

NASAL INFLUENCE IN SESOTHO
PHONOLOGY

BY

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CHAPTER 1

INTRODUCTION

1.0 Background Information

Sesotho sound system consists of four nasals which are [n], [m], [ɲ] and [ŋ]. Some of these nasal phonemes are used as part of prefixal or concordial morphemes. There are qualificative concords, such as adjectival concords, that comprise nasals. This can be seen with the adjectival concords below:

1.(a) *Lineo o rekile masale a maholo.*

1-Lineo 1-AGR-buy-PERF 6- earrings 6-AC- big¹

‘Lineo has bought big earrings.’

(b) *Ntja e lelekisa katse e ntšo.*

9-Dog 9-AGR-chase 9-cat 9-AC- black

‘A dog chases a black cat.’

In the above examples, *a ma* and *e n* are adjectival concords. [n] and [m] which are nasals, are parts of these concords.

In the example in (2a) below the objectival concord of the first person singular comprises the phoneme [n] while the phoneme [m] is part of the third person singular in class 1.

2.(a) *Thato oa nthata.*

1-Thato 1-AGR OC² -love

‘Thato loves me.’

(b) *Thato oa mo rata.*

1-Thato 1-AGR OC-love
 ‘Thato loves her.’

In (2a) and (2b) above, [n] and [mʔ] are objectival concords.

1.1 The Statement of the Problem

It is observed that the prefixation of nasal sound [n], which is the objectival concord before fricative sounds, causes these sounds to change to plosives as demonstrated in (3a). However, the nasal sound [n], which is part of the adjectival concord, causes labio-dental sounds to change to fricative velar sounds as illustrated in (3b) below:

| | |
|--|-----------|
| | — |
| OC + ‘find’ | ‘find me’ |
| (b) f x as in tse n + [fubedu] [tse nfubedu] [tse xubedu](tse khubelu) | |
| AC + ‘red’ | ‘red’ |

In (3a), when the objectival concord is prefixed to the verb [fumana] ‘find’, the initial consonant of this verb [f] changes to [p^h]. Similarly, the prefixation of the adjectival concord causes phonetic changes to occur to the initial consonant of the adjectival stem [fubedu]. However, the initial consonant of the adjective [fubedu] ‘red’ becomes [x] before the adjectival concord.

The prefixation of the nasal sound [n], which is the objectival concord of the first person singular to verbs, triggers the same assimilation and dissimilation processes that occur when the reflexive [i] is attached to verbs. The phonetic changes affect

[hɔpɔla] - [ixɔpɔla] (ikhopola) (REFL)
 ‘remember’ ‘remember oneself’

In the above examples, these sounds [f, d, l, r, ɔɜ, h] become [p^h, t, t, t^h, tʃ, x], respectively, when the objectival concord [n] of the first person singular and the reflexive [i] are attached to the verbs mentioned above in (4).

Apart from the changes that affect the initial consonants of adjectival stems and verbs to which the nasal sound [n] is attached, there is also homorganic nasal assimilation. The nasal sound [n] is realized as [m] before labials. It surfaces as [ɲ] before palatals. In addition, it changes to [ŋ] when it is attached to verbs beginning with velar sounds. The examples are provided below:

- 5.(a) [n] [m] n + [p^hɛhɛla] [np^hɛhɛla] [mp^hɛhɛla] (mphehela)
 OC + ‘cook for’ ‘cook for me’
 Tse n + [be] [tse npe] [tse mpe] (tse mpe)
 AC + ‘bad’ ‘bad’
- (b) [n] [ɲ] n + [ɲala] [nɲala] [ɲɲala] (’nyala)
 OC + ‘marry’ ‘marry me’
 Tse n + [tʃ^ha] [tse ntʃ^ha] [tse ɲtʃ^ha] (tse ncha)
 AC + ‘new’ ‘new’
- (c) [n] [ŋ] n + [ŋɔlla] [nŋɔlla] [ŋŋɔlla] (’ngolla)
 OC + ‘write for’ ‘write for me’

In examples in (5) above, [n] assimilates to the phonetic features of the sounds it precedes.

In (7) above, when the nominal prefix in class 1 and the objectival concord [mɿ] are attached to the stem [busa] ‘govern’, a vowel [ɿ] is deleted. The sound [b] totally assimilates into [m] and becomes syllabic. However, when the adjectival concord of the third person singular in class 1 [e mɿ] and the nominal prefix [mɿ] is attached to the stems *-be* and *-bu*, respectively, the vowel [ɿ] is not deleted as illustrated in (8) below:

8. (a) e mɿ + be e mɿbe not *⁴e mme (e ‘me)
 AC + ‘ugly’ ‘ugly’
- (b) mɿ + bu mɿbu not * mmu (‘mu)
 PREF + stem ‘soil’

In (8a-b) above, when the adjectival concord is attached to *-be* ‘ugly’, *-be* ‘ugly’ does not become [e mme] (e ‘me) as would be expected.

1.2 The Aim of the Study

The aim of this study is to investigate reasons that make the nasals behave differently in the same phonetic environments. This study further investigates the changes that are triggered by the prefixation of the reflexive. In order to achieve this aim, the following research questions are addressed:

- 9.(a) Why are labio-dental sound changes caused by the nasal sound [n] which is prefixed to verbs different from those that are caused by the nasal sound [n] which is attached to adjectival stems?
- (b) What makes the reflexive [i] cause the same phonetic changes as the nasal sound [n]?

(c) How do nasal sounds influence other affixes?

1.3 Hypotheses

10.(a) Labio-dental sound changes such as [f] → [p^h] that are caused by the prefixation of the nasal sound [n] to verbs are different from the ones such as [f] → [x] that are caused by the nasal sound [n] which is prefixed to adjectival stems because the former results in assimilation and dissimilation processes. The changes that occur when the phoneme [n] is attached to the adjectival stems are not all assimilatory in nature. Some of these changes are result of sound-shifting.

(b) With regard to the phonetic changes that occur when the reflexive is attached to verbs, it is hypothesized that the underlying representation for Sesotho reflexive is [in]. When the reflexive is attached to verbs, the nasal sound is deleted. It is the influence of this nasal that makes the changes that occur to the initial consonants of verbs.

(c) Verbs whose stem-final consonants are [n] and [m] influence the perfect tense suffix *-ile*. The vowel [i] is deleted and [l] completely assimilates features of the preceding nasals. The same process also takes place when the objectival concord of the third person in class 1 and the nominal prefix [m^h] of class 1 and 3 are attached to verbs whose initial consonants are [b]. The vowel [h] is deleted and [b] completely assimilates features of the preceding nasal. But, the same processes do not occur when the adjectival concord [e m^h] and the nominal prefix [m^h] are attached to adjectival stem *-be* 'ugly' and the nominal stem *-bu* 'soil' respectively because these stems *-be* 'ugly' and *-bu* 'soil' are monosyllabic.

1.4 Theoretical Framework

This study has employed generative phonology and distinctive feature. Generative phonology was proposed by Chomsky and Halle in 1968. According to Schane (1973), generative phonology theory focuses on the sound structure of language. This theory has been part of the theory of transformational generative grammar. In addition, Goldsmith and Laks (2000) state that the goal of generative phonology is to develop an explicit rule, given a set of observations from a language, and to determine which of a set of analyses is the best.

This theory has the following components: distinctive features, phonological rules and phonological representations. Phonological rules include feature changing rules in which sounds change features in certain phonetic environments. Rules for deletion allow sounds to be deleted while in insertion, sounds are inserted. Coalescence rules combine two or more segments into one segment. In this study, all the rules mentioned above have been used when accounting for the change of features of certain sounds in different phonetic environments. With regard to the phonological representations, there are two levels. One of these levels is the underlying representation and the second level is surface (derived) representation. Surface representations are formed out of the underlying representation. The generative phonology therefore facilitated in exploring abstract representations of some morphemes in this study.

The distinctive feature theory was proposed by Trubertzkoy (1939). It was developed by Jakobson and Halle (1951). In addition, it was adopted by Chomsky and Halle in 1968 in generative phonology and they further developed it because Jakobson and Halle's approach set up features defined in acoustic terms. Chomsky and Halle's approach defined features in articulatory terms. The distinctive feature

theory distinguishes sounds from one another using features and the binary system. According to Uffmann (2003), binary means that features can have two different values which are plus [+] or minus [-], meaning that the feature in question is present or absent.

Another function of this theory is to specify and group features to allow for the identification of the major classes of sounds or natural classes as indicated by Tatham (1999). The members of a natural class show similar behaviour in identical phonetic environments in that the same phonological rules apply to these natural classes. The use of this theory assisted in explaining assimilation processes in this study.

According to Chomsky and Halle (1968), Hyman (1975), Katamba (1989), Durand (1990) and Zonneveld (2001), features are divided into categories. They are grouped into major class features, cavity features which include primary and tongue-body features, lip-attitude, length of stricture, secondary apertures, manner of articulation features, source features, airstream mechanisms and prosodic features. On the other hand, Kenstowicz (1994), Uffmann (2003) and Hall (2007) include laryngeal and place features. The following features are defined and described as employed in the studies of Chomsky and Halle (1968), Hyman (1975), Katamba (1989), Kenstowicz (1994), Spencer (1996), Uffmann (2003), Jensen (2004) and Hall (2007) (Employing the groups of features mentioned above, we describe only features that have been used in this study):

Major Class features:

Consonantal:

Consonantal sounds are produced with a radical obstruction in the vocal tract.

Sonorant:

Sonorant sounds are produced in a manner that there is relatively free airflow which makes spontaneous voicing possible.

Manner Features:

Nasal:

In the production of nasal sounds, the velum is lowered to allow airstream to pass through the nose.

Lateral:

Lateral sounds are produced with the obstruction at the centre of the mouth which makes airstream to flow through the sides of the tongue.

Continuant:

Continuant sounds are articulated in such a way that air can pass continuously through the vocal tract.

Strident:

Sounds which are strident are noisy and are produced by directing the airstream in a complex path.

Delayed release:

The sounds which possess this feature are produced with turbulence in the vocal tract.

Approximant:

Approximant sounds are produced with an obstruction in the vocal tract which allows air to escape without causing friction.

Syllabic:

Syllabic sounds form a syllabic peak.

Laryngeal Features:

Spread glottis:

During the production of these sounds, the vocal cords are drawn apart to allow a breathy articulation and this feature is associated with aspirated sounds.

Voice:

During the articulation of voiced sounds, vocal cords vibrate.

Place Features:

Velar suction:

Velar suction sounds are produced with a constriction made using the back of the tongue and the velum.

Guttural:

Guttural sounds include pharyngeal and glottal sounds. Pharyngeal sounds are produced using the root of the tongue while glottal sounds permit air to pass through the glottis.

Labial:

With labial sounds, the active articulators are lips.

Anterior:

Anterior sounds are produced with an obstruction at or in front of the alveolar ridge.

Coronal:

Coronal sounds are produced with the blade or tip of the tongue raised from its neutral position.

Cavity Features:

High:

High sounds are produced by raising the body of the tongue above the level it occupies in the neutral position.

Low:

Low sounds are produced by lowering the body of the tongue below the level it occupies in the neutral position.

Back:

During articulation of back sounds, the body of the tongue is retracted from the neutral position.

1.5 The Delimitation of the Study

The present study investigated reasons which cause the phoneme [n] to bring about different changes to the initial consonants involving the same sounds. It also accounted for the deletion of [n] in adjectival concords of classes 8, 9 and 10. It is outside the scope of this study to deal with adjectival concords of other classes rather than class 8, 9 and 10 and the concords of other qualificatives. This is because these adjectival and other qualificative concords are not as problematic as the adjectival concords of class 8, 9 and 10. This study further accounted for the changes that are triggered by the reflexive and the objectival concords of the first person singular and the third person singular in class 1. As such, objectival concords of other classes are outside the boundaries of this study.

1.6 Literature Review

Many studies have been conducted in several languages focusing on the nasal sounds. In this section, the following areas have been reviewed: nasal influence on initial consonants of verbs and adjectival stems; nasal influence on reflexive verbs; and, nasal influence resulting in complete assimilation.

1.6.1 Nasal Influence on Initial Sounds of Verbs and Adjectival Stems

Scholars such as Meinhof and van Warmelo (1932) and Kunene (1961) discuss sound changes. Meinhof and van Warmelo (1932) state that sound change may result from sound-shifting, assimilation and dissimilation. Kunene (1961) discusses strengthening and assimilation processes in Sesotho. However, he does not account for the changes that are brought about by the prefixation of the adjectival concords.

Sesotho grammarians such as Guma (1971), Lekhotla la Sesotho (1984), Doke and Mofokeng (1985) as well as Kathekiso et al (2005) analyse nasals in Sesotho Phonology. Their studies have discussed the phonetic changes that are triggered by the prefixation of [n] which is the objectival concord of the first person singular. Their discussion is based on strengthening. Grammarians such as Cole (1955), Ziervogel and Mabusa (1976) and Ziervogel et al (1981) present traditional grammar of Setswana, IsiSwati and IsiZulu, respectively, in which nasals are discussed. However, they have not used phonological theories. In addition, their findings have not accounted for the difference between the changes that are triggered by the prefixation of the phoneme [n] to verbs and adjectival stems.

Harris and Lindsey (1995) discuss the combination of the nasal sound [n] with other consonants. They use the term fortition or strengthening to refer to processes which turn approximants or fricatives into homorganic stops when they follow the

nasal sound [n]. In addition, Dickens (1984) deals with strengthening in Setswana. Harris and Lindsey's (1995) work and Dickens' (1984) work are relevant because they have explained this process just as it applies in Sesotho. However, their studies differ from the current study in that the current study employs generative phonology while their work is just descriptive.

Casali (1995) argues that NCs (nasal consonant clusters) in Moghamo are prenasalised onsets rather than heterosyllabic clusters. Casali (1995) further indicates the positions where these NCs occur. Contrary to of Casali's findings, Downing (2003) proposes that the nasal is syllabified in coda position. These scholars have not employed the distinctive feature theory which will be employed in this study. Also, their focus is on the position of the syllabic nasal in the syllable it constitutes.

Batibo et al (1997) provide evidence of Makua-Sotho connections which involve the same phonological changes. Among the changes they demonstrated, they have included the shift of the voiceless stops [p], [t] and [k] to the continuants [f], [r] and [x], respectively. The examples given to illustrate this shift are: **tatu* which became *raru/raro* 'three', **pa* became *fa* 'give' and **kana* became *xana/gana* 'refuse'. Although the sounds in question in this study are not discussed, in the work of Batibo et al, this work has thrown more light on what might have happened to the sounds that are analysed in this study.

The studies of Kula and Marten (1998 and 2000) on Bemba, Herero and Swahili and Kula (1999) are relevant to the current study. They provide an analysis of nasal consonants. In their studies, they discuss nasal plus consonant clusters focusing on assimilation, strengthening of obstruents, simplification and nasal harmony. They have employed the government phonology approach as has been used in Kaye,

Lowenstamm and Vergnaud (1985, 1990), Charette (1991), Harris (1994) and Cobb (1997) while this study has adopted the generative phonology approach.

Coetzee (2000) analyzes the Setswana nasal sound [n]. Indicating phonological processes in which obstruents undergo featural changes as a result of the nasal sound that precedes them, he shows that when [n] is attached to the initial consonants of verbs, voiced stops are devoiced, voiced continuants become stops and devoice, and voiceless continuants change to homorganic aspirated affricates. He also explains the existence of phonotactic constraints against the sequence nasal + continuant and nasal + unaspirated stop to account for the appearance of non-continuant and aspirated sounds after nasals in Setswana. He further indicates that the process in which sounds following [n] change is called ‘occlusivation’ or ‘hardening’ by Setswana grammarians. These findings serve as a basis for the present study since Setswana is in many respects similar to Sesotho.

The department of African languages and literature at the University of Botswana (2000) discusses morphophonemic rules. That is, the rules which change sounds at morpheme boundaries, particularly where their sequences are incompatible with the sequence rules of the language. The department further indicates that when a nasal sound precedes a consonant in Setswana, some phonotactic processes have to take place. This work is relevant because the present study’s focus is also on phonotactic processes. The study mentioned above differs from the present study because theories such as generative phonology are not applied.

Chebanne (2000) analyses a Bantu language called Sebirwa. He investigates the diachronic sound shift processes, the synchronic processes and comparative phonology. He discusses sound shifting rules. He contends that *pi/u* first became *p^hhi/u* then *p^{sh}hi/u* in Sebirwa. The finding of his study has assisted in the investigation of sound shifting processes that have occurred in Sesotho.

1.6.2 Nasal Influence on Reflexive Verbs and Total Assimilation

Coetzee (2001) analyses the syllables with nasal peaks in Setswana. He argues that such syllables are not part of the morphology of certain noun and adjective classes but their occurrence is governed by ordinary phonological principles. The morphology of these noun and adjective classes creates the phonological environments in which only syllables are tolerated in Setswana. The current study further explores this situation to find out if this is the case with syllabic nasals in Sesotho. The difference between this study and the current study is that Coetzee uses Optimality Theory (OT) which this study has not employed.

Coetzee (2001) also provides an account of nasal deletion in Setswana. This scholar posits that the reflexive in Setswana encompasses the vowel and the nasal consonant as is also suggested in the work of Mulaudzi (1996) that the reflexive /i/ in Tshiguvhu is ascribed to have got influence from Northern Sotho whose reflexive consists of a vowel and a nasal. Coetzee (2001) further states that although the vowel which is part of the reflexive is the only sound that is visible on the surface, the underlying nasal still influences the initial consonants. Although Coetzee (2001)'s study differs from the present study in terms of the theories employed, it nevertheless forms the basis of the current study.

Assimilation processes in which nasals influence the following sounds have been discussed by various scholars including Naidoo (1993), wa Mberia (2002), Nkuna (2005) and Podile (2005). Naidoo (1993) discusses nasal assimilation processes that take place in IsiZulu. This scholar has employed generative phonology which makes his study a base of the present study. wa Mberia (2002) discusses three phonological processes affecting nasals in Kitharaka. These are homorganic nasal assimilation, nasal palatalization and nasal devoicing. He argues that Kitharaka has a nasal consonant devoicing rule. This rule underlies the process of homorganic

nasal assimilation which he claims is a natural phonological process. He further points out that homorganic nasal assimilation operates in verbs as well as in the nouns of classes 9 and 10. Nkuna (2005) deals with nasal place assimilation in Xitsonga and Podile (2006) analyses assimilation in Xhosa. Although wa Mberia (2002), Nkuna (2005) and Podile (2005) have not employed the generative phonology approach, their studies are relevant to the current study because the current study also discusses assimilation.

Hyman (2003) discusses consonant phonology of Bantu languages. He indicates that during fortition or strengthening, voiced stops are devoiced and variably pronounced as ejectives in languages such as Setswana and Sesotho. He also mentions that another process that affects voiceless stops is aspiration. In addition, he states that the combination of the nasal sound [n] with voiceless fricatives results in affrication in languages such as Kongo, Yaka and Venda. The findings are relevant to the current study because they reveal the same processes. The difference is that Hyman (2003) has not discussed sound-shifting processes.

'Matjotjo (2006) analyzes the phonetic changes caused by the attachment of the objectival concord [n] and the reflexive [i] in Sesotho. She indicates that the prefixation of the objectival concord and the reflexive in Sesotho results in devoicing of voiced stops and aspiration of the voiceless stops and affricates. She also mentions that the use of the reflexive and the objectival concord [n] with verb stems which start with vowels requires the insertion of a voiceless velar stop [k]. However, 'Matjotjo (2006) does not discuss the different realizations of [n] and the phonetic changes that affect the objectival concord when it is attached to some verbs. In addition, her study only focuses on three phonological processes which are devoicing, aspiration and insertion in relation to natural phonology. It does not discuss all the phonological processes which are triggered by the prefixation of the objectival concord to verbs in Sesotho which is partly the focus of this study.

Rantšo (2007) discusses syllabification in Sesotho indicating that the prefixation of the objectival concord of the first person singular to verbs causes this concord to become syllabic. Similarly, when the third person singular concords of class 1 and class 3 are attached to verbs whose initial consonants are labials, these labial sounds change to labial nasals after vowels have been deleted. She also discusses syllabic nasals formed when the perfect tense suffix [ile] is affixed to stems whose endings are [n] and [ma]. However, Rantšo (2007) has not accounted for the irregularities observed when [ile] is affixed to verbs which end in [na] and [ma] but syllabification of nasals does not occur.

1.7 Methodology

The method adopted in this study is a qualitative approach because it mainly describes, explains, explores complex situations and interprets data as pointed out by Leedy and Ormrod (2005). Hence, it is the intention of this study to explore complex situations created by the prefixation of [n] and the reflexive [i].

The population in this study comprised Basotho and the sample is made up of thirty Basotho. This sample included ten high school teachers who teach Sesotho, ten NUL students from the department of African Languages and Literature and ten uneducated people. For the purpose of this study, uneducated people included people who have not attended school and those who have attended up to standard seven. The selection was based on the assumption that judgements of educated people are based on their education while for uneducated people; it was believed that their responses were not influenced by any educational background but were rather predicated on their socio-cultural backgrounds.

The sampling designs which were employed are purposive sampling and convenience sampling. Purposive sampling as explained by Neuman (2000) and Leedy and Ormrod (2005), is a sample that is selected for a particular purpose while convenience sampling permits selection of people who are readily available. Convenience sampling is appropriate for this study because it allowed the researcher to interview and issued questionnaires to available people.

1.7.1 Questionnaires and Interviews

The Sesotho verbs to which the objectival concord of the first person singular and the reflexive may be prefixed were collected. Sesotho qualificatives and nouns which include nasals were also collected. The primary data was collected by means of questionnaires and interview from thirty people. All the respondents were given Sesotho verbs, nouns and adjectives from which they showed those that are acceptable and unacceptable. These words included ill-formed ones such as *[e mp^hubedu] ‘red’, *[tse nts^hεϕa] ‘yellow’, *[fumanne] ‘has / have found’ and *[εmme] ‘has / have stood up’.

1.7.2 Official Records and Documents

The secondary data was collected from written documents such as previous research, books and journals. The data collected were analysed by grouping them into categories. These categories included [n] + verbs, [m] + verbs, [n] + adjectival stems, [n] + nominal stems, [m] + nominal stems and [i] + verbs. These data were interpreted by applying generative phonology and the distinctive feature theory.

1.8 The Significance of the Study

This work provides a better insight into the grammar of Sesotho, as it deals with phonological processes which former Sesotho grammarians did not incorporate in

their studies. Furthermore, this study is significant to Sesotho learners as it provides a comprehensive account of rules of Sesotho phonology in relation to the phonology of nasals in concords and reflexive [i]. This study can also trigger new questions for further research.

1.9 Organization of the Study

This study is organized into five chapters. Chapter one encompasses the introduction. It includes the statement of the problem, literature review, theoretical framework, methodology, delimitation and significance of this study. Chapter two provides reasons that make labio-dental sound changes that are triggered by the prefixation of nasal sound [n] which is the adjectival concord of class 8, 9 and 10 differ from those that are triggered by the prefixation of the nasal sound [n] which is the objectival concord. Chapter three accounts for the changes that are caused by the attachment of the reflexive. Chapter four discusses nasal influence resulting in total assimilation. Chapter five provides concluding remarks.

NOTES

1. The numbers represent noun classes. For example, 1 and 6 represent noun classes 1 and 6 respectively.

AC = Adjectival Concord

AGR = Subject-Verb-Agreement

PERF = Perfect Tense Marker

2. OC = Objectival Concord

3. PREF = Nominal Prefix

4. * = Unacceptable word

CHAPTER 2

NASAL INFLUENCE ON INITIAL SOUNDS OF VERBS AND ADJECTIVAL STEMS

2.0 Introduction

As indicated in chapter 1, the phonetic changes that occur when the nasal sound [n] is attached to verbs whose initial consonants are labio-dental and alveolar sounds are different from the phonetic changes that occur when the nasal [n] is prefixed to some adjectival stems. For instance:

11.(a) [f] [p^h]

(i) n + [fupuletsa] [nfupuletsa] [mp^hupuletsa] (mphupuletsa)

OC + ‘research for’

‘research for me’

(ii) tse n + [fubelu] [tse nfubelu] *[tse mp^hubelu]*(tse mphubelu)
 AC + ‘red’ * ‘red’

(iii) tse n + [fubelu] [tse nfubelu] [tse k^hubelu] (tse khubelu)
 AC + ‘red’ ‘red’

(b) [r] [t^h]

(i) n + [rata] [nrata] [nt^hata] (nthata)
 OC + ‘love’ ‘love me’

(ii) tse n + [rɔɔ] [tse nrɔɔ] *[tse nt^hɔɔ]*(tse ntholo)
 AC + ‘black with white spots’

(iii) tse n + [rɔɔ] [tse nrɔɔ] [tse rɔɔ] (tse rolo)
 AC + ‘black with white spots’

(c) [s] [t^s]

(i) n + [sebeletsa] [nsebeletsa] [nt^sebeletsa] (ntšebeletsa)
 OC + ‘work for’ ‘work for me’

(ii) tse n + [sɔɔt^h] [tse nsɔɔt^h] [tse nt^sɔɔt^h] *(ntšotho)
 AC + ‘brown’ ‘brown’

(iii) tse n + [sɔɔt^h] [tse n sɔɔt^h] [tse sɔɔt^h] (tse sootho)
 AC + ‘brown’ ‘brown’

(d) [t] [t^h]

(i) n + [t^haba] [nt^haba] [nt^haba] (ntlhaba)
 OC + ‘stab’ ‘stab me’

| | | |
|----------------------|-------------|---------------------------------------|
| (ii) tse n + [ɸano] | [tse nɸano] | *[tse ntɸ ^h ano] *(tlhano) |
| AC + 'five' | | 'five' |
| (iii) tse n + [ɸano] | [tse nɸano] | [tse ɸano] (tse hlano) |
| AC + 'five' | | 'five' |

It can be noticed from the unacceptability of words in examples in (11a.ii, b.ii, c.ii and d.ii) above that the attachment of the nasal sound [n] brings about different phonetic changes to labio-dental and alveolar sounds. When the nasal sound [n] is prefixed to verbs which start with the sound [f], this sound changes to [p^h] as shown in (11a.i) with the verb [fupuletsa] 'research for'. On the other hand, when the nasal sound [n] is attached to adjectival stem [fubedu] 'red', [f] does not change to [p^h]. Similarly, the phonetic changes observed with alveolar sounds [r, s, ɸ] in (11) which are initial consonants of verbs, differ from those that occur to adjectival stems. The aim of this chapter is therefore to account for nasal influence on verbs and adjectival stems.

This chapter is divided into sections. Section 2.1 analyses assimilation processes that take place when the nasal sound [n] is attached to verbs and adjectival stems which will lead to further division of this chapter to encompass 2.1.1 which discusses stopping and 2.1.2 which deals with affrication. In section 2.2 dissimilation process is discussed with its sub-section, devoicing. Section 2.3 provides an account for unacceptability of some adjectival stems whose phonetic changes are different from those that are discussed under assimilation. This discussion focuses on sound-shifting processes in relation to labio-dental sound [f] and alveolar sounds [r, s, ɸ]. Section 2.4 is a conclusion.

2.1 Assimilation Processes

The phonetic changes that occur when the nasal sound [n] is prefixed to verbs result in a number of processes amongst which there is the assimilation and dissimilation processes. The term assimilation refers to the phonological process by which two sounds that occur close together in speech become more alike (Trask 1996). A segment may assimilate features of the preceding or following sounds. The features acquired from a neighbouring sound may be manner or place features. Assimilation is therefore believed to result in smoother, more effortless and more economical transitions from one sound to another (Katamba 1989). Assimilation processes to be examined in this section are stopping and affrication and dissimilation process examined is devoicing.

2.1.1 Stopping

The phonological process which is discussed under this section is stopping. According to O'Grady et al (1997), stopping involves the replacement of a fricative by a corresponding stop. Sounds which undergo this process are fricatives sounds demonstrated in (11) above.

Since our discussion in this chapter is based on stops, fricatives and affricates, it is essential to provide a list of these phonemes for better understanding below:

12.

| | | labial | coronal |
|------------|-----------|-------------------|------------------|
| stops | - voiced | [b] | [(d)] |
| | voiceless | [p] | [t] |
| | aspirated | [p ^h] | [t] ^h |
| fricatives | - voiced | - | [l, r] |
| | voiceless | [f] | [θ, s, ʃ] |

| | | |
|---------------------|---|--|
| aspirated | - | - |
| affricates - voiced | - | [dʒ] |
| voiceless | - | [ts, tʃ, tʃ] |
| aspirated | - | [ts ^h , tʃ ^h , tʃ ^h] |

When the nasal stop [n] is attached to verbs and adjectival stems whose initial consonants are [l], [l] changes to [t]. These changes are illustrated in (13) below:

13. (a) [l] [t]
- (i) n + [lɪfa] [nlɪfa] [ntefa] (ntefa)
 OC + 'pay' 'pay me'
- (ii) tse n + [lelele] [tse nlelele] [tse telele] (tse telele)
 AC + 'tall / long' 'tall / long'

In the above examples, [l] becomes [t] when it follows a nasal sound [n]. This is seen with both verbs and adjectival stems. The phonetic change illustrated above can be summarized by a phonological rule below:

| | | |
|--------------|-------------|-------------|
| 14. [l] | [t] | [n] |
| + continuant | -continuant | -continuant |
| + lateral | - lateral | - lateral |
| - nasal | | + nasal |
| + voice | - voice | |
| + coronal | | + coronal |

From the rule above, it is postulated that the output has acquired the features [-continuant, -lateral] from the environment. In other words, the manner of articulation of the sound [l] has changed from continuant and lateral where air passes without a complete closure in the oral cavity to a stop where the flow of air is obstructed at some point in the oral cavity. This is expected, as stated in the distinctive feature theory that sounds which occur in the neighbourhood of others tend to assimilate features of those sounds. For this reason, this rule is natural. Furthermore, it should be noted that the place of articulation has not changed as the environment also possesses [+coronal]. It can also be mentioned that the input has dispossessed a feature [voice] which is discussed under devoicing.

There are other phonetic changes that affect [r, f,] which result in aspiration. [f] changes to aspirated stop [p^h] but the initial sound of an adjectival stem becomes unacceptable as demonstrated in (11a.ii) above while [r] changes to [t^h] but with some adjectival stems, the changes differ as exemplified below:

- (15) [r] [t^h]
- | | | |
|-------------------------------|-------------|--|
| (a) n + [ruta] | [nruta] | [nt ^h uta] (nthuta) |
| OC + 'teach' | | 'teach me' |
| (b) Tse n + [raro] | [tse nraro] | [tse t ^h aro] (tse tharo) |
| AC + 'three' | | 'three' |
| (c) Tse n + [rɔɓɔ] | [tse nrɔɓɔ] | *[tse nt ^h ɔɓɔ] *(tse ntholo) |
| AC + 'black with white spots' | | 'black with white spots' |

As can be seen in the examples in (15a) and (15b), [r] has changed to [t^h]. Although [r] in [raro] ‘three’ has changed to [t^h] like in the verb [ruta] ‘teach, the nasal sound [n] is deleted. In contrast, [r] in (15c) which is the initial sound of an adjectival stem [rɔɫɔ] ‘black with white spots’, does not change to [t^h]. Considering the phonetic changes mentioned in (11a.i) and (15a and b), a basic question that arises is why the labio-dental sound and a trill [f, r], respectively, have changed to aspirated stops not to unaspirated stops because the nasal sound [n] is not aspirated. It should be noted that the corresponding stops for the labio-dental sounds are bilabial sounds because there are no labio-dental stops. The expectation therefore is for [f] to become [p] because it is its corresponding labial stop which leaves us with no option but to show the distinctive features for [f, p, p^h] as demonstrated below:

16.

| f | p | p ^h |
|------------------|------------------|------------------|
| + anterior | + anterior | + anterior |
| - voice | - voice | - voice |
| + labial | + labial | + labial |
| - spread glottis | - spread glottis | + spread glottis |
| + continuant | - continuant | - continuant |
| + strident | - strident | - strident |

Considering the features provided in (16) above, these three phonemes form a natural class in that they share these features [+ anterior, - voice, + labial]. However, [p^h] differs from [f, p] because it possesses [+ spread glottis] which reveals that the phoneme is aspirated. The phonemes [p, p^h] also form another natural class sharing [- continuant, -strident]. The assumption therefore

concerning the phonetic change where [f] becomes [p^h] is that their articulation inhibits voicing because the vocal cords are wide apart. According to an explanation of aspiration provided by Roca and Johnson (1999), aspirated sounds are produced with a puff of air. We want to assume that when aspirated sounds are articulated, it is as if they are produced in conjunction with a phoneme [h] which possesses [+continuant, + strident] features. According to Uffmann (2003), [h] is an instance of the feature [aspirated] or [spread glottis] without additional place features. As such, it is suggested that aspirated sounds have retained recessively some features of fricatives because [h] is a fricative.

Regarding [r], it would be expected that [r] would change to a voiceless stop that is an alveolar sound [t]. [l] becomes [t] when it follows [n] thus, [r] becomes aspirated [t] in order to distinguish this phonetic change from the phonetic change that occur to [l]. That is, [l] and [r] cannot both change to [t] because they are different phonemes; consequently, one of these phonemes has to change to [t] and the other sound to [t^h]. That is why [l] becomes [t] while [r] becomes [t^h]. Adopting Naidoo (1993)'s distinctive feature description of [r] and [l], Naidoo posits that they are liquids and they share [+continuant, +sonorant, +anterior, +coronal]. However, [l] has a feature [+lateral] which [r] does not possess. This feature is a manner of articulation feature. Phonetically we want to assume that the degree of continuancy of these sounds differs. It can further be assumed that the degree of continuancy of [l] is less than that of [r] because there is a complete closure at the centre though some portion of airstream is allowed to flow through the sides of the tongue. As for [r], it is produced in the same manner as other fricatives whereby the articulators are not in contact with each other.

In general, fricatives such as [f, l, r] become the following stops [p^h, t, t^h], respectively, when they follow the nasal sound [n]. It is because they assimilate the [-continuant] feature from the nasal [n].

2.1.2 Affrication

Apart from the assimilation process of stopping, there is affrication. Affrication occurs when a stop combines with a fricative to form one sound. Fricative sounds such as [s, ɬ] become [tʂ^h, tɬ^h], respectively, when the nasal sound [n] is prefixed to verbs and adjectival stems. This is demonstrated below:

17. (a) [s] [tʂ^h]
- (i) n + [sɔt^ha] [nsɔt^ha] [ntʂ^hɔt^ha] (ntšotha)
 OC + ‘make turn’ ‘make turn’
- (ii) tse n + [tse nsɛɬa] [tse nsɛɬa] [tse tʂɛɬa] (tse tšehla)
 AC + ‘yellow’ ‘yellow’
- (iii) tse n + [sɔɔt^hɔ] [tse nsɔɔt^hɔ] *[tse ntʂ^hɔɔt^hɔ] (tse sootho)
 AC + ‘brown’ ‘brown’
- (b) [ɬ] [tɬ^h]
- (i) n + [ɬatswa] [nɬatswa] [ntɬ^hatswa] (ntlhatsoa)
 OC + wash’ ‘wash me’
- (ii) tse n + [ɬanɪ] [tse nɬanɪ] *[tse ntɬ^hanɪ]*(tse ntlhano)
 AC + ‘five’ ‘five’
- (iii) tse n + [ɬanɪ] [tse nɬanɪ] [tse ɬanɪ] (tse hlano)

In the examples in (17a.i and ii) above, [s] becomes [tʰsʰ] when it follows the nasal sound [n]. However, the initial sound of an adjectival stem [sɔɔtʰɔ] ‘brown’ has not changed to [tʰsʰ] and the reasons are provided under sound-shifting. While [ɬ] has to change to [tʰɬʰ], this is not the case with the adjectival stems whose initial sounds are [ɬ]. The phonetic changes in (17a) and (17b) above can be represented using distinctive feature theory as follow:

| | | |
|------------------|------------------|------------------|
| 18. + continuant | - continuant | - continuant |
| - voice | | |
| + strident | | - strident |
| - spread glottis | + spread glottis | - spread glottis |
| - nasal | | + nasal |

The phonological rule above stipulates that voiceless continuants change to voiceless affricates in the environment of the nasal sound [n]. These sounds acquire the feature [-continuant] which they share with the nasal sound [n]. However, this rule seems to be less natural because the output is aspirated, which is the feature that the environment lacks. Furthermore, as affricates are combination of stops and fricatives, it can be suggested that [+strident] feature is retained to indicate the presence of fricatives in such sounds.

Bringing insight into the formation of affricates, Hyman (2003) stipulates that a nasal sound followed by a voiceless fricative results in affrication. He shows that /n+s/ changes to [ts] and /n+ f/ becomes [pf] in languages such as Kongo. The following examples show the forms in Kongo as presented by Hyman (2003):

- | | | |
|------------------|-------------|---------------|
| 19. /ku-N?fil-a/ | ku-m?pfil-a | ‘to lead me’ |
| /ku-N?sib-a/ | ku-n?tsib-a | ‘to curse me’ |

It should be noted that there are other sound changes that affect only the initial consonants of verbs which begin with the sound [ʃ]. This sound is not found in adjectival stems as they are limited in number in Sesotho. As with other fricatives discussed in this section, the sound [ʃ] becomes an affricate which is [tʃ^h] as demonstrated below:

- | | | |
|-------------|--------------------|---------------------------------|
| 20. [ʃ] | [tʃ ^h] | |
| n + [ʃapa] | [nʃapa] | [ntʃ ^h apa] (nchapa) |
| OC + ‘beat’ | | ‘beat me’ |

In summary, all sound changes that affect the initial consonants of verbs and some adjectival stems such as [lelele] ‘tall / long’ and [raro] ‘three’ result in assimilation process of stopping. This fact is evident from features that have been acquired from the environment which is [-continuant]. In the case of [l], the phonological rule is more natural than the rule formulated to represent the phonetic changes that occur to [f, r]. Another assimilation process that has been discussed in this section is affrication. As with stopping, the feature [-continuant] is acquired from the phonetic environment. It is noted that the phonological rule depicting the phonetic changes affecting these sounds [s, ʃ, ʃ] is less natural because outputs are aspirated. Furthermore, with adjectival stems, there are phonetic changes which differ from the ones mentioned above which result in assimilation and we consider them to occur due to other phonological processes rather than assimilation.

2.2 Dissimilation Process

Dissimilation is the opposite of assimilation. Unlike in assimilation, in dissimilation segments become less similar with their neighbouring sounds (Jensen 2004). As segments become alike with their neighbouring sounds, some assimilation processes such as stopping and affrication take place. In this study devoicing is a dissimilation process in which segments become less similar.

2.2.1 Devoicing

This section discusses devoicing as a dissimilation process. In this process, sounds are devoiced. That is, the sounds that are voiced become voiceless. In our case, this happens when the nasal sound [n] is attached to stems whose initial consonants are [b, d, l, r, dʒ] as can be seen below:

| | | |
|--------------------------------------|---------------------------|--|
| 21. (a) (i) n + [bat ^h a] | [nbat ^h a] | [mpat ^h a] (mpatla) |
| OC + ‘want’ | | ‘want me’ |
| (ii) Tse n + [be] | [tse nbe] | [tse mpe] (tse mpe) |
| AC + ‘ugly /bad’ | | ‘ugly /bad’ |
| (b) (i) n + [ruta] | [nruta] | [nt ^h uta] (nthuta) |
| OC + ‘teach me’ | | ‘teach me’ |
| (ii) Tse n + [rar ^h ʉ] | [tse nrar ^h ʉ] | [tse t ^h ar ^h ʉ] (tse tharo) |
| AC + ‘three’ | | ‘three’ |
| (c) (i) n + [lifa] | [nlifa] | [ntifa] (ntefa) |
| OC + ‘pay’ | | ‘pay me’ |

The dissimilation process in rule (23) follows the phonotactic constraints on the nasal and consonant combinations in Sesotho. For instance, if these sounds [b, d, r, l, **ɟ**] were not devoiced, we would have ended up with the forms such as *[mbatla], *[ndumedisa], *[nruta], *[nlɪfa] and *[n**ɟ**abɛla] which are unacceptable. In Bantu languages such as Bemba, Herero and IsiZulu, a combination of a nasal and a voiced consonant is acceptable. As indicated by Kula et al (1998), voiced consonants following an alveolar nasal do not dispossess their voice feature as demonstrated in (24) below. Herero shows a different pattern. According to Kula and Marten (2000), Herero permits voiced stops at word initial as derivative of voiceless sounds as can be seen in (25).

24. Data from Bemba by Kula et al (1998):

| | |
|---------------|------------------------|
| -βila ‘sew’ | mb ila ‘I sew’ |
| - leka ‘stop’ | nd eka ‘I stop’ |

25. Data from Herero by Kula and Marten (2000)

| | |
|----------------|------------------------------|
| - pe ‘new’ | om be ‘new one’ |
| - twe ‘sharp’ | ond we ‘sharp thing’ |
| - titi ‘small’ | ond iti ‘small thing’ |

The examples of IsiZulu from Ziervogel et al (1981) are provided below:

26. Zulu

| | |
|---------------|--------------------------|
| hamba | ‘go/ walk’ |
| phinda | ‘repeat’ |
| emva | ‘behind/ at the back of’ |

After providing examples from other languages indicating the fact that devoicing after a nasal sound is not universal, it may be concluded that

devoicing of sounds following nasals is language-specific. However, devoicing in Sesotho ensures the following forms acceptable: [mpatla] ‘want me’, [ntumedisa] ‘greet me’, [nt^huta] ‘teach me’, [ntefa] ‘pay me’ and [ntʃabɛla] ‘slap me’. Unlike Bemba, Herero and IsiZulu, in Sesotho devoicing is a common phonological process. In other words, consonants following nasals are all voiceless. Devoicing is notably seen in non-derivative nouns and verbs as illustrated below:

27. (a) nasal at initial position

(i) nouns

mpa ‘belly’

ntwa ‘war’

nt^hɔ ‘thing’

(ii) verbs

nts^ha ‘take out’

ŋka ‘take’

ŋxa ‘smell’

(b) nasal at medial position

(i) nouns

m^hŋkɔ ‘smell’

m^hntswa ‘fertilizer’

mantswe ‘words’

To Further justify that devoicing takes place because of Sesotho phonotactic constraints, let us consider the following loan words from English. English and

Afrikaans permit nasal + voiced sound combination. When nasal + voiced sound combinations from these languages are borrowed into Sesotho, voiced sounds change to voiceless sounds as shown below:

| | |
|--------------------|--------------------|
| 28. (a) English | Sesotho |
| sunday | sontaha |
| rand | ranta |
| change | tʰeŋtʰe |
| ginger beer | tʰiŋtʰibiri |

| | | |
|---------------|---|---------|
| (b) Afrikaans | Sesotho (from Lekhotla la Sesotho 1984) | |
| pond | pɔntɔ | ‘pound’ |
| ondo | ɔntɔ | ‘oven’ |
| band | lebanta | ‘band’ |

To sum up, the type of dissimilation process that takes place in Sesotho is devoicing. The phonological process of devoicing occurs across Sesotho as a result of the phonotactics of Sesotho. It is also evident in nouns and verbs that devoicing of sounds following nasals at initial positions of words is language-specific. We have seen that borrowed words from other languages are forced to change voiced sounds following nasal sounds to voiceless sounds.

2.3. Sound-shifting Processes

In an attempt to account for all the phonetic changes that occur to initial consonants of verbs and adjectival stems, assimilation and dissimilation processes fail to account for all the changes. For instance, adjectival stems whose initial consonants start with [f] become velar sound [x] when they follow

| | | |
|--------------|----------|--------------|
| + labial | - labial | - labial |
| - nasal | | + nasal |
| + continuant | | - continuant |

The rule in (29) states that the output does not share [- continuant, + nasal] features which are manner features with the environment. Although the rule shows that the output and the environment share [-labial] feature, their points of articulation are still different. For instance, [x] is a velar sound while [n] is an alveolar sound. It should therefore be noted that place assimilation has not occurred as well as manner assimilation as the output is still a fricative while the environment is a stop. We consider this rule unnatural and thus opt for sound-shifting.

With regard to the phonetic changes that occur when [n] is prefixed to [fubedu] ‘red’, we consider the sound [f] to originate from the Ur-Bantu [p]. The evidence cited from Meinhof (1932) in relation to Ur-Bantu reveals that *pa* has become Sotho [fa] ‘give’. Furthermore, as indicated by Kruger and Snyman (1988), [p] that is followed by *u* has changed to [f] which has then shifted to [hu]. It is in this view that we say that the initial sound of [fubedu] [f] results from sound-shifting other than pure assimilation processes. Sound-shifting of [f] is clearly illustrated in (30):

30. (a)

| | | | | | |
|--|----|----|----|----|----|
| | | | p | | |
| | pa | pi | | pu | |
| | fa | fe | fi | f | fu |
| | | | | | hu |

| | | | |
|-----|-----------------|-----------------|-----------------|
| (b) | [h] | [x] | [ŋ] |
| | + guttural | - guttural | - guttural |
| | + velar suction | - velar suction | - velar suction |
| | - high | + high | + high |

The application of the rule in (32a) states that an output has lost [+ anterior] feature because the environment lacks that feature. In the second rule, the output dispossesses [guttural, velar suction] features as the environment does not possess them. The output has also acquired [+ high] feature from the environment. These two rules seem to be natural because the outputs have acquired some features from the phonetic environments.

To sum up, it can be said that the difference between the phonetic changes that occur to verbs and adjectival stems whose initial consonants begin with [f] is that changes that affect verbs are assimilation processes while those with adjectival stems involve sound-shifting. The sound which becomes [x] after [n] is [h] not [f]. In general, we have argued that there is a sound shift from [f] to [h] and after that assimilation takes place.

2.3.2 Sound-shifting of Alveolar Sounds

Other sound-shifting has affected alveolar sounds [s, r, ʎ]. Since we have posited that primary plosives have been [p, t, k], in this section we will begin by providing the origin of [r, s, ʎ]. When analyzing sound-shifting in dialects of Setswana such as Hurutswe, Kwena, Ngwaketse, Kgatla and Rolong, Kruger and Snyman (1988) indicate that [ki] and [ti] have shifted to [s] in some

languages while in others they have shifted to [ʃ]. Furthermore, they show that palatalized [k] (kʲ) and [t] (tʲ) have become [tʃʰ] in some languages while in others they have become [ʃ]. We would like to exemplify their data in (34):

34. (a) [ki] [si] and [se]
 moki mosi ‘smoke’
- (b) [ti] [si]
 butiku bosixo ‘night’
- (c) [tu] [ro]
 tuma roma ‘send’
- (d) [tʲ] [tʃʰ/ʃ]
 tʲakuna tlhahuna ‘chew’
- (e) [kʲ] [tʃʰ/ʃ]
 lakʲa latlha ‘throw down’

From the data provided above from Kruger and Snyman (1988) we want to adopt their framework in this study and suggest that [r, s] come from [t] while [tʃʰ, ʃ] come from palatalized [t/k].

We assume that [r] of [rʊʊʊ] ‘black with white spots’ comes from [t], [s] of [sʊʊʊʰʊ] ‘brown’ originates from [t] while [ʃ] of [ʃano] ‘five’ comes from palatalized [k]. We also assume that the attachment of the nasal [n] does not affect [r, s, ʃ] in [rʊʊʊ], [sʊʊʊʰʊ] and [ʃanu], respectively, because it is attached to their underlying representations as demonstrated below:

35. AC + underlying segments surface segments

/t/ becomes /r/. Concerning [ɕ, tɕʰ] as indicated by Kruger and Snyman (1988), these sounds originate from either palatalized [k] or [t]. In Swahili, ‘five’ is *tano* and in Kongo, it is *tanu* which shows that [t] has not changed. In Setswana, ‘five’ is *tlhano*, in Xhosa, it is *hlanu* and in Sesotho, it is *hlano*. Based on these examples from other languages, we want to suggest that some languages have maintained stops at the initial position while others have changed to affricates. As has already been stated, affricates are combination of stops and fricatives. As for those that begin with fricatives, we want to say that their stop features appear in their underlying representations.

Generally, alveolar sounds [r, s, ʃ] in the adjectival stems are not affected by phonetic changes when [n] is attached before them because it is attached to their underlying representations. Their original sounds are stops. This means that there is constriction of airflow on the oral cavity as there is closure of airstream in the articulation of [n].

2.4 Conclusion

To sum up the foregoing discussions on the phonetic changes that occur to verbs to which the sound [n] is prefixed is that these sound changes result in stopping and affrication which are assimilation processes. Stopping and affrication occur with fricatives. The phonetic changes that take place when [n] is prefixed to verbs show that the initial consonants of verbs and some adjectival stems assimilate some features from [n] to become stops and affricates.

We also conclude that devoicing which also occurs to the initial consonants of verbs and adjectival stems is a dissimilation process. This phonological process occurs to all voiced sounds preceded by nasals. We have suggested that

devoicing in Sesotho which takes place when the nasal sound is prefixed to voiced sounds happens due to Sesotho phonotactic constraints. We cannot say that we devoice some sounds to ease articulation which is the main reason for dissimilation because the combination of a nasal + a voiced sound is possible in other Bantu languages and other languages of the world.

With regard to the sound changes which take place to adjectival stems that differ from those that occur with verbs, it is concluded that such sound changes are based on sound-shifting. With the labio-dental sound [f], it is suggested that there is a sound-shifting to [h] to which assimilation processes later apply resulting in the change of [n] to [ŋ] where the nasal sound [n] precedes [h] and also the change of [h] to [x] where [h] is preceded by [ŋ]. Furthermore, alveolar sounds [r, s, ʃ] do not change at all because their underlying representations are stops and [n] shares [-continuant] feature with those underlying stops. As a result, no assimilation has taken place to [r, s, ʃ].

CHAPTER 3

NASAL INFLUENCE ON REFLEXIVE VERBS

3.0 Introduction

In the previous chapter, we have seen that the nasal sound [n] exerts influence on the consonants it precedes. It has been shown that initial consonants of verbs and adjectival stems undergo phonetic changes which result in assimilatory and dissimilatory processes. As indicated, assimilatory processes involve stopping and affrication while dissimilation involves devoicing.

This chapter analyses the phonetic changes that occur when the reflexive [i] is prefixed to verbs. We propose that the reflexive is composed of [in] on underlying representation and [n] gets deleted on surface representation. Our proposal is based on the fact that the phonetic changes observed cannot result from the prefixation of the vowel [i] to verbs considering the phonological features that this vowel contains. That is to say, in other situations the vowel [i] can be attached to sounds such as [f, l] which with reflexive have to change. Regarding the deletion of the nasal [n] on surface representation, we show that this is not only the case with the reflexive as proposed but it also occurs when the adjectival concords of classes 8, 9 and 10 are attached to disyllabic and polysyllabic adjectival stems. We also argue that the assimilation and dissimilation processes that take place when the reflexive is attached to verbs are caused by the influence of [n] on underlying representation. That is why the changes observed with reflexive are similar to those that occur when the objectival concord of the first person singular [n] is attached to verbs. At this juncture, we would like to provide examples where the reflexive is attached to verbs below:

| | | |
|----------------------------|-------------------|--------------------------------|
| 37. [f] | [p ^h] | |
| (a) i + [fa] | [ifa] | [ip ^h a] (ipha) |
| REFL ⁵ + ‘give’ | | ‘give oneself’ |
| (b) i + [fasa] | [ifasa] | [ip ^h asa] (iphasa) |
| REFL + ‘fasten’ | | ‘fasten oneself’ |

The examples in (37) indicate that [f] changes to [p^h] and [l] changes to [t] when the reflexive [i] is attached to verbs as has been indicated by some Sesotho grammarians such as Guma (1971), Lekhotla la Sesotho (1981) and Kathekiso et al (2005). Guma (1971) states that the changes are associated with

the reflexive prefix [i] which has no nasal. Hyman (2003) similarly sees sound changes that take place when [i] is attached before consonants, as caused by the influence of [i]. He states that consonants harden not only after nasals but also after Proto-Bantu *i and refers to examples from Setswana where stops devoice after reflexive *i*. Considering the phonetic changes caused by the attachment of the reflexive [i], we would have the rule such as the one in (38) below:

| | | |
|---------------|-------------------|---------------|
| 38. [f] | [p ^h] | [i] |
| + consonantal | | - consonantal |
| + continuant | - continuant | + continuant |
| - high | | + high |

The rule in (38) states that the input dispossesses [+ continuant] feature in the environment which has [+continuant] feature. The environment also has [-consonantal, + high] features which the output has not acquired. For this reason, the rule becomes unnatural. This leaves us with no option but to adopt the suggestion of Louwrens et al (1995), Mulaudzi (1996) and Coetzee (2001) that the changes are caused by [n] not [i]. Louwrens et al (1995) state that the activator initiating the process where all continuant consonants become stops is a nasal preceding the subservient phonemes. Mulaudzi (1996), when analyzing Tshiguvhu, stipulates that the fact that the reflexive concord is /i/ in Tshiguvhu is ascribed to influence from Northern Sotho where it is believed that the reflexive morpheme can be traced to -i(N)- which causes sound changes similar to that of the objectival concord (N) in Northern Sotho. According to Coetzee (2001) referring to Setswana, the vowel is the only part of the reflexive prefix that is ever visible on the surface while the influence is exerted by the nasal on underlying level.

3.1 The Phonology of the Vowel [i]

In this section, we want to argue that vowel [i] which is the reflexive does not influence the following sounds as the nasal prefix does and hence the instances where the vowel [i] has influenced sounds adjacent to it are shown. The syllabic vowel [i] influences sounds that precede it. For instance, it influences a lateral sound [l]. This sound changes to [d] before [i] as in [dila] ‘smear’. This change can be summarized by the rule below:

| | | |
|-----------|-----------|---------------|
| 39. [l] | [d] | [i] |
| + lateral | - lateral | - lateral |
| - back | - back | - back |
| | | - consonantal |
| | | + high |

The rule above states that the output has acquired the feature [- lateral] from the environment. It also says that the feature [-back] is retained as the input already possesses [- back] feature.

The vowel [i] is found in several word positions. It can appear word- initially, -medially and -finally. It is possible for [i] in word-initial position to be followed by fricatives [f, s, l] on which the reflexive brings about changes. Below we provide examples where vowel [i] is followed by fricatives:

40. verbs

- [ile] (ile) ‘has gone’ (perfect tense of *ea* ‘go’)
- [ila] (ila) ‘abstain’

nouns

- [isatʰ] (isao) ‘next year’

[ifɔ̃] (ifo) 'hearth'

Unlike the nasal sound which is always followed by stops word medially, the vowel [i] as can be seen in (41) is followed by fricatives. Below are examples showing vowel [i] word medially:

41. verbs

[p^haila] (phaila) 'roams'

[beisa] (beisa) 'race'

nouns

[leiɬɔ̃] (leihlo) 'eye'

[mɯifɔ̃] (moifo) 'representatives'

Regarding loan words from English, it is also observed that the vowel [i] unlike the objectival concord [n] is followed by fricatives. With the objectival concord, we have seen that even in loan words the same pattern is maintained as exemplified in devoicing process. Examples of [i] in loan words are provided below:

42. loan words English

[feila] (feila) 'fail'

[feisi] (feisi) 'fist'

[seifa] (seifa) 'save'

In summary, the changes that are observed when the reflexive is attached to verbs are not triggered by the vowel [i] as has been seen that this vowel does not exert the same influence as the alveolar nasal. In other words, it is argued that vowel [i] changes fricative to stops as we have seen that this vowel permits fricatives to follow it but the alveolar nasal does not allow such combinations.

3.2 Nasal Deletion and Place Assimilation in Verbs

In this section, we want to examine nasal deletion in consonantal clusters which result from the prefixation of the reflexive. In order to account for this process, the discussion will include nasal deletion in adjectival concords of class 8 and 10, and 9 [tse n] and [e n], respectively. The purpose of this section is to provide evidence to the fact that we have suggested that the reflexive comprises [n] which is deleted on surface representation. Where nasal deletion does not occur, nasal place assimilation takes place hence this section also discusses place assimilation observed with objectival concord.

3.2.1 Nasal Deletion Occurring in Disyllabic and Polysyllabic

Stems

It is observed that nasal prefix is deleted before disyllabic and polysyllabic stems in adjectives. For instance, when the adjectival concords of class 8, 9 and 10 are attached to disyllabic or polysyllabic adjectival stems, the nasal sound [n] gets deleted as can be seen below:

43.(a) class 8 and 10

Tse n + [bedi] [tse nbedi] [tse pedi] (tse peli)

| | | |
|------------------|---------------|----------------------------|
| AC + ‘two’ | | ‘two’ |
| Tse n + [fubedu] | [tse nfubedu] | [tse xubedu] (tse khubelu) |
| AC + ‘red’ | | ‘red’ |

(b) class 9

| | | |
|--------------------|-------------|------------------------------------|
| E n + [sɛʦa] | [e nsɛʦa] | [e ts ^h ɛʦa] (e tšehla) |
| AC + ‘yellow’ | | ‘yellow’ |
| E n + [lelele] | [e nlelele] | [e telele] (e telele) |
| AC + ‘long / tall’ | | ‘long / tall’ |

In all the instances provided in (43), the nasal sound [n] is deleted. The morphological explanation stated by many linguists such as Guma (1971) and Doke and Mofokeng (1985) is that when the nasal prefix is attached to disyllabic or polysyllabic stem, the nasal sound is deleted and therefore, this accounts for the nasal deletion in the reflexive.

It is also observed that nasal sound attached to monosyllabic stems is not deleted. Adopting Coetzee’s (2001) explanation on Setswana syllabic nasals, we want to suggest that nasals attached to monosyllabic stems are not deleted because of word minimality requirement which is based on prosodic status of lexical words. According to this requirement, a word must have two syllables.

Returning to our argument, the reflexive experiences nasal deletion in the same manner as the adjectival concords mentioned above because these morphemes consist of more than one syllable. As a result, if one phoneme is deleted other phonemes are left representing such morphemes. That is why most Sesotho

grammarians assume that the phonetic changes are caused by [i]. It should also be noted that when the nasal sound in reflexive morpheme is deleted, it does not result in monosyllabic word and for that reason word minimality requirement is also observed as can be seen below:

| | | |
|---------------|--------|----------------------------|
| 44. in + [fa] | [infa] | [ip ^h a] (ipha) |
| REFL + ‘give’ | | ‘give oneself’ |

Considering the example in (44) above, when the proposed reflexive [in] is affixed to a monosyllabic stem [fa] ‘give, it becomes [ip^ha] ‘give oneself’ which has become disyllabic. In this regard, the nasal in the reflexive is deleted in all verbs.

If we were to compare Sesotho with related languages such as IsiZulu, we would find that in the sequence V⁶ nasal C⁷ the nasal is deleted. This can be seen when IsiZulu is converted to Sesotho as shown below:

45. IsiZulu (by Ziervogel et al 1981) Sesotho

| | | |
|----------|--------|----------|
| phinda | pheta | ‘repeat’ |
| donsa | tosa | ‘pull’ |
| thanda | rata | ‘love’ |
| thunga | roka | ‘sew’ |
| thengisa | rekisa | ‘sell’ |

In cases where V nasal is a prefix in IsiZulu, the end result in Sesotho is deletion of the vowel alongside the nasal, unless the end result is a monosyllabic stem. This can be seen below:

46. IsiZulu (by Ziervogel et al 1981) Sesotho

| | | |
|----------|-------|-----------------------|
| indaba | taba | ‘a matter’ |
| induku | thupa | ‘a stick’ |
| ingozi | kotsi | ‘danger / accident’ |
| inkōosi | khosi | ‘a chief’ |
| inhlōoko | hloho | ‘head’ (of an animal) |

3.2.2. Place Assimilation in Verbs

It has been stated that nasal deletion does not occur in verbs when the objectival concord of the first person singular is affixed to them. In fact, its attachment results in nasal place assimilation (homorganic nasal assimilation). According to Kula et al (1998), the place of articulation of the nasal depends on the following stop. This is also stipulated by Paster (2006) who says that nasals agree in place of articulation with the immediately following consonant, in some cases resulting in alternations such that [m, n] change to [ŋ]. In addition, Podile (2005) indicates that the homorganicity condition results in the complementary distribution of the allophonic variants of the nasal phoneme /N/. In Sesotho, it can be said that the allophonic variants of the nasal sound [n] are [n], [m], [ɲ] and [ŋ] as exemplified in (47) below:

| | | |
|--------------------------|-----------------------|--------------------------------|
| 47.(a) [n] | [m] | |
| n + [bat ^h a] | [nbat ^h a] | [mpat ^h a] (mpatla) |
| OC + ‘want’ | | ‘want me’ |
| tse n + [be] | [tse nbe] | [tse mpe] (tse mpe) |
| AC + ‘bad’ | | ‘bad ones / things’ |

(b) [n]

| | | |
|----------------------------|-------------------------|-----------------------------------|
| n + [l ^h fa] | [nl ^h fa] | [nt ^h fa] (ntefa) |
| OC + ‘pay’ | | ‘pay me’ |
| n + [ts ^h wara] | [nts ^h wara] | [nts ^h wara] (ntšoara) |
| OC + ‘hold’ | | ‘hold me’ |

(c) [n]

[ɲ]

| | | |
|-----------------------------|--------------------------|-------------------------------------|
| n + [ʃapa] | [nʃapa] | [ɲtʃ ^h apa] (nchapa) |
| OC + ‘beat’ | | ‘beat me’ |
| Tse n + [tʃ ^h a] | [tse ntʃ ^h a] | [tse ɲtʃ ^h a] (tse ncha) |
| AC + ‘new’ | | ‘new ones / things’ |

(d) [n]

[ŋ]

| | | |
|------------------|-----------|----------------------|
| n + [hɰpɰla] | [nhɰpɰla] | [ŋxɰpɰla] (nkhopola) |
| OC + ‘remember’ | | ‘remember me’ |
| n + [ŋolla] | [nŋolla] | [ŋŋolla] (’ngolla) |
| OC + ‘write for’ | | ‘write for me’ |

In the examples provided in (47) above, nasal sound has assimilated features of the following sounds. In (47a), the following sound is a labial, therefore, the alveolar nasal changes to a labial nasal. As exemplified in (47b), the alveolar nasal is retained before alveolar sounds. Example (47c) shows nasal place assimilation where alveolar nasal becomes a palatal nasal. In (47d), alveolar nasal changes to velar nasal. Below are phonological rules to capture the changes demonstrated in (47a-d), respectively:

| | | |
|---------------|-----------|------------------|
| 48.(a) [n] | [m] | [labial stops] |
| + consonantal | | |
| + nasal | | - nasal |
| - labial | + labial | + labial |
| | | |
| (b) [n] | [n] | [alveolar stops] |
| + consonantal | | |
| + nasal | | - nasal |
| + coronal | + coronal | + coronal |
| | | |
| (c) [n] | [ɲ] | [palatal stops] |
| + consonantal | | |
| + nasal | | - nasal |
| + coronal | | |
| - high | + high | + high |
| | | |
| (d) [n] | [ŋ] | [velar stops] |
| + consonantal | | |
| + nasal | | - nasal |
| - high | + high | + high |
| - back | + back | + back |

The phonological rule (48a) states that the output assimilates feature [+labial] from the environment. The rule (48b) indicates that the feature [+coronal] is retained. In other words, this rule means that the place of articulation of the output is the same as the ones of the input and the environment thus there is no change. As for the rule (48c), the output possesses [+high] feature acquired from the environment which distinguishes it from the one represented in rule

/ N + βatl + ɔ/ [mbatlɔ] ‘small adze’

/ tiN + βambu / [timbambu] ‘ribs’

(e) Data from Xhosa by Podile (2005):

iN + balisa ‘narrate’ > imbalisa ‘a history’

iN + shumayela ‘reach’ > intshumayelo [ɲ] ‘a sermon’

The data provided above indicate that nasal sound [n] assimilates to the place of articulation of the following consonants. As is the case with Sesotho, nasal sound [n] assimilates features from labial, palatal and velar sounds where nasal deletion is blocked. In a nutshell, we say that these are the changes which would have been likely to occur to the reflexive if the nasal [n] of the reflexive passes to the surface representation.

3.3 Assimilation Processes Triggered by Attachment of the Reflexive

In this section, we would like to argue that assimilatory processes that occur when the reflexive [i] is attached to verbs are end-results of the nasal influence and hence the changes result in manner assimilation. So, we state that the prefixation of the reflexive triggers assimilation processes in the same way the objectival concord of the first person singular does. In this section, we are going to demonstrate the changes caused by a reflexive consisting of a nasal sound as proposed [in]. Assimilatory processes that are illustrated are stopping and affrication.

3.3.1 Stopping Triggered by Prefixation of the Reflexive

Stopping takes place when the alveolar nasal is attached to a fricative. Sounds which undergo stopping when the reflexive is attached to them are [f, l, r]. It has become customary among linguists to name phonological processes according to the results of the sound changes; therefore, we have adopted the same approach in this study.

f-Stopping

f-stopping can be defined as a process in which labio-dental sound [f] becomes a stop. In this study, when the nasal stop [n] is attached to verbs whose initial consonants are [f], [f] changes to aspirated stop [p^h], as illustrated below:

51. [f] [p^h]
- | | | | |
|------------------------|------------|--------------------------|------------------------------------|
| (a) in + [fa] | [infa] | [inp ^h a] | [ip ^h a] (ipha) |
| REFL + ‘give’ | | | ‘give oneself’ |
| (b) in + [fɛpa] | [infɛpa] | [inp ^h ɛpa] | [ip ^h ɛpa] (iphepa) |
| REFL + ‘feed’ | | | ‘feed oneself’ |
| (c) in + [fiɛlla] | [infiɛlla] | [inp ^h iɛlla] | [ip ^h iɛlla] (iphiella) |
| REFL + ‘sweep for’ | | | ‘sweep for oneself’ |
| (d) in + [fodisa] | [infodisa] | [inp ^h odisa] | [ip ^h odisa] (ipholisa) |
| REFL + ‘cause to heal’ | | | ‘cause oneself to heal’ |
| (e) in + [fumana] | [infumana] | [inp ^h umana] | [ip ^h umana](iphumana) |
| REFL+ ‘find’ | | | ‘find oneself’ |

On the basis of the examples provided above, it is observed that [f] changes to [p^h] irrespective of vowels that follow it as long as this sound occupies the initial position of verbs. That is, the phonetic changes regarding this sound are

the same when it is followed by all vowels, [a, e, i, o, u]. The change which occurs to [f] happens because [f] is preceded by the prefix consisting of [n]. Using distinctive features, the following phonological rule summarizes the phonetic changes illustrated in (51):

| | | |
|------------------|-------------------|---------------|
| 52. [f] | [p ^h] | / [n] |
| + continuant | - continuant | - continuant |
| + consonantal | | + consonantal |
| + anterior | | + coronal |
| - nasal | | + nasal |
| - spread glottis | + spread glottis | |

The above phonological rule indicates that the sound [f] which possesses [continuant] feature loses it and becomes an aspirated stop as shown by the possession of [- continuant, spread glottis] features in the environment of the nasal [n]. This is because the nasal sound [n] is a stop hence the sound [f] has acquired the feature [-continuant] from this nasal sound. In other words, the manner of articulation of the sound [f] has changed from fricative to a stop. This rule is natural as the output and the environment share [- continuant] feature.

l-Stopping

This process takes place when a lateral sound [l] changes to a stop. We provide examples of phonetic changes that affect lateral sound as demonstrated below:

| | | |
|------------------|-----------|-------------------|
| 53. [l] | [t] | |
| (a) in + [laɛla] | [inlaɛla] | [itaɛla] (itaela) |

| | | | |
|-----|--------------------|--------------|-------------------------|
| | REFL + ‘order’ | | ‘order oneself’ |
| (b) | in + [lɪfa] | [inlɪfa] | [itɪfa] (itefa) |
| | REFL + ‘pay’ | | ‘pay oneself’ |
| (c) | in + [lɥha] | [inlɥha] | [itoha] (itoha) |
| | REFL + ‘plait’ | | ‘plait oneself’ |
| (d) | in + [dilɛla] | [indilɛla] | [itilɛla] (itilela) |
| | REFL + ‘smear for’ | | ‘smear for oneself’ |
| (e) | in + [dumedisa] | [indumedisa] | [itumedisa] (itumelisa) |
| | REFL + ‘greet’ | | ‘greet oneself’ |

In the above examples, [l] becomes [t] when it follows a nasal sound [n]. As observed from the examples in (53a-c), [l] is followed by vowels [a, e, o] while [l] becomes [d] when it is followed by [i, u]. It is not surprising; therefore, that [l] and [d] become [t] when they follow a nasal sound [n]. According to Podile (2005), the same process where the lateral changes to a stop takes place in Xhosa when the prefix *iN* is affixed to a verbal stem in the derivation of deverbative (nouns derived from verbs) nouns as illustrated below:

| | | |
|-----|------------------|-------------------|
| 54. | in + lima | indima |
| | ‘plough’ | ‘a ploughed area’ |

As can be seen from the Xhosa example provided above, the lateral [l] changes to [d]. This differs from the Sesotho lateral sound [l] in that it changes to [t] not to [d] as [l] and [d] constitute a single phoneme. Below is the phonological rule representing phonetic changes in (53) above:

| | | | | |
|-----|-----------|-----------|---|-----------|
| 55. | [l] | [t] | / | [n] |
| | + lateral | - lateral | | - lateral |

| | | |
|---------------|---------------|---------------|
| + approximant | - approximant | - approximant |
| - nasal | | + nasal |
| + continuant | - continuant | - continuant |

The phonological rule in (55) indicates that a continuant sound which is a lateral loses [continuant] feature and possesses [- continuant] in the environment of the nasal sound [n]. According to Podile (2005), this change happens because the manner of articulation of the preceding nasal differs from that of the lateral [l]. He postulates that they differ in manner of airstream obstruction and release. He further posits that in the articulation of the nasal sound, the oral cavity is completely obstructed which is not the case when the lateral sound is articulated. This means that the lateral assimilates a greater degree of airstream obstruction from the nasal stop. It should be noted, however, that the place of articulation has not been affected as this lateral and nasal sound are articulated at the same place.

r-Stopping

In this process, a trill becomes a stop. As with other fricatives, the production of trills does not involve a complete closure. Examples illustrating phonetic changes that affect trills are provided in (56) below:

| | | |
|---------------------|-------------------|--|
| 56. [r] | [t ^h] | |
| (a) in + [raha] | [inraha] | [it ^h aha] (ithaha) |
| REFL + ‘kick’ | | ‘kick oneself’ |
| (b) in + [rɛkɛla] | [inrɛkɛla] | [it ^h ɛkɛla] (ithekela) |
| REFL + ‘buy for’ | | ‘buy for oneself’ |
| (c) in + [ritedisə] | [inritedisə] | [it ^h itedisə] (ithitelisa) |

| | | | |
|----------|------------------------|------------|------------------------------------|
| | REFL + ‘cause to brew’ | | ‘cause oneself to brew’ |
| (d) in + | [rʉkɛla] | [inrʉkɛla] | [it ^h okɛla] (ithokela) |
| | REFL + ‘sew for’ | | ‘sew for oneself’ |
| (e) in + | [ruta] | [inruta] | [it ^h uta] (ithuta) |
| | REFL + ‘teach’ | | ‘teach oneself’ |

The data in (56a-e) above suggest that where the nasal [n] is attached to verbs whose initial consonants start with [r], [r] changes to [t^h]. These phonetic changes are represented by the rule below:

| | | | |
|-----|------------------|-------------------|---------------|
| 57. | [r] | [t ^h] | [n] |
| | + continuant | - continuant | - continuant |
| | + approximant | - approximant | - approximant |
| | - nasal | | + nasal |
| | + anterior | | + coronal |
| | - spread glottis | + spread glottis | |

As represented by the phonological rule in (57), the sound [r] loses its manner feature of being continuant to that of the nasal sound and becomes [-continuant] which indicates that it has become a stop. Note however, that the place of articulation of the input, output and the environment is similar. They possess [+anterior] because they are alveolar sounds.

In all of the cases of assimilation discussed up to this point, all sounds that are not stops become stops when they follow the nasal sound [n] because they assimilate the [-continuant] feature from the nasal [n]. The phonetic changes that take place when the reflexive [i] is attached to verbs result in stopping

because the sounds following [i] assimilate [-continuant] feature from [n] on underlying representation.

3.3.2 Affrication Triggered by Attachment of the Reflexive

There are some sounds which do not totally lose their continuance when they assimilate features from a nasal stop [n]. This view is elaborated in Podile (2005) when stipulating that the voiceless fricatives become affricates with ejectives and the breathy voice in fricatives is retained in the resulting affricates. These sounds (as will be shown in the discussion) lose [continuant] feature to become more like stops but retain [strident] feature.

s-Affrication

This process occurs when the sound [s] becomes [ts^h]. This happens when [n] precedes [s] as illustrated below:

| 58. [s] | [ts ^h] | |
|---------------------------------|--------------------------|--|
| (a) in + [saxɛla] | [insaxɛla] | [its ^h axɛla] (itšakhela) |
| REFL + ‘saw’ | | ‘saw for oneself’ |
| (b) in + [sɛha] | [insɛha] | [its ^h ɛha] (itšeha) |
| REFL + ‘cut’ | | ‘cut oneself’ |
| (c) in + [sidila] | [insidila] | [ints ^h idila] (itšilila) |
| REFL + ‘rub’ | | ‘rub oneself’ |
| (d) in + [sɔt ^h isa] | [insɔt ^h isa] | [its ^h ɔt ^h isa] (itšothisa) |
| REFL + ‘cause to turn for’ | | ‘cause to turn for oneself’ |
| (e) in + [supisa] | [insupisa] | [its ^h upisa] (itšupisa) |

REFL + ‘show’

‘show oneself’

In the examples in (58) above, [s] has changed to [tʰ] where it follows [n] which is the objectival concord of the first person singular and the reflexive [in]. These changes are summarized by the rule below:

| | | |
|-------------------|-------------------|--------------|
| 59. [s] | [tʰ] | n |
| + continuant | - continuant | - continuant |
| + strident | | + nasal |
| - delayed release | + delayed release | + coronal |
| - spread glottis | + spread glottis | |

ʃ-Affrication

In this process, the sound [ʃ] changes to [tʃʰ] which is an affricate. The examples are provided below:

| | | |
|------------------|----------|--------------------|
| 60. [ʃ] | [tʃʰ] | |
| (a) in + [ʃapa] | [inʃapa] | [itʃʰapa] (itsapa) |
| REFL + ‘beat’ | | ‘beat oneself’ |
| (b) in + [ʃɛba] | [inʃɛba] | [itʃʰɛba] (icheba) |
| REFL + ‘look at’ | | ‘look at oneself’ |

The changes above show that [ʃ] becomes [tʃʰ] when it follows [n]. The changes are formalized using features as demonstrated below:

| | | |
|--------------|--------------|--------------|
| 61. [ʃ] | [tʃʰ] | [n] |
| + continuant | - continuant | - continuant |

| | | |
|-------------------|-------------------|-----------|
| + high | | + nasal |
| - delayed release | + delayed release | + coronal |
| - spread glottis | + spread glottis | |

The rule above means that the output has acquired [- continuant] from the environment. The feature acquired by the output is a manner feature. The place of articulation of [ʃ] has not changed.

ɬ-Affrication

This process can be defined as a process whereby [ɬ] changes to [tɬ^h]. The changes are illustrated below:

| | | |
|-----------------------|--------------------|---|
| 62. [ɬ] | [tɬ ^h] | |
| (a) in + [ɬatswa] | [inɬatswa] | [itɬ ^h tswa] (itlhatsoa) |
| REFL + ‘wash’ | | ‘wash oneself’ |
| (b) in + [ɬεkεla] | [inɬεkεla] | [itɬ ^h εkεla] (itlhekela) |
| REFL + ‘clear for’ | | ‘clear for oneself’ |
| (c) in + [ɬubudisa] | [inɬubudisa] | [itɬ ^h ubudisa] (tlhobolisa) |
| REFL + ‘make undress’ | | ‘make oneself undress’ |

The changes in (62) show that [ɬ] becomes [tɬ^h] when it follows a nasal sound [n]. The phonetic changes above can be represented using distinctive feature theory as follows:

| | | |
|-------------------|-------------------|--------------|
| 63. [t̥] | [t̥ʰ] | [n] |
| + continuant | - continuant | - continuant |
| - delayed release | + delayed release | + nasal |
| - spread glottis | + spread glottis | + coronal |

The rule above states that output has acquired [-continuant] from the environment. However, the output possesses [delayed release, spread glottis] features which show that it is aspirated.

3.4 Dissimilation Process Triggered by Attachment of the Reflexive

As has already been stated, dissimilation occurs where segments become less similar to each other. The process which behaves this way when the reflexive is attached to verbs is devoicing.

3.4.1 Devoicing Triggered by Prefixation of the Reflexive

This process takes place where voiced sounds lose their voice and become voiceless. Zsiga et al (2006) refer to this process as post-nasal devoicing because word initial voiced stops devoice after a nasal prefix. When analyzing Tswana, Dickens (1984) and Zsiga et al (2006) state that Setswana voiced stops devoice post-nasally as can be seen in (64) below:

| | |
|--------------|----------------|
| 64. luma | ntuma |
| ‘bite’ | ‘bite me’ |
| r ata | n thata |
| ‘love’ | ‘love me’ |
| b ata | m pata |
| ‘look for’ | ‘look for me’ |

| | |
|--------------------|-----------------------|
| direla | ntirela |
| ‘do something for’ | ‘do something for me’ |

The data above from Setswana suggest that when a nasal sound is prefixed to voiced sounds, voiced sounds become voiceless. The Sesotho examples where voiced sounds have lost their voicing are provided below:

| | | |
|-----------------------|------------|---------------------|
| 65. (a) in + [bɔna] | [inbɔna] | [ipɔna] (ipona) |
| REFL + ‘see’ | | ‘see oneself’ |
| (b) in + [dilɛla] | [indilɛla] | [itilɛla] (itilela) |
| REFL + ‘smear for’ | | ‘smear for oneself’ |
| (c) in + [lɪfa] | [inlɪfa] | [itɪfa] (itefa) |
| REFL + ‘pay’ | | ‘pay oneself’ |
| (d) in + [rata] | [inrata] | [ithata] (ithata) |
| REFL + ‘love’ | | ‘love oneself’ |
| (e) in + [dʒesa] | [indʒesa] | [itʃesa] (itjesa) |
| REFL + ‘cause to eat’ | | ‘make oneself eat’ |

All the changes demonstrated above indicate that voiced sounds [b, d, l, r, dʒ] become voiceless when [in] which is the reflexive is prefixed to verbs. Note however that voiced sounds shown in the examples above change to voiceless stops and voiceless affricates. The changes are summarized by the phonological rule below:

66.

+ consonantal

+ voice
- nasal

- voice

+ voice
+ nasal

This rule states that voiced consonantal sounds change to voiceless sounds in the environment of the nasal sound. In other words, these sounds do not acquire the feature [voice] which the environment has. It is, therefore, suggested that dissimilation has taken place and as indicated in the previous chapter, it was said that it is because of the phonotactic constraints of this language.

In general, the phonological process of devoicing takes place when the nasal sound [n] not [ɲ] is affixed to verbs. That is why we have suggested that the reflexive comprises [n] which causes all these changes. This fact makes the phonetic changes caused by the objectival concord [n] alike with those that are caused by the reflexive [ɲ] because they possess [n].

3.5 Conclusion

Regarding the phonology of vowel [i], the conclusion reached is that this vowel does not cause the phonetic changes observed when the reflexive is attached to verbs. This is because there are situations where it permits *i* + fricative combination while as reflexive prefix, it only allows stops to follow it.

The conclusion reached regarding nasal cluster reduction and nasal place assimilation in verbs is that nasal deletion takes place in disyllabic and polysyllabic stems. In the case of monosyllabic stems, nasal deletion is restricted because of word minimality requirement of two syllables. However, nasal deletion is also blocked to avoid loss of the morpheme as it comprises one syllable [n]. It is in situations where the nasal prefix is not deleted where nasal

place assimilation takes place. The alveolar nasal assimilates to the place of articulation of labial, palatal and velar sounds.

We conclude that assimilatory processes such as stopping and affrication take place when the reflexive is attached to verbs as a result of nasal influence. It has been suggested that the reflexive comprises [in] and the nasal sound gets deleted on surface representation hence the changes are similar to those caused by the objectival concord of the first person singular.

We also conclude that devoicing which is dissimilation is caused by nasal influence. This process takes place in a similar manner as it does with the nasal influence of the objectival concord.

NOTES

5. REFL = A reflexive prefix

6. V = Vowel

7. C = Consonant

CHAPTER 4

NASAL INFLUENCE RESULTING IN TOTAL ASSIMILATION

4.0 Introduction

Chapters two and three discussed partial assimilation where the alveolar nasal [n] exerts influence on the consonants it precedes. As explained by Trask (1996), partial assimilation takes place when the assimilated sound becomes more similar but not identical to the influencing sound. So, we have seen that consonants following alveolar nasal assimilate manner features from this nasal but not all the features.

The focus of this chapter, however, is on affixes such as the nominal prefix [mʰ] of class 1 and 3, objectival concord of the third person in class 1 [mʰ] and the perfect tense suffix [ile] which cause consonants adjacent to them to undergo or the affix itself to undergo total assimilation. According to Trask (1996), total assimilation occurs when the sound undergoing assimilation has become identical to the influencing sound. That is, some consonants acquire manner as well as place of articulation of the preceding nasals. Still referring to total assimilation, which in

Hyman's (1995) study is referred to as Consonantal Nasal Harmony (CNH), he has suggested that only voiced consonants are nasal-bearing units in Yaka. We understand nasal-bearing units to be sounds that allow total assimilation to nasality. He further suggests that nothing blocks the rightward spread of nasality if the [+nasal] feature can find an appropriate nasal bearing unit (which is the voiced sound l or d) to its right within the stem. He states that the perfective suffix in Yaka /-idi/ is seen to alternate between /-idi/ and /-ini/.

In Sesotho, [l] of the perfect tense suffix and [b] which is the initial sound of verbs seem to behave in a similar manner as [l] or [d] in Yaka. In this regard, we want to assume that [l] and [b] are the nasal-bearing units in Sesotho because they are voiced. There are other voiced sounds such as [r, dʒ] which do not undergo total assimilation. We would expect [r] to undergo total assimilation because it shares [+voice, +approximant, +sonorant, +coronal] features with [l]. Adopting the explanation provided in chapter two that [r] and [l] differ in the degree of continuancy, we have indicated that the degree of continuancy of [l] is less than that of [r]. There is a complete closure at the centre though portion of airstream flows at the sides of the tongue while with [r] the articulators are not in contact. Consequently, [l] behaves like nasal stops [n, m] because of that obstruction of airstream. In addition, [l] possesses [+syllabic] feature which is also possessed by nasal sounds [m, n]. On the other hand, [dʒ] is an affricate which means that two sounds have combined. In the production of this sound, there is a complete closure which is followed by the hissing sound just like that of fricatives hence this makes it difficult for total assimilation to occur.

It is observed that when the objectival concord of the third person of class 1 is affixed to verbal stems whose initial consonants start with [b]; [b] undergoes total assimilation. These phonetic changes also occur when the nominal prefix [mʰ] of

class 1 and 3 are prefixed to stems whose initial consonants begin with [b]. For instance:

| | | | |
|-----------------|----------|---------|----------------|
| 67. mɸ + [bɸpa] | [mɸbɸpi] | [mbɸpi] | [mmɸpi](’mopi) |
| PREF + ‘create’ | | | ‘creator’ |

In the example provided above, the attachment of the nominal prefix [mɸ] triggers vowel deletion of [ɸ]. Deletion is a natural process normally associated with syllabification. According to Urua (2000), deletion and insertion are syllable structure processes and when segment deletion or insertion takes place in a language; there is the tendency for the syllable structure to be reorganized from its basic component structure. With this, it can be said in passing that after the deletion of [ɸ] the syllable structure is affected as the end-result of this process is a syllabic nasal [m] which influences [b] to change to [m].

Furthermore, when the perfect tense suffix [ile] is attached to verbs whose stem-final consonants are nasal sounds; [l] undergoes total assimilation. However, [l] does not undergo total assimilation with other verbs ending with nasals. The examples are provided below:

| | | |
|------------------------|------------|----------------------|
| 68. (a) [nahana] + ile | [nahanile] | [nahanne] (nahanne) |
| ‘think’ PERF | | ‘have / has thought’ |
| (b) [bɔna] + ile | [bɔnile] | *[bonne] *(bonne) |
| ‘see’ | | ‘have / has seen’ |

As can be seen in example (68a) above, the vowel [i] is deleted and [l] totally assimilates into [n]. In example (68b), the vowel [i] is elided but total assimilation

brings about unacceptable word *[bonne] ‘have / has seen’. It is therefore the aim of this chapter to investigate reasons that cause this irregularity.

4.1 The Influence of [m] on nominal stems and verbs

As stated earlier, [m] influences consonants that follow it. It makes sounds such as [b] acquire its features. We will start with the nominal prefix [m~~ɓ~~] of class 1 and 3 to demonstrate how it causes total assimilation.

4.1.1 Total Assimilation in Deverbative nouns of class 1 and 3

The nominal prefix [m~~ɓ~~] is attached to verbs to form deverbative nouns of class 1 and 3. According to Doke and Mofokeng (1984), deverbative nouns are nouns that are derived from verbs. So, when the prefix [m~~ɓ~~] is attached to verbs whose initial sound is [b], [b] changes to [m] as illustrated below:

69. (a) Class 1

| [b] | [m] | | |
|--|--------------------------------------|------------------------|---------------------------------|
| (i) m ɓ + [bala] | [m ɓ badi] | [mbadi] | [mmadi] (‘mali) |
| PREF + ‘read’ | | | ‘reader’ |
| (ii) m ɓ + [bua] | [m ɓ bui] | [mbui] | [mmui] (‘mui) |
| PREF + ‘speak’ | | | ‘speaker’ |
| (iii) m ɓ + [b ɓ laja] | [m ɓ b ɓ laji] | [mb ɓ laji] | [mm ɓ laji] (‘molai) |
| PREF + ‘kill’ | | | ‘killer’ |

(b) Class 3

| | | | |
|-----------------------------|-----------------------|---------|-----------------|
| (i) m ɓ + [busa] | [m ɓ buso] | [mbuso] | [mmuso] (‘muso) |
|-----------------------------|-----------------------|---------|-----------------|

| | | | |
|-----------------------------|---------------------|---------|-----------------|
| PREF + ‘govern’ | | | ‘government’ |
| (ii) m t + [bina] | [m t bino] | [mbino] | [mmino] (’mino) |
| PREF + ‘sing’ | | | ‘music’ |
| (iii) m t + [besa] | [m t beso] | [mbeso] | [mmeso] (’meso) |
| PREF + ‘roast’ | | | ‘braai’ |

In the examples provided, when [m t] is affixed to verbs beginning with [b], a vowel [ɨ] is elided and as [b] gets adjacent to [m]; [b] totally assimilates into [m]. Kunene (1961) also indicates that elision occurs in noun classes. With regard to the word [mmuso] ‘government’, Kunene (1961) states that the elision is compulsory and it is accompanied by assimilation of [b] to preceding nasal. Kunene (1961) and Rantšo (2007) point out that during syllabification the vowel between two l_s, m_s and n_s is elided. These changes are also observed in Northern Sotho as presented by Louwrens et al (1995). They indicate that in all cases where total assimilation takes place the sequence /mo/, which we assume is [m t], is either the nominal prefix of class 1 or class 3, or the objectival concord of class 1. Examples from Northern Sotho are provided below:

70. Northern Sotho by Louwrens et al (1995)

- */moβali/ /mmali/ ‘reader’
- */moβutla/ /mmutla/ ‘hare’
- */moβɔna/ /mmɔna/ ‘see him / her’

As can be seen, the vowel /o/ which is assumed to be [ɨ] is elided just as it is in Southern Sotho. It is after elision of the vowel that the following consonant changes to a preceding nasal. Below are the phonological rules to capture the

changes demonstrated above. The rule in (71) represents deletion of the vowel [ɘ] while the rule in (72) summarizes total assimilation.

| | | | | |
|-----|---------------|---|------------|------------|
| 71. | [ɘ] | ∅ | [m] | [b] |
| | - consonantal | | + nasal | - nasal |
| | + labial | ∅ | + labial | + labial |
| | + high | | + voice | + voice |
| | + back | | + anterior | + anterior |

The rule in (71) states that a back sound which possesses [+ labial, + high] features is elided between two sounds which possess [+ labial, + voice] features. One of the environments is a nasal sound. This rule seems to be natural because [ɘ] is a round vowel and thus it possesses [+ labial] feature which indicates that [ɘ, m, b] make a natural class. Hall (2007) stipulates that labial and round features are necessary to account for lip-rounding in vowels and consonants. He further states that round is analysed as a dependent of labial, hence it is expected that rounded vowels and labial consonants make a natural class.

To ease articulation, [ɘ] is deleted because it is a back sound while [m, b] possess [+ anterior] feature, hence front. After the deletion of the vowel [ɘ], we have a combination of /m + b/. As indicated by Rantšo (2007), [b] assimilates into [m] to avoid creation of unacceptable word forms such as *mbila ‘road’ or *mbele ‘body’. The changes are represented by a phonological rule below:

| | | | |
|-----|----------|-----|----------|
| 72. | [b] | [m] | [m] |
| | + labial | | + labial |

| | | |
|--------------|---------|--------------|
| + voice | | + voice |
| - continuant | | - continuant |
| - nasal | + nasal | + nasal |

The rule in (72) indicates that [b] totally assimilates [+ nasal] feature from the nasal sound [m]. It also shows that features such as [+ labial, + voice, - continuant] are retained. That is, the place of articulation of the input is not affected as [b] and [m] are both labial sounds. As has been stated earlier, assimilation takes place among other reasons to ease articulation; we also see this reason to apply here. Although [b, m] share the place of articulation, their manner of articulation differs. [b] is an oral stop while [m] is a nasal stop. Therefore, to ease articulation, one of these sounds has to change its manner of articulation. That is why [b] totally assimilates into [m].

4.1.2 Total Assimilation in Verbs

The attachment of the objectival concord of the third person in noun class 1 [m⁺] to verbs that begin with a sound [b] brings about the same phonetic changes to [b] as those illustrated above. The examples are provided below:

| | | | |
|------------------------------|------------------------|----------|----------------------|
| 73. [b] | [m] | | |
| (a) m ⁺ + [balla] | [m ⁺ balla] | [mballa] | [mmalla] ('malla) |
| OC + 'read for' | | | 'read for him / her' |
| (b) m ⁺ + [bɔna] | [m ⁺ bɔna] | [mbɔna] | [mmɔna] ('mona) |
| OC + 'see' | | | 'see him / her' |
| (c) m ⁺ + [bitsa] | [m ⁺ bitsa] | [mbitsa] | [mmitsa] ('mitsa) |
| OC + 'call' | | | 'call him / her' |

would be expected. Also, a monosyllabic verb [na] ‘rain’ does not influence [l] of the perfect tense suffix to undergo similar phonetic changes which it undergoes when [ile] follows disyllabic and polysyllabic verbs whose stem-final consonants are nasals such as [bina] ‘sing’. With these observations, we want to draw the conclusion that Sesotho has restrictions concerning monosyllabic stems and morphemes which cannot be phonologically explained.

The second instance in which total assimilation does not occur is where the polysyllabic word [mʉbiʃɔpo] (*mobishopo*) ‘bishop’ which is borrowed from English is used. The expectation would be for [ʉ] to be deleted and [b] to change to [m]. The assumption would have been that this vowel deletion occurs when [mʉ] is prefixed to verbs but there are cases where this vowel deletion takes place to stems which are not verbs as is the case with disyllabic stems such as [bila] ‘road’ which has become [mmila] ‘road’ and [bele] ‘body’ which has changed to [mmele] ‘body’ to mention a few. We have no explanation for this issue so we leave it for further investigations as we did not find other loan words following the same sequence as [mʉbiʃɔpo] ‘bishop’.

In summary, we have seen that Sesotho disallows [mʉ + b] (mo- + b) combination in verbs. As a result, the vowel [ʉ] of the prefix [mʉ] is elided when [mʉ] is attached to verbs whose initial sound is [b]. After the deletion of the vowel, [b] changes to [m] which means that [b] has totally assimilated in nasality. In other words, [b] has changed its manner of articulation to that of a nasal sound to ease articulation. Our discussion has also revealed that the deletion of the vowel [ʉ] in adjectival concord of class 1 and the noun [mʉbu] ‘soil is blocked. This is

associated with the phonotactic constraints of this language concerning monosyllabic stems and morphemes.

4.2 Total Assimilation on Perfect Tense Suffix

In this section, we discuss total assimilation that occurs due to the attachment of the perfect tense suffix to verbs which end in nasals. These verbs are divided into two groups, namely, those that end in [n] and those that end in [m] and so are the sections. We will also account for irregularities concerning the surface representations of verbs in perfect tense.

4.2.1 Total Assimilation in Verbs Ending in [na]

The focus of this section is to account for different changes that occur when the perfect tense suffix [ile] is affixed to verbs that end in [na]. It is observed that the attachment of [ile] to these verbs leads to the deletion of the vowel [i] and manner assimilation of [l] to [n] as illustrated below:

| | | | |
|----------------------|------------|-----------|---------------------|
| 74.(a) [lwana] + ile | [lwanile] | [lwanle] | [lwanne] (loanne) |
| ‘fight’ + PERF | | | ‘have/has fought’ |
| (b) [hana] + ile | [hanile] | [hanle] | [hanne] (hanne) |
| ‘refuse’ + PERF | | | ‘have/has refused’ |
| (c) [bina] + ile | [binile] | [binle] | [binne] (binne) |
| ‘sing’ + PERF | | | ‘have/has sung’ |
| (d) [nahana] + ile | [nahanile] | [nahanle] | [nahanne] (nahanne) |
| ‘think’ + PERF | | | ‘have/has thought’ |
| (e) [ɬafuna] + ile | [ɬafunile] | [ɬafunle] | [ɬafunne] (hlafuna) |
| ‘chew’ + PERF | | | ‘have/has chewed’ |

In the above examples, the first phonetic change to take place is vowel deletion of [i]. After the vowel [i] has been elided, [l] assimilates to [n]. The phonetic changes illustrated in (74) can be summarized by phonological rules below. The rule in (75) deals with vowel deletion while the rule in (76) represents changes where [l] becomes [n].

| | | | |
|---------------|---|------------|------------|
| 75. [i] | ∅ | [n] | [l] |
| - consonantal | | + nasal | - nasal |
| + high | ∅ | + coronal | + coronal |
| - back | | + sonorant | + sonorant |
| + sonorant | | - lateral | + lateral |
| + syllabic | | + syllabic | + syllabic |

The rule in (75) states that a sound with [- consonantal, + high, - back, + sonorant, + syllabic] features is elided between a nasal sound and a sonorant lateral sound. The vowel [i], [l] and [n] share the following features: [+ syllabic, + sonorant]. We have indicated that after elision of a vowel [i], [l] becomes [n] as represented by the rule below:

| | | |
|------------|-----------|-----------|
| 76. [l] | [n] | [n] |
| + lateral | - lateral | + nasal |
| + coronal | | + coronal |
| - nasal | + nasal | |
| + sonorant | | |
| + syllabic | | |

Hyman (2003) indicates the ability of a consonant to affect another consonant across a vowel in other Bantu languages. He stipulates that in Bukusu [l] assimilates to a preceding [r] across a vowel. He also states that a wide range of Bantu languages nasalize [l] or [d] to [n] after a NV(V) syllable. This indicates that the change can occur where the nasal is followed by a vowel or there is no vowel in between. Kula and Marten (1998) also indicate that in Bemba suffixes containing the consonant [l] for example, *-ile* ‘perfect’ or *-ila* ‘applicative’ becomes [n] when the preceding consonant is a nasal. The illustrations from Bemba by Kula and Martens (1998) are provided below:

| | | | |
|--------------|----------|-----------------|------------------|
| 78. -tana | ‘refuse’ | -tan ina | ‘refuse for, at’ |
| -tuma | ‘send’ | -tum ina | ‘send for’ |
| | | | |
| (-tana + ila | | tan ila | tan ina |
| ‘refuse’ | | | ‘refuse for’ |
| - tuma + ila | | tum ila | tum ina |
| ‘send’ | | | ‘send for’) |

Although examples where perfective suffix affixed to verbs are not provided above, it can be seen that [l] changes to [n] when applicative suffix is attached to verbs whose stem-final consonants are nasals. Selebeleng (1997) has also analysed the changes that are brought by the attachment of the perfective suffix in Sesotho. This scholar states that perfect tense forms such as [nonne] ‘have / has become fat’ and [remme] ‘have / has chopped’ involve vowel deletion and complete progressive assimilation processes. According to Trask (1996), progressive assimilation is the assimilation of an earlier sound to a later one. Because Selebeleng’s (1997) focus is on vowel raising and vowel laxing rules, this scholar

mentions that the presence of a high vowel on underlying representation of the perfect verb stems accounts adequately for the laxing of the preceding mid-low vowels. According to Selebeleng (1997), the deletion of the high vowel is triggered by the mid-low vowels as illustrated in [nonne] ‘have / has become fat’ below:

79. Example of perfect tense by Selebeleng (1997):

- /-nɔ̃n + a/ become fat
- /- nɔ̃n + iɛ/ perfect tense
- /- nɔ̃n + iɛ̃/ mid-low vowel Laxing Rule and Mid-low vowel Raising Rule
- /- nɔ̃n + lɛ/ vowel deletion rule
- /- nɔ̃n + nɛ/ complete progressive Assimilation
- /- nɔ̃nnɛ/ surface representation

From the example in (79) as illustrated by Selebeleng (1997), [i] is elided because of the influence of [ɔ̃] and [ɛ̃]. In our case, we do not consider the second vowel of the suffix *-ile* as a mid-vowel [ɛ̃] so we do not adopt Selebeleng’s (1997) idea that the deletion of the vowel [i] is influenced by the vowel [ɔ̃] and [ɛ̃]. It is also shown that complete progressive assimilation of [l] takes place after the deletion of the vowel [i]. For the purpose of this study, vowel laxing and raising rules will not be discussed. We are interested in features which have changed. Also, we have observed that in our case we cannot single out vowels which can be regarded as the triggers of [i] deletion as almost all Sesotho vowels are involved in this deletion. For instance, vowels such as [a] in [hana] ‘refuse’, [u] in [ʈafuna] ‘chew’, [i] in

[bina] ‘sing’, [ɛ] in [rɛma] ‘chop’, [ɔ] in [nɔna] ‘become fat’ and [ʉ] in [rʉma] ‘send’ are involved.

There is one phonetic context in which vowel deletion and total assimilation do not occur. This context involves the monosyllabic verb [na] ‘rain’. Instead of the aforementioned phonological rules applying, coalescence rule applies. The example is provided below:

| | | |
|----------------|---------|---------------|
| 80. [na] + ile | [naile] | [nele] (nele) |
| ‘rain’ + PERF | | ‘has rained’ |

The example above shows that the ending vowel [a] is not deleted when the perfect tense suffix is attached to the verb [na] ‘rain’ as is the case with other verbs ending in this vowel. In addition, the vowel [i] is not elided as has been seen in the preceding examples. In this case the vowel [a] and [i] coalesce and form [e]. This is not exceptional, as is the case with nouns such as [metsi] ‘water’ which originates from [maitsi] and [menɔ] ‘teeth’ from [mainɔ]. This change can be summarized by the rule below:

| | | | | |
|-----|---------------|---|---------------|---------------|
| 81. | [a] | + | [i] | [e] |
| | - high | | + high | - high |
| | - consonantal | + | - consonantal | - consonantal |
| | + low | | | - low |

The rule in (81) states that the outcome of a combination of a [+ high] vowel and a [- high] vowel constitutes an output which possesses [- high, - consonantal] features.

We have also observed that there is another group of verbs whose stem-final consonants are nasals which undergo consonantal deletion instead of total assimilation. That is, after the deletion of the vowel [i], [l] also gets deleted and the perfect tense suffix [ile] surfaces as [ɨ]. The examples are demonstrated below:

| | | | |
|----------------------|------------|-----------|----------------------------|
| 82. (a) [kɛna] + ile | [kɛnile] | [kɛnle] | [kɛnɨ] (kene) |
| ‘enter’ + PERF | | | ‘have / has entered’ |
| (b) [bɔna] + ile | [bɔnile] | [bɔnle] | [bɔnɨ] (bone) |
| ‘see’ + PERF | | | ‘have / has seen’ |
| (c) [fana] + ile | [fanile] | [fanle] | [fanɨ] (fane) |
| ‘be generous’ | | | ‘have / has been generous’ |
| (d) [teana] + ile | [teanile] | [teanle] | [teanɨ] (teane) |
| ‘meet’ + PERF | | | ‘have / has met’ |
| (e) [fumana] + ile | [fumanile] | [fumanle] | [fumanɨ] (fumane) |
| ‘find’ + PERF | | | ‘have / has found’ |
| (f) [kɔpana] + ile | [kɔpanile] | [kɔpanle] | [kɔpanɨ] (kopane) |
| ‘meet’ + PERF | | | ‘have / has met’ |

The examples provided above reveal that verbs such as [kɛna] ‘enter’, [bɔna] ‘see’, [teana] ‘meet’ [fumana] ‘find’ and [kɔpana] ‘meet’ do not undergo total assimilation like verbs such as [bina] ‘sing’ and other verbs mentioned earlier. Total assimilation is blocked by the deletion of [l] to disallow syllabification of the nasal sound [n]. According to Doke and Mofokeng (1985), verbs such as [fumana]

‘find’ and [xa†ana] ‘meet’ are reciprocal. These verbs form a group with [teana] ‘meet’, [kɔpana] ‘meet’, [arohana] ‘separate from’ and [lekana] ‘to be enough’ which in the sense of Doke and Mofokeng (1985), we consider them to be reciprocal verbs. Although [bɔna] ‘see’, [fana] ‘be generous’ and [kɛna] are not reciprocal verbs, they have implied causative meaning. Their semantic meanings are as if these actions occur because they are triggered by something. Therefore, most verbs in this category are not basic verbs but inchoative in the sense of Doke and Mofokeng. Other inchoative radicals, whose ending is [†] in the perfect tense, are those whose stem-final consonant is [r] such as [apara] ‘put on’, [jara] ‘carry’ and [ɛmara] ‘be pregnant’ which become [aper†] ‘has put on’, [jer†] ‘has carried’ and [emer†] ‘has become pregnant’, respectively. We will not repeat the phonological rule of deletion of the vowel [i] represented in (75) but we would rather formulate a rule to capture the phonetic changes involving the deletion of [l] following a nasal sound as summarized below:

| | | | |
|-----------|---|-----------|---------------|
| 83. [l] | ∅ | [n] | [e] |
| + lateral | ∅ | + nasal | - consonantal |
| + voice | | + coronal | - high |
| | | | - back |

The above rule indicates that a voiced lateral is deleted between a nasal and a vowel that possesses [-high, -back] features.

Considering the traditional grammar of IsiZulu and IsiSwati, when the perfect tense suffix is followed by an object or an adverb, the suffix *-ile* is shortened to *-e*. the examples are provided below:

84. IsiZulu examples by Ziervogel et al (1981)

bona (see) > bone (have seen)

funda (learn) > funde (have learnt)

ngibon**ile** ‘I have seen’ > ngibone abafana ‘I have seen boys’

85. IsiSwati examples by Ziervogel and Mabusa (1976)

bona (see) > bon**ile** (have seen) long form

bona (see) > bone (have seen) short form

Although Ziervogel et al (1981) and Ziervogel and Mabusa (1976) do not account for the phonological processes involved in these examples, we can see that the short form of *bonile* ‘have seen’ is similar to Sesotho *bone* ‘have seen’.

In general, this section has accounted for the difference of the output where the perfect tense suffix is affixed to verbs whose stem-final consonants are nasal [n]. It has been stated that with verbs such as [bina] ‘sing’, [nahana] ‘think’ and [ɬafuna] ‘chew’, the high vowel in the suffix is elided and the following consonant acquires manner feature [+ nasal] from the preceding nasal [n]. In other cases where verbs such as [ɛma] ‘stand up’, [bɔna] ‘see’ and [fumana] ‘find’ are involved, both the vowel and the following consonant in the suffix are elided and only the ending vowel of the suffix is present on the surface representation. Also, there is a monosyllabic verb which disallows vowel deletion and total assimilation or consonant deletion. The rule which applies to this verb is coalescence rule where the ending vowel [a] of the verb and the vowel [i] of the suffix coalesce to form [e].

4.2.2 Total Assimilation in Verbs Ending in [ma]

| | | | |
|-----|--------------------|------------------|-------------------------|
| | ‘cultivate’ + PERF | | ‘have / has cultivated’ |
| (e) | [hama] + ile | [hamile] [hamle] | [hamme] (hamme) |
| | ‘milk’ + PERF | | ‘have / has milked’ |

The above examples show that the vowel [i] is elided and [l] assimilates the features of the preceding nasal [m]. The changes in (86) are represented by the phonological rule below:

| | | | |
|-----|-----------|-----------|-----------|
| 87. | [l] | [m] | [m] |
| | + lateral | - lateral | - lateral |
| | + voice | | + voice |
| | - labial | + labial | + labial |
| | - nasal | + nasal | + nasal |

The rule in (87) states that a voiced lateral changes to a labial nasal in the environment of a labial nasal. That is, [l] has changed its place of articulation which is shown by the feature [+ labial] and manner feature shown by acquiring [+ nasal].

We have indicated that other verbs do not undergo total assimilation when the perfect tense suffix is affixed to them. In this case, after the deletion of a vowel [i], [l] is also deleted while with the verbs mentioned above; [l] undergoes total assimilation. The changes are illustrated below in (88):

| | | | |
|---------|-------------------------|----------------------|-------------------------------|
| 88. (a) | [ɛma] + ile | [ɛmile] [ɛmle] | [ɛmɪ ⁹] (eme) |
| | ‘stand up’ + PERF | | ‘have / has stood up’ |
| (b) | [aɬama] + ile | [aɬamile] [aɬamle] | [aɬamɪ] (ahlame) |
| | ‘open the mouth’ + PERF | | ‘have / has opened the mouth’ |
| (c) | [palama] + ile | [palamile] [palamle] | [palamɪ] (palame) |

‘ride’ + PERF

‘have / has ridden’

(d) [inama] + ile [inamile] [inamle] [inamɨ] (iname)

‘bow down’ + PERF

‘have / has bowed down’

(e) [xumama] + ile [xumamile] [xumamle] [xumamɨ] (khumame)

‘kneel down’ + PERF

‘have / has kneeled down’

According to the examples provided above, it is indicated that when the perfect tense suffix [ile] is attached to verbs such as [inama] ‘bow down’ and [palama] ‘ride’, the vowel [i] is elided. Instead of assimilation of [l] to [m], [l] is also elided and the vowel [e], which surfaces as [ɨ], is the only sound of the perfect suffix which is present on surface representation as also indicated by Guma (1971) and Doke and Mofokeng (1985). The changes illustrated in (88) are summarized by the phonological rule below:

| | | | |
|-----------|---|----------|----------|
| 89. [l] | ∅ | [m] | [e] |
| + lateral | ∅ | + nasal | - nasal |
| + voice | | + labial | - labial |

As indicated by the rule in (89), there are no features acquired from the environment because the input is deleted. This rule shows that the deletion of [l] is allowed in the environment of [m] and [e].

The similar situation is seen in IsiZulu. Ziervogel et al (1981) state that verbs ending in *-ama* and *-ana* change to *-eme* and *-ene*, respectively, for the long form of the perfect while *-ame* and *-ane* are short forms of the perfect. In Setswana and IsiSwati, a similar situation exists. These instances are illustrated below:

90. (a) Examples extracted from Ziervogel et al (1981)'s work:

phaphama (awaken) > phaphe:me and phaphame

bonana (see each other) > bone:ne and bonane

(b) Examples from Setswana by Cole (1955):

khubana (kneel) > khubane

atlhama (gape, open the mouth) > atlhame

palama (climb, ride) > palame

(c) Example from IsiSwati by Ziervogel and Mabusa (1976):

phakama (lift) > phakeme

The examples above are said to be contracted forms of the perfect suffix *-ile* which does not pass to the surface level. In the case of IsiZulu and IsiSwati, the vowel preceding the nasal may also change to /e/ and the one following the nasal also changes to /e/. Setswana behaves in a similar manner as Sesotho as only the vowel following the nasal changes to /e/. Doke and Mofokeng (1984) indicate that verbs provided in (88) are stative verbs. In addition, Ziervogel et al (1981) and Ziervogel and Mabusa (1976) also classify the verbs with the same ending *-ana* and *-ama* as the ones in (88) as statives in IsiZulu and IsiSwati languages, respectively.

One may wonder why we have left out other nasals. Nasals such as [ɲ] and [ŋ] do not trigger total assimilation like [n] and [m]. Where the perfect tense suffix [ile] is affixed to [ɲ], affrication takes place and with [ŋ], phonetic changes do not occur as exemplified below:

91. (a) [t^huɲa] + ile [t^huɲile] [t^huɲtse] [t^huntse] (thuntse)

‘shoot’

‘have / has shot’

(b) ŋaŋa + ile

[ŋaŋile]

[ŋaŋile] (ngangile)

‘quarrel’

‘have / has quarrelled’

In the examples in (91a), the vowel [i] is elided but [l] does not assimilate to the preceding nasal [ŋ]. Instead, [l] changes to the affricate [ts]. Similarly, [ŋ] does not influence the following sounds, hence, [ŋ, ɲ] are irrelevant to the phonological process of total assimilation analysed in this chapter. The changes in (91a) are similar to the changes discussed in chapters two and three which dealt with partial assimilation.

In summary, unacceptable forms involve application of deletion rules of two sounds, namely, the deletion of a vowel [i] and the deletion of the sound [l]. Regarding the acceptable forms, only the vowel [i] is deleted.

4.3 Conclusion

This section has discussed total assimilation that is triggered by the attachment of the prefixes comprising a nasal sound [m]. It has been observed that when the nominal prefix [mɘ] is attached to verbs whose stem-final consonants are [b], the vowel [ɘ] is elided to ease articulation because it is a back vowel while [b] and [m] are front sounds. Thereafter [b] assimilates manner features of the nasal [m]. The place of articulation is retained as [b] and [m] are both labial sounds. We have seen that these changes also occur when the objectival concord of the third person in class 1 is attached to verbs whose stem-final consonants are [b].

With regard to the changes that occur when the perfect tense suffix is affixed to verbs whose stem-final consonants are nasal sounds, it is concluded that some verbs undergo vowel deletion, coalescence, consonant deletion and total assimilation. The coalescence rule has applied only to a monosyllabic verb [na]

‘rain’. It is also concluded that there are some verbs which do not permit syllabification of the nasals [n] and [m] hence the sound which has to assimilate features from the nasal is deleted. However, it is observed that there are cases when [l] is not deleted to allow total assimilation of [l] to nasals. Generally, vowels that are deleted in this chapter possess [+ high] feature. We can say that these vowels are total assimilation triggers.

NOTES

8. It should be noted that the vowels of verbs such as [rɪma], [mɛma] and [lɪma] change to [o] and [e], respectively after the attachment of the suffix [ile].
9. When the perfect tense suffix [ile] is attached to verbs such as [ɛma],

[palama], [inama] and [xumama], [e] of the suffix [ile] changes to [ɨ].

CHAPTER 5

CONCLUSION

This study has analysed the phonological processes which take place when affixes comprising nasals such as objectival concords of the first person singular,

objectival concord of the third person in class 1, adjectival concords of classes 8, 9 and 10, nominal prefixes of classes 1 and 3 and the reflexive, are attached to verbs and adjectival stems. We have employed generative phonology and distinctive feature theory to investigate the reasons that make some sounds trigger phonological processes. We have used generative phonology to determine the underlying representation of some sounds. This theory also helped in the analysis of some phonological processes such as rules of deletion, coalescence rules and feature-changing rules. In addition, distinctive feature theory helped us to distinguish affected sounds and also enabled us to identify features that have been lost or acquired from the neighbouring sounds.

In chapter two, the conclusion reached with the phonetic changes that occur to verbs to which the sound [n] is prefixed is that the sound changes are the outcome of assimilation, dissimilation and sound-shifting processes. With regard to changes that occur to verbs whose initial consonants are [f, l, r,] and [s, t, ʃ], we have found that they result in stopping and affrication, respectively. Stopping and affrication are found to be assimilatory processes because segments have acquired one or more features from the neighbouring segments. That is, the phonetic changes that take place when [n] is prefixed to verbs show that the initial consonants of verbs and some adjectival stems assimilate some features from [n] to become stops and affricates.

Concerning dissimilation process, we have found that devoicing, which also occurs to the initial consonants of verbs and adjectival stems, is a dissimilation process. This phonological process occurs to all voiced sounds preceded by nasals. We have suggested that devoicing which takes place when the nasal sound is prefixed to voiced Sesotho sounds, happens due to Sesotho phonotactic constraints because devoicing occurs to nouns and also to loan words. We cannot contend that we

devoice some sounds to ease articulation which is the main reason for dissimilation because this combination of a nasal + a voiceless sound is observed word-initially, word-medially and word-finally. Furthermore, we have noticed that a nasal + a voiced sound combination is possible in other Bantu languages and other languages of the world.

It is also concluded that the sound- changes which take place to adjectival stems that differ from those that occur with verbs are based on sound-shifting. With regard to the labio-dental sound [f], it is suggested that there is a sound-shifting to [h] to which assimilation processes apply resulting in the change of [n] to [ŋ], where the nasal sound [n] precedes [h] and also the change of [h] to [x] where [h] is preceded by [ŋ]. Furthermore, alveolar sounds [r, s, ʃ] do not change at all because their underlying representations are stops like [n] and [n] shares [-continuant] feature with those underlying stops. As a result, no assimilation has taken place to [r, s, ʃ].

The third chapter has discussed phonological processes that are triggered by the attachment of the reflexive [i]. The phonology of vowel [i] has revealed that this vowel does not trigger the phonetic changes observed when the reflexive [i] is attached to verbs. We argued that there are situations where the combination of *i* + fricative is permissible while as a reflexive prefix, it only allows stops to follow it.

It is also concluded that nasal deletion occurs when the nasal sound [n] is prefixed to disyllabic and polysyllabic stems hence the nasal encompassed in reflexive is deleted. In the case of monosyllabic stems, nasal deletion is restricted, as has been indicated with adjectival monosyllabic stems, because of word minimality requirement of two syllables. In the case of the nasal sound in the reflexive, it has been shown that it is not affected by word minimality requirements since it consists

of two syllables. That is, the reflexive affixed to monosyllabic verbs is permitted because the vowel [i] which remains forms a disyllabic word. In addition, when the nasal part of the reflexive is deleted, another part is left to represent the morpheme. It is in situations where the nasal prefix is not deleted where nasal place assimilation takes place. The alveolar nasal assimilates to the place of articulation of labial, palatal and velar sounds.

With regard to assimilatory processes of stopping and affrication which occur when the reflexive is attached to verbs, it is suggested that these processes are end-results of nasal influence. It has been suggested that the reflexive comprises [in] and the nasal sound gets deleted on surface representation hence the changes are similar to those caused by the objectival concord of the first person singular and the adjectival concords of classes 8, 9 and 10.

Concerning devoicing which is dissimilation, it is revealed that it is caused by nasal influence. This process takes place in a similar manner as it does with the nasal influence of the objectival concord.

In chapter four, we have analysed total assimilation that is triggered by the attachment of the prefixes comprising a nasal sounds. Concerning the sound changes that are triggered by [m], it has been observed that when the nominal prefix [mɘ] is attached to verbs whose stem-final consonants are [b], the vowel [ɘ] is elided. It has been revealed that this happens to ease articulation because the vowel [ɘ] is a back vowel while [b] and [m] are anterior sounds. Thereafter, [b] assimilates manner features of the nasal [m]. The place of articulation is retained because [b] and [m] are both labial sounds. We have seen that these changes also occur when the objectival concord of the third person in class 1 is attached to verbs whose stem-final consonants are [b].

With regard to the changes that occur when the perfect tense suffix is affixed to verbs whose stem-final consonants are nasal sounds, it is concluded that other verbs undergo vowel deletion, coalescence, consonant deletion and total assimilation. The coalescence rule has applied only to a monosyllabic verb [na] ‘rain’. It is also concluded that there are some verbs which do not permit syllabification of the nasals [n] and [m] hence the sound which has to assimilate features from the nasal is deleted. However, it is observed that there are cases when [l] is not deleted to allow total assimilation of [l] to nasals. Generally, vowels that are deleted in this chapter possess [+ high] feature.

REFERENCES

Batibo, H. M., Moilola, J. and N. Mosaka. 1997. “The Historical Implications of the Linguistic Relationship Between Makua and Sotho Languages” *Pula Journal of African Studies*. 11 (1): 23-29 Retrieved from

<http://archive.lib.msu.edu/DMC/Africa%20Journals/pdfs/PULA/pula011001/pula011001006.pdf>. Accessed on 22/10/2007

Casali, F. R. 1995. “NCs in Moghamo: Prenasalised Onsets or Heterosyllabic Clusters?” *Studies in African Linguistics*. 24 (2):151- 166

Chebanne, A. 2000. “The Sebirwa Language: A Synchronic and Diachronic Account” *Pula: Botswana Journal of African Studies*. 14 (2):186-200 Retrieved from

<http://archive.lib.msu.edu/DMC/African%20Journals/pdfs/PULA/pula014002/pula014002007.pdf>. Accessed on 22/10/2007

Coetzee, A. W. 2000. “Post Nasal Neutralization Phenomenon in

Tswana” Retrieved from

<http://www.personal.unitech.edu/~Coetzee/pdfs/Tswana%20post%20nasal%20devoicing.pdf>. Accessed on 27/07/2007

Coetzee, A. W. 2001. “Nasal-only Syllables in Tswana” Retrieved from <http://www-person.umich.edu/~coetzee/pdfs/nasal-only-pdf>. Accessed on 27/07/2007

Cole, T. D. 1955. *An Introduction to Tswana grammar*. Cape Town: Longman.

Chomsky, N. and M. Halle. 1968. *The Sound Pattern of English*. Cambridge: MIT Press.

Department of African languages and literature. (2000). *An Introduction to the Structure of Setswana Sentences*. Gaborone: Lentswe la Lesedi (pty) Ltd.

Dickens, P. 1984. “The History of So-called Strengthening in Tswana” *Journal of African Languages and Linguistics*. 6:97-125

Doke, C. M. and S. M. Mofokeng. 1985. *Textbook of Southern Sotho Grammar*. Cape Town: Maskew Miller Longman.

Downing, L. J. 2003. “On the Ambiguous Segmental Status of Nasals in Homorganic NC Sequences” Retrieved from <http://www.zas.gwz-berlin.de/home/downing/preNC2.pdf>. Accessed on 27/07/2007

Durand, J. 1990. *Generative and Non-Linear Phonology*. London: Longman.

Goldsmith, J. and B. Laks. 2000. “Generative Phonology: Its Origins, its Principles and its Successors” Retrieved from <http://hum.unchicago.edu/~jagoldsm/papers/GenerativePhonology.pdf>. Accessed on 22/10/2007

Guma, S. M. 1971. *An Outline Structure of Southern Sotho*.

- Pietermaritzburg: Shutter and Shooter.
- Hall, T. A. 2007. "Segmental Features" In de Lacy, P. (ed). *The Cambridge Handbook of Phonology*. Cambridge: Cambridge University Press.
- Harris, J. and G. Lindsey. 1995. "The Elements of Phonological Representation" In Durand, J. and F. Katamba (eds). *Frontiers of Phonology: Atoms, Structure, Derivations*. London: Longman.
- Hyman, L. M. 1975. *Phonology: Theory and Analysis*. New York: Holt, Rinehart and Winston.
- Hyman, L. M. 1995. "Nasal Consonant Harmony at a Distance: The Case of Yaka" *Studies in African Linguistics*. 24 (1):5-30
- Hyman, L. M. 2003. "Segmental Phonology" In Nurse, D. & G. Philippson (eds). *The Bantu Languages*. London: Routledge.
- Jensen, J. T. 2004. *Principles of Generative Phonology: An Introduction*. Amsterdam: John Benjamins Publishing Company.
- Katamba, F. 1989. *An Introduction to Phonology*. London: Longman. Cambridge: Blackwell Publishers.
- Kathekiso, J., Matia M. and M. Ramaili. 2005. *Letlotlo: Buka ea 2*. Lesotho: Longman.
- Kenstowicz, M. 1994. *Phonology in Generative Grammar*. Cambridge: Blackwell Publishers.
- Kruger, C. J. H. and J. W. Snyman. 1988. *The Sound System of Setswana*. Goodwood: Via Africa Ltd.
- Kula, N. C. 1999. "On the Representation of NC Clusters in Bemba" In Bezooizen, R. and R. Kager (eds). *Linguistics in the Netherlands*. Retrieved from <http://www.nancykula.net/kula%201999.pdf>. Accessed on 26/07/2007
- Kula, N. C. and L. Marten. 1998. "Aspects of Nasality in Bemba"

Retrieved from

<http://www.nancykula.net/Kula%20Marten%201998.pdf>.

Accessed on 26 July 2006.

Kula, N. C. and L. Marten. 2000. "Constraints and Processes: Evidence from Bemba, Herero and Swahili" Retrieved from <http://www.nancykula.net/Kula%20&%20Marten%202000.pdf>. Accessed on 26/07/2007

Kunene, D. P. 1961. "The Sound System of Southern Sotho" PH.D Thesis. University of Cape Town.

Leedy, D. P and J. E. Ormrod. 2005. *Practical Research: Planning and Design*. New Jersey: Pearson Education, Inc.

Lekhotla la Sesotho. 1984. *Sebopeho-puo: Buka ea Bobeli*. Mazonod: Mazonod Book Centre.

Louwrens, L. J., Kosch I. M. and A. E. Kotze. 1995. *Northern Sotho*. New Castle: Lin com Europa.

Makoa, F. M. 2007. "An Analysis of Phonological Processes in Some Sesotho Affixes and Verbal Extensions" Unpublished M.A Thesis. National University of Lesotho.

'Matjotjo, M. 2006. "The Phonology of a Reflexive and an Objectival Concord in Sesotho" Unpublished NUL Term Paper.

Meinhof, C. and N. J. van Warmelo. 1932. *Introduction to the Phonology of the Bantu Languages*. Johannesburg: Dietrich Reimer.

Mulaudzi, P. A. 1996. "A Descriptive Analysis of the Morphology of the Tsiguvhu Dialect of Venda" M.A. Thesis. University of South Africa.

Naidoo, S. 1993. "Distinctive Features for Zulu Phonemes" M.A. Thesis. University of Natal.

Neuman, L. W. 2000. *Social Research Methods: Qualitative and*

- Quantitative Approaches*. Gould Street: Allan & Bacon.
- Nkuna, P. 2005. "Linking Feature Geometry and Aperture Theory: A Strategy to Explain the Complex Cases of the Xitsonga Nasal Place Assimilation" *Language Matters*. 36 (1):83-97.
- O'Grady, W., Dobrovolsky, M. and F. Katamba. 1997. *Contemporary Linguistics: An Introduction*. London: Longman.
- Paster, M. 2006. "Aspects of Maay Phonology and Morphology" *Studies in African Linguistics*. 35 (1): 71-120.
- Podile, K. 2005. "Dependency Assimilatory Relations Within Xhosa Nasal Compounds of the Class 9 Nominal Prefixes" *Language Matters*. 36 (1): 61-82
- Rantšo, L. 2007. "The Occurrence of Syllabic Consonants in Sesotho" Unpublished NUL Term Paper.
- Roca, I. and W. Johnson. 1999. *A Course in Phonology*. Oxford: Blackwell Publishers Ltd.
- Schane, S. A. 1973. *Generative Phonology*. New Jersey : Prentice-Hall, Inc.
- Selebeleng, K. Z. 1997. "Phonetic and Phonological Aspects of Vowel Raising in Sesotho" unpublished M.A. Thesis. University of Stellenbosch.
- Spencer, A. 1996. *Phonology*. Massachusetts: Blackwell Publishers.
- Tatham, M. 1999. "Distinctive Feature Theory" Retrieved from <http://www.msu.edu?course?asc?232/DF/df-theory.html>. Accessed on 26/07/2007
- Trask, R. L. 1996. *Historical Linguistics*. London: Arnold.
- Uffmann, C. 2003. "Distinctive Features: An Introduction" Retrieved from <http://www.staff.uni-marburg.de/~uffmann/Features.pdf>. Accessed on 22/10/2007
- Urua, E. 2000. *Ibibio Phonetics and Phonology*. Cape Town: Centre

- for Advanced Studies of African Society (CASAS).
- wa Mberia, K. 2002. "Nasal Consonant Processes in Kitharaka"
Nordic Journal of African Studies. 11 (2):156-166. Retrieved
from
http://www.njas.helsinki.fi/ppdf-files/vol_11num2/mberia.pdf.
Accessed on 27/07/2007
- Ziervogel, D. and E. J. Mabusa. 1976. *A Grammar of the Zwati
Language (siSwati)*. Pretoria: J. L. Van Schaik (Pty) Ltd.
- Ziervogel, D., Louw J. A. and P. C. Taljaard. 1981. *A Handbook of the
Zulu Language*. Pretoria: J. L. van Schaik (Pty) Ltd.
- Zonneveld, W. 2001. "Three Approches to Generative Phonology"
Retrieved from
<http://www.lot.let.uu.nl/zs2001/zonneveld1.PDF>. Accessed on
22/10/2007
- Zsiga, E., Gouskova, M. and O. Tlale. 2006. "On the Status of Voiced
Stops in Tswana: Against *ND" Retrieved from
<http://roa.rutgers.edu/files/807-0206/807-ZSIGA-O-O.PDF>.
Accessed on 25/01/2008.