

High Tone Spread in the Sotho Verb

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1. Introduction

Mobility of high tones is one of the most fundamental phenomena of Bantu tonology (Kisseberth & Odden 2003: 62). High tone spread (HTS) is one instance of such tonal mobility: A high tone does not only surface on the syllable it is associated with underlyingly but also on succeeding syllables.

The paper deals with the variation of HTS in varieties of the Sotho family as displayed in the infinitive and Present Tense of verbs. The Sotho family belongs to the Southern Bantu languages and comprises Northern and Southern Sotho as well as Tswana (S.30 in the classification of Guthrie 1948). Sotho languages are spoken in South Africa and Botswana and are mutually intelligible. In what concerns the direction of high tone spread, the Sotho languages uniformly display HTS to right-adjacent syllables. As for the domain in which the high tone spreads there is considerable variation found in the Sotho varieties, ranging from one syllable to an unlimited number.

In contrast to the Nguni family which displays a rather homogeneous tone shift pattern (Peterson 1989; Downing 1990), the Sotho languages are heterogeneous with respect to tone spread. Research on HTS in Sotho varieties attributes the variation to two different types of HTS (Khoali 1991; Mmusi 1992; Monareng 1992; Cassimjee & Kisseberth 1998): Bounded HTS spreads a high tone once to the immediately adjacent syllable, whereas unbounded HTS spreads a high tone to an unlimited number of syllables within a certain prosodic domain. The goal of this paper is to provide a unified account to HTS in the Sotho languages by examining three Sotho varieties in detail. Sesotho and Southern Tswana dialects uniformly show bounded HTS. The range of variation of HTS manifests itself especially in the Northern Sotho dialects. Therefore, the current study comprises two Northern Sotho dialects (Setswapo and a northwestern dialect) besides Sesotho. By contributing relevant unreported data from a northwestern variety of Northern Sotho the paper aims at enriching the descriptive basis on which a comparative study has to be based.¹

The theoretical frame for the analysis is OT as laid out in Prince & Smolensky (1993). The basic characteristics of OT, namely universal constraints and language-specific rankings, account not only for common tonal properties but also for divergent tonal patterns in the Sotho varieties. In adopting an Optimal Domains Theory-analysis for HTS in Sotho the paper draws on prior insights from work on HTS (Cassimjee & Kisseberth 1998) and high tone shift (Cassimjee 1998) showing that only reference to both tonal and metrical domains can account for the data.

Section 2 compares the findings of literature research and my own elicitation work with respect to HTS in Sesotho (section 2.1.), a northwestern dialect of Northern Sotho (section 2.2.) and the Northern Sotho dialect Setswapo (section 2.3). In section 3, the analysis is presented. Section 4 summarizes the findings and concludes.

2. Tonological characteristics of Sotho varieties

The tone system of the Sotho family displays the underlying two-tone system (H, L) common to many Bantu languages (Doke 1954; Cole 1955). In the verbal paradigm, verbs are classified into high and

¹ The data stem from my work with Lister Maphuti Matloga, a Northern Sotho speaker from near Polokwane who I am greatly indebted to. All errors of interpretation are mine.

low-toned verbs depending on the tone quality of the stem-initial vowel (Guthrie 1967-1971; Clements 1984), as shown in (1).

| | | | | |
|--------|---|-------------|--------------------------------------|-------------|
| (1)(a) | L-toned verbs | (b) | H-toned verbs (Zerbian, field notes) | |
| | (H tone is marked by acute, underlying high tones are underlined) | | | |
| | go lwa | -‘to fight’ | go fá | -‘to give’ |
| | go hlaba | -‘to stab’ | go ráta | -‘to love’ |
| | go tlogela | -‘to leave’ | go bóláya | -‘to kill’ |
| | go dumediša | -‘to greet’ | go khúrúmétša | -‘to cover’ |

In the case of H-toned verb stems, there is always a high tone on the first stem syllable, as in (1b). It is assumed that this syllable is associated with a H underlyingly. The overall tonal pattern of a verb form in Sotho is not only determined by lexical association of a H to a tone bearing unit but also by principles governing tone spread and deletion. Cases of tone deletion, as in OCP contexts (Myers 1997 for an overview), will not be dealt with in this paper. As for tone spread, the verb stem-initial H tone spreads to the right in all Sotho varieties.

High tone spread (HTS) and the finality restriction, which excludes a domain-final syllable from the tonal domain, lead to a uniform behaviour of verb forms containing one to three syllables across Sotho varieties. This is shown in (2): Monosyllabic verbs surface with a high tone. Disyllabic verbs also realize the underlying high tone on the stem-initial syllable but do not show high tone spread to the final syllable.² Trisyllabic verbs show a H on the initial syllable that spreads to the right-adjacent syllable. The final syllable is not in the scope of HTS.

| | | | |
|-----|--|---------------------------------|---|
| (2) | HTS in one- to three-syllabic verbs in Sotho varieties | | |
| | Sesotho (Southern Sotho) | NW dialect of Northern Sotho | Setswapo (Northern Sotho dialect) |
| | monosyllabic | go já | go já |
| | disyllabic | go bína | go bína |
| | trisyllabic | go bóláya | go kítíma |

In up to trisyllabic forms, as in (2), no divergent spreading pattern emerges across varieties. The finality restriction interferes with HTS and therefore obscures the spreading pattern. A comparison of longer verb forms in the next sections will detect variation in HTS in different Sotho varieties, beginning with Southern Sotho followed by the two dialects of Northern Sotho.³

2.1. *Sesotho*

Southern Sotho (Sesotho) is spoken in Lesotho, South Africa and Botswana. The tonology of Southern Sotho is quite well-studied compared to other African tone languages (Köhler 1956; Khoali 1991;

² There is a common tonal alternation showing that the finality restriction is related to the larger phrase not the word. In Sesotho, this alternation only occurs in disyllabic verbs (Khoali 1991; Mmusi 1992; Lets'eng 1994; Creissels 1996).

(i) HTS in disyllabic verbs
 go búá maaka ‘to tell lies’ (Mmusi 1992: 40)
 go ráta p'óodi ‘to like a goat’ (Khoali 1991: 170)

³ The Sengwaketse dialect of Tswana (also Sotho family) provides an area of further study as it displays a spreading pattern which is particularly interesting for a typology of HTS (Chebanne, Creissels et al. 1997; Creissels 1998). The Tswana spreading pattern is a case of bounded spreading over two adjacent syllables which is also found in Shona, Venda, Kalanga, and Tonga (Kisseberth and Odden 2003: 63) as well as in Sukuma (Sietsema 1989). Future research will show how the analysis proposed here can provide an account of these data.

Mmusi 1992; Lets'eng 1994; Cassimjee & Kisseberth 1998). All sources report a uniform tonal behaviour with respect to HTS for the Southern varieties of the Sotho family cluster.

Polysyllabic verbs show that in Sesotho a verb stem-initial H spreads only to the right-adjacent syllable, as shown in (3).

- (3) HTS in polysyllabic verbs in Sesotho (Mmusi 1992: 40)
- | | |
|--------------------------|----------------------|
| go <u>á</u> gísanya | ‘to live in harmony’ |
| go kh <u>ú</u> rúmeletsa | ‘to cover for’ |

Underived polysyllabic verbs as in (3) are quite rare in Bantu languages due to the basic stem structure of CVCV. However, the spreading behaviour can be observed in any verb form that contains an underlying H followed by toneless syllables. This includes forms containing verbal extensions or conjugated verb forms containing subject and/or object marker, as illustrated in (4) with a high-toned subject marker.

- (4) HTS in Sesotho with H-toned subject marker (Mmusi 1992: 63)
- | | |
|---------------------------------|----------------------|
| <u>ó</u> -á- <u>l</u> ema | ‘s/he is ploughing’ |
| <u>ó</u> -á- <u>l</u> ebala | ‘s/he is forgetting’ |
| <u>ó</u> -á- <u>l</u> gorometsa | ‘s/he is pushing’ |

To sum up the spreading pattern of Sesotho, the data in (3, 4) show that in Sesotho HTS occurs only to the immediately right-adjacent syllable. In contrast to the uniform behaviour of Southern Sotho, Northern Sotho varieties are generally more divergent, as will be shown in the next two sections.

2.2. Northwestern dialect of Northern Sotho

For Northern Sotho seven dialect clusters are reported (Van Wyk 1969) with each comprising several dialects and showing influences of neighbouring languages such as Venda, Tsonga, and Swazi. Northern Sotho varieties therefore provide a fruitful area to investigate dialectal variation. Tonal studies on Northern Sotho dialects are only available in Lombard (1976) and Monareng (1992). The data presented in this section are from my own work with a language consultant from the village Mogalakwena in the Limpopo province.⁴

For one-to three syllabic verbs the emerging pattern is identical to the one in Sesotho. Longer verb forms show HTS up to the penultimate syllable, as shown in (2) and (5).

- (5) HTS in a northwestern dialect of Northern Sotho (Zerbian, field notes)
- | | |
|---|----------------|
| go kh <u>ú</u> rú <u>m</u> é <u>t</u> ša | ‘to cover’ |
| go kh <u>ú</u> rú <u>m</u> é <u>l</u> é <u>t</u> ša | ‘to cover for’ |

Again, this pattern of HTS emerges not only in infinitives but in all verb forms containing one high tone, as shown in (6).

- (6) HTS in a northwestern dialect of Northern Sotho (Zerbian, field notes)
- | | | |
|-----|---|----------------------------|
| (a) | go <u>r</u> é <u>k</u> -é <u>l</u> -á <u>n</u> -a | ‘to buy for each other’ |
| | (cf. go nyak-el-an-a | ‘to look for each other’) |
| | go kh <u>ó</u> lóbé <u>t</u> š-á <u>n</u> -a | ‘to baptize each other’ |
| (b) | Ke <u>k</u> á t <u>l</u> ógé <u>l</u> á m <u>ó</u> kgá <u>l</u> á <u>b</u> je. | ‘I can leave the old man.’ |
| | Ke <u>k</u> á d <u>ú</u> médí <u>š</u> á m <u>ó</u> kgá <u>l</u> á <u>b</u> je. | ‘I can greet the old man.’ |
| (c) | go <u>r</u> é <u>m</u> á m <u>ó</u> hlá <u>r</u> e | ‘to split a tree’ |

⁴ This dialect is categorized as a northwestern Sotho dialect for geographical reasons. Further research is needed to establish linguistic reasons to classify it together with the other North(-Western) Sotho dialects, such as Birwa and Dzwabo (Tucker 1932) and Hananwa, Tlokwa, Matlala, Dikgale, and Mamabolo (Monareng 1992).

- | | | |
|-----|----------------------------|----------------------------|
| (c) | go <u>r</u> émá móhláre | ‘to split a tree’ |
| | go <u>b</u> óláyá móhláre | ‘to kill a tree’ |
| | go <u>t</u> hókómélá ngáka | ‘to look after the doctor’ |

The data in (6a) exemplify that verbs containing toneless verbal extensions show the same unbounded spreading pattern as polysyllabic infinitives. The data in (6b) further illustrate that also verbal affixes which bear a high tone trigger regular HTS up to the penultimate syllable. The data in (6c) show that HTS occurs across word boundaries. Therefore the domain for HTS is larger than the phonological word.

Unbounded high tone spread has also been observed in areally close Bantu languages which do not belong to the Sotho family. Also in Tsonga and Venda, a high tone spreads up to the penultimate syllable within a relevant prosodic domain (Cassimjee 1992; Kisseberth 1994), as shown in (7).

- (7) HTS in Tsonga (Kisseberth 1994:138, 142)
- | | | |
|-----|-----------------------------------|-------------------------|
| (a) | ku-ph <u>á</u> kámí:sa | ‘to lift up’ |
| | ku-c <u>ú</u> mbúlúká:nya | ‘to break in two’ |
| (b) | ndzi-l <u>á</u> vá nyá:ma. | ‘I want meat.’ |
| | cf. ndzi-xava nya:ma. | ‘I am buying meat.’ |
| (c) | v <u>á</u> -x <u>á</u> vá nyá:ma. | ‘They are buying meat.’ |
| | cf. ndzi-xava nya:ma. | ‘I am buying meat.’ |

In (7a) the high tone on the verb stem-initial syllable spreads up to the penultimate syllable of the word. The data in (7b, c) show that the domain of HTS is larger than the phonological word as the high tone of either a high-toned verb (7b) or a high-toned subject marker (7c) spreads to the penultimate syllable of the phrase.

To sum up, the northwestern dialect of Northern Sotho variety, as described in (5, 6), displays unbounded spread up to the penultimate syllable of a phrase.

2.3. Setswapo dialect of Northern Sotho

The Setswapo dialect belongs to the North-Eastern cluster of Northern Sotho dialects along with Lobedu, Phalaborwa, Mahlo (Van Wyk 1969, cited in Louwrens (1995)) and Roka, Kgaga (Monareng 1992). The Setswapo dialect is spoken around Phalaborwa and Tzaneen in the Limpopo Province. All data presented are taken from Monareng (1992).

For up to trisyllabic verb forms the Setswapo dialect shows the same surface representation as all Sotho varieties, see (2). For up to quadrisyllabic verb stems the Setswapo dialect is identical to the Southern Sotho pattern as HTS is restricted to the two initial syllables (8a). Only the investigation of longer verb stems reveals the spreading pattern in Setswapo. These data show that the penultimate syllable is exempt from spreading in more than trisyllabic verbs. The target for tone spread is the antepenultimate, as exemplified in (8b).

- (8) HTS in the Northern Sotho dialect Setswapo (Monareng 1992: 49)
- | | | |
|-----|-------------------------|----------------|
| (a) | go <u>k</u> ólóbetša | ‘to baptize’ |
| (b) | go <u>kh</u> úrúméletša | ‘to cover for’ |

Again, the spreading pattern also occurs with verb forms other than infinitives. This is shown in (9a) for H-toned subject marker and in (9b) for H-toned object marker. Furthermore, HTS in the Setswapo dialect is not bound to the word but also occurs across word boundaries, as shown in (9c). The examples in (9d) show that HTS is unbounded in this Northern Sotho dialect, targeting the antepenultima.

- (9) HTS in Setswapo (Monareng 1992: 25, 26, 61, 62)
- | | | |
|-----|-------------------|--------------------|
| (a) | <u>ó</u> á hlaba | ‘s/he is stabbing’ |
| | <u>ó</u> á bápala | ‘s/he is playing’ |

- | | | |
|-----|----------------------|------------------------------------|
| (b) | go ɛ́ hláǵóla | ‘to weed it’ |
| | go ɛ́ kgórómetša | ‘to push it’ |
| (c) | Ke thúsá ngaka. | ‘I am helping the doctor.’ |
| | Ke ópélá koša. | ‘I am singing a song.’ |
| (d) | ǒ á kgóróméletša | ‘s/he is pushing it for someone’ |
| | Ke gólóká lébótwana. | ‘I am rough-casting a small wall.’ |

In Setswapo, a high tone spreads onto a varying number of succeeding syllables showing variation with respect to the target of HTS which alternates between the penultimate and the antepenultimate syllable.

The tone pattern in the Setswapo dialect reported by Monareng is similar to the tone pattern reported for the Nguni languages (Downing 1990; Cassimjee 1998) which are the southern neighbor of the Sotho languages. The basic difference between Nguni and Sotho languages is one between tone shift and spread. High tones contributed by the verb stem (if the stem is longer than three syllables) regularly surface on the antepenultimate syllable in Nguni languages, as shown in (10a) for Ndebele. However, high tones which are underlyingly contributed by the penult or antepenult surface on the penultimate syllable in these same languages. This is shown in (10b).

- | | | |
|------|-----|---|
| (10) | (a) | Antepenultimate shift in Ndebele (Rycroft 1983) |
| | | si-ya-thumélana ‘we are sending for each other’ |
| | | si-ya-gombolózela ‘we are surrounding’ |
| | (b) | Penultimate shift in Ndebele (Rycroft 1983) |
| | | si-ya-thúma ‘we send’ |
| | | si-ya-zì-khúpha ‘we remove them’ |

This behaviour of high tones is parallel to the Setswapo pattern where a stem initial H in disyllabic and trisyllabic verbs (i.e. the high tone is on the antepenult or penult underlyingly) spreads onto the penultimate syllable and a H originating on any other syllable spreads to the antepenult. Further research is needed to determine if the similar pattern is due to areal influences.

To sum up the findings with respect to HTS in Sotho varieties, the following generalizations about HTS in these three Sotho varieties can be made based on the data in (1) to (9):

- An underlying H tone is realized on the syllable it is associated with.
- A H spreads at least once but never to the (phrase)final syllable.
- If the domain of HTS exceeds the immediately right-adjacent syllable, it spreads to a syllable close to the right edge of the phrase, generally the penultimate syllable, or (in the Setswapo dialect) the antepenultimate.

In the next section, I will follow work by Cassimjee (1998) and Downing (2001, 2003a), and show how an analysis in Optimal Domains Theory (ODT) provides an account of HTS in Sotho.

3. Analysis

Cassimjee (1998) and Downing (2001, 2003a) have argued for both metrical and tonal structure being necessary in an account for tonal patterns as the ones observed in the Nguni languages where the target of tone shift alternates between the penultimate and antepenultimate syllable.

The motivation for metrical structure lies in properties of Bantu tone systems which are comparable to stress systems, such as culminativity, positional restrictions, and tone-stress-interactions (see Downing 2003b; Downing (to appear) for an overview). These properties are also apparent in the Sotho languages: First, verb stems only display one high tone, paralleling stress systems where every morpheme bears only one accent. Second, just like stress, the high tone tends to occur at word edges, at least in Northern Sotho, where it appears on either the penultimate, or antepenultimate. Third, work at least since Doke (1954) assumes that in Southern Bantu languages the penultimate syllable is

stressed when words appear in phrase-final position as expressed by a lengthened syllable. The penultimate syllable is considered the head of a binary foot (stress foot) and therefore in a prominent metrical position which might attract tone (Kenstowicz & Kisseberth 1990).

The existence of tonal structure is part of Optimal Domains Theory, as proposed in Kisseberth (1994) and Cassimjee & Kisseberth (1998). In Optimal Domains Theory (ODT) autosegmental representations are replaced by representations denoting feature domains. Every phonological feature invokes its domain in which it is realized. The domain of realization of the phonological feature is defined by alignment constraints. That means that for tone, tone alignment constraints define the domain in which the tone is realized. The motivation for tonal domains lies in the assumption that tonal domains are prosodic constituents and therefore show properties common to other prosodic constituents, e.g. being subject to minimality and to nonfinality.⁵

The existence of both metrical and tonal domains includes the assumption that both domains respect each others boundaries. This is a crucial aspect for Downing's analysis (2001) of the Nguni tone patterns which will be adopted for Setswapo in the next section.

3.1. *Constraint inventory*

Cassimjee (1998), Cassimjee & Kisseberth (1998) and Downing (2001) show how the ODT-approach accounts for the tone pattern in Nguni. As the Setswapo dialect of Northern Sotho displays the analogous tone pattern (see section 2.3.) I will adopt their analysis leaving it open if the similar tonal behaviour is a result of areal influence.

The following alignment constraints define the tone domains that account for the tone pattern in the Setswapo dialect:

- (11) **BASICALIGN-R**: Align R (TD, sponsor)
- (12) **ALIGN TONE DOMAIN (TD)**: Align R (TD, PP)
- (13) **NONFINALITY**: The phrase-final syllable is exempt from a tone domain.
- (14) **NOOVERLAP**: Prosodic constituents must not overlap.
- (15) **MINIMALITY (TD)**: Tone domains are minimally disyllabic.

BASICALIGN-R bans any expansion of a high tone domain to the right beyond its sponsor in stating that the right edge of a tone domain (TD) is right-aligned with its sponsor, i.e. with the underlying tone. The constraint is violated whenever a high tone spreads to the right. For the purposes here, **BASICALIGN-R** is comparable to **DEP**-constraints banning insertion in standard OT-accounts. Its counterpart, **ALIGN (TD)**, optimizes extending the tone domain through the end of the phrase in requiring that the right edge of a tone domain is aligned with the right edge of a phonological phrase. If **ALIGN (TD)** is ranked above **BASICALIGN-R** spreading occurs through the end of the phrase.

However, as noted above, high tones never spread to the phrase-final syllable in Sotho. Ranking **NONFINALITY** above **ALIGN(TD)** accounts for this. These constraints and the ranking in (16) optimize spreading the high tone through the penult of the phrase.

- (16) Ranking for unbounded spread to penultimate
NONFINALITY >> **ALIGN (TD)** >> **BASICALIGN-R**

The constraint **NOOVERLAP** is proposed to account for why the antepenult is the rightmost target of high tone shift instead of the penult in the Nguni languages (Downing 2001) and will be adopted here for Setswapo. **NOOVERLAP** requires that prosodic constituents of the same type do not overlap. At the right edge of a phrase there is a conflict of tonal domain boundaries and stress foot boundaries. Due to the influence of **ALIGNR** the tone domain is extended to the right phrase edge. However, work since

⁵ It is beyond the scope of this paper to motivate ODT in further detail. See (Kisseberth 1994; Cassimjee 1998; Cassimjee & Kisseberth 1998) for a detailed description of the theory and the derivation of Bantu tonal properties within this theory.

Doke (1954) assumes that the penultimate syllable is stressed when words appear in phrase-final position and is therefore in a prominent metrical position. Following the literature that suggests that high tones and stress attract each other Downing (2001) concludes that tone and stress domains are both subtypes of prominence-defining constituents and can therefore be considered constituents of the same type. Consequently, they are evaluated by NOOVERLAP.

In Setswapo, NOOVERLAP is ranked high and therefore an overlap of stress foot and tonal domain boundaries is dispreferred. The analysis of antepenult HTS in the Setswapo dialect is illustrated in table 1 (parentheses indicate tone domains; brackets indicate stress foot).

Table 1: Antepenult high tone spread in Setswapo

| | NON-FINALITY | NO OVERLAP | ALIGNR | BASICALIGN-R |
|---------------------------------|--------------|------------|--------|--------------|
| a (kó)lo[betša] | | | ***! | |
| b [☞] (kóló)[betša] | | | ** | * |
| c (kóló)[bé]tša] | | *! | * | ** |
| d (kóló)[bétšá] | *! | * | | *** |
| e (khú)rume[letša] | | | ***!* | |
| f (khúrú)me[letša] | | | ***! | * |
| g [☞] (khúrúmé)[letša] | | | ** | ** |
| h (khúrúmé)[lé]tša] | | *! | * | *** |
| i (khúrúmé)[létšá] | *! | * | | *** |

Candidates (b) and (g) which show high tone spread onto the antepenult are optimal because the tone domain edge is as far to the right as possible (ALIGNR) without violating the higher ranked constraints NONFINALITY and NOOVERLAP. In candidates (c), (d), (h), and (i) the tone domain edge is too far to the right: candidates (c) and (h) violate NOOVERLAP by including the stressed penult, candidates (d) and (i) violate NONFINALITY (and NOOVERLAP). Candidates (a) and (e) are non-optimal because the tone domain edge is not far enough to the right. They violate ALIGNR once more than the winning candidates.

The analysis in table 1 can, however, not account for why the penultimate is sometimes included in the tone domain as in trisyllabic verb forms. Appropriate ranking of MINIMALITY ensures that the tone domain, just like other prosodic constituents, must be minimally disyllabic. The restriction on the size of a tone domain is only a minimality restriction (in other Sotho varieties the tone domain can contain more than two high tones) and is prevalent also in other aspects of Bantu grammar, e.g. in imperatives and reduplication. The reference to minimality provides an explanation for why also in tonal domains binary associations are preferred over single ones.

Ranking MINIMALITY above NOOVERLAP yields the result of including the penultimate syllable into the tonal domain in trisyllabic verbs in Setswapo. However, the final syllable is never included in the tone domain even if that means the tone domain is monosyllabic, showing that NONFINALITY outranks MINIMALITY (the realization of high tones on monosyllabic verbs will be treated in section 3.3.). The complete ranking for the Setswapo dialect of Northern Sotho is given in (17) and illustrated by table 2.

- (17) Ranking in Setswapo
NONFINALITY >> MINIMALITY >> NO OVERLAP >> ALIGNR >> BASICALIGN-R

Table 2: Effect of MINIMALITY in Setswapo

| | NONFINALITY | MINIMALITY | NO OVERLAP | ALIGNR | BASICALIGN-R |
|---------------------------|-------------|------------|------------|--------|--------------|
| a (bó)[laya] | | *! | | ** | |
| b [☞] b́ó[lá]ya] | | | * | * | * |
| c (b́ó)[láyá] | *! | | * | | ** |

In table 2, the tone domain in candidate (b) which spreads the high tone onto the penultimate syllable, is optimal. Even though it violates NOOVERLAP it satisfies the higher ranked constraint MINIMALITY. Not extending the tone domain to the penult as in candidate (a) satisfies NOOVERLAP but crucially violates MINIMALITY which is higher ranked. Also extending the tone domain to the final syllable as in candidate (c) crucially violates NONFINALITY.

To sum up the analysis so far, high tone spread to the antepenultimate syllable allows high tones to spread as far to the right as possible without overlapping tonal and metrical boundaries or targetting the final syllable. Di- and trisyllabic verbs are an exception because the high tone surfaces on the penult in order to satisfy MINIMALITY without violating NONFINALITY.

In the next section it will be shown how the analysis allows a unified account to HTS in other Sotho varieties by reranking of the same universal constraints.

3.2. Variation in Sotho dialects

In the northwestern dialect of Northern Sotho described in (5, 6) spreading occurs unbounded up to the penultimate syllable of a phrase. As already shown in (16), if ALIGN (TD) is ranked above BASICALIGN-R, and NONFINALITY above ALIGNTD this spreading pattern falls out automatically. Reference to metrical structure is not needed as it is systematically violated in order to satisfy the higher ranked alignment-constraint. This means that a constraint such as NOOVERLAP, that refers to metrical structure, is low-ranked. The analysis for the northwestern dialect of Northern Sotho is illustrated in table 3.

Table 3: Unbounded HTS in the northwestern dialect of Northern Sotho

| | NONFINALITY | ALIGNR | BASICALIGN-R |
|------------------|-------------|--------|--------------|
| a (khú)ru[metša] | | **!* | |
| b (khú)ú[metša] | | **! | * |
| c (khú)ú[mé]tša | | * | ** |
| d (khú)ú[métšá] | *! | | *** |

In table 3, candidate (c) is the winner as it violates ALIGNR only in order to satisfy the higher ranked constraint NONFINALITY. Candidates (a) and (b) which show no or bounded HTS are excluded as they violate the high-ranked constraint ALIGNR more often than the winner. NONFINALITY is crucially violated by candidate (d).

Also for the bounded HTS pattern in the Southern Sotho varieties there is no crucial reference to metrical structure. If MINIMALITY outranks BASICALIGN-R, and BASICALIGN-R outranks ALIGNR it falls out automatically that the high tone spans are not only minimally but also maximally bimoraic in Sesotho.

Table 4: Bounded HTS in Sesotho

| | NONFINALITY | MINIMALITY | BASICALIGN-R | ALIGNR |
|-----------------|-------------|------------|--------------|--------|
| a (á)gi[sanya] | | *! | | *** |
| b (á)gi[sanya] | | | * | ** |
| c (á)gi[sá]nya] | | | **! | * |
| d (á)gi[sányá] | *! | | *** | |

The winning candidate (b) violates BASICALIGN-R just enough to avoid a violation of MINIMALITY therefore resulting in maximally bimoraic high tone spans. Candidate (a) crucially violates MINIMALITY, candidates (c) spreads too far to the right therefore violating BASICALIGN-R which is high-ranked in Sesotho. Candidate (d) violates NONFINALITY which is high-ranked in all Sotho varieties.

This section has shown that the constraints necessary for the analysis of the complex tonal patterns of the Setswapo dialect also account for the tone patterns of other Sotho varieties. By constraint

reranking as in tables 3 and 4 the divergent surface tone patterns of Sesotho and the northwestern dialect can be accounted for.

In the next section it will be shown how the approach accounts for the similarities in tone patterns of mono- to trisyllabic verbs in all Sotho varieties.

3.3. Common properties of Sotho languages

As seen in (2), mono- to trisyllabic verbs show identical behaviour in all Sotho varieties. The ranking of the four constraints MAX-T (No deletion of tones), NONFINALITY, MINIMALITY, and NOOVERLAP accounts for the identical behaviour. This is shown in table 5.

Table 5: Common tonal properties in Sotho varieties

| | MAX(T) | NONFINALITY | MINIMALITY | NO OVERLAP |
|--------------------------|--------|-------------|------------|------------|
| a ja | *! | | | |
| b ☞ (já) | | * | | * |
| c [bina] | *! | | | |
| d ☞ [(b)na] | | | * | * |
| e [(b)iná] | | *! | | * |
| f bo[laya] | *! | | | |
| g (bó)[laya] | | | *! | |
| h ☞ (bó)[lá]ya] | | | | * |
| i (bó)[lá]yá] | | *! | | * |

In all Sotho varieties, the relative ranking of these constraints is identical, as shown in table 5. The ranking MAX-T \gg NONFINALITY accounts for why underlying high tones have to be realized on monosyllabic verbs as in candidate (b). In disyllabic verbs, the underlying high tone does not spread to the final syllable as in (d). The optimal output violates MINIMALITY but satisfies NONFINALITY. The ranking NONFINALITY \gg MINIMALITY therefore accounts for the tone pattern in disyllabic verbs. In trisyllabic verbs, a high tone spreads once therefore violating NOOVERLAP but satisfying MINIMALITY. The ranking MINIMALITY \gg NOOVERLAP accounts for this.

The relative ranking of these four constraints is identical across all three varieties therefore predicting the parallel tonal behaviour in mono- to trisyllabic verbs.

4. Conclusion

The analysis proposed here for three different varieties of the Sotho language family accounts for the observable bounded (Sesotho) and unbounded HTS (Northern Sotho dialects) by positing constraints referring to both metrical and tonal structure. Their interaction yields the observable outcome.

The analysis derives language-specific rankings which share the relative ranking of MAX-T, NONFINALITY, MINIMALITY, and NOOVERLAP in order to account for properties of HTS that all Sotho languages have in common. The fixed ranking of these four constraints is given in bold in (18).

(18) Constraint ranking in three Sotho varieties

| Sesotho, Southern Tswana | Setswapo (Northern Sotho) | northwestern dialect of Northern Sotho |
|--|--|--|
| MAX-T \gg NONFIN \gg MINIMALITY \gg BASICALIGN-R \gg NOOVERLAP \gg ALIGN-R | MAX-T \gg NONFIN \gg MINIMALITY \gg NOOVERLAP \gg ALIGN-R \gg BASICALIGN-R | MAX-T \gg NONFIN \gg MINIMALITY , ALIGN-R \gg NOOVERLAP \gg BASICALIGN-R |

Differences in the ranking of the tone-specific constraint ALIGN-R, the faithfulness constraint BASICALIGN-R, and the constraint relating tonal and metrical domains, NOOVERLAP, account for language-specific HTS patterns. If ALIGN-R is ranked high, unbounded spread occurs as in the northwestern dialect of Northern Sotho, if the faithfulness constraint is high-ranked, bounded spread occurs as in Sesotho, and finally, if NOOVERLAP is ranked high, the target syllable for spread alternates, as in the Setswapo dialect of Northern Sotho.

The presentation of yet unreported data on a northwestern dialect of Northern Sotho enlarges the spectrum of phenomena to be accounted for in a treatment of tonal processes in the Sotho languages.

The ODT-approach presented here allows a unified account to the similarities and variations concerning the domain of HTS in Sotho varieties. Thereby the divergent patterns of HTS are not considered as resulting from two different universal constraints but rather from the interaction of a tone-specific alignment constraint (ALIGN (TD)) with markedness-constraints present in the language also in other prosodic areas (e.g. MINIMALITY, NOOVERLAP).

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