

SYLLABLE STRUCTURE PROCESSES IN NORTHERN SOTHO. A LINEAR AND NON- LINEAR PHONOLOGICAL ANALYSIS

BY

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DECLARATION

I, the undersigned, hereby declare that the work contained in this assignment is my own original work and that I have not previously in its entirety or in part submitted it at any university for a degree.

Signature

Date

ABSTRACT

This study intends to describe and explain syllable structure processes in Northern Sotho. It deals with phonological processes such as vowel deletion, semivocalization and semivowel insertion. The major aim of these processes is to restore the preferred /CV/ syllable structure which has been violated by morphological processes such as passive, diminutive, the construction of absolute pronouns, etc.

Two phonological models are applied with the intention to determine the one that presents the most credible explanation for the phenomenon at hand. The two models employed are, respectively, the Transformational (TG) and Feature Geometry (FG) models. It appears that Feature Geometry model yields better results in the description of syllable structure processes in Northern Sotho.

OPSOMMING

Hierdie studie beskryf en verklaar sillabestruktuur prosesse in Noord-Sotho. Die tersaaklike fonologiese prosesse is vokaaldelesie, semivokalisasie en semivokaalinvoeging. Die doel van hierdie prosesse is om 'n bepaalde voorkeursillabestruktuur /KV/ te herstel wat versteur word deur morfologiese prosesse met die vorming van die passief, diminutief, die konstruksie van absolute voornaamwoorde ensovoorts.

Twee fonologiese modelle word geïmplementeer ten einde te bepaal welke model die mees geloofwaardige verklarings vir die betrokke verskynsels kan bied. Die Transformasioneel-Generatiewe (TG) en Kenmerk Geometries (KG) modelle word respektiewelik toegepas. Dit skyn asof die Kenmerk Geometries model beter resultate lewer in die beskrywing van sillabestruktuurprosesse in Noord-Sotho.

KHUTSUFATSO

Thuto ye e ikemišeditše go laodiša le go hlatholla ditshepetšo tše di tšeago karolo tlhamegong ya dinoko tša polelo ya Northern Sotho.

Thuto ye e šomana le ditshepetšo tša fonolotši (thutapopomedumo) bjalo ka go phumulwa ga tumanoši (vowel deletion), phetošo ya tumanoši go ba seka-tumanoši (semivocalization) le go šunyetša seka-tumanoši magareng ga ditumanoši tše pedi ge di bapelane.

Maikemišetšo a magola a ditshepedišo tše ke go bošetša morago senoko sa /CV/ seo se sentšwego ke ditshepetšo tša mofolotši (popegopolelo) bjalo ka lefetile, nyenefatšo, ge go hlangwa mašalašala bj.bj.

Go šomišitšwe mebotlolo ye mebedi ya fonolotši ka maikemišetšo a go hwetša dipelo tše kaone ge go dirwa dinyakišišo. Mebotlolo ya gona ka Transformational (TG) le Feature Geometry (FG). Feature Geometry e bonagetše e le mmotlolo o mokaone go tšweletša dipelo tše kaonekaone tlhathollong ya tlhamego ya dinoko polelong ya Northern Sotho.

DEDICATION

I dedicate this thesis to my late grandfather, Mashikane, whom I am named after, my grandmother, Makgoale, my beloved parents, Sehlabane and Ramaabele and my brother, Seitiabatho.

I would like to thank all of you for your unconditional support and encouragement. There is a reason for me to love you.

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CHAPTER 1

ORIENTATION

1.1 INTRODUCTION

Syllable structure processes refer to the manner in which syllable structures are preserved in a particular language.

Syllable structure processes affect the relative distribution of consonants and vowels within a word. Hyman (1975:161) says that the /CV/ syllable structure is the only syllable type which is found in all languages. He argues that it is the first which is learned in child language acquisition even in languages having other syllable types. Northern Sotho has the following typical structure /CV/, CwV/, /CCV/ and /CCwV/. However these preferred syllable structures may be violated by morphological processes such as the addition of the diminutive suffix /-ana/, the construction of the absolute pronouns, etc. This will be discussed in full detail in chapter two.

1.2 THE AIMS OF THIS STUDY PROJECT

This study project focuses on the following:

- (i) To describe and explain the nature of syllable structure processes in Northern Sotho.
- (ii) To show how phonological processes play a role in the restoration of the preferred syllable structure in Northern Sotho.
- (iii) To assess the applicability of two phonological models in describing and explaining phenomena related to syllable structure processes in Northern Sotho.

Phonological descriptions in Northern Sotho have in the past mainly taken place within a structural (taxonomic) framework. Whilst applying a pre-generative model linguists were only interested in sound changes without explaining these changes. In the works of, for example Nokaneng and Louwrens (1995), Phatudi and Mashabela (1975), Kotzé (1989), Mojapelo and Hoffman (n.d.) the deletion of vowels are discussed without explaining the cause of this deletion. Why for instance, it is the first and not the second vowel which is deleted in the following example?:

- (1) /βa+ɔ̯ɛ/ > [βɔ̯ɛ] bohle “all of them”
 or
 /βa+ɔ̯na/ > [βɔ̯na] bona “them”

There are no rules which explain these sound changes or explanations of environments which causes these sound changes.

It was only important to the structuralists to list these sound changes without any attempt to explain them (cf. also Lombard *et al*, 1985).

With the development of Transformational Generative (TG) model (cf. Chomsky and Halle, 1968), the aims of linguistic description were broadened. In particular the TG model strive to obtain:

- (a) Observational adequacy (i.e observe all the changes that take place).
- (b) Descriptive adequacy (i.e describe all the changes that take place in terms of set rules etc).
- (c) Explanatory adequacy (i.e. explain in terms of its formalism why and how the change takes place).

Consider the following (TG) example describing vowel deletion:

- (2) Input /βa+ɔ̯na/
 rule 1 ɹ̥
 Output [βɔ̯na] bona “them”

In the above example the explanation lies in the fact that a syllable in Northern Sotho can only have one vowel. The deletion of vowel /a/ in the example (2) above could be formulated in terms of the following rule 1:

- (2^a) V → ϕ / C ____ + V

This means that a vowel is deleted when it follows a consonant and proceeds a morpheme boundary and a vowel. This is how rules are used to account for sound changes (cf. also Chomsky and Halle (1968), Hyman (1975), Schane (1973), Durand (1990), Gussenhoven and Jacobs (1998)).

1.3. THE TYPICAL SYLLABLE STRUCTURE IN NORTHERN SOTHO

Northern Sotho has the following typical syllable structures /CV/, /CwV/, /CCV/, /CCwV/. In case of /CV/ type of syllable structure a stem or word consists of the syllable /C/ and /V/. Northern Sotho stems show a consonant as the initial phoneme and a vowel as the final or terminating phoneme (cf. Endemann 1967:2).

Consider the following example:

- | | | | | |
|-----|------|------|------|-----------|
| (3) | /na/ | /ka/ | naka | “whistle” |
| | /CV/ | /CV/ | | |

However, this preferred /CV/ syllable structure may be violated by morphological processes such as diminutive, the construction of the absolute pronoun, demonstrative, quantitative, the noun prefix of class 2, 3 and 14. Phonological processes such as vowel deletion, semivocalisation and semi-vowel insertion play a major role in the restoration of the preferred /CV/ syllable structure and will be discussed in detail later in this chapter.

Another syllable structure which is also preferred in Northern Sotho is the /CwV/.

- | | | | |
|-----|-------|-------|---------|
| (4) | lwa | /CwV/ | “fight” |
| | rwala | /CwV/ | “carry” |

The /CwV/ type of syllable structure occurs also when back vowels [u, o, ɔ] change to /w/ after the addition of the diminutive suffix /-ana/ to a word.

Consider the following example:

- | | | | |
|-----|--------------------------|---------|---------------|
| (5) | /p'elo+ana/ > [p'elwana] | pelwana | “small heart” |
|-----|--------------------------|---------|---------------|

/pe/lwa/na/ has the following syllables /CV/CwV/CV/. The above example demonstrates that the /CwV/ is also regarded as the preferred syllable structure in Northern Sotho following restoration.

The addition of the diminutive suffix /-ana/ to a word could also do to another syllable structure /CCwV/ which is also regarded as preferable in Northern Sotho.

Consider the following example:

(6) /molap'o+ana/ > [molatswana] molatswana "small valley"

The noun /mo/la/tswa/na/ is composed of the following syllable structure /CV/ /CV/ /CwV/ /CV/.

The syllable structure which is also acceptable in Northern Sotho is the /CCV/. The /CCV/ type of syllable structure also occurs when a back vowel changes to /w/ after the addition of the diminutive suffix /-ana/ onto a word. In this case /w/ has a role as /C/ as well.

Consider the following example:

(7) /selo+ana/ > [selwana] selwana "small thing"

/selwana/ has the following syllable structure /CV/CCV/CV/. The example above proves that the syllable structure /CCV/ is also regarded as legitimate in Northern Sotho.

In the case of /CCV/, C may be considered a nasal /N/. Consider the following example:

(8) [nt^hɔ] ntho "small wound"

/NCV/

or

(9) [nt'wa] ntwā "war" or "a fight"

/NCwV/

Consonants, vowels or semivowels may be deleted or inserted in order to restore the preferred /CV/ syllable structure in Northern Sotho, for example:

- (10) Input /tau+ana/
 rule 1 /u/ > /w/
 Output [tawana] tawana “small lion”

The example (10) above indicates that a vowel /u/ becomes /w/. The phonetic surface structure shows that the semivowel /w/ has taken the position of /u/, hence the phonetic representation is [t'awana].

In a form like [t'awana], the semivowel becomes the onset to a syllable on its own.

- (11) /t'a/wa/na/
 /CV/CV/CV/

This means that the semivowel /w/ has a role as a /C/ as indicated by the example (11) above. On the other hand two segments may coalesce into one segment e.g:

- (12) /mainɔ/ > [menɔ] meno “teeth”

The example (12) above indicates that the two segments /a/ and /i/ have coalesced to form one segment which is /ɛ/ resulting in the formation of the syllable structure /CV/CV/.

Schane, (1973:52) says that a segment may change major class feature such as a vowel becoming a glide. All front vowels become glide /j/ when they appear in diminutives while back vowels become /w/. This could be depicted in the following examples:

- (13) Input /moloi+ana/
 rule 1 j
 Output [molojana] moloyana “small witch”

(14)	Input	/lerũɔ+ana/		
	rule 1	w		
	Output	[leruwana]	leruwana	“small livestock”

The examples (13) and (14) above indicate that the vowels /i/ and /u/ become glides /j/ and /w/ respectively.

The processes such as semivocalization, coalescence, semivowel insertion and vowel deletion are aimed at restoring the preferred syllable structure (cf. also Schane, 1973:52).

The vowel deletion depicted below is aimed towards the restoration of the preferred /CV/ syllable structure in Northern Sotho.

(15)	Input	/βa+ ɔlɛ/		
	rule 1	a		
	Output	[βɔ lɛ]	bohle	“all of them”

In Northern Sotho the /CV/ syllable structure is considered to be basic. Schane (1973: 52-3) argues that a syllable containing a single consonant and a vowel is considered to be basic.

The example (15) above shows that a complex or cluster of sequence of vowels has been reduced to the /CV/ pattern which is the preferred syllable structure in Northern Sotho.

1.4 DESCRIPTIONS OF CORE CONCEPTS OF THE MODELS

This study intends to implement two models in the description of syllable structure process in Northern Sotho. The two models are respectively Transformational Generative (linear) and the Feature Geometry (non-linear) model. The two models are applied with the intention to determine the one that presents the most credible explanation for the phenomena at hand.

1.4.1 Linear Phonological Model

The Transformational Generative Model as a linear phonological model may be seen as a reaction to the structuralist approach. According to the structuralist approach the phoneme was central in the analysis of sounds (McMahon 1994:26).

Kotzé (1989:80) says that according to structuralists the existing relationship between speech sounds within the structure were regarded as the primary source of interest. Compare the following Northern Sotho example:

(16) /ɾema/ “chop” and /reka/ “buy”

The sounds /m/ and /k/ are called phonemes because they contrast each other. The two words /ɾema/ and /reka/ consist of a sequence of sounds which are identical in all respects except for a single sound which occurs in the same place in sequence. The sound /m/ and /k/ bring the contrast in meaning in the above examples (cf. also Durand, 1990:7-8).

The Transformational Generative Model was introduced by Chomsky and Halle (1968) when analysing the sound pattern of English. The primary aim of this model was to observe the facts, to describe the facts and to explain the exceptions that may occur. The Transformational Generative Model explains the inadequacies shown by the structuralist approach to a very large extent.

The Transformational Generative Model refers to the following basic concepts: distinctive features, underlying representation, phonological rules and phonetic representation (cf. also Chomsky and Halle, 1968; Hyman, 1975, Durand, 1990; Schane 1973; Gussenhoven and Jacobs 1998; Clark and Yallop, 1990). These concepts will be discussed in detail in another chapter.

1.4.2 Distinctive Features

Chomsky and Halle (1968:64) used the distinctive features to denote differences between sounds. Durand (1990:37) argues that unlike segments or phonemes distinctive features should remain the basic unit in phonology (cf. also Hyman, 1975: 24; Chomsky and Halle, 1968:64; Kenstowicz, 1994:19).

Compare the sound /n/ and /m/ to see what brings the difference between these two sounds in terms of the distinctive features.

The sounds such as /n/ and /m/ as in the Northern Sotho word /nama/ “meat”. Each sound consists of bundle of features as shown below:

(17)	/n/	/m/
Consonantal	+	+
Sonorant	-	-
Coronal	+	-
Voice	+	+
Anterior	+	+
Continuant	+	+
Aspirated	-	-
Etc		

The difference between the two segments may be expressed by the distinctive feature [coronal]. The important question is how to choose a particular set of distinctive features for a particular language?

A set of distinctive features are applied in no specific order. The choice of the distinctive feature should meet the following criteria:

- (a) The distinctive feature must have a phonetic correlate. It must refer either to one of the following:
 - (i) articulatory dimensions e.g. to [\pm voice] which refers to vocal cords, or

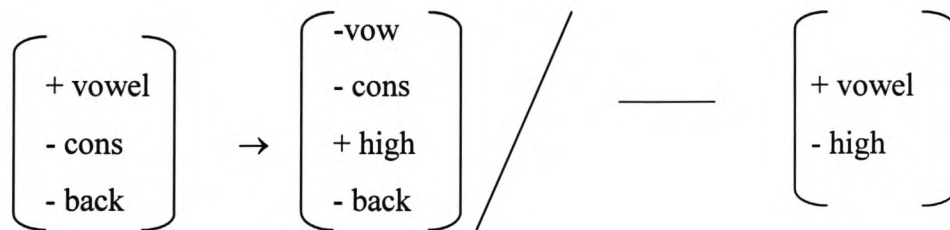
- (ii) articulatory dimensions such as e.g. [\pm anterior] which refer to a place of articulation, or
- (iii) acoustic dimension (cf. Schane, 1973:33) or it must refer to an auditory impression it creates.

(b) The distinctive features and phonological rules should explain the processes that are taking place. Consider the following example:

(18)	Input	/kolo β e + ana/
	rule 1	j
	rule 2	β 3
	rule 3	ʃ
	Output	[k'olo β 3ana] kolobjana "piglet"

Distinctive features are applied to denote the differences between sounds as shown by the example (18) above. Rule 1 in the example (18) above could be stated as follows:

(19a) e → j / + V



Rule 1: Means that a vowel which has the feature [-back] becomes [-cons + high – back] when it precedes a vowel which has the feature [-high] i.e a vowel becomes a semivowel.

Rule 2 could be postulated as follows:

$$\begin{array}{lcl}
 (19b) & \beta & \rightarrow \beta_3 \quad / \quad \text{---} \quad +[\text{high}] \\
 & \left[\begin{array}{c} + \text{ cons} \\ - \text{ high} \end{array} \right] & \rightarrow \left[\begin{array}{c} + \text{ high} \end{array} \right] \quad / \quad \text{---} \quad \left[\begin{array}{c} + \text{ high} \\ - \text{ back} \end{array} \right]
 \end{array}$$

Rule 2 as depicted by above means that a consonant which has the feature [- high] becomes [+ high] if it is succeeded by a $\left[\begin{array}{c} + \text{ high} \\ - \text{ back} \end{array} \right]$ segment.

Rule 3 as shown by the example (18) above could be postulated as follows:

$$\begin{array}{lcl}
 (19c) & j & \rightarrow \emptyset \quad / \quad V \quad \text{---} \\
 & \left[\begin{array}{c} - \text{ vocalic} \\ + \text{ high} \\ - \text{ cons} \\ - \text{ back} \end{array} \right] & \rightarrow \emptyset \quad / \quad \left[\begin{array}{c} + \text{ high} \\ - \text{ back} \end{array} \right] \quad \text{---}
 \end{array}$$

Rule 3 means that a semivowel which has the features [+ high; - back] becomes deleted when it follows a sound having the features [+ high; - back].

The example above shows that the distinctive features are used to show the difference between the segments. Rules and distinctive features explain the processes that are taking place as depicted by the example (19) above.

- (c) Another prerequisite for choosing the distinctive features is that they should bring contrast between segments or sounds. Chomsky and Halle (1968) argued for binary system (i.e pluses and minuses) to indicate the differences between sounds. (cf. also Schane, 1973:25). Refer to example (17) where distinctive features were used to bring contrast between the sound /n/ and /m/. The contrast between the two sounds is depicted by the feature [coronal].

- (d) Another prerequisite is that the features must accommodate the principal allophones of the language e.g in English a feature [aspirated] is needed even though it never functions contrastively (cf. also Schane; 1973:33).

The distinctive features are regarded as bundles of features with no specific order and may freely combine (cf. also Clark and Yallop, 1995:379; Durand, 1990:37; Kenstowicz, 1994:19).

1.4.3 Underlying representation

Clark and Yallop (1990) describe the underlying representation as representation of the unpredictable elements in an utterance. The underlying representation forms a central part of the linear model. The underlying representation exhibits structural regularities which are not always present in the derived form. Consider the following example:

- (20) Input /le + rolex + ana/
 rule 1 j
 rule 2 3
 rule 3 j
 Output [leroxana] lerojana “small dust”

The underlying structure shown by the example above consists of two morphemes and the root. The two morphemes are prefixal morpheme /le-/ and suffixal morpheme which is /-ana-/ . The root is /-rolex-/. They can change if they are in plural form. The prefixal morpheme /le-/ can change to /ma+/ and suffixal morpheme can then change to (-nyana). Kenstowicz and Kisseberth (1979:32) say that the underlying representation contains all the idiosyncratic information about the pronunciation of the constituted morphemes of the utterance. This is depicted also by the Northern Sotho example (20) above.

Gussenhoven and Jacobs (1998) describe the underlying representation as the cornerstone of phonological theory. The underlying representation is more abstract and detailed than the phonetic representation e.g, it depicts the components such as prefixal morpheme, root and suffix morpheme within a word. Refer to the example (20) as shown above.

The underlying representation is selected in such a way that the objective of the description can be reached. Harms (1968:12) formulates this in the following way: “The primary aims of generative phonology are to provide a phonemic representation of morphemes and a series of ordered rules that, together with the information about boundary phenomena (junctures) 1: adequately express the phonological generalizations of the language and 2: at the same time determine the phonetic form of all utterances in the language”.

1.4.4 Phonological rules

Kotzé (1989:82) says that a set of phonological rules should be able to predict all possible utterances in a particular language. Different types of phonological rules are applied to underlying representation to change it into phonetic representation. Refer to example (20) showed earlier on.

Phonological rules are formal expressions that describe changes in the phonological representation of words. Phonological rules serve to explain the variants which appear; c.f. Schane, (1973:77). Gussenhoven and Jacobs (1998:86) say phonological rules are formal expressions that describe changes in the phonological representation of words.

As a result of application of phonological rules a segment may be inserted or deleted or one or two feature values may be changed as depicted by the example (21) below:

- (21) Input /le + roʎ + ana/
 rule 1 j
 rule 2 ʒ
 rule 3 ɹ
 Output [lerɔʒana] lerɔʒana “small dust”

According to the Transformation Generative Model there is an assumption that the human brain operates in linear fashion. This implies that ordering of rules is vital in generating a specific utterance (cf. also Durand, 1990:12). He argues that rules must be ordered in a way as to maximize feeding relations (cf. also Schane, 1973; Gussenhoven and Jacobs, 1998:92; Clark and Yallop, 1990:170; Kenstowicz, 1994:90).

The position advocated in generative phonology is that rules are linearly ordered. Chomsky and Halle (1968:340) argues that when starting to speak, the speaker of a language has a particular underlying representation stored in his mental lexicon upon which she/he imposes one or more phonological rule(s) in order to generate a surface structure (cf. also Clark and Yallop, 1990:170). Clark and Yallop (1990) claims that rules are applied in a fixed order one after another.

The example (21) above shows that rules are applied in a fixed order e.g rule 1 is semivocalization. It precedes rule 2 which is palatalization and rule 2 comes before rule 3 which is deletion until phonetic representation is reached (cf. also Schane, 1973:89; Clark and Yallop, 1990:147-150, Chomsky and Halle, 1968:340). Chomsky and Halle (1968) referred to this model as the input-output model. This means that the output of one rule is taken as the input of another rule. In this situation, you would have to know in which order the rules are applied. This option is known as linear ordering (Gussenhoven and Jacobs, 1998:92).

The example (22) below demonstrates the input-output model:

- (22) Input /maβeɛ + ana/
 rule 1 j
 rule 2 3
 rule 3 ɹ
 Output [maβeɹana] mabejana “small corn”

In the example (20) depicted above /maβeɛ + ana/ is regarded as an input while [maβeɹana] is an output. Rule 1 is an input to rule 2. Rule 2 is an output to rule 1 and in input to rule 3. This means that the output of one rule serves as the input to the next rule. Kaye (1989:32) argues that a phonological rule must depict three things:

- (a) The set of segments that undergo the rule.
- (b) The set of segments that trigger the rule along with the location of this with respect to the first set.
- (c) The change to the input segment brought about by the rule.

Kenstowicz and Kisseberth (1979:32) also identified the function of the phonological rule as to convert the underlying representation of an utterance into corresponding phonetic representation i.e rules convert the unpredictable information into predictable information.

1.4.5 Phonetic representation

McCawley (1968:14) states that a phonetic representation accounts for all those characteristics which are linguistically governed (i.e not governed by extra linguistic factors such as speakers mood, the shape of his vocal organs etc.). Such characteristics are the ones which a speaker cannot deviate from without displaying a foreign accent

The phonetic representation is the final output of the phonological component.

The example below depicts the phonetic representation as the final output of the phonological component:

(23) Input /βa + ɔɪɛ/
 rule 1 / /
 Output [βɔɪɛ] bohle “all of them”

The above example shows that if a deletion rule is applied to the underlying representation /βa + ɔɪɛ/, the vowel /a/ becomes deleted from the underlying representation. The end result will be [βɔɪɛ] which is the phonetic representation.

1.5. FEATURE GEOMETRY (NON-LINEAR) MODEL

The Feature Geometry Model represents a reaction to the Transformational Generative Model, because implicit in the linear model is the assumption that phonological rules apply in a linear order and also that phonological features (distinctive features) are unordered meaning that they can combine freely.

Linguists such as Mascaró (1983), Clements (1985), Archangeli and Pulleyblank (1994), Sagey (1986), Piggot (1987), McCarthy (1988) who opted for the Feature Geometry Model assume that segments are not unordered feature of bundles but have hierarchical

structure (cf. also Kenstowicz, 1994:46; Van Der Hulst, 1988:13; Paradis and Prunnet, 1991:4). These bundles of distinctive features are internally structured (Clark and Yallop, 1995:382).

One of the most important motivations for a hierarchical structure for a segment internal structure is the assumption that distinctive features are organised into sets constituting natural classes (cf. also Paradis and Prunnet, 1991:160).

Kenstowicz, (1994:100) says that features are organised hierarchically in a tree graph.

A universal tree structure organises features into class nodes and group class nodes together. It is assumed that while class nodes are unary, features are binary.

A feature tree accounts for different assumption processes in a principled way (Paradis and Prunnet, 1991).

Gussenhoven and Jacobs (1988:172) summarizes the main advantages of this autosegmentalized representation as that features can spread to the neighbouring segments which greatly improves the description of assimilation process.

The Feature Geometry Model argues for simultaneous application of rules on representations (cf. also Newman, 1994:4; Goldsmith, 1995:249; Clark and Yallop, 1990:321).

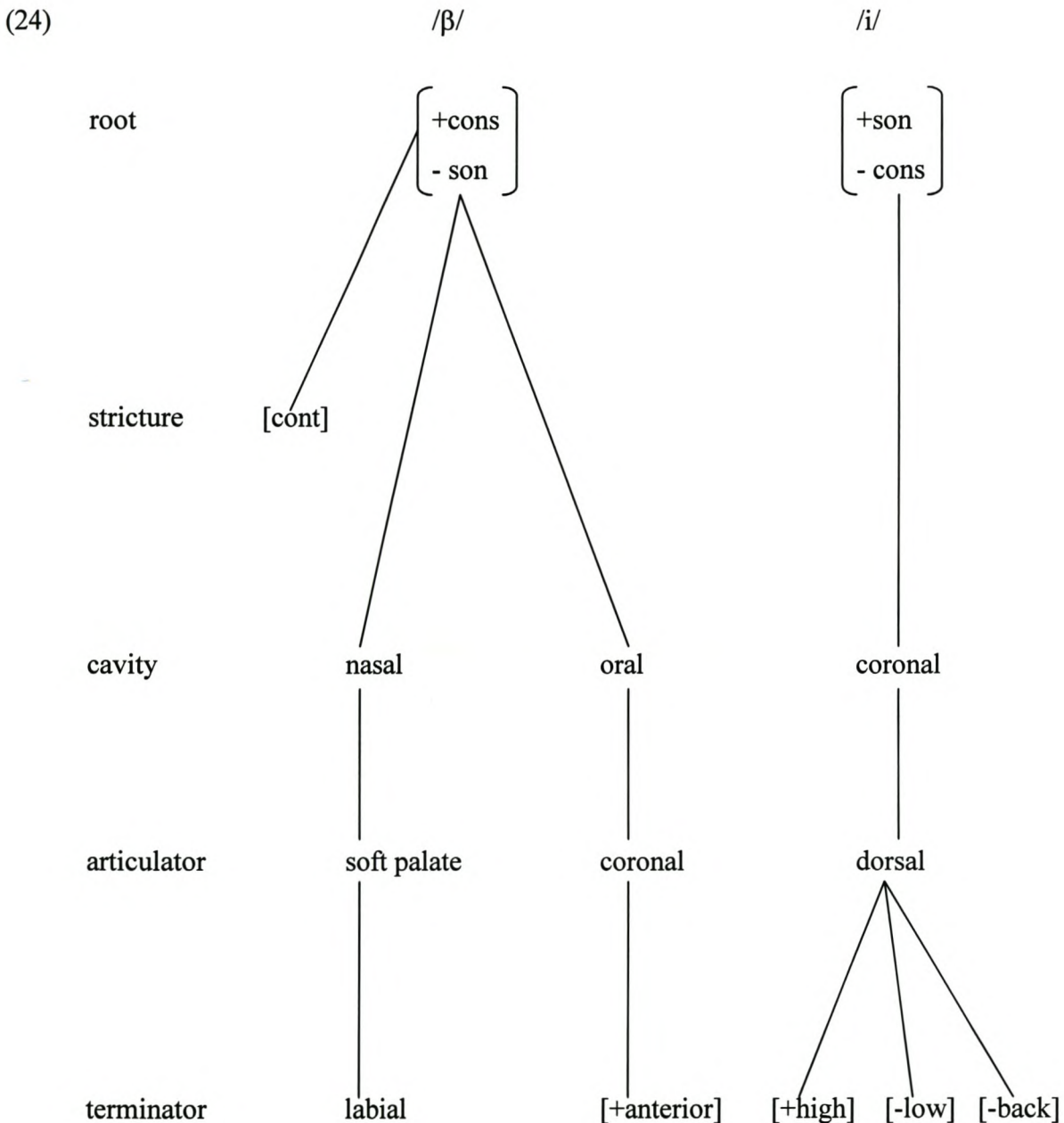
This Feature Geometry Model was introduced because the Transformational Generative Model was found incapable of dealing adequately with certain range of phonological phenomena such as deletion, palatalization, nasalization etc (Kenstowicz, 1994; Goldsmith, 1995).

To represent the relationships among the articulatory features, generative phonologists have developed a "feature tree" showing how both features are related to articulators and how they are hierarchically ordered. This model is explained in details in Halle (1992) and also a detailed account can be found in the work of Kenstowicz (1994).

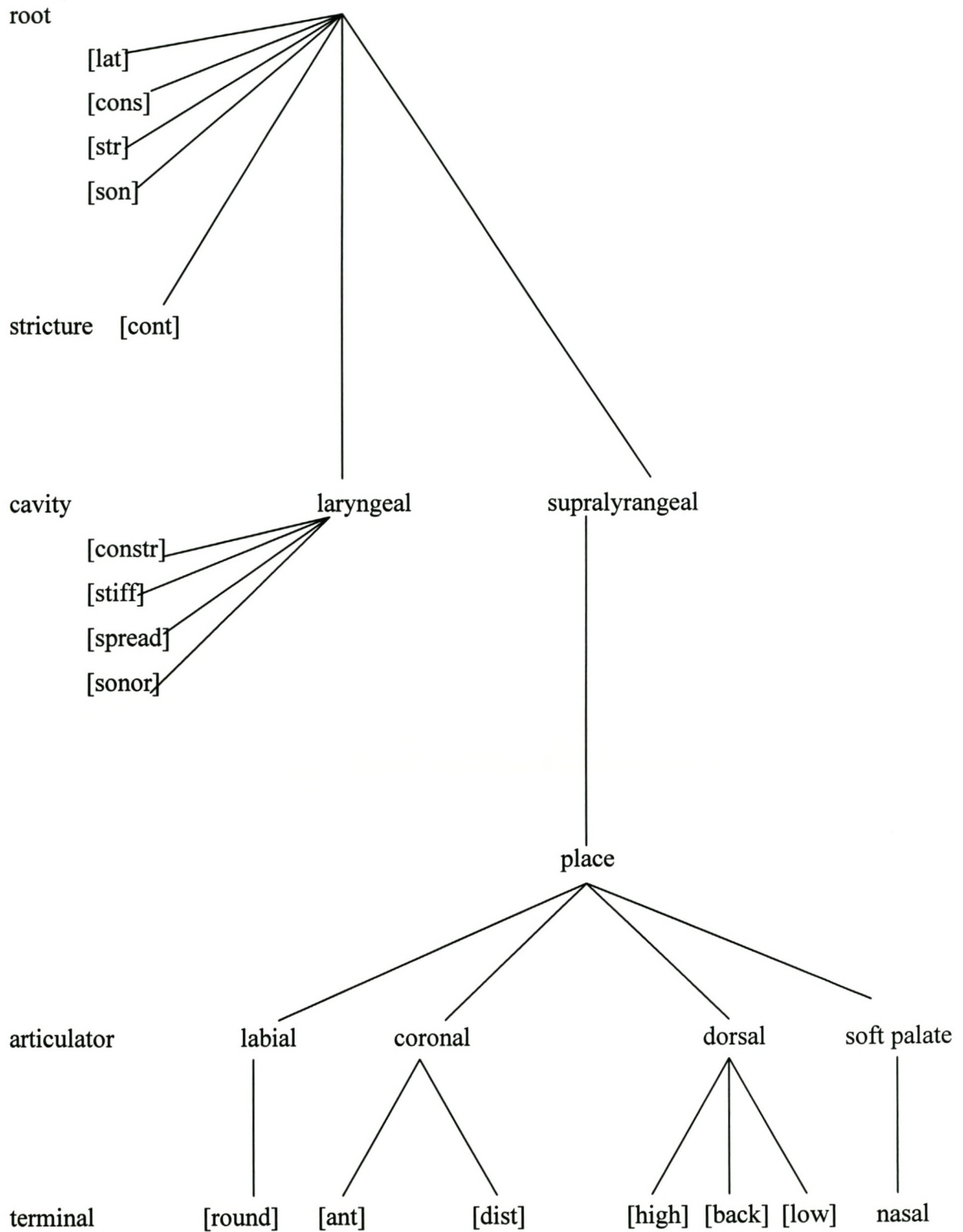
The Feature Geometry Model is characterised by the following basic concepts: root node, laryngeal node, supralaryngeal node, place node (cf. also Gussenhoven and Jacobs, 1998; Goldsmith, 1995; Kenstowicz, 1994; Clark and Yallop, 1995; Paradis and Prunnet 1991). These concepts will be discussed later in detail.

The example shown below demonstrates how features are organised in a tree graph.

The syllable /βi/ as in /βina/ bina “dance” will be represented as follows on a tree graph:



(25) Feature Geometry Model by Sagey (1990)



In Sagey's model phonetic considerations have always played a central role in the justification and motivation of its primitive and hierarchical organisations (Van der Hulst and Smith (eds) 1998).

The Feature Geometry Model uses the following basic concepts underlying the Sagey's FG model (1990) as indicated by Nkuna (1998:49): root node, supralaryngeal node, place node, articulatory node and soft palate node.

1.5.1 The root node

The root node is the highest node in hierarchy. It is the one, which corresponds to the segment. The root node dominates all features. The root node expresses the coherence of all the segments as a phonological unit (cf. also Goldsmith, 1995:268). The features are directly or indirectly attached to a root node. The root node is something like the mixing bowl, which will hold all the ingredients together. The root node dominates both the laryngeal node and the supralaryngeal node. The following manner features are attached to it: [continuant], [sonorant], [consonantal], [strident] and [lateral]. If an assimilation process takes place at the root node the entire segment assimilates.

1.5.2 The supralaryngeal node

The supralaryngeal node is on the second level in hierarchy. It dominates both the place node and the soft palate node. It is connected to the root. A rule identifying the supralaryngeal node would affect both place node and its dependents and soft palate and its dependent. The dependents of the place node are [labial], [coronal] and [dorsal] and the dependent of the soft palate node is nasal. Refer to the diagram of the Sagey' model showed previously.

1.5.3 The laryngeal node

Like the supralaryngeal node, the laryngeal node is second in the level of hierarchy and, it attaches to the root node. Refer to the diagram shown previously. The laryngeal node dominates the following manner features [spread], [stiff], [slack] and [constricted]. It dominates all the features of the vocal cords. The primary motivation for a laryngeal node comes from the fact that laryngeal features may spread and delink not only individually,

but as a unit (Goldsmith, 1995:269). The laryngeal node dominates the features of the vocal cords. If a rule affects a laryngeal node all features mentioned above will be affected. The laryngeal node just like the supralaryngeal node is attached to the root.

1.5.4 The place node

The place node is called the organising node and it is on the third level in the hierarchy. See previous diagram. The place node keeps together all the information relating to the place of articulation (Newman, 1994:6). The place node dominates articulatory features such as [labial], [coronal] and [dorsal]. These nodes appear as daughter nodes of the place node (Newman, 1994:7). There is no ordering between labial, coronal and dorsal. Each of these three nodes dominates subconstituents corresponding to their relevant features. Thus the labial dominates [\pm round], the dorsal node dominates [\pm high], [\pm low] and [\pm back] (Gussenhoven and Jacobs, 1998:176). Because all the features are directly or indirectly attached to the place node, a rule affecting the place node will affect all the articulatory features (cf. also Paradis and Prunnet, 1991:88). See the diagram shown previously how the place node is represented on the tree graph.

1.5.5 The articulatory node

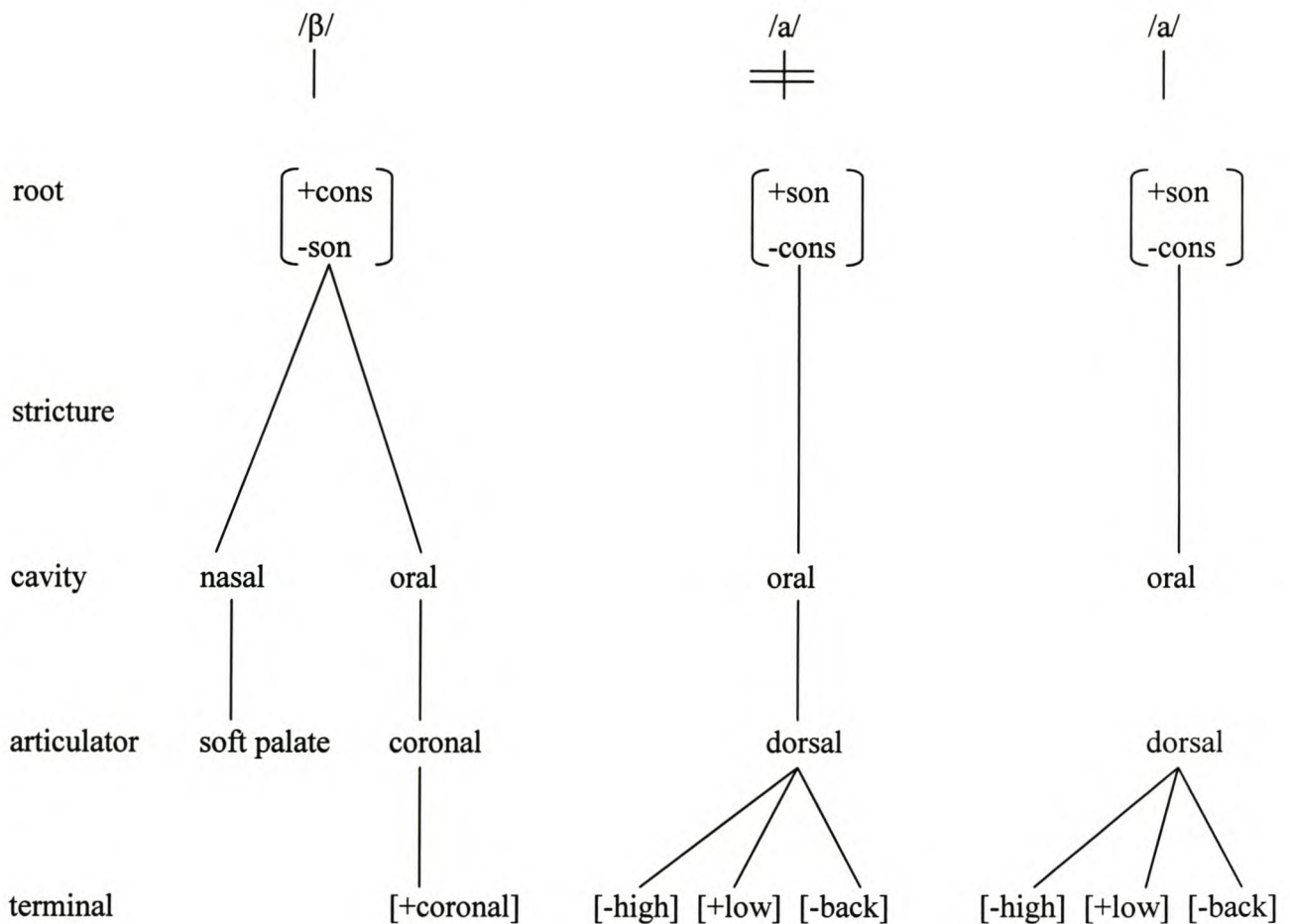
The articulatory nodes are parallel to those features under the laryngeal node. The three articulatory nodes are [labial], [coronal] and [dorsal]. The labial dominates the feature [round] while dorsal dominates the features [high], [back] and [low]. Spreading of the articulatory node implies spreading not just for the features [high], [back] and [low] individually but also the node as a whole and therefore any or all of the features dominated by it (Paradis and Prunnet, 1991:88). Coronal dominates the features such as [anterior] and [distributed]. A rule identifying the coronal node would affect the features [anterior] and [distributed] hence they are attached to the coronal node. Because the feature [round] is attached to labial, anything happening to the labial node will obviously affect it.

1.5.6 The soft palate

The soft palate is parallel to the place node refer to example (25). It dominates the feature nasal. If soft palate assimilates, it affects the feature nasal. The feature nasal is the daughter of soft palate.

The Feature Geometry model does not make use of concepts such as rules and derivations, rather it relies on “representations (cf. Clements in Goldsmith, 1995; Nkuma, 1998; Kenstowicz, 1994). See the diagram below:

(26) Deletion can be represented as follows e.g:



The above tree graph represents the process of V_1 deletion.

The purpose of V_1 deletion as indicated by above example is to break up the sequence of vowels so that the preferred /CV/ syllable structure could be restored.

The above example depicts the deletion of vowel /a/ which is the first vowel in order to maintain the preferred /CV/ syllable structure. Deletion on the tree graph occurs at the root node. The root node is directly or indirectly attached to the segment. The root node with all its features detaches itself from the tree graph and this is called delinking. In this case deletion has taken place consider the example shown previously.

CHAPTER 2

A LINEAR PHONOLOGICAL MODEL

2.1 INTRODUCTION

This chapter deals with phonological processes such as vowel deletion, semivocalization and semi vowel insertion. The aim of these processes is to restore the preferred /CV/ syllable structure which has been violated by the morphological processes such as passive, diminutive, the construction of absolute pronoun etc (cf. also Endemann, 1964:4; Schane, 1973:52-3).

A linear TG model will be implemented to account for the changes that take place in the above-mentioned processes.

2.1.1 The aims of this chapter

- (i) To critically evaluate the linear model, i.e to see if it can account for the phonological processes mentioned above.
- (ii) To show how the violated /CV/ syllable structure can be restored by phonological processes such as vowel deletion, semivocalization and semi vowel insertion.
- (iii) To formulate general rules regarding phonological processes such as vowel deletion, semivocalization and semi vowel insertion.
- (iv) To test the effectiveness of phonological rules applied in the processes mentioned above.
- (v) To account why the vowel /a/ is regarded as back vowel not a central low vowel as indicated in many Northern Sotho grammar books.

2.2 THE /CVV/ CRITICAL SYLLABLE STRUCTURE

The preferred /CV/ syllable structure may be violated by morphological processes such as the formation of diminutive, passive, the construction of pronoun etc to form /CV+V/ critical syllable structures in Northern Sotho (Endemann, 1964:4). However the critical /CVV/ syllable structure can be reduced to a normal /CV/ syllable structure by phonological processes such as coalescence, vowel deletion, semivocalization and semivowel insertion.

The example (27) below indicates the reduction of /CVV/ type of syllable structure to /CV/ type of syllable structure. Consider the following example:

- (27) /p'itʃa + ana/ has /CV + V/ syllable structure i.e. $C_1V_1V_2 > C(V_1)V_2$ [p'itʃana] p'itšana
 “small pot”. This process and other processes will be discussed in detail later in this chapter. The critical /CVV/ syllable structure can come into existence with the following morphological constructions.

- (i) The diminutive suffix /-ana/.
- (ii) The construction of the absolute pronoun.
- (iii) The construction of the quantitative pronoun.
- (iv) The construction of the demonstrative pronoun
- (v) The noun prefix of class 2,3 and 14.

2.2.1 The diminutive suffix /-ana/

There are two diminutive suffixes distinguished in Northern Sotho. The two suffixes are /-ana/ and /-jana/. These diminutives are employed to express relative smallness. If the suffix /-jana/ is added onto the noun it expresses the intense meaning whereas /ana/ expresses ordinary diminutive. Consider the example below:

- (28) /#seβata + ana/ > [seβat'ana] sebatana “small carnivore”
 (29) /#seβata + jana#/ > [seβat'ajana] sebatanyana “very small carnivore”

The emphasis or focus will be on the diminutive suffix /-ana/ because it activates phonological processes. The addition of the suffix /-ana/ on to the noun results in an impermissible /CV + V/ syllable structure as shown by example (28) above. This is referred to as critical syllable structure by Endemann (1964:4). An application of a phonological rule such as vowel deletion results in the restoration of the preferred /CV/ syllable structure. Consider the following example:

- (30) /#nosi + ana#/
- V₁ del rule $\text{ɛ} \rightarrow \text{ɔ}$
- [nosana] nosana “small bee”

2.2.2 The construction of the absolute pronoun

Morphologically the absolute pronouns consist of the concordial morpheme as prefix and the stem /ɛna/ or /ɔna/ as indicated by example (31) below (Lombard *et al.*, 1985:84). The underlying representation displays /CVV/ syllable structure which appears to be irregular or foreign to Northern Sotho. The construction of absolute pronoun creates the critical /CV+V/ type of syllable structure. The phonological process as semivocalization helps to restore the preferred /CV/ type of syllable structure as indicated by the examples below.

(31) Absolute pronoun

2p.s	/u + ɛna/	>	[wɛna]	wena	“you”
class 1	/ɛ + ɛna/	>	[jɛna]	yena	“him” or “her”
class 2	/βa + ɔna/	>	[βɔna]	bona	“them”
class 3	/ɔ + ɔna/	>	[wɔna]	wona	“it”
class 4	/ɛ + ɔna/	>	[jɔna]	yona	“it”
class 5	/lɛ + ɔna/	>	[lɔna]	lona	“it”

For the morphological formation of other noun classes refer to Appendix C.

2.2.3 The construction of the quantitative noun

Morphologically the quantitative pronouns consist of subject concord plus the stem /ɔtɛ/. Before semivocalization or deletion occurs, the quantitative pronouns display the critical /CVV/ syllable structure. See the examples below:

(32)	class 1	/ɛ + ɔtɛ/	>	[jɔtɛ]	yohle	“all of it”
	class 2	/βa + ɔtɛ/	>	[bɔtɛ]	bohle	“all of them”
	class 3	/ɔ + ɔtɛ/	>	[wɔtɛ]	wohle	“all of it”
	class 5	/lɛ + ɔtɛ/	>	[lɔtɛ]	lohle	“all of it”

For the morphological structure of other noun classes see Appendix F₂. This will be discussed later in this chapter.

2.2.4 The construction of the demonstrative pronoun

Demonstrative pronouns like quantitative or absolute pronoun consist of concordial morpheme plus the noun stem. Demonstrative pronouns are subdivided into positions on the ground of relative distance from the speaker which the demonstrative indicates. The three basic distances or positions distinguished are position 1(a) and 1(b) “here” i.e close to the speaker. Position 2 “there” i.e a little removed from the speaker. Position 3 “Yonder” i.e still further away from the speaker.

For this study, emphasis will be laid on position 1(a) and 1(b) because they are relevant to this study, in that they depict vowel deletion of semivocalization which are phonological processes treated in this study.

Before semivocalization and vowel deletion take place demonstrative pronouns display a /CVV/ type of syllable structure which is referred to as critical syllable structure and is not acceptable in Northern Sotho. The construction of the demonstrative pronoun reduces the /CVV/ syllable structure through the phonological processes such as vowel deletion and semivocalization. See examples below:

(33) Demonstrative pronouns

Position 1(a)

Class 1	/ε + ɔ/	[jɔ]	yo	“this one”
Class 3	/ɔ + ɔ/	[wɔ]	wo	“this one”
Class 4	/ε + ε/	[jε]	ye	“this one”

Position 1(b)

Class 1	/ε + ɔɔ/	[jɔɔ]	yono	“this one”
Class 3	/ɔ + ɔɔ/	[wɔɔ]	wono	“this one”
Class 4	/ε + εɔ/	[jεɔ]	yeno	“this one”

For the morphological structure of other noun classes refer to Appendix F₃.

2.2.5 The noun prefix of class 2, 3 and 14

When noun prefixes of class 2, 3, and 14 are with the root having an initial vowel also result in the combination of /C₁ V₁ V₂ / which is a critical syllable structure. See examples below.

(34)

- | | | | | | |
|----|-------------|---|---------|-------|--------------------|
| 1. | /βa + ale/ | > | [βale] | bale | “female initiates” |
| 2. | /βa + etʃi/ | > | [βetʃi] | betši | “brides” |
| 3. | /mo + ɔja/ | > | [moja] | moya | “air” |

For morphological structure of other noun classes see Appendix E.

Later in this chapter, see how phonological processes such as first vowel deletion, semivowel insertion and semivocalization reduces the critical /CVV/ syllable structure to the preferred /CV/ syllable structure.

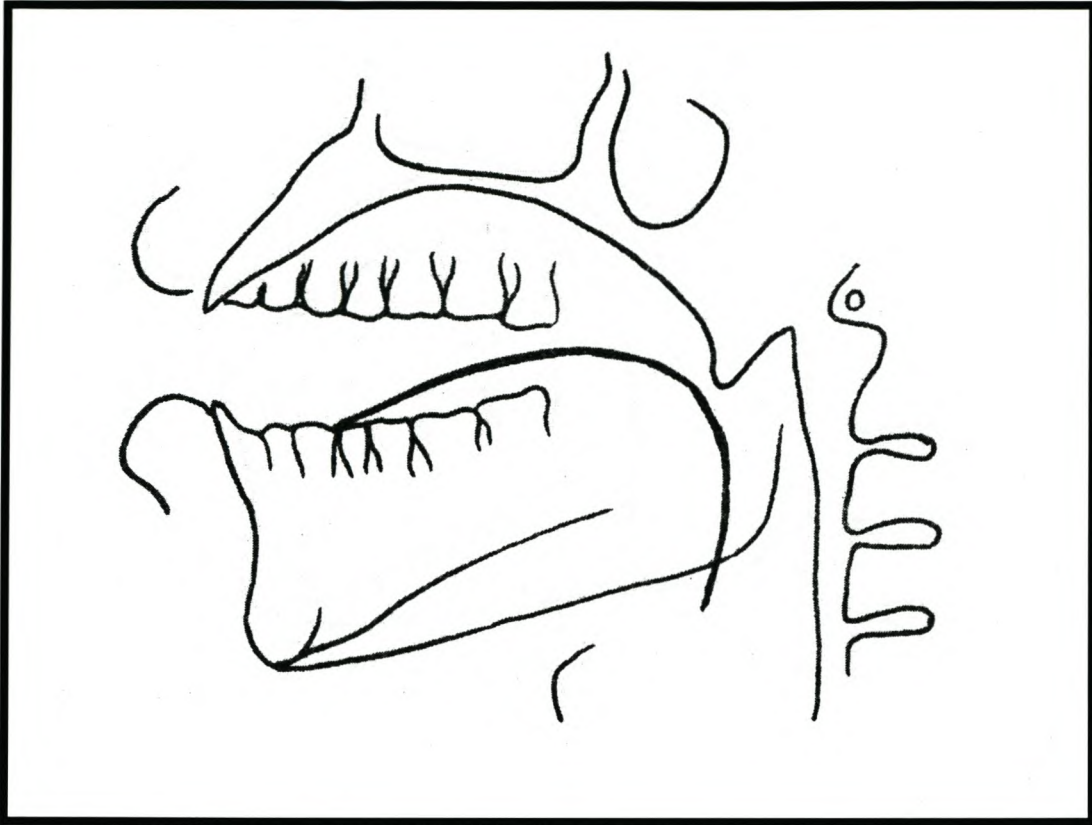
2.2 CLARIFICATION OF THE POSITION OF VOWEL /a/ IN NORTHERN SOTHO

For the purpose of this study, it is important to clarify the position of vowel /a/ because its distinctive features are necessary for the formation of phonological rules.

Northern Sotho grammarians such as (Kotzé, 1989; Nokaneng, n.d; Nokaneng and Louwrens, 1995; Ziervogel, *et al*, 1967) argue that vowel /a/ is a central low vowel. Kotzé, (1989:56) argues that in the articulation of vowel /a/ lips are on a neutral position and he further argues that during the articulation of all back vowels lips are round and with the case of vowel /a/ lips are neither round nor spread, i.e. they are neutral.

Roux (1979) argues that vowel /a/ in Sesotho is regarded as back low vowel not central low vowel. His observation has adequately been verified on experimental grounds (cf. also Khabanyane 1991; Selebeleng, 1997; Guma, 1971). Linguists such as (Wang, 1968; Chomsky and Halle, 1968; Kenstowicz, 1994; Durand, 1990; Hyman, 1995) also regard vowel /a/ as a back vowel. X-ray analysis of the articulation of /a/ in Sesotho is presented by Roux (1979); these views are supported by Selebeleng, 1997 and Khabanyane, 1991.

Figure 6.1 [a]



The picture has been taken from Roux (1979). Also see Khabanyane (1991: 31).

The contour of the body tongue during vowel articulation in Sesotho (Roux, 1979:34) shows that vowel /a/ is grouped with back vowels. This diagram of the contour of the body of the tongue was drawn, first by taking X-ray films of the mouth cavity during individual vowel articulation. The X-ray films were then traced compositively into a vowel hierarchy. This diagram supports the argument that vowel /a/ is a back vowel not a central low vowel as indicated in many grammar books. Refer to the diagram on this page

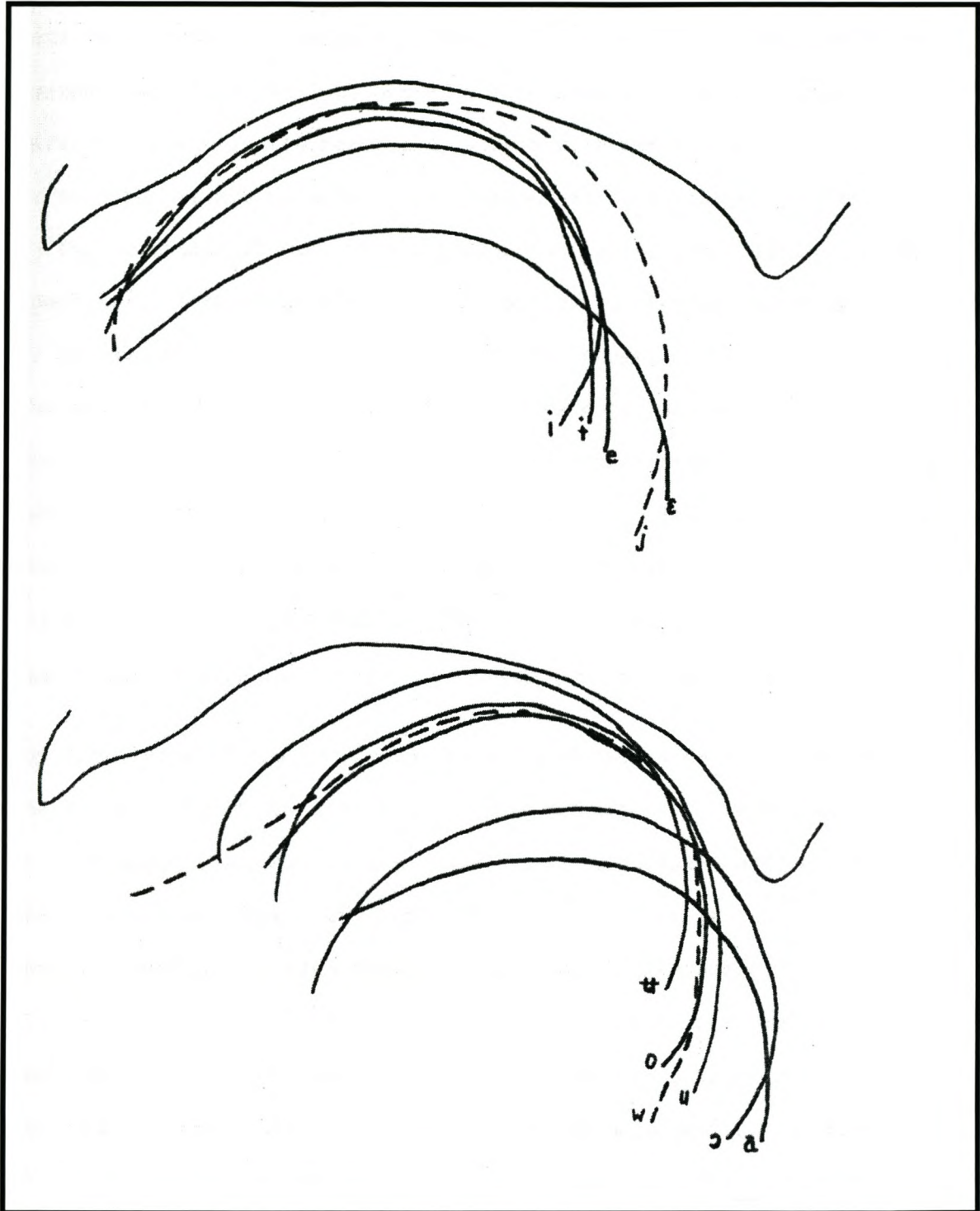
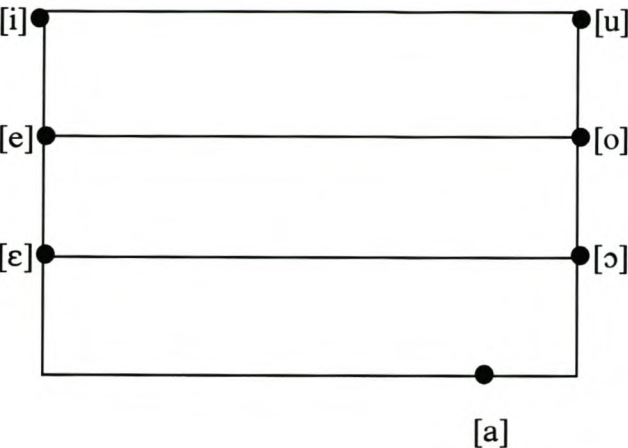


Figure 7: Contour of the body of the tongue during vowel and semivowel articulations in Sesotho.

In view of a lack of experimental data for Northern Sotho, the position is taken in this work that the vowel /a/ could also be regarded as a low back vowel rather than a low central vowel as indicated by Kotzé (1989).

Therefore vowel /a/ should be depicted as follows on the vowel chart (cf. also Selebeleng, 1997:5 and Khabanyane, 1991)



2.4 **DISTINCTIVE FEATURES OF VOWELS (BASIC VOWELS)**

Chomsky and Halle (1968:236) suggested that vowel segments in human language may inter alia, be specified in terms of the tongue body features “high”, “low” and “back”. These features however, allow only three different heights to be identified; [+high, -low], [-high, -low], and [-high, +low].

Wang (1968:700) however, demonstrates that there are in fact languages that differentiate between more than three tongue heights. He proposed a phonetic feature “middle” thereby facilitating a four way distinction: [+high, -mid], [+high, +mid], [-high, +mid] and [-high - mid].

Basic vowel segments should be specified as follows in Northern Sotho.

	- back	+ back
+ high - mid	i	u
+ high + mid	e	o
- high + mid	ɛ	ɔ
- high - mid		a

This table above excludes raised vowels such as /e, ε, o and ɔ/ because this study is only concerned with basic vowels. For more information about the raised vowels refer to (Selebeleng, 1997; Khabanyane, 1991). The distinctive features are important in the explanation and formulation of phonological rules.

2.5 FORMULATION OF PHONOLOGICAL RULES

According to TG model Northern Sotho like other natural languages have rules which are ordered. Kenstowicz and Kisseberth, (1979) maintain that phonological rules of the language are applied in sequence. Kenstowicz (1994:100) says that phonetic representation is computed from the phonological representation by an ordered sequence of rules with various intermediate stages (cf. also Schane, 1973; Chomsky and Halle, 1968; Durant, 1990; Hyman, 1975 and Katamba, 1989).

There are many rules in Northern Sotho. This study focuses only on the following three rules: the vowel deletion rule, the semivocalization rule and semivowel insertion rule because they play a significant role in restoring syllable structure processes as such.

All these phonological rules are applied to the critical /CVV/ syllable structure with the aim of restoring the preferred /CV/ syllable which has been violated by morphological structure such as passive, diminutive, the construction of the absolute pronoun etc.

2.6 PHONOLOGICAL PROCESSES

The following phonological processes are involved in the restoration of the preferred /CV/ syllable structure which has been violated by morphological structure as indicated in the previous paragraph.

2.6.1 Vowel deletion

Vowel deletion is the process by which certain vowels are eliminated or deleted. Northern Sotho identifies two processes of vowel deletion. Those are first vowel deletion and vowel deletion taking place between consonants of the same kind. This takes place only with some specific C's eg. /l/, /m/.

The first vowel deletion (V₁ deletion)

It has been previously stated that the addition of the diminutive suffix /-ana/ onto the final syllable or a noun (be it proper noun or deverbative noun), the construction of pronouns such as absolute, quantitative, demonstrative and possessive result in the formation of critical /CVV/ syllable structure. In order to restore the preferred /CV/ syllable structure, phonological rule such as first vowel deletion applies. This rule will act on vowel sequence displayed by the critical /CVV/ syllable structure caused by morphological processes mentioned above.

The first vowel deletion rule specifies that in case of vowels occurring within the same syllable (due to morphological reasons) the first vowel is deleted in which case the optimal syllable structure of /CV/ is restored (cf. Endemann, 1964:2)

The first vowel deletion breaks up the sequence of vowels, thus preventing vowels from being juxtaposed in the surface structure (cf. also Schane, 1973). See the examples below:

35 (a) Diminutive Nouns

/lefa + ana/	>	[lefana]	lefana	“small inheritance”
/t ^h aβa + ana/	>	[t ^h aβana]	thabana	“small mountain”
/kx ^h ɔ̯fi + ana/	>	[kx ^h ɔ̯fana]	kgošana	“small chief”

cf. Appendix A₁

35(b) Diminutive of derived nouns

/mo + aɾ + i + ana/	>	[moaɾana] or [mowaɾana]	moagana	“small builder”
/mo + βuɟ + i + ana/	>	[moβuɟana]	mobušana	“small ruler”
/mo + rek + i + ana/	>	[morek'ana]	morêkana	“small buyer”

cf. Appendix B

35(c) Quantitative pronouns

/βa + ɔtɛ/	>	[βɔtɛ]	bohle	“all”
/lɛ + ɔtɛ/	>	[lɔtɛ]	lohle	“all of it”
/sɛ ɔtɛ/	>	[sɔtɛ]	sohle	“all of it”

cf. Appendix F₂

All these examples given above display the critical /CVV/ syllable structure before first vowel deletion rule applies. Then the first vowel deletion applies /C₁ V₁ V₂/ result in /C₁ V₂/ which is a preferred syllable structure in Northern Sotho. Refer to the derivation later.

From the data presented above the following rule can be postulated. (V₁ deletion rule)

$$(36) \quad V_1 \rightarrow \emptyset / C (+) \text{ ——— } + V$$

see the example below

(37)

Input	/kx ^h ɔfi + ana/		
V ₁ del rule	ɪ		
Output	[kx ^h ɔfana]	kgošana	“small king”

This rule states that the first vowel becomes eliminated or deleted when it appears before the morpheme boundary and another vowel which has the features [-high], [±back]

Or

The first vowel becomes deleted when it appears between two morpheme boundaries and a vowel having the features [-high], [±back]. This is to cater for, inter alia deverbative nouns.

V₁ deletion rule as indicated by example (37) above states that a vowel which has the feature [-high], [±back] becomes deleted when it appears after a consonant and precedes a morpheme boundary.

Vowel deletion taking place between consonants of the same kind (interconsonantal vowel deletion)

Earlier in Chapter 1, it was mentioned that Northern Sotho has the following syllable structures as a point of departure /CV/, /C/, /CwV/ etc. This type of vowel deletion is concerned with /C/ which is called syllabic. This type of deletion happens between the following types of consonants /m-m/, /n-n/, /l-l/, /r-r/. This type of vowel deletion could also be called interconsonantal vowel deletion.

In the following examples the asterisk (*) occurring before a word indicates that a word is historic i.e it is no longer used.

38(a) Nouns

/*monona/	>	[monna]	monna	“man”
/*molelo/	>	[mollo]	mollo	“fire”
/*mama/	>	[mma]	mma	“mother”
/*rara/	>	[rra]	rra	“father”

Also see Appendix A₂


38(b) Verbs

/*lela/	>	[lla]	lla	“cry”
/*βofɔlɔla/	>	[βofɔlla]	bofolla	“to loosen”
/*tl'emɔlɔla/	>	[tl'emɔlla]	tlemolla	“to loosen”

38(c) Deverbatives

/*selelɔ/	>	[sellɔ]	sello	“weeping”
/*βɔlɔla/	>	[bɔlla]	bolla	“circumcised”

All the examples above display /CV/ type of syllable structure before interconsonantal vowel deletion rule applies. After vowel deletion between consonants of the same /C/ which is syllabic results and is acceptable in Northern Sotho. See the following example.

(39)	Input	/*lela/		
	rule 1			
	Output	[lla]	lla	“cry”

From the data presented above the following rule can be postulated.

(40) Interconsonantal vowel deletion rule

$$V \rightarrow \emptyset \quad / \quad C \text{ — } C$$

[αplace] [αplace]

This rule is only applicable to liquids, trills and nasals.

This rule above states that a vowel becomes deleted when it appears between consonants of the same kind which share the same features. This rule is not general as such it is only applicable to certain words e.g

$$(41) \quad V \rightarrow \emptyset \quad / \quad \begin{array}{l} m - m \\ n - n \\ r - r \\ l - l \end{array}$$

In case of /l-l/ Northern Sotho has words such as /ŋwalela/ “to write on behalf of” or “to write to”, /bolela/ “to speak”, /selela/ “to look for food on behalf of” etc. There is no vowel deletion.

2.6.2 Semivocalization process

It is generally been accepted that semivocalization as a process restores syllable structure in Northern Sotho. This phenomenon, also described by Endemann (1964:7) as “Devocalization” of Consonantalization changes front vowels into /j/ and back vowels into /w/ (cf. Also Ziervogel, 1968:262).

Schane (1973:53) says that the effect of the process of semivocalization is to break up clusters or sequence of vowels with the aim of restoring the preferred /CV/ syllable structure. In short it is the replacement of vowels by glides /w/ and /j/.

The semivocalization process may result in the following syllable structures which are acceptable in Northern Sotho e.g /CwV/ and /CjV/. The /CjV/ is an intermediate structure whereas /CWV/ can be both intermediate or final.

Compare the following forms explicating the use of a Semivocalization Rule (SV-Rule):

42(a) Nouns diminutives

/leot'o + ana/	>	[leot'wana]	leotwana	"small foot"
/motho + ana/	>	[mothwana]	mothwana	"small people"
/serot'o + ana/	>	[serot'wana]	serotwana	"small basket"

42(b) Derived nouns

/mo + ru + i + ana/	>	[morujana] or [moru ^w ana]	moruyana or moruwana	"small breeder"
/mo + tʃe + i + ana/	>	[motʃejana]	motšeyana	"small bridal couple"
/mo + laɔ + ana/	>	[molawana]	molawana	"small law"

cf. Appendix B

42(c) Passive form

/rat' + u + a/	>	[rat'wa]	ratwa	"to be loved"
/rek + u + a/	>	[rek'wa]	rekwa	"to be bought"
/lor + u + a/	>	[lorwa]	lorwa	"to be dreamed"

cf. Appendix F₁

42(d) Pronouns

/ε+ɛna/	>	[jɛna]	yɛna	"him or her"
/ɔ + ɔna/	>	[wɔna]	wɔna	"it"
/ε + ɔna/	>	[jɔna]	yɔna	"it"

cf. Appendix C

42(e) Demonstrative pronouns (1st position)

/ε + ɔ/	>	[jɔ]	yo	“this”
/ɔ + ɔ/	>	[wɔ]	wo	“this”
/ε + ε/	>	[jε]	ye	“this”

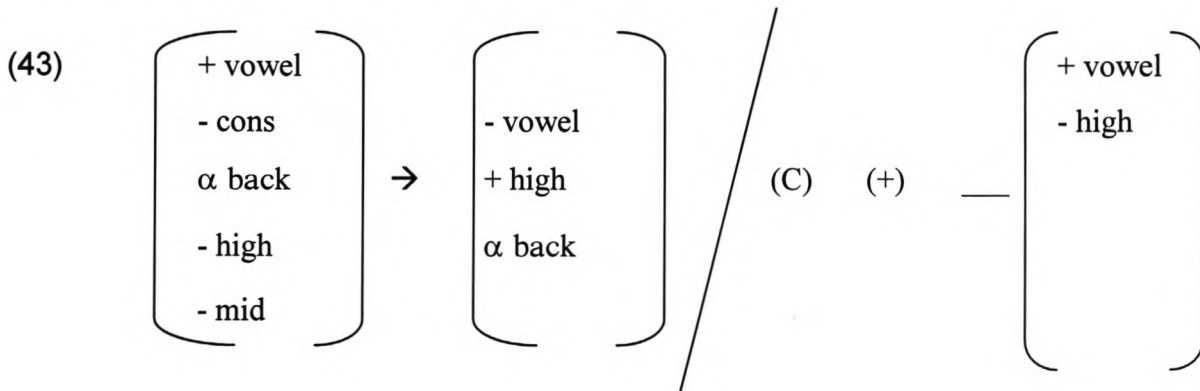
cf. Appendix F₃

42(f) Quantitative pronouns

/ɔ + ɔɛ/	>	[wɔɛ]	wohle	“all of it”
/ɔ + ɔɛ/	>	[lɔɛ]	lohle	“all of it”

cf Appendix F₂

The semivocalization rule could be depicted as follows



This rule states that a vowel which has the features [± back, - high, - mid] becomes a glide which can be [± back], [+ high] when it appears between a consonant (optional) and or morpheme boundary and another vowel which has the feature [- high].

Consider the following example:

(44) /le + ot'o + ana/

SV Rule w
[le ot' w ana]

This analysis may an oversimplification as there may also be other processes involved such as “semivowel insertion”, “diphthongization” and “gliding” respectively.

Compare the following phonetic representations of the noun “tau” (lion) and its diminutive variation “tawana” (small lion):

- (45) (i) tau [t'au] or [t'awu]
 (ii) tawana [t'awana]

The following phonological analyses may be possible to derive these phonetic outputs. There may be evidence for existence of the following rules:

- (i) a diphthongization rule
- (ii) a semivowel insertion rule
- (iii) a gliding rule

Diphthongization rule (D-rule)

The diphthongization rule collapses two adjacent vowels to form a single phonetic segment. In this case “tau” will be pronounced as a relatively short single syllable utterance, i.e as [t'au] complying to the /CV/ structure.

Consider the following example:

- (46) /C V V/
 /t' a u/

D-Rule ay
 [t' ay]
 /C V/

This is one way of restoring the preferred syllable structure. However, some experimental phonetic research may be necessary to check the status of /au/ as a diphthong.

Semivowel insertion rule (SVI-rule)

To account for a bisyllabic pronunciation [t'awu] (i.e. /CVCV/) it appears as if a semivowel has been inserted between the two underlying vowels.

Compare the following derivation

(47) /CVV/
 /t'au/
 ⋮
 SV insertion w
 [t'awu]
 /CVCV/

This Semivowel Insertion rule (SV-I-Rule) can be formulated as follows:

(48) $\emptyset \rightarrow \left\{ \begin{matrix} \text{h} \\ \text{w} \\ \text{j} \end{matrix} \right\} / \text{V} \text{---} \text{V}$

The SVI-rule above means that [-vowel] which has the features [\pm high, \pm back] become inserted between vowels of any feature with the same specification.

Examples of the Semivowel Insertion rule may be found in the following forms:

49(a) Nouns

/p ^h ɔɔfɔɔ/	>	[p ^h ɔɔfɔɔ]	phoofolo	“an animal”
/tʃiɛ/	>	[tʃiɛ] or [tʃijɛ]	tšie	“locust”
/phɔɔkɔ/	>	[p ^h ɔɔk'ɔ]	phooko	“bull”

cf. Appendix A₂

49(b) Deverbative Nouns

/βatʃei/	>	[βatʃɛji] or [βatʃɛhi]	batšei	“bridal couple”
/βaβoi/	>	[βaβowi] or [βaβohi]	baboi	“skinners”
/morui/	>	[moruɔi] or [moruhi]	morui	“breeder”

cf. Appendix B

49(c) Verbs

/βoa/	>	[βowa]	boa	“come back”
/tswia/	>	[tswija] or [tswiha]	tswia	“skin”
/rua/	>	[ruwa]	rua	“breed”

cf. Appendix F₁

All the examples above display the /CVV/ critical syllable structure before semivowel insertion rule applies. After inserting the semivowel /w/, /j/ or consonant /h/ between two vowels, the /CVV/ structure is reduced to /CV/ syllable structure which is the preferred syllable structure in Northern Sotho.

(iii) $/\text{?}/ \longrightarrow j/$ $V \longrightarrow V$
 [-back] [-back]

(52) $/t'a^?u/$
 Gliding rule w
 $[t'awu]$
 $/CVCV/$

(53)

	/t'a u + ana/
	⋮
Semivocalization rule	w
	[t'awana]

(54)	/t'a?u + ana/
	⋮
Gliding rule	w
	⋮
V ₁ del rule	ɹ
	[t'awana]

The occurrence of V₁ deletion rule and semivocalization rule in Northern Sotho

It is important to clarify the occurrence of the V₁ deletion and semivocalization rules in Northern Sotho.

It seems that the linear phonological model fails to demonstrate different conditions for the application of first vowel deletion rule because it is difficult to know as to when V₁ deletion occurs or when semivocalization occurs. See the following examples:

- (55) Input /nosi + ana/
 V₁ del rule ɨ̥
 Output [nosana]
- (56) Input /leβat'i + ana/
 SV rule j
 pal rule tʃ
 del rule ɨ̥
 Output [leβatʃana]

2.6.3 Extrinsic rule ordering

In the phonological process such as palatalization where both vowel deletion rule and semivocalization rule are applied, rule ordering is necessary.

The semivocalization rule preceeds vowel deletion rule. Refer to the example (56) shown earlier. The semivocalization rule is independent in that it does not depend on other rules. It works on the underlying representation. See example (56) above. Its output becomes the input of rule such as palatalization rule.

In case of phonological processes such as vowel deletion and semivocalization where only one rule applies, as indicated by the example (55) shown earlier, a condition is needed to be set for the application of these general rules. It is necessary that the application of these two rules need to be conditioned, in order to get a better picture of their operation in the language.

2.6.4 Hypothesis

The application of one rule may prevent the application of another i.e the application of first vowel deletion rule will remove the conditions for the application of semivocalization rule with regard to front vowels /i/, /e/ and /ɛ/.

The Semivocalization rule and the first vowel deletion rule are in a potentially counter-bleeding relationship because the application of one rule destroys the relevant environment of the application of the other rule. The destruction of relevant environment have no effect on the application of Semivocalization.

The table Y explains the above hypothesis. The table shows with which vowels and consonants do first vowel deletion occurs and with which vowel and consonants do semivowel occurs.

The symbol \emptyset stands for vowels deletion while asterisk /*j/ or /*w/ stands for intermediate i.e the word has not reached its final derived representation.

Table Y

Consider the following table which focuses in vowel deletion and semivocalization in nouns: (as intermediate and/or final forms denotes intermediate)

	V₁ Proper nouns							Deverbative nouns	
C	a	i	e	ɛ	u	o	ɔ	+ i	+ ɔ
p'	\emptyset	*j	*j	*j	*w	*w	*w		*w
p ^h	\emptyset		*j	*j	*w	*w	*w		*w
t'	\emptyset	*j	*j	*j	w	w	w	*j	w
t ^h	\emptyset	*j	*j	*j	w	w	w	*j	w
k'	\emptyset	\emptyset	\emptyset	\emptyset	w	w	w	\emptyset	w
k ^h		\emptyset		\emptyset	w				
tl'	\emptyset		\emptyset	\emptyset		w	w	\emptyset	w
tl ^h	\emptyset								
r	\emptyset	*j	*j	*j	w	w	w	*j	w
β	\emptyset	*j	j	*j	*w	*w	*w	*j	*w
β ₃			\emptyset	\emptyset					
f	\emptyset	*j	*j		*j	*j	*j	*j	*w

fj									
fs									
s	∅	∅	∅	∅					w
ʃ	∅	∅		∅	w	w	w		
ʒ								∅	w
ʔ	∅						w	∅	w
ʏ	∅					w	w	∅	w
ɦ					w		w		
pʃ	∅								
pʃ ^h			∅						
ps ^h									

Table I

	V₁ Proper nouns							Deverbative nouns	
C	a	I	e	ε	u	o	ɔ	+ i	+ ɔ
ts'	∅	∅	∅	∅		w	ww	∅	w
ts ^h	∅					w			
tʃ	∅	∅			w		w	∅	w
tʃ ^h	∅	∅	∅	∅	w		w	∅	w
kx ^h	∅					w	w	∅	w
m	∅								
m									
n	∅		*j	*j		w	w	*j	w
ɲ	∅							∅	w
ŋ	∅							∅	w
l	∅	*j	*j	*j	*w	*w	w	*j	w
j	∅								w
w	∅	∅	∅	∅					

The deduction from this table is that where the symbol ∅ is used it means that such a vowel is deleted, when the deletion rule applies while the asterisk before /j/ or /w/ stands for intermediate i.e the word has not reached its final derived representation. The /w/ without an asterisk means that a back vowel becomes a glide /w/ when semivocalization rule applies.

2.6.5 Evaluation of the effectiveness of the model

The linear phonological model has been successful in showing how to restore the violated /CV/ syllable structure caused by morphological processes such as passive, diminutive, the construction of the absolute pronoun etc.

The restoration of these preferred syllable structures can be achieved through a limited number of very general phonological rules. It presents different possibilities to analyse the data depending on the nature of underlying representation postulated.

CHAPTER 3

THE FEATURE GEOMETRY MODEL

3.1 INTRODUCTION

The Feature Geometry Model is a reaction to the Transformational Generative Model. The Feature Geometry Model (henceforth FG) was introduced because the Transformational Generative Model was found incapable of dealing adequately with certain range of phonological phenomena (Docherty and Ladd 1992:149).

The FG model was proposed by Clements in 1985 (Docherty and Ladd 1992:149) and was later used by phonologists such as Elizabeth Sagey, Goldsmith, J.A, Clark, J and Yallop, C etc.

The FG model was developed to address the shortcomings of the Generative Theory such as the haphazard arrangement of distinctive features.

The FG model seeks a more ordered and meaningful arrangement of features in representing phonological processes (Selebeleng, 1997:43)

In the FG model features are arranged in separate tiers. The tiers are in turn arranged hierarchically so that the one dominates the other. For instance, the feature tree is characterized by the relationship of dependency and or dominance e.g the feature [distributed] and [anterior] are represented as the daughters of [coronal] on the feature tree. In other words, the mention of a particular node such as coronal will be interpreted to all the information dominated by that node. A rule identifying the coronal node would affect the features [distributed] and [anterior] because they are attached to the coronal. The FG model employs concepts such as spreading and delinking or dissociation.

In the following sections an attempt will be made to determine whether the FG model can adequately account for the processes involved in optimal syllable structures in Northern Sotho.

3.2 VOWEL DELETION

Deletion on the tree graph occurs at the root node. The root node is attached to the segment. Because assimilation takes place at root node, the entire segment assimilates i.e the root node with all features identified with it will be entirely affected. The root node with all its features detaches itself from the tree graph and this is called delinking. In this case deletion has taken place.

The following phonological processes (rules) will be investigated:

- (i) V_1 deletion
- (ii) Interconsonantal V-deletion
- (iii) Semivocalization
- (iv) Semivowel insertion
- (v) Gliding

3.2.1 V_1 Deletion

The examples below indicates the V_1 deletion in restoring the preferred syllable structure:

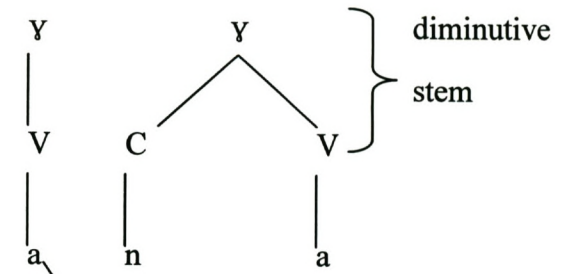
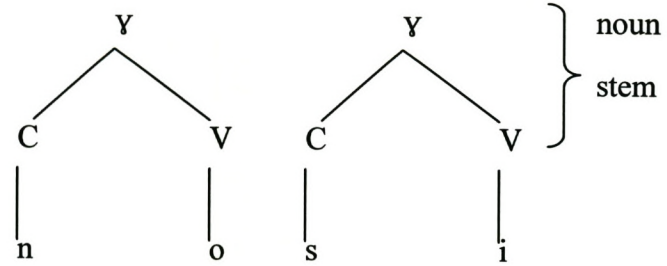
(57)

/nosi + ana/	>	[nosana]	nosana	“small bee”
/βa + ɔ ɪ ε/	>	[βɔɪε]	bohle	“all of them”
/leβak'e + ana /	>	[leβak'ana]	lebakana	“small dagga”

The first vowel deletion could be represented as follows on the FG tree:

(58) Syllable tier

Skeleton tier



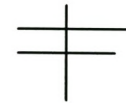
Root

Stricture [+cont]

Cavity

Articulator

Terminal



[+ son]
[- cons]

[+ son]
[- cons]

[+ cont]

oral

oral

dorsal

dorsal

[+h] [-L] [-B]

[-h] [+L] [+B]

[n o s]

[a n a]

The first vowel deletion occurs when diminutive nouns are formed. The above tree graph indicates the V₁ deletion. In this case the vowel /i/ with all its related features detaches itself from the tree graph hence delinking takes place. Delinking or deletion takes place at root node. It is therefore possible to adequately account for this phenomenon within the FG model.

3.2.2 Interconsonantal vowel deletion

The examples below indicate the interconsonantal vowel deletion:

- (59) /mama/ > [mma]
 /molelo/ > [mollo]
 /rara/ > [rra]

For more examples refer to Appendix A₂

This type of deletion takes place between consonants of the same kind. The two C's have the same specification e.g /ll/, /m/, /n/ and /r/. Interconsonantal vowel deletion could be represented as follows on the FG tree:

- (60) Syllable tier

Skeleton tier

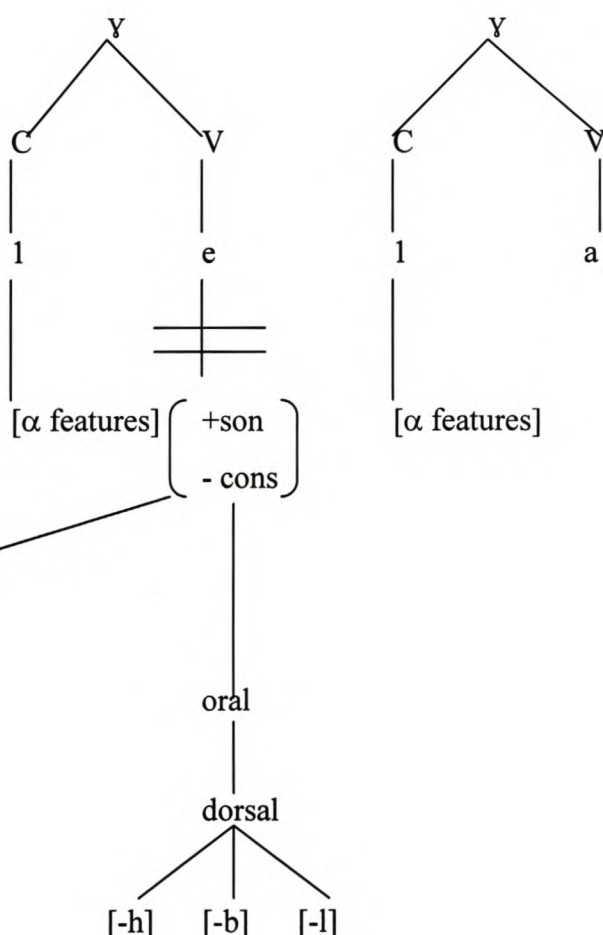
Root

Stricture [+cont]

Cavity

Articulator

Terminal



3.2.3 Semivolization and Semivowel Insertion

It does not appear to be possible to interpret the process of Semivocalization in a classical sense within the FG model. However, if the underlying glottal stop approach as followed, it is possible to treat this phenomenon as an assimilation process.

Consider the following examples:

- (61)

/tʰaʔu + ana/

>

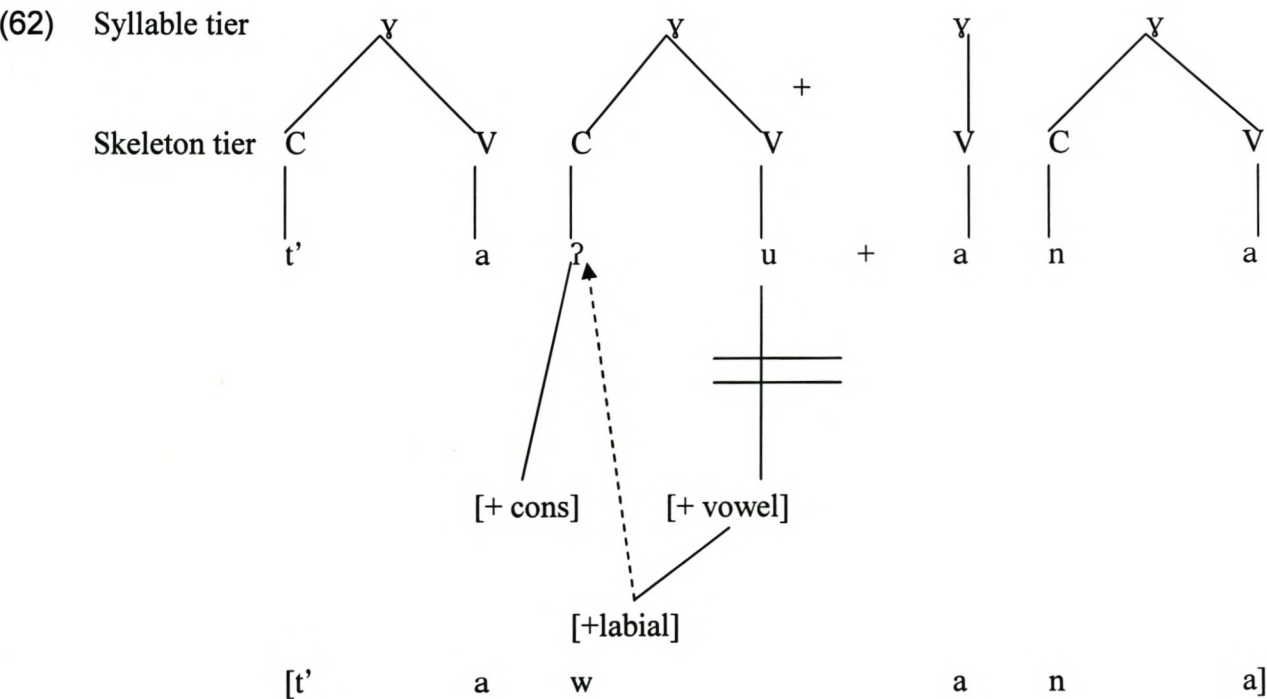
[tʰawana]
- /kʰoloʔi + ana/

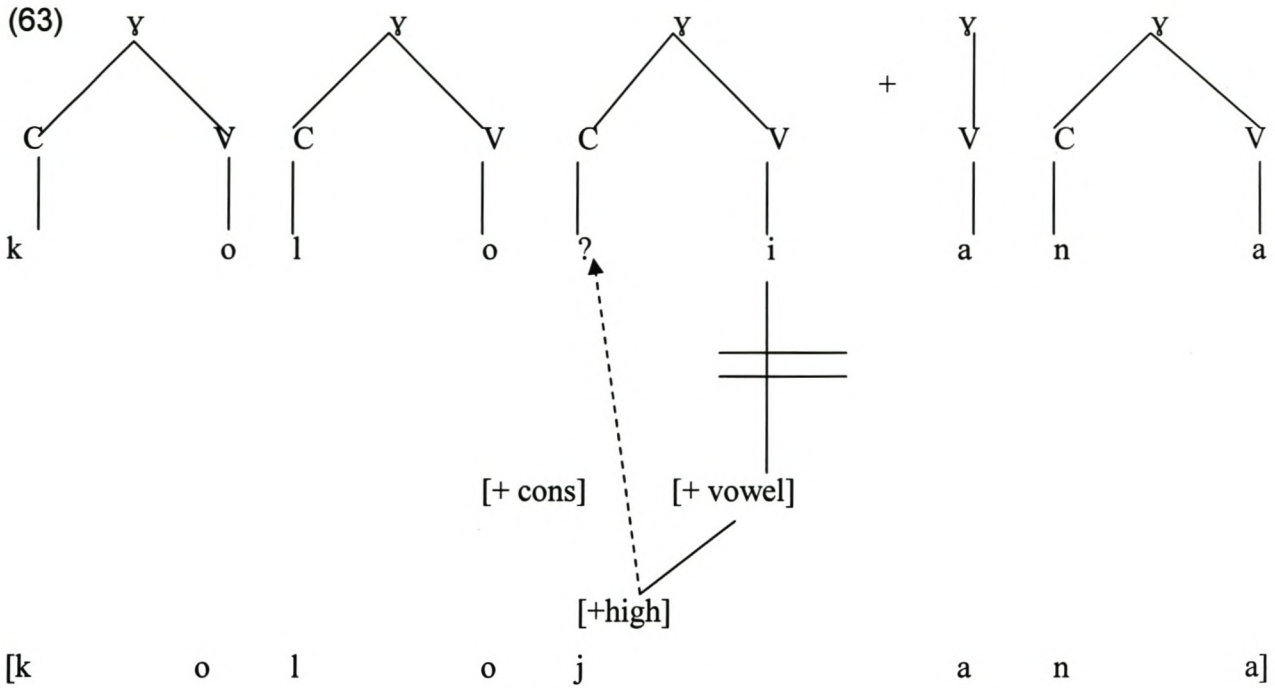
>

[kʰoɔjana]
- /tʃiʔe + ana/

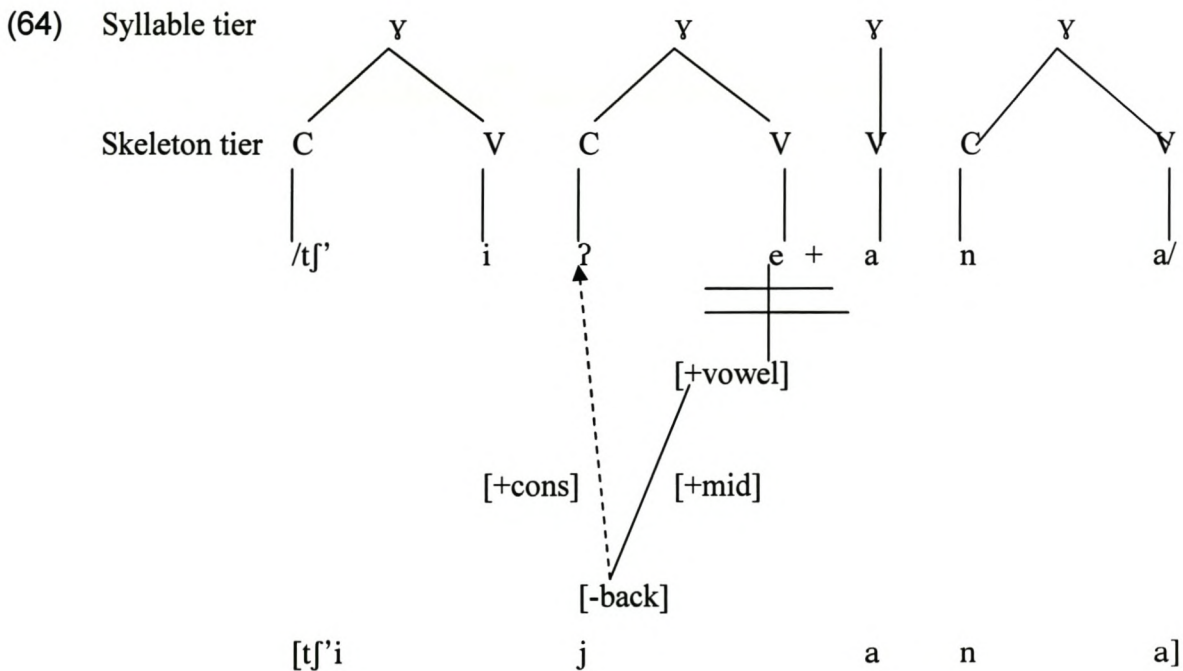
>

[tʃijana]





In this example it appears as if the vowel /i/ spreads its [+high] features to the glottal consonant changing it into a palatal entity /j/ after which /i/ is delinked according to the V_1 deletion convention. Obviously this analysis could become problematic in the case of non-high vowel as in the following case:



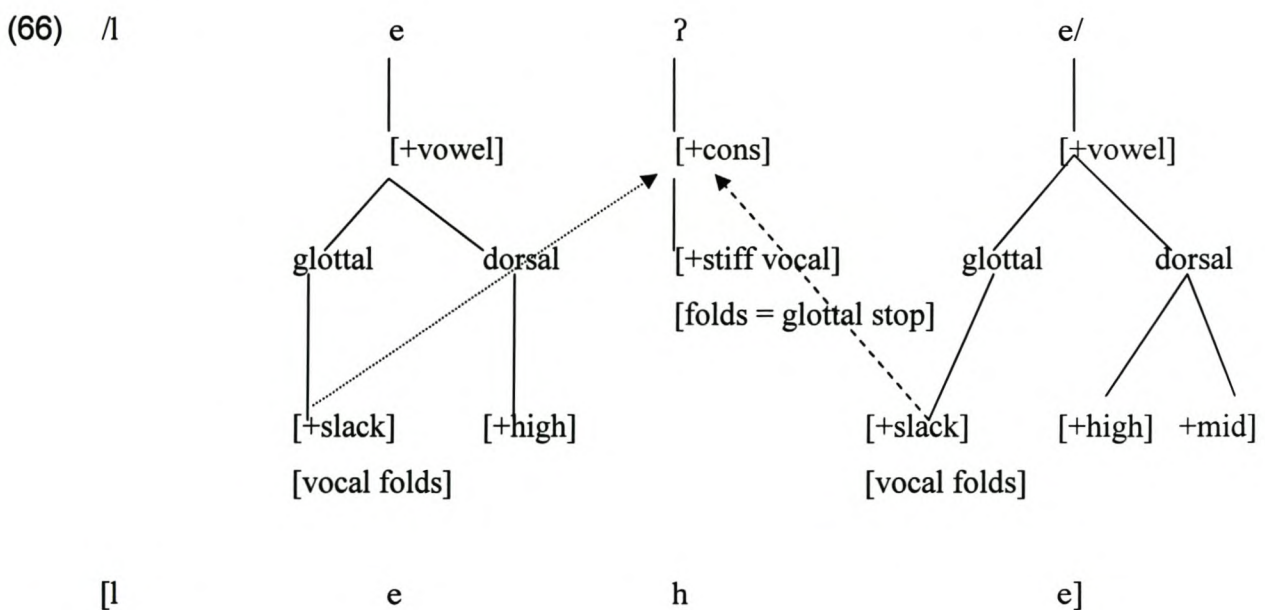
Here it seems as if the frontness [-back] of the vowel has spread to the glottal stop, transforming it into a front semivowel /j/. This argument obviously is not as strong as that of the [+high] vowel.

This assimilation approach presents a new view on the classical treatment of semivocalization. This approach simultaneously also taken care of the semivowel insertion process.

3.2.4 Gliding

Consider the following data representing the phenomenon of Gliding.

- (65) /le^ʔe/ > [le^he]
 /po^ʔo/ > [po^ho]
 /tʃ^ʔi^ʔe/ > [tʃ^ʔi^hε]



As in the case of Semivocalization and Semivowel Insertion it appears as if the FG model is adequate to account for these phenomena in a coherent and relatively simple manner.

CHAPTER 4

CONCLUSION

The aim of this chapter is to assess the two phonological models i.e. the TG and the FG models in describing and explaining different processes that play a role in syllable structure process in Northern Sotho.

Both models yield better results in the description of syllable structure process in Northern Sotho. Both the TG and the FG models have something to offer. They can contribute adequately in describing these phenomena.

The TG model has 5 or 6 rules. The rules are as follows:

- (i) V₁ deletion
- (ii) Interconsonantal V-deletion
- (iii) Semivocalization
- (iv) Semivowel insertion
- (v) Gliding
- (vi) Diphtongization

However there are two problems identified with the TG model. The two problems are:

- (i) Diphtong – Regarding the diphthong rule there are too little phonetic evidence.
- (ii) Rule ordering – Rule ordering is not so clear even with the extrinsic rule ordering.

Refer to examples (55) and (56) given earlier in Chapter 2. In the example /nosi+ana/ and /le + βati + ana/ respectively, it is difficult to know as to when the V₁ deletion applies and when the Semivocalization rule applies. In the example /nosi + ana/ the V₁ deletion rule was applied hence the output is [nosana] the vowel /i/ was deleted whereas in the example /le + βati + ana/ Semivocalization rule was applied, i.e. the vowel /i/ becomes the semivowel /j/ hence the output is [leβatʃana]. The problem is which rule is to be applied and when it is to be applied.

On the other hand the FG model has two basic sets of representation. The two basic sets of representations are for:

- (i) Deletions
- (ii) Assimilations

Assimilation covers the traditional processes which were treated separately in the TG model.

It is hoped that this study has presented some new insights into the nature of syllable structures in Northern Sotho.

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APPENDIX A₁

PROPER NOUNS

Combination	Example	Gloss	Underlying Representation	Phonetic Representation
ba + ana	bana	children	/ba + ana/	[βana]
fa + ana	lefa	inheritance	/lefa + ana/	[lefana]
ga + ana	leraga	mud	/leraya + ana/	[lerayana]
go + ana	lego	wildfig	/leyo + ana/	[leywana]
gɔ + ana	segô	calabash	/seyɔ + ana/	[seywana]
hɔ + ana	lehô	spoon	/lehɔ + ana/	[lehwana]
hu + ana	lehu	death	/lehu + ana/	[lehwana]
ka + ana	leswika	stone	/leswik'a + ana/	[leswik'ana]
ke + ana	lebake	dagga	/lebak'e + ana/	[lebak'ana]
kɛ + ana	lekêkê	ant	/lek'ɛke' + ana/	[lek'ɛk'wana]
ki + ana	baki	jacket	/bak'i + ana/	[bak'ana]
ko + ana	moroko	bran	/morok'o + ana/	[morok'wana]
kɔ + ana	morakô	wall	/morak'ɔ + ana/	[morakwana]
ku + ana	puku	book	/p'uk'u + ana/	[p'uk'wana]
khe + ana	khêkhê	cake	/khekhe + ana/	[khekhana]
khi + ana	khakhi	khaki	/khakhi + ana/	[khakhana]
khu + ana	serêkhu	resin	/serekhu + ana/	[serekhwana]
la + ana	mohlala	example	/mołala + ana/	[mołalana]
le + ana	bolêlê	spirogyra	/bolele + ana/	[bolelana]
lo + ana	pelo	heart	/pelo + ana/	[p'elwana]
lɔ + ana	setulô	chair	/set'ulɔ + ana/	[set'ulwana]
mo + ana	kôma	initiation	/k'ɔma + ana/	[k'ɔmana]
na + ana	monna	man	/monna + ana/	[monnana]
ne + ana	lefene	cockroach	/lefene + ana/	[lefenana]
nɔ + ana	nohlônô	wild apricot tree	/mołɔnɔ + ana/	[mołɔnwana]
pa + ana	legapa	gourd	/leyap'a + ana/	[leyap'ana]
pha + ana	sekgôpha	aloe	/sekxhɔpha + ana/	[sekxhɔphana]
phe + ana	Tshêphê	springbok	/tshephe + ana/	[tshephana]
pʃa + ana	mpša	dog	/mpʃa + ana/	[mpʃana]
pʃhe + ana	mpšhê	ostrich	/mpʃhe + ana/	[mpʃhana]
ra + ana	sehlôra	squirrel	/sełora + ana/	[sełorana]
rɔ + ana	sepôrô	railway line	/sep'ɔrɔ + ana/	[sep'ɔrwana]
ru + ana	kgêru	nutshell	/kxheru + ana/	[kxherwana]
sa + ana	masa	down	/masa + ana/	[mosana]
se + ana	lebesese	fresh milk	/leβese + ana/	[leβesana]
se + ana	mataêsê	dice	/mataesɛ + ana/	[mataesana]
si + ana	nosi	bee	/noosi + ana/	[nosana]
so + ana	bôrôsô	wors	/βɔrɔsɔ + ana/	[βɔrɔswana]

tša + ana	potsa	undone porridge	/póts'a + ana/	[po'ts'ana]
tse + ana	motse	homestead	/motse + ana/	[mots'ana]
tse + ana	kôtsê	shield	/k'ots'ε + ana/	[k'ots'ana]
tsi + ana	pitsi	zebra	/pits'i + ana/	[p'its'ana]
tso + ana	motsotso	moment	/motsótsó + ana/	[mots'ots'wana]
tsó + ana	kgôtsô	peace	/kxhóts'ó + ana/	[kxhóts'wana]
tsha + ana	letsha	lake	/letsha + ana /	[letshana]
ta + ana	sebata	carnivore	/sebat'a + ana /	[sebat'ana]
to + ana	molato	case	/molat'o + ana /	[molat'wana]
tó + ana	lebatô	floor	/lebató + ana /	[lebat'wana]
tu + ana	sutu	suit	/sut'u + ana /	[sut'wana]
tha + ana	mokgôtha	street	/mokhxótha + ana/	[mokhxóthana]
tho + ana	motho	people	/motho + ana /	[mothwana]
thó + ana	borôthô	bread	/boróthó + ana /	[boróthwana]
thu + ana	mokgôthu	bushman	/mokhxóthu + ana/	[mokhxóthwana]
tla + ana	setlatla	fool	/setl'atl'a + ana /	[setl'atl'ana]
tle + ana	lewatile	sea	/lewatl'e + ana /	[lewatl'ana]
tlo + ana	nkgêtlo	broken piece	/ŋkxhetl'o + ana /	[ŋkxetl'wana]
tló + ana	ntló	house	/ŋtl'ó + ana /	[ŋtl'wana]
ša + ana	seša	firebrand	/seʃa + ana /	[seʃana]
še + ana	mošê	overseas	/moʃε + ana /	[moʃana]
ši + ana	kgoši	chief	/kxhoʃi + ana /	[kxhoʃana]
šo + ana	sebešo	hearth	/seβeʃo + ana /	[seβeʃwana]
šó + ana	sešô	ulcer	/seʃó + ana /	[seʃwana]
šu + ana	sešu	dung	/seʃu + ana /	[seʃwana]
tša + ana	mašotša	mopani worms	/maʃotʃ'a + ana /	[maʃotʃ'ana]
tši + ana	letšatši	sun	/letʃatʃi + ana /	[letʃ'atʃ'ana]
tšó + ana	mphufutšô	sweat	/mphufutʃó + ana /	[mpufutʃwana]
tšu + ana	lentšu	voice	/lenʃtu + ana /	[lenʃwana]
tšha + ana	tšhatšha	hunting spider	/tʃhatʃha + ana /	[tʃhatʃhana]
tšhe + ana	watšhê	watch	/watʃhe + ana /	[watʃhana]
tshi + ana	ntšhi	fly	/ŋtʃhi + ana /	[ŋtʃhana]
tšhu + ana	ntšhu	eagle	/ŋtʃhu + ana /	[ŋtʃhwana]
wa + ana	lewa	cave	/lewa + ana /	[lewana]
we + ana	moswe	meercat	/moswe + ana /	[moswana]
we + ana	segwêgwê	frog	/seɣweɣwe + ana/	[seɣweɣwana]
swi + ana	maswi	milk	/maswi + ana /	[maswana]
ja + ana	môya	air	/moja + ana /	[mojana]
je + ana	eiye	onion	/eiye + ana /	[eijana]
nga + ana	lenga	crack	/leŋa + ana /	[leŋana]
kga + ana	kgakgakga	magnesium/ potassium	/kxhakxhakxha + ana /	[kxhaxkxhakxhana]
kgo + ana	borokgô	trouser	/borokxho + ana /	[borokxhwana]

kgɔ + ana	nkgô	clay pot	/ŋkxhɔ + ana /	[ŋkxhɔwana]
hla + ana	sehlahla	reed	/seɬaɬa + ana /	[seɬaɬana]
hlɔ + ana	mahlô	eyes	/maɬɔ + ana /	[maɬwana]
tlha + ana	ntlha	point	/ŋtlha + ana /	[ntlhana]
tsho + ana	dintsho	sugar cane	/lihtsho + ana /	[lihtshwana]

APPENDIX A₂

Combination	Example	Gloss	Underlying Representation	Phonetic Representation
	monna	man	/monona/	[monna]
	mollo	fire	/molelo/	[mollo]
	mma	mother	/mama/	[mma]
	mmê	mother	/mame/	[mme]
	rra	father	/rara/	[rra]
	rrê	father	/rare/	[rre]
ae + ana	mae	eggs	/mae + ana /	[majana]
ai + ana	letswai	salt	/letswai + ana /	[selejana]
aɔ + ana	molaô	law	/molaɔ + ana /	[molawana]
au + ana	tau	lion	/t'au + ana /	[t'awana]
ea + ana	lesea	baby	/lesea + ana /	[lesejana]
ee + ana	lee	egg	/lee + ana /	[lejana]
ei + ana	selei	sledge	/selei + ana /	[lelejana]
eɔ + ana	moseô	farther end	/moseɔ + ana /	[mosewana]
eu + ana	peu	seed	/p'eu + ana /	[p'ewana]
ie + ana	tšiê	locust	/tj'ie + ana /	[tj'ijana]
io + ana	pshiô	kidney	/pfhiɔ + ana /	[pfhiwana]
oa + ana	seboa	threshing floor	/seβoa + ana /	[seβowana]
oi + ana	moloi	witch	/moloi + ana /	[molojana]
oi + ana	koloi	car	/k'oloi + ana /	[k'olojana]
oo + ana	tloo	ground-nut	/tloo + ana /	[tlowana]
ɔɔ + ana	pôô	bull	/p'ɔɔ + ana /	[p'ɔwana]
ou + ana	tlôu	elephant	/tlosu + ana /	[tlowana]
ua + ana	serua	domestic animal	/serua + ana /	[seruwana]
ue + ana	lebuê	flower	/leβue + ana /	[leβuwana]

APPENDIX B

DEVERBATIVE NOUNS

Combination	Example	Gloss	Underlying Representation	Phonetic Representation
hu + ana	mohu	deceased	/mo+hu +ana/	[mohwana]
ji + ana	moji	consumer	/mo + j + i +ana/	[moʒana]
jɔ + ana	sejô	food	/se + j + ɔ +ana/	[seʒwana]
ka + ana	maka	lies	/mak'a +ana/	[mak'ana]
ki + ana	moreki	buyer	/mo + re + i +ana/	[morek'ana]
kɔ + ana	mohlakô	worry	/mo + ɬak + ɔ +ana/	[moɬak'wana]
la + ana	sehlôla	evildoer	/se + ɬɔl' + a + ana/	[seɬɔlana]
lɔ + ana	bodulô	residence	/βo + ɬul + ɔ +ana/	[βoɬulwana]
na + ana	marena	chiefs	/ma + ren + a +ana/	[marenana]
nɔ + ana	monônô	fatness	/mo + nɔnɔ +ana/	[monɔnwana]
pa + ana	mogwapa	biltong	/mo + ɣwaɸ + a +ana/	[moɣwaɸana]
phɔ + ana	mphô	gift	/mph + ɔ +ana/	[mphwana]
si + ana	mpohasi	appeaser	/mo + phas + i +ana/	[mophasana]
sɔ + ana	dliphasô	appeasement	/li + phas + ɔ + ana /	[ɬiphaswana]
gɔ + ana	moago	building	/mo + aɣ + ɔ + ana/	[moaɣwana]
ši + ana	mobuši	ruler	/mo + βuɸ + I +ana/	[moβuɸana]
ša + ana	modiša	sheperd	/mo + ɬiɸ + a +ana/	[moɬiɸana]
šo + ana	sebešo	hearth	/se + βɛɸ + o + ana/	[seβɛɸwana]
šɔ + ana	mmusô	government	/mo + βuɸ + ɔ + ana/	[moβuɸwana]
tša + ana	molatša	cold porridge	/mo + latɸ' + a +ana/	[molatɸ'ana]
tšɔ + ana	seletšô	musical instrument	/se + letɸ + ɔ +ana/	[seletɸwana]
tši + ana	molwetši	patient	/mo + lwetɸi + i +ana/	[molwetɸ'ana]
tse + ana	mokgôtsê	friend	/mo + kxhɔtsɛ +ana/	[mokxhɔtsana]
ta + ana	molata	subject	/mo + lat' + a +ana/	[molat'ana]
tɔ + ana	mokatô	races	/mo+ k'at'ɔ +ana/	[mok'at'wana]

APPENDIX C
PRONOUNS

Possessive/Absolute Pronouns

Class	Example	Gloss	Underlying Representation	Phonetic Representation
1	wena	you	/u + ɛna/	[wɛna]
2 ps	yena	he, she	/ɛ + ɛna/	[jɛna]
3	wôna	it	/ɔ + ɔna/	[wɔna]
4	yôna	him, her	/ɛ + ɔna/	[jɔna]
5	lêna	it	/lɛ + ɔna/	[lɔna]
6	wôna	it	/ɔ + ɔna/	[wɔna]
7	sôna	it	/sɛ + ɔna/	[sɔna]
8	tšôna	them	/tʃɛ + ɔna/	[tʃɔna]
9	yôna	it	/ɛ + ɔna/	[jɔna]
10	tsôna	them	/tʃ + ɔna/	[tʃɔna]
14	bjôna	it	/βɔ + ɔna/	[βʒɔna]
15	gôna	this place	/ɣɔ + ɔna/	[ɣɔna]
16	gôna	this place	/ɣɔ + ɔna/	[ɣɔna]
17	gôna	this place	/ɣɔ + ɔna/	[ɣɔna]
18	gôna	this place	/ɣɔ + ɔna/	[ɣɔna]

APPENDIX D

CONCORDS

SUBJECT CONCORDS

Class	Underlying representation	Phonetic representation
3	/ɔ + a/	[wa]
4	/ɛ + a/	[ja]
9	/ɛ + a/	[ja]
15	/ʏo + a/	[ɥwa]
16	/ʏo + a/	[ɥwa]
17	/ʏo + a/	[ɥwa]
18	/ʏo+ a/	[ɥwa]

POSSESSIVE CONCORDS

Class	Underlying representation	Phonetic representation
1	/ɛ + ɔ/	[jo]
3	/ɔ + a/	[wa]
4	/ɛ + a/	[ja]
9	/ɛ + a/	[ja]
15	/ʏo + a/	[ɥwa]
16	/ʏo + a/	[ɥwa]
17	/ʏo + a/	[ɥwa]
18	/ʏo+ a/	[ɥwa]

DEMONSTRATIVE PRONOUNS: POSITION 1 (A)

Class	Example	Gloss	Underlying Representation	Phonetic Representation
1	yô	this	/ɛ + ɔ/	[jo]
3	wô	this	/ɔ + ɔ/	[wo]
4	yê	this	/ɛ + ɛ/	[jɛ]
9	yê	this	/ɛ + ɛ/	[jɛ]

APPENDIX E

PREFIXES OF NOUN CLASS

Class 2

Combination	Example	Gloss	Underlying Representation	Phonetic Representation
ba + a	bale	female initiates	/βa + ale/	[βale]
ba + ε	betsi	brides	/βa + ɛtʃi/	[βɛtʃi]
ba + ε	bɛɲe	owners	/βa + ɛɲe/	[βɛɲe]

Class 3

Combination	Example	Gloss	Underlying Representation	Phonetic Representation
mo + ɔ	moôya	air	/mo + ɔja/	[mɔja]
mo + ɔ	moôkô	marrow	/mo + ɔkɔ/	[mɔkɔ]
mo + u	muši	smoke	/mo + uʃi/	[muʃi]

Class 14

Combination	Example	Gloss	Underlying Representation	Phonetic Representation
bo + ɔ	bôya	hair	/βo + ɔja/	[βɔja]
bo + u	bupi	mealiemeal	/βo + upil/	[βup'i]
bo + u	buɟwa	porridge	/βo + uɟwa/	[βuɟwa]

APPENDIX F₁

VERBS

Example	Gloss	Underlying Representation	Phonetic Representation
raga	kick	ray + u + a	[raywa]
rêka	buy	rɛk + u + a	[rɛk'wa]
fala	scrap	fal + u + a	[falwa]
bôna	see	βɔn + u + a	[βɔnwa]
lora	dream	lor + u + a	[lɔrwa]
lesa	leave	les + u + a	[leswa]
besa	roast	βeʃ + u + a	[βeʃwa]
rata	love	rat + u + a	[ratwa]
thotha	migrate	thoth + u + a	[thothwa]
nganga	arguing	ŋaŋ + u + a	[ŋaŋwa]
betla	curve	betl + u + a	[βetlwa]
fehla	mix porridge	feɫ + u + a	[feɫwa]
thunya	shoot	thuɲ + u + a	[thuɲwa]
lôra	dream	y + u + a	[lɔrwa]

APPENDIX F₂
QUANTITATIVE PRONOUNS

Class	Example	Gloss	Underlying Representation	Phonetic Representation
1	yohle	all of it	ε + ɔ̌ɛ	[jɔ̌ɛ]
2	bohle	all of it	βa + ɔ̌ɛ	[βɔ̌ɛ]
3	wohle	all of it	wɔ + ɔ̌ɛ	[wɔ̌ɛ]
4	yohle	all of it	ε + ɔ̌ɛ	[jɔ̌ɛ]
5	lohle	all of it	lɛ + ɔ̌ɛ	[lɔ̌ɛ]
6	ohle	all of it	a + ɔ̌ɛ	[ɔ̌ɛ]
7	sohle	all of it	sɛ + ɔ̌ɛ	[sɔ̌ɛ]
8	tsohle	all of them	li + ɔ̌ɛ	[tʃɔ̌ɛ]
9	yohle	all of it	ε + ɔ̌ɛ	[jɔ̌ɛ]
10	tsohle	all of them	li + ɔ̌ɛ	[tʃɔ̌ɛ]
14	bjohle	all of it	βʒo + ɔ̌ɛ	[βʒɔ̌ɛ]
15	gohle	everywhere	γo + ɔ̌ɛ	[γɔ̌ɛ]
16	gohle	everywhere	γo + ɔ̌ɛ	[γɔ̌ɛ]
17	gohle	everywhere	γo + ɔ̌ɛ	[γɔ̌ɛ]
18	gohle	everywhere	γɔ + ɔ̌ɛ	[γɔ̌ɛ]

APPENDIX F₃

DEMONSTRATIVE POSITION 16

Class	Example	Gloss	Underlying Representation	Phonetic Representation
1	yônô	this person	jɔ + ɔno	[jɔno]
2	banô	these ones	βa + ano	[βano]
3	wônô	it	wɔ + ɔno	[wɔno]
4	yenô	this one	jɛ + eno	[jɛno]
5	lenô	this one	lɛ + eno	[lɛno]
6	anô	these ones	a + ano	[ano]
7	seno	this one	sɛ + eno	[sɛno]
8	tsenô	these ones	li + eno	[tʃɛno]
9	yenô	this one	ɛɔ + ɔno	[jɛno]
10	tsenô	these ones	li + eno	[tʃɛno]
14	bjônô	this one	βɔ + ɔno	[βɔno]
15	gônô	this place	ɣɔ + ɔno	[ɣɔno]
16	gônô	this place	ɣɔ + ɔno	[ɣɔno]
17	gônô	this place	ɣɔ + ɔno	[ɣɔno]
18	gônô	this place	ɣɔ + ɔno	[ɣɔno]