proposes that sonority plays an important role in the repair strategies when dissimilation occurs. The place in the sonority hierarchy among sounds at issue is as follows.

(9) a. Vowels > Glides > Nasals > Fricatives > Stops
b. /i/ /w/ /ɣ/ /ᵐb / /p/
(Since /ᵐb / is a pre-nasalized sound, it might have higher sonority than that of /p/.)

Shona tries to avoid having sounds with similar sonority next to each other. For example, /mw/ or /ww/ sequence does not become /mɣ/ or /wɣ/ because these sequences have closer sonority than /pɣ/ or /ᵐbɣ/. At the same time, however, /ᵐbw/ sequence has two types of dissimilation.

4 Analysis

This section analyzes the data in the framework of Optimality Theory (OT; Prince and Smolensky 1993/2004). In Optimality Theory, the avoidance of labial sequence is hypothesized by setting a ranking between faithfulness constraints (10) and markedness constraints (11).

(10) Faithfulness constraints
a. MAX: Assign a violation mark when the input does not have a correspondent in the output.
b. DEP: Assign a violation mark when corresponding segments in the input and the output do not have identical values.
c. IDENT(LAB): Assign a violation mark when corresponding segments in the input and output do not have identical values for [labial] features.

(11) Markedness constraints
a. OCP-LABIAL[6]: Assign a violation mark to labials that are adjacent.
b. OCP-SONORITY: Assign a violation mark to adjacent segments that have the same sonority.
c. C1·PERIPHERY: Assign a violation mark to a consonant pair in heterosyllabic consonant cluster where one of the consonants in the cluster belongs to non-peripheric consonants.

In (6d~e), /w/ is deleted in the /ᵐbw/ sequence, and in (6k~n), /i/ is inserted for avoiding /ww/ sequence, and thus, the constraints MAX and DEP seem to be lower constraints in Shona. Since labial features can be changed between the underlying and surface representations when dissimilating /pw/, IDENT(LAB) is assumed to be in the same constraint ranking as MAX and DEP. Bilabial sequences are dissimilated in all examples in (6), and passive forms do not have [+coronal] sounds, which are dental, alveolar, or palatal sounds. From this observation, OCP-LABIAL and C1·PERIPHERY are higher constraints in Shona. Some surface representatives violate OCP-SONORITY, but this constraint is not assumed to be lower ranked since (6e) /gʷaᵐb-w-a/ does not surface as [gʷaᵐbɣa] but as [gʷaᵐba]. Based on this observation, the constraints ranking is as follows.

(12) OCP-LABIAL, C1·PERIPHERY >> OCP-SONORITY >> MAX, DEP, IDENT(LAB)

The rest of this section evaluates the constraints ranking by using examples.

[6] The Obligatory Contour Principle (OCP) prohibits two identical features from being in the adjacent position in the surface form.

4.1 *Velarization (/pw/ and /bw/ sequence)* (13) shows the constraint ranking using /tap-w-a/ example. Since [w] is changed to [ɣ] and there is no [+sonorant] sequence, rankings of IDENT(LAB) and OCP-SONORITY are lower than OCP-LABIAL and C1·PERIPHERY.

(13) OCP-LABIAL, C1·PERIPHERY >> OCP-SONORITY >> MAX, DEP, IDENT(LAB)

/tap-w-a/	OCP-LABIAL	C1·PERIPHERY	OCP-SONORITY	MAX	DEP	IDENT(LAB)
→ a.[tapɣa]						*
→b. [tapa]				*		
c. [tapwa]	*!					
→d. [tapiwa]					*	
e. [tapza]		*!				*

The situation for /ᵐbw / sequence is similar with /pw/ sequence since they both change [w] into [ɣ]. The constraints ranking for this pattern is as shown in (14).

(14)

/ taᵐb-w-a/	OCP-LABIAL	C1·PERIPHERY	OCP-SONORITY	MAX	DEP	IDENT(LAB)
→a.[taᵐbɣa]						*
→b. [taᵐba]				*		
c. [taᵐbwa]	*!					
→d. [taᵐbiwa]					*	
e. [taᵐza]		*!		*		*

4.2 */w/-deletion (/ᵐbw/ sequence)* For this dissimilation pattern, /w/ is deleted, and thus, MAX is placed as a lower constraint. In this situation, OCP-SONORITY is a higher constraint than MAX since [gʷaᵐbɣa] could be a winner without the constraint. (15) would be as follows.

(15)

/gʷaᵐb-w-a/	OCP-LABIAL	C1·PERIPHERY	OCP-SONORITY	MAX	DEP	IDENT(LAB)
→a. [gʷaᵐba]				*		
b. [gʷaᵐbwa]	*!					
→c. [gʷaᵐbiwa]					*	
→d. [gʷaᵐbɣa]						*
e. [gʷaᵐbza]		*!			*	*

4.3 *Bilabial Click Formation (/mw/ sequence)* Since [labial] features are changed into [velar] and a bilabial click [ʘ], (16) indicates the constraint ranking as follows.

(16)

/gum-w-a/	OCP-LABIAL	C1·PERIPHERY	OCP-SONORITY	MAX	DEP	IDENT(LAB)
→a. [guŋʘa]						*
b. [gumwa]	*!					
→c. [gumiwa]					*	
→d. [gumɣa]						*
e. [gumza]		*!				*

At the same time, however, it is still unclear if the bilabial click [ʘ] is produced as an alternative for the glide.

Moreover, this pattern seems to be an exception since the root final consonant is repaired, in contrast to all other patterns which repair the passive morpheme /w/.

4.4 */i/-Insertion (/ww/ sequence)* Since a vowel insertion is occurring for dissimilating /ww/ sequence, DEP must be ranked as a lower constraint. In this case, /w/ does not change into the velar fricative [ɣ] or the bilabial click [ʘ]. (17) provides the evaluation on the ranking.

(17)

/pfuw-w-a/	OCP-LABIAL	C1·PERIPHERY	OCP-SONORITY	MAX	DEP	IDENT(LAB)
→a. [pfuwiwa]					*	
b. [pfuwwa]	*!		*			
→c. [pfuwɣa]						*
d. [pfuwza]		*!				*

As tableaux in this section indicate, there are several winners for each. Since these winners represent possible repair strategies, this constraint ranking may not explain why one strategy occurs for a certain labial sequence.

5 Discussion

5.1 *Two Variations for Dissimilating /ᵐbw/ Sequence* Shona dissimilates /ᵐbw/ sequence in two ways. One way is deleting the glide, and another way is velarizing the glide. This pattern might happen because of the uniqueness of the /ᵐb / sound. Since the sound has both nasal and stop features, it could depend on which feature the speaker focuses more than another.

5.2 *Two Passive Forms From One Verb Stem* One of the interesting findings in this paper comes from the comparison between the two examples in (18) (reproduced from (6)).

(18) Intra-word variation in labial dissimilation

	Active	Passive	English
a.	bvuma	bvuŋʘa	'be agreed'
b.	bvuma	bvumiwa	'be accepted'

As shown in (18a) and (18b), even though the stems take the same form, passive forms of these verbs are different. The segment of the verb stems are exactly same, but the meanings of the words are different. Thus, the repair strategies may vary based on the lexical meaning of the root.

In Japanese, different pitch sometimes distinguishes the meanings of two words. For example, [kɽɯ́](LH) 'wear' and [kíɽɯ̀](HL) 'cut'. However, with (18), [bvuma](LH) 'agree' and [bvuma](LH) 'accept' have the same tone for both meanings.

5.3 *Labial Dissimilation in Nouns: Phonotactic Restrictions* The previous parts of this paper discussed labial dissimilation in verbs where the passive morpheme *w* is infixed. However, labial dissimilation can be observed in nouns as listed in (19).

(19)

	Shona Spelling	Pronunciation	English
a.	bwanana	[bɣanana]	'puppy'
b.	imbwa	[imbɣa]	'dog'
c.	pwere	[pɣere]	'infant'
d.	pweza	[pɣeza]	'devil octopus, fish'
e.	kamwana	[kaŋʘana]	'small child'
f.	kamwena	[kaŋʘena]	'small hole'

In (19), it can be predicted that /bw/, /pw/, and /mw/ sequences respectively become [bɣ], [pɣ], and [ŋʘ]. The possible criticism for (19) is that there is merely a difference between the spelling and the pronunciation. For example, the underlying form of [bɣanana] is not /bwanana/ but /bɣanana/ itself. However, based on the observation in Section 4, this paper shows that there is a labio-velar glide in the underlying form because the *w* is the passive morpheme in Shona. Since the same dissimilation patterns can be observed, underlying forms are also assumed to include /w/. Moreover, the speaker produced [w] when speech rate was slow. As a result,

this subsection concludes that labial dissimilation can be observed not only in verbs but also in nouns.

Since /bw/, /pw/, and /mw/ sequences do not occur, it is possible to assume that Shona has phonotactic restrictions on these sound sequences.

5.4 *Phonotactic Allowance of Labial Sequence* Based on the data, labial sequences allowed to occur in the root beginnings are as shown in (20).

(20)

	Active	Passive	English
a.	**bv**uma	**bv**uŋΘa	'be agreed'
b.	**pf**uwa	**pf**u(w)iwa	'be kept stock'
c.	**bv**uma	**bv**umiwa	'be accepted'

It can be pointed out that all of the bolded sounds in example (20) are labial affricates, and the second sounds are not [w]. Based on the observation, the dissimilation occurs only when the labial sequence straddles the edge of the root and the passive morpheme. The reason for this can be ascribed to the positional faithfulness constraint. This constraint prevents dissimilation from applying to the root-initial, but does not prevent from applying to the labials in other positions of the root (Bennett 2015).

6 Conclusion

Labial sequences are dissimilated in Shona. Dissimilation strategies and processes vary among those labial sequences. Sonority also plays an important role in dissimilating the sounds. When the [+sonorant] consonant is in the penult position of the verb stem, the passive morpheme /w/ cannot be converted to nasals since nasals are [+sonorant]. Although this study unexpectedly reports one unique dissimilation pattern with a bilabial click, it is subject to a future study as to explain why this sound is produced. This paper started to examine this phenomenon with verbs, however, the same phenomena could also be observed in nouns.

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