The conjoint / disjoint distinction
in the tonal morphology of Tswana

Denis Creissels
Université Lumière (Lyon 2)
denis.creissels@univ-lyon2.fr
http://deniscreissels.fr

1. Introduction

Some of the tenses that constitute the inflection of Tswana verbs have a distinction between a conjoint (henceforth: CJ) and a disjoint (henceforth: DJ) form. In the tenses that have this distinction, the CJ form cannot be found in clause final position, and cannot be separated from the following phrase by a pause, whereas the DJ form does not have this limitation, but is not excluded from non-final contexts either, and when in clause-internal position, is not necessarily separated from the following word by a perceptible pause.

As regards the function of the CJ/DJ distinction, Tswana (a.k.a. Setswana – Bantu S31) is among the languages that do not have an IAV focus position,[1] and in which the choice between CJ and DJ forms is determined by the distinction between post-verbal phrases that enrich or make more precise the comment expressed by the verb, and post-verbal phrases that do not contribute to the comment and fulfill the discourse function of afterthought (or antitopic).

The aim of this paper is to provide a precise description of the morphological distinction between CJ and DJ verb forms in Tswana.

Functionally, the CJ/DJ distinction in Tswana is straightforward, in the sense that in the tenses that have this distinction, there is not the slightest variation in the way it is conditioned, or in its function. But the distinction exists in some tenses only, and there is no feature (either morphological or semantic) common to the tenses that have this distinction, and only to them.

Moreover, the functional homogeneity of this distinction across the tenses that have it sharply contrasts with its extreme morphological heterogeneity. In Tswana, the existence of a CJ/DJ distinction is obvious in one tense only, the present positive, in which the distinction is made apparent by the presence vs. absence of the DJ marker *a* /a/ immediately after the subject marker. In all the other tenses in which a functionally identical distinction must be recognized, it has no segmental manifestation, and is manifested only in tone. In one tense (the perfect positive), the distinction affects the whole tonal contour of the verb stem, and is therefore uncontroversial, but in the others, its manifestations are limited to the last syllable of verb forms, which raises the problem of a possible relationship with the tonal processes affecting the syllables that immediately precede a pause. It is particularly puzzling that the

---

[1] In Tswana assertive clauses, the only possible focalizing strategy is the use of a cleft construction in which the focalized phrase is the complement of *ke* [kí] 'it is', and the verb is in the relative form.

tonal melodies that in some tenses characterize the DJ form may be very similar to those characterizing the CJ form in other tenses, and vice-versa.

The paper is organized as follows. Section 2 gives the inventory of the synthetic forms of Tswana verbs and describes their morphological structure. Section 3 puts forward a system of rules accounting for their tonal contours. Sections 4 compares the tonal behavior of Tswana verb forms in contexts selecting CJ forms with that of the corresponding forms in contexts selecting DJ forms. Section 5 discusses the possible correspondences between the tonal patterns of CJ and DJ forms. Section 6 summarizes the main conclusions.

The analysis is based on the pronunciation of a native speaker of the Ngwaketse dialect. The available documentation on other varieties as well as my own field notes on the Ngwato and Kgatla varieties suggest that the variation observed across Tswana varieties with respect to the details of the H tone spreading processes does not affect the overall organization of the system and the classification of the tenses according to the tonal behavior of verb forms in CJ and DJ contexts. Moreover, (Letšeng 1995) describes a system of tonal marking of the CJ/DJ distinction in Southern Sotho differing only in minor details from that analyzed here.

2. The inflected forms of Tswana verbs: inventory and structure

The list of the synthetic tenses of Tswana verbs with their precise morphological identification is given in Appendix 2.

A Tswana verb form consists of a *root* (irreducible lexical element) together with an obligatory suffix (the *final vowel*, or simply *final*) and a variable number of other affixes whose presence depends on a variety of factors, each affix having its position in the string. The root may be immediately followed by derivative suffixes that modify its meaning without altering its valency. The *extended* root is the part of the verb form constituted by the root and such derivative suffixes. The *stem* is the part of the verb form constituted by the root, the final, and all the formatives occupying a position between the root and the final. The formatives that precede the root constitute the *prefixal string*, and those that follow the final are designated as *postfinals*.

Starting from the extended root as the zero point, the order in which the affixes appear can be described as a sequence of positions numbered from –4 (the leftmost possible position) to +5 (the rightmost possible position).

Position –4 is occupied in the indicative present negative and indicative perfect negative by the negation marker *ga* /χa/, otherwise it remains empty.

Position –3 remains empty in the imperative. In the infinitive, which shows both morphologically and syntactically a mixture of nominal and verbal properties, it is filled by the prefix of noun class 15. In all the other tenses, it is obligatorily filled by a subject marker (henceforth SM). Four partially different sets of SMs must be recognized, depending on the individual tenses – see Appendix 1.

Position –2 can be filled by the following affixes or affix sequences: *a* /a/ (DJ form of the indicative present positive), *a* /a/ (indicative perfect negative), *tlaa* /tɬaa/ (future positive), *tlaa se* /tɬaa-sɩ/ (future negative), *ka* /ká/ (potential positive),[2] *ka se* /ká-sɩ/ ~ /ka-sɩ/ (potential

---

[2] An optional toneless variant /ka/ of this formative must be posited in the circumstantial and relative forms of the potential in order to account for the free variation observed in the tonal realization of these tenses.

negative),[3] *sa* /sa/ (circumstantial present negative, circumstantial perfect negative, infinitive present negative, and infinitive perfect negative), *se* /sɩ/ (subjunctive negative and imperative negative), or *sa* /sá/ (infinitive potential).

Position –1 can be occupied by OMs (see Appendix 1) and by the reflexive marker (or midvoice marker) /íⁿ/.[4] Up to three successive affixes can be found in this position.

Position +1 can be filled by one or more affixes encoding operations on verb valency: causative /(i)s/ or /J/,[5] applicative /εl/, anticausative /εχ/, /al/, /afal/, /aχal/, /εsεχ/, or /Jεχ/, reciprocal /an/.

Position +2 can only be occupied by a perfect marker /(i)l/ or /J/, used only in the perfect positive (in negative forms, 'perfect' is encoded by formatives occupying Slot –2).

Position +3 can only be filled by the passive marker /(i)w/.

Position +4 is the only one that can be left empty in no circumstances. The affix filling this position, traditionally called 'final (vowel)', is a vowel with four possible values: a, ɩ, ε, and e ~ ɩ (with an alternation that can be accounted for by a dissimilation rule). The final contributes to the identification of the individual tenses, but does not carry any syntactic or semantic information of its own, since with the exception of e ~ ɩ (found in the perfect positive only), each final is shared by a set of forms impossible to define straightforwardly as sharing a particular set of syntactic or semantic features.[6]

Position +5 can be filled by one of the following three 'postfinals': /ŋ´/ (toneless syllabic nasal followed by a floating H tone) marking the plural of the imperative, the relative marker /ŋ́/, and /ŋ́/, clitic form of the interrogative pronoun *eng* [ɨŋ́] 'what'.[7]

3. Underlying tonal representations and tonal processes

3.1. Introductory remarks

In Tswana, the tonal behavior of verb prefixes cannot be accounted for by means of phonological rules applying to underlying representations in which H tones only are specified without positing invisible underlying elements or special boundaries. The introduction of floating L tones in the underlying representation of some prefixes would be a possible solution, but there is strong evidence that the L tone must be analyzed as the default tone, and the introduction of L tones in underlying representations would lead to miss some important insights. The solution explored in (Creissels et al. 1997) was the introduction of 'empty syllables' doing more or less the same job as floating L tones in other frameworks. However, the discussion I had with Irina Monich about the paper she presented at the 5th International Conference on Bantu Languages (Monich 2013) eventually convinced me of the theoretical shortcomings of resorting to empty syllables, and another solution is explored here: the

---

[3] This formative must be analyzed as underlyingly /ká-sɩ/ when it follows a toneless SM, but a variant /ka-sɩ/ must be posited in order to account for its tonal properties when it follows a H-toned SM.
[4] The notation /íⁿ/ means that this formative triggers modifications of the onset of the following syllable identical to those triggered by the syllabic nasal, although no nasal is present in its surface form.
[5] /J/ is an abstract morphological element that can be posited in order to account for consonant alternations analyzable as originating from a phonological process of palatalization.
[6] A limited number of verbs (such as *itse* [ítsí] 'know') invariably show the final ɩ in all tenses, except in the perfect positive. This irregularity does not affect the tonal behavior of these verbs, which is perfectly regular.
[7] In addition to these unproblematic postfinals, we will see in Section 4.2 that a postfinal consisting of a floating H tone provides a simple explanation of the tonal behavior of the final syllable of some verb forms.

introduction, at some points in the prefixal sequence, of a special boundary (represented as =) whose properties with respect to tone spreading processes depart from those of the standard morpheme boundary and are more similar (although not identical) to those of the boundary between words (represented as #). An advantage of this solution is the plausibility of the diachronic interpretation it suggests. Many authors have observed that, in Bantu languages, the formatives traditionally analyzed as verb prefixes often show a morphophonological behavior suggesting that verb forms synchronically analyzable as single words may result from the relatively recent univerbation of analytic verb forms. Consequently, the idiosyncrasies in the behavior of the verbal prefixes of Tswana are best viewed as the reflex of tonal processes that were active at word boundaries before the univerbation processes that converted former auxiliaries into prefixes took place. [8]

The general idea (which is by no means original in the Bantu context, since it is nothing more than a variant of the well-known Obligatory Contour Principle) is that most of the apparent complexity of the tonal morphology of Tswana results from conditions on repair rules motivated by a constraint on non-adjacency of H tone domains. A H tone domain is defined as a sequence of H-toned syllables that behaves as a single unit for tonal processes. Whenever two H tone domains are in contact, the violation of the non-adjacency constraint must be eliminated, but the possible repair strategies are not equally available, depending on the grammatical nature of the boundary. Five different repair strategies must be distinguished: (a) contraction of the second H tone domain, (b) contraction of the first H tone domain, (c) toneless vowel insertion, (d) downstep insertion, and (e) fusion. Fusion is always the last resort strategy, contraction can only affect non-monosyllabic H tone domains, a downstep can only be inserted before a non-monosyllabic H tone domain, and toneless vowel insertion can only operate if the inserted vowel takes the penultimate position in the verb form, but in other respects, the repair strategies are variously available and variously ranked, depending on the grammatical nature of the boundary:[9]

- special morpheme boundary: contraction of the second H tone domain > contraction of the first H tone domain > toneless vowel insertion > fusion
- special word boundary: contraction of the first H tone domain > downstep insertion > fusion
- standard word boundary: downstep insertion > fusion

3.2. The distribution of the special morpheme boundary =

Correct prediction of the surface tonal melodies by means of the rules proposed in the rest of this section requires positing the special boundary = in the following contexts:

---

[8] For example, in Creissels & al. (1997), an empty syllable is posited in the underlying representation of H-toned OMs in order to account for their tonal behavior. However, historically, it is not necessary to assume an originally disyllabic form of object markers, since it can be assumed that, like other prefixes, OMs were originally autonomous units whose affixal status is the outcome of a historical process of cliticization. Consequently, the special limit posited to account for their tonal behavior has a natural interpretation as the reflex of the interaction between the verb and the OM at an early stage of the cliticization process.

[9] No repair strategy has to be considered at standard morpheme boundaries, since in the account proposed in this paper, the delimitation of H tone domains and the formulation of tone spreading rules preclude H tone domain adjacency at standard morpheme boundaries.

– immediately after the SM in the DJ form of the indicative perfect positive, in the sequential 1, in the subjunctive positive, and in the circumstantial present positive before lexically H-toned stems (but not in the other tenses);
– immediately after the potential marker /ká/;
– immediately after the continuative marker /sá/;
– immediately after the underlyingly toneless OMs;
– immediately before the variant /ka/ of the potential marker;
– immediately before the negative marker /sa/;
– immediately before the underlyingly H-toned OMs.

3.3. Lexical and post-lexical tone rules

The rules analyzed in this section account for the tonal structure of verbal words, but the output of these rules may be further modified by the following post-lexical processes:

– if the last syllable of a word belongs to a H tone domain, and if the following word begins with at least two syllables that do not belong to a H tone domain, the first syllable of the second word is 'annexed' by the preceding H tone domain;
– if two H tone domains are in contact at a word boundary and the second one is monosyllabic, they merge into a single H tone domain;[10]
– if two H tone domains are in contact at a word boundary and the second one comprises two syllables or more, a downstep is inserted between them;
– if the right boundary of a non-monosyllabic H tone domain coincides with a pause, the last syllable in this domain is assigned a L tone, whereas the penultimate syllable is lengthened, and realized with a falling tone.

3.4. The H tone as the marked tone, and the notion of H tone domain

The tonal alternations affecting Tswana verb forms are at first sight fairly complex, but their description is facilitated by positing an underlying H vs. Ø rather than H vs. L contrast, and by describing tonal processes in terms of interaction between H tone domains rather than between the tones of individual syllables. L tones are accounted for as default tones assigned to syllables that are not included in a H tone domain after the limits of H tone domains have been established by means of rules (or constraints) formulated in terms of expansion of H tone domains and repair strategies eliminating the violations of the non-adjacency constraint.

Underlying H tone domains are defined as word-internal sequences of underlyingly H-toned syllables not interrupted by boundaries other than the standard morpheme boundary.

In the underlying tonal representations, the association of H tones to the syllables that constitute the stem is determined by morphological rules (see Sections 3.5 and 3.6), and each of the formatives that constitute the prefixal string is introduced as either associated to a H tone, or toneless. The first step in the derivation leading to the surface tonal contour is the

---

[10] A consequence of these two postlexical tonal processes is that the distinction between words beginning with two toneless syllables and words beginning with a H-toned syllable followed by a toneless syllable is neutralized when such words follow another word ending with a H-toned syllable. In both cases, the first two syllables of the second word are realized with a H L contour.

merging of sequences of H-toned syllables not interrupted by special boundaries or word boundaries into H tone domains.

For example, the underlying structures of *ke ba bona* [kì-bá-bɔ́n-á] 'I see them' and *ke ka bona* [kì-ká-bɔ̀ná] 'I can see' equally include a H tone associated to the first syllable of the stem and a H tone associated to the preceding formative. However, in the case of *ke ka bona* [kì-ká-bɔ̀ná], the presence of the special boundary = after the potential marker prevents them from merging into a single H domain, which explains why, after annexing the second syllable of the stem, the H domain generated by the H tone of the root contracts in order to satisfy the non-adjacency constraint: [11]

#kɪ=bá-bɔ́n-a#	→ #kɪ=(bá-bɔ́)n-a#	(H tone domain constitution)
	→ #kɪ=(bá-bɔ́n-á)#	(H tone domain expansion)

#kɪ-ká=bɔ́n-a#	→ #kɪ-(ká)=(bɔ́)n-a#	(H tone domain constitution)
	→ #kɪ-(ká)=(bɔ́n-á)#	(H tone domain expansion)
	→ #kɪ-(ká)=bɔ(n-á)#	(H tone domain contraction)

3.5. The lexical tone of verbs

Tswana has two tonal types of verbal lexemes (toneless and H-toned), irrespective of their length, syllabic structure, and morphological complexity. The perfect prefinal and the finals show no correlation with particular types of tonal contours, and are therefore best analyzed as underlyingly toneless too.[12]

3.6. Templates accounting for the tonal contour of verb stems

Excluding from consideration tonal alternations resulting from the interaction between a prefix and the stem, or between the stem and a postfinal, four possible tonal structures must be recognized for verb stems, two for stems including a toneless root, and two for stems including a H-toned root. They are analyzed as resulting from the interaction between the inherent tonality of the root and the presence vs. absence of a grammatical H tone. This H tone contributes to the morphological identity of individual tenses, but does not carry a specific meaning by itself, since the tenses marked by this H tone do not share any syntactic or semantic feature. Consequently, any solution positing the grammatical H tone as underlyingly attached to a particular formative (as in (Creissels et al. 1997)) can only lead to needless complications. What I propose here is that the tonal processes resulting in the surface contour of verb forms operate on representations in which the lexical H and the grammatical H are not represented separately, and verb stems are directly represented with an underlying tonal contour determined by a morphological rule. The following chart summarizes the output of this rule:

---

[11] The parentheses in the underlying representations make apparent the limits of H tone domains.
[12] The subjunctive positive is the only tense with a systematic neutralization of the distinction between H-toned roots and toneless roots that requires positing a special set of morphological rules stipulating that, in the subjunctive positive, if no OM (or reflexive marker) is present: (a) if the stem is lexically H-toned, the lexical H tone is deleted; (b) if the stem comprises three syllables or more, a H tone is assigned to the final; (c) the SM is followed by the special boundary =.

		–lexH	*+lexH*
–grH	1 syll.	o	ó
	2 syll.	o o	ó o
	3 syll.	o o o	ó o o
	4 or more syll.	o o o ... o	ó o o ... o
+grH	1 syll.	ó	ó
	2 syll.	o ó	ó ó
	3 syll.	o ó ó	ó ó ó
	4 or more syll.	o ó ó ... ó	ó ó ó ... ó

In the simplest cases, if the grammatical H tone is not present and no particular interaction with a prefix or a postfinal occurs, the tonal contour of the stem as represented in this chart is only modified by the expansion of the H domain generated by the H tone underlyingly attached to the first syllable of lexically H-toned stems, which expands up to three syllables. For example, in non-prepausal position, the DJ form of the infinitive present positive shows the following tone pattern:

Lexically toneless verbs:

χò-tɬà   *go tla* 'to come'
χò-lìmà   *go lema* 'to cultivate'
χò-tswὲlὲlà   *go tswelela* 'to continue'
χò-dùmèdìsà   *go dumedisa* 'to greet'
χò-dùmèdìsànà   *go dumedisana* 'to greet each other'
χò-dùmèdìsètsànà   *go dumedisetsana* 'to transmit greetings for each other'

Lexically H-toned verbs:

χò-dʒá   *go ja* 'to eat'
χò-rέká   *go reka* 'to buy'
χò-rékísá   *go rekisa* 'to sell'
χò-símʊ́lʊ́là   *go simolola* 'to begin'
χò-tɬʰókómʊ́lòχà   *go tlhokomologa* 'to neglect'
χò-símʊ́lʊ́lὲlànà   *go simololelana* 'to begin for each other'

If the grammatical H tone is present, and if the tone of the final syllable is not modified by the interaction with a postfinal or with the following word, the surface tone of the stem coincides with that indicated in the chart above, as illustrated by the CJ form of the present negative:

Lexically toneless verbs

χà-kí-tɬ-í   *ga ke tle* 'I do not come'

χà-kí-bàlí	*ga ke bale* 'I do not read'
χà-kí-tswèlélí	*ga ke tswelele* 'I do not progress'
χà-kí-tlʰàlóχáɲí	*ga ke tlhaloganye* 'I do not understand'
χà-rí-dùmédísání	*ga re dumedisane* 'we do not greet each other'
χà-rí-dùmédísétsání	*ga re dumedisetsane* 'we do not greet people for each other'

Lexically H-toned verbs

χà-kí-dʒí	*ga ke je* 'I do not eat'
χà-kí-rékí	*ga ke reke* 'I do not buy'
χà-kí-bérékí	*ga ke bereke* 'I do not work'
χà-kí-símʊ́lʊ́lí	*ga ke simolole* 'I do not begin'
χà-kí-sírélédíwí	*ga ke sirelediwe* 'I am not protected'
χà-rí-símʊ́lʊ́lɛ́lání	*ga re simololelane* 'we do not begin for each other'

3.7. First observations on word-internal H tone spreading

In the Tswana variety described in this paper, H tone spreading is limited in the number of syllables that can be affected. In verb forms, word-internal tone spreading affecting three successive toneless syllables can only be observed in the particular configuration dealt with in Section 3.9.5. In all the other configurations, the maximum range of word-internal H tone spreading is either one or two syllables. H tone spreading with a maximum range of two syllables occurs in syllable strings interrupted only by a standard morpheme boundary. In addition to the spreading of the lexical H tone within verb stems devoid of grammatical H tone, word-internal H tone spreading with a maximum range of two syllables can be observed with H tone domains generated by SMs or OMs. For example, the tonal contour of *ba a tlhaloganya* [bá-á-tlʰálʊ̀χàɲ-à] 'they understand (DJ)' and *ke lo tlhaloganya* [kì-lʊ́-tlʰálʊ́χàɲ-à] 'I understand you (CJ)' can be predicted as follows:

#bá-a-tlʰalʊχaɲ-a#	→ #(bá)-a-tlʰalʊχaɲ-a#	(H tone domain constitution)
	→ #(bá-á-tlʰá)lʊχaɲ-a#	(H tone domain expansion)

#kɪ=lʊ́-tlʰalʊχaɲ-a#	→ #kɪ=(lʊ́)-tlʰalʊχaɲ-a#	(H tone domain constitution)
	→ #kɪ=(lʊ́-tlʰálʊ́)χaɲ-a#	(H tone domain expansion)

However, toneless syllables immediately following a H-toned prefix, or separated from a H-toned prefix by a single toneless syllable, do not always undergo the spreading of this H tone. The explanation may be simply that, within sequences of syllables not interrupted by boundaries other than the standard morpheme boundary, the annexation of a toneless syllable is blocked by the presence of a H tone associated to the following syllable, as illustrated by the comparison of *ba a tlhaloganya* [bá-á-tlʰálʊ̀χàɲ-à] 'they understand' and *ba a berekelana* [bá-à-bɛ́rɛ́k-ɛ́l-ànà] 'they work for each other'.

#bá-a-tlʰalʊχaɲ-a#	→ #(bá)-a-tlʰalʊχaɲ-a#	(H tone domain constitution)
	→ #(bá-á-tlʰá)lʊχaɲ-a#	(H tone domain expansion)

#bá-a-bɛ́rɛk-ɛl-an-a#   → #(bá)-a-(bɛ́)rɛk-ɛl-an-a#   (H tone domain constitution)
　　　　　　　　　 → #(bá)-a-(bɛ́rɛ́k-ɛ́l)-an-a#   (H tone domain expansion)

However, in cases such as *ke ka tlhaloganya* [kì-ká-tɬʰálòχàɲà] 'I can understand (DJ)', there is no obvious explanation for the fact that the spreading of the H tone of the potential marker does not reach the second syllable of the stem. A crucial observation is that the tonal processes involving the prefixes showing such apparent exceptions to the rule of word-internal tone spreading are partially similar to those observed at word boundaries. In particular, word boundaries too allow for a spreading process limited to one syllable. This similarity justifies positing a special boundary = either to the left of to the right of the prefixes listed in Section 3.2, as in #kɪ-ká=tɬʰalʊχaɲ-a#, underlying representation of *ke ka tlhaloganya* [kì-ká-tɬʰálòχàɲà] 'I can understand'. The special boundary = blocks the application of the spreading rule allowing for the annexation of two successive toneless syllabes (henceforth designated as SPR2), but allows for the application of another spreading rule (SPR1) with a maximum range of one syllable.

3.8. H tone domain expansion / contraction within verb forms

Leaving aside for the moment processes whose effect is limited to the last syllable of verb stems, the interaction between H tone domains within verb forms can be analyzed as the result of the successive application of three rules or sets of rules:

(a) A first spreading rule (designated as SPR2 since it allows for the annexation of two syllables), already illustrated in Section 3.7, stipulates that, within syllable strings not interrupted by the special boundary =, H tone domains followed by one or more toneless syllables can annex the following syllable or the following two syllables, provided this does not result in adjacency with another H tone domain. The derivation of *ba a berekelana* [bá-à-bɛ́rɛ́k-ɛ́l-ànà] 'they work for each other' presented above illustrates a configuration in which SPR2 is blocked.

Note that the restriction to SPR2 holds only within the limits of syllable strings not interrupted by the special boundary =. The tonal behavior of the prefixes triggering the insertion of the special boundary = can only be predicted by positing that the expansion of a H-tone domain according to SPR2 can reach the special boundary = irrespective of what follows it. In this respect, the special boundary = behaves exactly like the word boundary #:

　　... ó) o = (ó ...   –SPR2→   ... ó ó) = (ó ...
　　... ó) o o = (ó ...   –SPR2→   ... ó ó ó) = (ó ...

(b) A second set of rules (REPAIR) deals with situations in which two H tone domains are adjacent through the special boundary = (either because the syllables on both sides of the boundary are underlyingly associated to H tones, or because a toneless syllable preceding the special boundary has been annexed by a H tone domain). In this configuration, four of the five repair strategies mentioned in Section 3.1 are available, and they are ranked as follows:

– the preferred strategy is the contraction of the second H tone domain, if it comprises two or more syllables (REPAIRa);

– if the second H tone domain is monosyllabic (and consequently cannot contract), and if the first H tone domain comprises two or more syllables, the non-adjacency constraint is satisfied by contracting the first H domain (REPAIRb);

– if the special boundary = is both immediately preceded and immediately followed by monosyllabic H domains, the non-adjacency constraint is satisfied by the insertion of a toneless vowel if and only if the inserted vowel takes the penultimate position in the verb form (REPAIRc);

– if two or more successive monosyllabic H domains are only separated from each other by the special boundary =, and the toneless vowel insertion strategy is not available, they merge (REPAIRe). [13]

(c) The repair rules presented in (b) can be followed by a second spreading rule (designated as SPR1 since it allows for the annexation of two syllables), applying to H tone domains whose right edge coincides with a special boundary =. This rule stipulates that, in this configuration, a toneless syllable immediately following the special boundary can be annexed by the H tone domain, provided this does not result in adjacency with another H tone domain included in the same word. This rule must be posited as applying step by step from left to right in order to account for the spreading of H tones in the following configuration :

... ó) = o = o ...   –SPR1→   ... ó = ó) = o ...   –SPR1→   ... ó = ó = ó) ...

3.9. Illustrations of the tonal processes involving the special boundary =

3.9.1. The behavior of the potential marker /ká/

The underlying tonal structure of *ke ka tlhaloganya* [kì-ká-tɬʰálòχàɲ-à] 'I can understand (DJ)' is #kɩ-(ká)=tɬʰalʊχaɲ-a#. Since the only H tone present in this representation immediately precedes the special boundary, it cannot spread according to SPR2 (which accounts for spreading with a possible range of two syllables), but only according to SPR1 (which accounts for spreading limited to one syllable):

#kɩ-ká=tɬʰalʊχaɲ-a#   → #kɩ-(ká)=tɬʰalʊχaɲ-a#   (H tone domain constitution)
                               → #kɩ-(ká=tɬʰá)lʊχaɲ-a#   (SPR1)

The special boundary also accounts for the L tone surfacing on the first syllable of underlyingly H-toned roots in *ò ka tshameka* [ʊ̀-ká-tshàmík-á] 'you(sg) can play'. The underlying structure is #ʊ-ká=tshámɩk-a#, where the special boundary = prevents the two underlying H tones from merging into a single H tone domain. In such cases, if the second H tone domain comprises two or more syllables (which is the case here after the application of SPR2), it contracts in order to eliminate the violation of the non-adjacency constraint:

#ʊ-ká=tshámɩk-a#   → #ʊ-(ká)=(tshá)mɩk-a#   (H tone domain constitution)
                               → #ʊ-(ká)=(tshámík-á)#   (SPR2)
                               → #ʊ-(ká)=tsha(mík-á)#   (REPAIRa)

---

[13] Alternatively, it could be posited that there is no repair, and that the violation surfaces.

In configurations in which two non-monosyllabic H domains are in contact through the special boundary =, the repair strategy is again the contraction of the second one, as illustrated by *ó ka tshameka* [ɔ́-ká-tshàmɪ́k-á] '(s)he can play':

    #ɔ́-ká=tsʰámɪk-a# →#(ɔ́-ká)=(tsʰá)mɪk-a# (H tone domain constitution)
                →#(ɔ́-ká)=(tsʰámɪ́k-á)# (SPR2)
                →#(ɔ́-ká)=tsʰa(mɪ́k-á)# (REPAIRa)

In configurations in which the special boundary = is immediately followed by a H-toned syllable that cannot generate a non-monosyllabic domain, but preceded by a H tone domain comprising at least two syllables, as in *ó ka ja* [ɔ́-kà-dʒá] '(s)he can eat', contraction affects the only one of the two H domains that can contract, i.e., the first one:

    #ɔ́-ká=dʒ-á# →#(ɔ́-ká)=(dʒ-á)# (H tone domain constitution)
          →#(ɔ́)-ka=(dʒ-á)# (REPAIRb)

A dissyllabic variant [káà] of the potential marker (as in *ò kaa ja* [ò-káà-dʒ-á] 'you (sg) can eat') appears if and only if the potential marker follows a toneless SM and immediately precedes a H-toned monosyllabic stem. In this configuration, none of the two H tone domains in contact can contract, since both are monosyllabic, but the insertion of a toneless copy of the preceding vowel ensures the respect of the non-adjacency constraint:

    #ʊ-ká=dʒ-á# →#ʊ-(ká)=(dʒ-á)#   (H tone domain constitution)
          →#ʊ-(ká)a=(dʒ-á)# (REPAIRc)

Note that, in this configuration, monosyllabic toneless stems also surface with a H tone, but the difference in the underlying tone of the stem conditions a different treatment of the potential marker, since the only rule that applies in this case is SPR1, as illustrated by the tonal derivation of *ò ka tla* [ò-ká-tɬ-á] 'you (sg) can come':

    #ʊ-ká=tɬ-a# →#ʊ-(ká)=tɬ-a# (H tone domain constitution)
         →#ʊ-(ká=tɬ-á)# (SPR1)

3.9.2. The behavior of SMs in the circumstantial form of the present positive

In the circumstantial form of the present positive, when immediately preceded by the SM (which in this tense is invariably H-toned), lexically H-toned stems comprising two syllables or more surface with a L tone on their first syllable, as in *ke bina* [kí-bìn-á] 'while I dance'. Moreover, an additional syllable consisting of a L-toned vowel copying the vowel of the SM appears when lexically H-toned monosyllabic stems are immediately preceded by the SM, as in *kee ja* [kíì-dʒ-á] 'while I eat'. This can be explained by positing that, in this tense, the SM is followed by the special boundary =, and consequently cannot merge with the first syllable of H-toned stems into a single H tone domain. If the H tone underlyingly attached to the first syllable of lexically H-toned stems generates a H tone domain comprising at least two syllables, the contraction of this H tone domain eliminates the violation of the non-adjacency

constraint, but a toneless copy of the vowel of the SM is inserted if the contraction of the second H tone domain is not possible:

#kɪ́=bín-a# → #(kɪ́)=(bí)n-a# (H tone domain constitution)
          → #(kɪ́)=(bín-á)# (SPR2)
          → #(kɪ́)=bi(n-á)# (REPAIRa)

#kɪ́=dʒ-á# → #(kɪ́)=(dʒ-á)# (H tone domain constitution)
          → #(kɪ́)ɪ=(dʒ-á)# (REPAIRc)

3.9.3. The behavior of SMs in the DJ form of the perfect positive

In the DJ form of the perfect positive, if the stem is in contact with a H-toned SM, the H tone of the SM spreads to the first syllable of toneless stems only, though nothing seems to prevent it from spreading further, as in *ba dumedisetsanye* [bá-dúmèdìs-èts-àɲ-ì] 'they too have greeted people for each other (DJ)', whereas H-toned stems surface with a L tone on their first syllable, the following two syllables remaining H, as if a H tone went on spreading from the first syllable, as in *ba simololelanye* [bá-sìmʊ́lʊ́l-ɛ̀l-àɲ-ì] 'they have begun for each other'.

The explanation is that, in this tense, the special boundary = immediately after the SM blocks the application of SPR2 if the verb stem begins with two or more toneless syllables, and triggers the application of a repair rule if the verb stem begins with a H-toned syllable:[14]

#bá=dumedis-ets-aɲ-ɪ# → #(bá)=dumedis-ets-aɲ-ɪ# (H tone domain constitution)
             → #(bá=dú)medis-ets-aɲ-ɪ# (SPR1)

#bá=símʊlʊl-ɛl-aɲ-ɪ# → #(bá)=(sí)mʊlʊl-ɛl-aɲ-ɪ# (H tone domain constitution)
             → #(bá)=(símʊ́lʊ́)l-ɛl-aɲ-ɪ# (SPR2)
             → #(bá)=si(mʊ́lʊ́)l-ɛl-aɲ-ɪ# (REPAIRa)

3.9.4. The behavior of OMs in verb forms including a single OM (1)

Tswana has a distinction between underlyingly toneless OMs (1st person singular, 2nd person singular, and cl. 1) and H-toned OMs (all the others). The reflexive marker behaves in all respects like H-toned OMs.

However, when inserted between a H-toned SM and a H-toned root, an underlyingly H-toned OM surfaces with a L tone, as in *ó lo thusa* [ó-lò-tʰús-á] '(s)he helps you(pl) (CJ)'. When inserted between a H-toned SM and a toneless root, an underlyingly H-toned OM also surfaces with a L tone, but the spreading of its H tone modifies the melody of the stem, as in *ó lo dumedisa* [ó-lò-dúmédìs-à] '(s)he greets you(pl) (DJ)'. This can be predicted in a simple way by assuming that H-toned OMs are immediately preceded by the special boundary =:

#ó=lʊ́-tʰús-a# → #(ó)=(lʊ́-tʰú)s-a# (H tone domain constitution)
          → #(ó)=(lʊ́-tʰús-á)# (SPR2)

---

[14] The difference with the cases analyzed in Sections 3.9.1 and 3.9.2 is that, in the perfect positive, the insertion of a toneless vowel (REPAIRc) never occurs, but the explanation is simply that, in the perfect positive, verb stems cannot be monosyllabic.

→ #(ó)=lʊ-(tʰús-á)#   (REPAIRa)

#ʊ́=lʊ́-dumedis-a#   → #(ʊ́)=(lʊ́)-dumedis-a#   (H tone domain constitution)
→ #(ʊ́)=(lʊ́-dúmé)dis-a#   (SPR2)
→ #(ʊ́)=lʊ-(dúmé)dis-a#   (REPAIRa)

In *ga ke lo dumedise* [χà-kí-lʊ́-dùmédís-í] 'I do not greet you (CJ)', the H-toned OM cannot generate a non-monosyllabic H tone domain, and consequently two monosyllabic H tone domains are in contact through the special boundary =. The violation of the non-adjacency constraint cannot be eliminated by inserting a toneless vowel or a downstep, since vowel insertion can only occur if the inserted vowel takes the penultimate position in the verb form, and downstep insertion is not available at word-internal boundaries. Consequently, the only possibility is the last resort strategy, namely fusion (REPAIRe).

#χa-kí=lʊ́-dumédís-í#   → #χa-(kí)=(lʊ́)-du(médís-í)#   (H tone domain constitution)
→ #χa-(kí=lʊ́)-du(médís-í)#   (REPAIRe)

3.9.5. The behavior of OMs in verb forms including a single OM (2)

H tone spreading affecting three successive syllables inside a verb form is observed when the second underlyingly toneless syllable involved in this process represents an OM, as in *ba a go tlhaloganya le bone* [bá-á-χʊ́-tɬʰálʊ̀χàɲ-à] 'they understand you(sg) (DJ)'. This can easily be predicted without any additional ad hoc stipulation by inserting the special boundary = immediately after toneless OMs. In this configuration, the expansion of the H tone domain generated by the SM reaches the special boundary = as the result of the application of SPR2, and consequently the H tone domain can annex one more syllable by virtue of SPR1:

#bá-a-χʊ=tɬʰalʊχaɲ-a#   → #(bá)-a-χʊ=tɬʰalʊχaɲ-a#   (H tone domain constitution)
→ #(bá-á-χʊ́)=tɬʰalʊχaɲ-a#   (SPR2)
→ #(bá-á-χʊ́=tɬʰá)lʊχaɲ-a#   (SPR1)

3.9.6. The behavior of OMs in verb forms including two or three OMs

In verb forms including two or three OMs (or one or two OMs plus the reflexive marker), the distinction between two tone classes of OMs disappears; the tone taken by each of the OMs depends exclusively on the context, not on the choice of a particular OM:

– when immediately followed by another OM, all the OMs invariably surface with a H tone;
– when preceded by another OM, an OM immediately preceding the verb stem surfaces with a H tone if the verb stem has the tonal pattern o ó ..., and with a L tone in the other cases; if the melody of the verb stem when not influenced by a H-toned formative is entirely L, the L tones of its initial syllables give way to H tones.

These observations can be predicted by assuming that, in contact with another OM or with the reflexive marker, all OMs (including those which are toneless in forms including a single

OM) are underlyingly H-toned, and preceded by the special boundary =. Sequences of two or three OMs are thus represented as =ó=ó- or =ó=ó=ó- at the beginning of the tonal derivation, which means that the first OM in a sequence of two OMs and the first two OMs in a sequence of three OMs generate adjacent monosyllabic H domains, a configuration that can only be regularized by the fusion of the monosyllabic H domains. The last OM in a sequence of two or three OMs is the only one which can surface with a L tone, due to the contraction of the H domain in which it is initially included, as illustrated by the derivations of *ga ke e ba lo rokisetse* [χà-kí-í-bá-lò-rók-ís-éts-í] 'I do not make them sew them (the dresses) for you (CJ)' and *ga ke di ba lo apeisetse* [χà-kí-dí-bá-lʊ́-àpé-ís-éts-í] 'I do not make them cook it (the food) for you (DJ)'.

#χa-kí=í=bá=lʊ́-rók-ís-éts-í#	→ #χa-(kí)=(í)=(bá)=(lʊ́-rók-ís-éts-í)#	(H tone domain constitution)
	→ #χa-(kí)=(í)=(bá)=lʊ-(rók-ís-éts-í)#	(REPAIRa)
	→ #χa-(kí=í=bá)=lʊ-(rók-ís-éts-í)#	(REPAIRe)

#χa-kí=dí=bá=lʊ́-apé-ís-éts-í#	→ #χa-(kí)=(dí)=(bá)=(lʊ́)-a(pé-ís-éts-í)#	(H tone domain constitution)
	→ #χa-(kí=dí=bá=lʊ́)-a(pé-ís-éts-í)#	(REPAIRe)

3.10. The tonal behavior of postfinals

The postfinal of the imperative plural invariably surfaces with a L tone, and does not trigger any modification of the tonal contour of the stem to which it is suffixed, as illustrated by *lema* [lìmá] 'cultivate (imper.sg) / *lemang* [lìm-á-ŋ̀] 'cultivate (imper.pl). This can be predicted by positing that this postfinal is underlyingly a toneless syllabic nasal followed by a floating H tone that prevents the syllabic nasal from being annexed by a H tone domain.

The postfinal of relative verb forms and the interrogative clitic have exactly the same segmental form and tonal properties. They are invariably realized as H-toned syllabic nasals, and the tonal contour of the stem to which they are suffixed differs from that predicted by the rules proposed in the previous sections by the deletion of the H tone of the last syllable of the stem if and only if it belongs to a non-monosyllabic H tone domain. This can be predicted by positing that these postfinals are separated from the stem by the special boundary =, which prevents the postfinal from merging with the last syllables of the stem into a single H domain and triggers the contraction of non-monosyllabic H tone domains including the last syllable of the stem. For example, the tonal contour of *ba tlhalogantseng* [bá-tɬʰàlʊ́χáń-ts-è-ŋ́] '(those who) have understood' can be explained as follows:

#bá-tɬʰalʊ́χáń-ts-é=ŋ́#	→ #(bá)-tɬʰa(lʊ́χáń-ts-é)=(ŋ́)#	(H tone domain constitution)
	→ #(bá)-tɬʰa(lʊ́χáń)-ts-e=(ŋ́)#	(REPAIRb)

3.11. Tonal alternations affecting finals in the absence of any overt postfinal

In some tenses in which no overt postfinal is present, the verb stem shows tonal contours different from those predicted by the rule presented in Section 3.6. Crucially, in all cases, the deviation can be described as the contraction of a H tone domain including the last syllable of

the stem. This is for example the case of the sequential 2, whose tone pattern is summarized in the following chart:

	lex. H-toned stem	lex. toneless stem
monosyllabic stem	ó	ó
2-syllable stem	ó ò	ò ó
3-syllable stem	ó ó ò	ò ó ò
4-syllable stem	ó ó ó ò	ò ó ó ò
5 syllables or more	ó ó ó … ó ò	ò ó ó … ó ò

the tonal contour of verb stems in the sequential 2

The crucial observation is that the L tones on the final syllables preceded by a H-toned penultimate syllable constitute the only difference with the pattern for stems including a grammatical H tone as defined in Section 3.6:

	lex. H-toned stem	lex. toneless stem
monosyllabic stem	ó	ó
2-syllable stem	ó ó	ò ó
3-syllable stem	ó ó ó	ò ó ó
4-syllable stem	ó ó ó ó	ò ó ó ó
5 syllables or more	ó ó ó … ó ó	ò ó ó … ó ó

the basic tonal contour of verb stems including a grammatical H tone

Within the framework adopted here, at least two relatively simple types of explanation can be considered: either the structure of such forms includes an underlying element not immediately apparent on the surface but responsible for the contraction of H tone domains including the last syllable of the stem (for example, a postfinal consisting of a floating H tone), or the boundary between such verb forms is not a standard word boundary, and allows for tonal interactions that do not occur at standard word boundaries.

The difficulty is that the analysis of the tone pattern illustrated by the sequential 2 interferes with the question of the tonal marking of the CJ/DJ distinction, which constitutes the topic of Section 4.

4. The tone of the final vowels of verb forms and the CJ/DJ distinction

4.1. DJ forms with stable final H tones in non-prepausal position

In the examples cited in this section, DJ forms in non-prepausal contexts are illustrated by sentences in which the verb is immediately followed by *le* /lí-/ 'too' plus a pronoun resuming the subject: in this context, conjunct forms are not allowed.

In some DJ forms, for example the DJ form of the infinitive present positive in (1), final H tones predicted by the rules posited in Section 3 are invariably maintained in non-prepausal contexts, and can only be modified by the postlexical rules that operate in prepausal position, according to which, (a) the penultimate syllable is lengthened, (b) if the tone of the penultimate syllable is H, it surfaces as a HL falling tone, and (c) a final H immediately preceded by another H (realized as HL) surfaces as L.

(1) a. *Ke batla go bereka.* / *Ke batla go bereka le nna.*
          'I want to work.'   'I too want to work.'

   kì-bàtɬ-à   χʊ̀-bɛ́rɛ̂ːk-à   kì-bàtɬ-à   χʊ̀-bɛ́rɛ́k-á   lí-ǹːná
   1SG.SM-want-FV(CJ) 15-work-FV(DJ)   1SG.SM-want-FV(CJ) 15-work-FV(DJ)   ADD-1SG

     b. *Ke batla go go ya.* / *Ke batla go go ya le nna.*
          'I want to go there.'   'I too want to go there.'

   kì-bàtɬ-à   χʊ̀-χûː-j-à   kì-bàtɬ-à   χʊ̀-χʊ́-j-á   lí-ǹːná
   1SG.SM-want-   15-17.OM-go-FV(DJ) 1SG.SM-want-   15-17.OM-go-FV(DJ) ADD-1SG
   FV(CJ)   FV(CJ)

4.2. DJ forms that never end with two successive H-toned syllables

   In other DJ forms, as illustrated in (2) by the DJ form of the present negative, in all
contexts, the final H tones predicted by the rules posited in Section 3 are maintained if the
final syllable constitutes a monosyllabic H tone domain, but give way to L tones whenever the
rules posited in Section 3 delimit a H tone domain including the last two syllables of the verb
form.

(2) a. *Ga ke lele.* / *Ga ke lele le nna.*
          'I do not cry.'   'I do not cry either.'

   χà-kí-lìːl-í   χà-kí-lìl-í   lí-ǹːná
   NEG-1SG.SM-cry-FV(DJ)   NEG-1SG.SM-cry-FV(DJ)   ADD-1SG

     b. *Ga ke tshabe.* / *Ga ke tshabe le nna.*
          'I am not afraid.'   'I am not afraid either.'

   χà-kí-tsʰâːb-ì   χà-kí-tsʰáb-ì   lí-ǹːná
   NEG-1SG.SM-be_afraid-FV(DJ)   NEG-1SG.SM-be_afraid-FV(DJ) ADD-1SG

   In contrast to the DJ forms of the type presented in Section 4.1, which may have very
different tonal melodies in prepausal and non-prepausal contexts, DJ forms of this type always
show very similar melodies in prepausal and non-prepausal contexts.
   If all verb forms in DJ contexts behaved in this way, one could consider positing that the
boundary between verb forms and phrases in afterthought function triggers a post-lexical rule
similar to that operating in prepausal contexts. This is however not the case. Historically, the
tone pattern of such DJ form may have resulted from the morphologization of the post-lexical
rule of prepausal lowering, but synchronically, we must posit something in their tonal
structure distinguishing them from DJ forms occurring in the same contexts with a tonality
that cannot be explained in the same way. More precisely, the underlying representation of DJ
forms of this type must include an element triggering the contraction of H tone domains
including the last syllable of the stem. This can be done very simply by positing a postfinal

16

consisting of a floating H tone separated from the stem by the special boundary =. In such a configuration, if a non-monosyllabic H tone domain including the final is created, the postfinal triggers its contraction:

#χa-kí-lɪl-í=´#   → #χa-(kí)-lɪ(l-î)=(´)#   (H tone domain constitution)
               → #χa-(kí)-lɪ(l-î)#   (floating tone deletion)

#χa-kí-tsʰáb-í=´#   → #χa-(kí-tsʰáb-í)=(´)#   (H tone domain constitution)
               → #χa-(kí-tsʰá)b-ɪ=(´)#   (REPAIRb)
               → #χa-(kí-tsʰá)b-ɪ#   (floating tone deletion)

4.3. CJ forms with non-alternating finals

In some CJ forms (for example, the present positive circumstantial – Section 4.5.4, or the present negative – Section 4.5.5), final H tones are invariably maintained, irrespective of the grammatical nature and tone pattern of the following word. In contrast to disjunct forms, whose tonal structure may be blurred by the rules operating in prepausal position, the non-alternating nature of the CJ forms in question is obvious, since they cannot occur in contexts in which their tonal contour could undergo similar modifications.

4.4. CJ forms with alternating finals

Some other CJ forms show a tonal alternation if (and only if) the rules posited in Section 3 delimit a H tone domain including at least the last two syllables of the verb form. In this configuration, the last syllable surfaces with a L tone if and only if the following word begins with an underlyingly H-toned syllable and is neither a proper name nor a substantive. The explanation put forward here is that, depending on the nature of the following word, such CJ forms may be followed by a special word boundary. [15]

For example, *podi* [pódí] 'goat' and *ele* [élé] 'that one (cl. 9)', though having both a H-toned initial syllable, do not interact in the same way with a CJ verb form like *ke reka* [kìrɛ́ká/à] 'I buy, I am buying (DJ)':

(3)   a. *Ke reka podi.*   b. *Ke reka ele (podi).*
        'I am buying a goat.'   'I am buying that one (goat).'

      kì-rɛ́k-á̱   ⁺pô:dì   kì-rɛ́k-à̱   ê:lè
      1SG.SM-buy-FV(CJ)   9.goat   1SG.SM-buy-FV(CJ)   9.DEM

---

[15] Historically, it seems reasonable to assume that, originally, such CJ forms were followed by a special word boundary irrespective of the nature of the following word. In present-day Tswana, most substantives beginning with a H-toned syllable belong to class 9, whose original L-toned prefix has been maintained as a L-toned syllabic nasal with monosyllabic noun stems only (for example *ntša* [ɲ̀tʃá] 'dog'). What probably happened is that, when the L-toned prefix of class 9 was deleted, the tonal realization did not change, but the phonological conditioning was reanalyzed as a morphological conditioning involving not only nouns that originally had a L-toned prefix, but also proper names or common nouns of class 1a for which there is no evidence that a L-toned initial syllable was ever present. The result of this reanalysis was the partial re-establishment of an ordinary word boundary at the junction between this type of CJ forms and the following word, depending on the grammatical nature of the following word.

In these two sentences, *podi* [pʊ́dí] 'goat' and *ele* [élé] 'that one (cl. 9)' equally fulfill the object function in the construction of the same verb, and consequently argument structure plays no role in the tonal alternation. Since *podi* [pʊ́dí] 'goat' and *ele* [élé] 'that one (cl. 9)' show identical tonal behavior in all other contexts, the only possible relevant factor in a strictly synchronic account is the grammatical nature of the word in immediate postverbal position: *podi* is a substantive, whereas *ele* is a demonstrative used pronominally. Example (4) shows that the same change in the grammatical nature of the following word does not affect the tone of conjunct forms with non-alternating finals (in this example, the CJ form of the present negative).

(4) a. *Ga ke reke podi.*
     'I am not buying a goat.'

     χà-kí-rék-ì   ⁺pʊ̂:dì
     NEG-1SG.SM-buy-FV(CJ)   9.goat

     b. *Ga ke reke ele (podi).*
     'I am not buying that one (goat).'

     χà-kí-rék-ì   ⁺ê:lè
     NEG-1SG.SM-buy-FV(CJ)   9.DEM

The following two examples provide additional illustrations of the contrast between CJ verb forms whose final shows no tonal alternation – see (5), and CJ verb forms with an alternating final – see (6).

(5) a. *Ga ke bereke nae.*
     'I don't work with him/her.'

     χà-kí-bérék-ì   nà:-ɛ́
     NEG-1SG.SM-work-FV(CJ)   ADD-1

     b. *Ga ke bereke nao.*
     'I don't work with you(sg).'

     χà-kí-bérék-ì   nâ:-ʊ̀
     NEG-1SG.SM-work-FV(CJ)   ADD-2SG

     c. *Ga re di bae mmogo.*
     'We don't put them (cl.8) together.

     χà-rí-dì-bá-ì   m̀mʊ̂:χɔ̀
     NEG-1PL.SM-8.OM-put-FV(CJ)   together

     d. *Ga re di bae mo ntlong.*
     'We don't put them (cl.8) in the house.'

     χà-rí-dì-bá-ì   mó   ń-tɬʊ̀:-ŋ̀
     NEG-1PL.SM-8.OM-put-FV(CJ)   there   9-house-LOC

(6) a. *Ke bereka nae.*
     'I work with him/her.'

     kì-bɛ́rɛ́k-á   nà:-ɛ́
     1SG.SM-work-FV(CJ)   ADD-1

     b. *Ke bereka nao.*
     'I work with you(sg).'

     kì-bɛ́rɛ́k-à   nâ:-ʊ̀
     1SG.SM-work-FV(CJ)   ADD-2SG

     c. *Re di baya mmogo.*
     'We put them (cl.8) together.'

     rì-dí-báj-á   m̀mʊ̂:χɔ̀
     1PL.SM-8.OM-put-FV(CJ)   together

     d. *Re di baya mo ntlong.*
     'We put them (cl.8) in the house.'

     rì-dí-báj-à   mó   ń-tɬʊ̀:-ŋ̀
     1PL.SM-8.OM-put-FV(CJ)   there   9-house-LOC

The crucial observation is that, when followed by words beginning with a H-toned syllable, CJ forms with alternating finals show a tonal alternation that can be described as the contraction of a non-monosyllabic H tone domain including the last syllable of the verb form if and only if the following word is not a proper name or a substantive. This means that the boundary between such CJ forms and a word which is not a proper name or a substantive has in common with the special morpheme boundary = and the standard word boundary # that it triggers a process motivated by the constraint of non-adjacency of H domains, but apart from the general use of fusion as the last resort strategy, the details are different:

– when two H tone domains are in contact through the special morpheme boundary =, the available strategies are, in order of preference, (a) the contraction of the second H tone domain, (b) the contraction of the first H tone domain, and (c) the insertion of a toneless vowel;

– when two H tone domains are in contact through the standard word boundary #, the only available strategy is the insertion of a downstep;

– when two H tone domains are in contact at the boundary between a CJ form with an alternating final and a word which is neither a substantive nor a proper name, the available strategies are, in order of preference, (a) the contraction of the first H tone domain, and (b) the insertion of a downstep.

The only simple way to account for this alternation is to posit that, at the syntax-morphology interface, a special word boundary ≠ is inserted immediately after the CJ verb forms that have an alternating final if and only if the following word is not a proper name or a substantive. This special word boundary differs from the standard word boundary in that, if both immediately preceded and immediately followed by H tone domains, it allows for the contraction of the first H tone domain as a possible repair strategy.

#kɪ-rɛ́k-á#pʊ́dí#   → #kɪ-(rɛ́k-á)#(pʊ́dí)#   (H tone domain constitution)
                   → #kɪ-(rɛ́k-á)#⁺(pʊ́dí)#   (REPAIRd)

#kɪ-rɛ́k-á≠é-lé#   → #kɪ-(rɛ́k-á)≠(é-lé)#   (H tone domain constitution)
                   → #kɪ-(rɛ́)k-a≠(pʊ́dí)#   (REPAIRb)

4.5. Possible tonal structures for verb forms in CJ and DJ contexts

Four tonal patterns are attested for the stems of verb forms in CJ contexts, and three for the stems of verb forms in DJ contexts.

4.5.1. Verb forms in CJ contexts with no grammatical H tone and a non-alternating final

In the absence of any tonal interaction with the prefixal sequence, the tonal contour of the stem in CJ verb forms belonging to this type would show the following pattern:

	lex. H-toned stem	lex. toneless stem
monosyllabic stem	ó	ò
2-syllable stem	ó ó	ò ò
3-syllable stem	ó ó ó	ò ò ò
4-syllable stem	ó ó ó ò	ò ò ò ò
5 syllables or more	ó ó ó ò … ò	ò ò ò ò … ò

However, in the only tense that has these characteristics in CJ contexts (the present positive circumstantial), all SMs are H-toned, the special boundary = is inserted between the SM and lexically H-toned stems, and there is no configuration in which the tonal contour of lexically toneless stems would not be modified by the interaction with H tones anchored in the prefixal string. For example, if a toneless OM is inserted between the SM and the stem, the first syllable of the stem is annexed by the H tone domain generated by the SM, and the tonal contour of the stem varies as follows:

	lex. H-toned stem	lex. toneless stem
monosyllabic stem	ó	ó
2-syllable stem	ó ó	ó ò
3-syllable stem	ó ó ó	ó ò ò
4-syllable stem	ó ó ó ò	ó ò ò ò
5 syllables or more	ó ó ó ò … ò	ó ò ò ò … ò

kí-mò-dʒá	*ke mo ja* 'while eating it (the ostrich, 1sg, CJ)'
kí-χò-tʰúsá	*ke go thusa* 'while helping you (1sg, CJ)'
kí-χò-tsʰámíkísà	*ke go tshamekisa* 'while playing with you (1sg, CJ)'
rí-χò-símʊ́lʊ́lèlà	*re go simololela* 'while beginning for you (1pl, CJ)'

kí-mʊ́-ísà	*ke mo isa* 'while taking him/her away (1sg, CJ)'
kí-mʊ́-dírèlà	*ke mo direla* 'while working for him/her (1sg, CJ)'
kí-χʊ́-dúmèdìsà	*ke go dumedisa* 'while greeting for you (1sg, CJ)'

4.5.2. Verb forms in CJ contexts with a grammatical H tone and a non-alternating final

Whatever prefixes are added to them, and irrespective of the nature of the following word, the stem of CJ forms of this type varies in the following way:

	lex. H-toned stem	lex. toneless stem
monosyllabic stem	ó	ó
2-syllable stem	ó ó	ò ó
3-syllable stem	ó ó ó	ò ó ó
4-syllable stem	ó ó ó ó	ò ó ó ó
5 syllables or more	ó ó ó ó … ó	ò ó ó ó … ó

This type can be illustrated by the CJ form of the present negative:

| χà-kí-dʒí | *ga ke je* 'I do not eat (CJ)' |

χà-kí-rékí	*ga ke reke* 'I do not buy (CJ)'
χà-kí-bérékí	*ga ke bereke* 'I do not work (CJ)'
χà-kí-símúlúlí	*ga ke simolole* 'I do not begin (CJ)'
χà-kí-sírélédíwí	*ga ke sirelediwe* 'I am not protected (CJ)'
χà-rí-símúlúlélání	*ga re simololelane* 'we do not begin (CJ)'

χà-kí-tɬí	*ga ke tle* 'I do not come (CJ)'
χà-kí-bàlí	*ga ke bale* 'I do not read (CJ)'
χà-kí-tswèléí	*ga ke tswelele* 'I do not progress (CJ)'
χà-kí-tɬʰàlóχáɲí	*ga ke tlhaloganye* 'I do not understand (CJ)'
χà-rí-dùmédísání	*ga re dumedisane* 'we do not greet each other (CJ)'
χà-rí-dùmédísétsání	*ga re dumedisetsane* 'we do not greet people for each other (CJ)'

4.5.3. Verb forms in CJ contexts with no grammatical H tone and an alternating final

When no prefixed formative influences it, the tonal melody of the stem of CJ forms of this type varies as indicated in the following chart. Note that, when no H-toned formative exerts an influence, the alternation is apparent only in the case of lexically H-toned stems comprising two or three syllables:

	lex. H-toned stem	lex. toneless stem
monosyllabic stem	ó	ò
2-syllable stem	ó ó/ò	ò ò
3-syllable stem	ó ó ó/ò	ò ò ò
4-syllable stem	ó ó ó ò	ò ò ò ò
5 syllables or more	ó ó ó ò … ò	ò ò ò ò … ò

This pattern can be illustrated by the CJ form of the present positive, when a toneless SM is immediately prefixed to the stem:

kì-dʒá	*ke ja* 'I eat (CJ)'
kì-réká/à	*ke reka* 'I buy (CJ)'
kì-béréká/à	*ke bereka* 'I work (CJ)'
kì-símúlúlà	*ke simolola* 'I begin (CJ)'
kì-sírélédìwà	*ke sirelediwa* 'I am protected (CJ)'
rì-símúlúlèlànà	*re simololelana* 'we begin for each other (CJ)'

kì-tɬà	*ke tla* 'I come (CJ)'
kì-bàlà	*ke bala* 'I read (CJ)'
kì-tswèlèlà	*ke tswelela* 'I progress (CJ)'
kì-tɬʰàlòχàɲà	*ke tlhaloganya* 'I understand (CJ)'
rì-dùmèdìsànà	*re dumedisana* 'we greet each other (CJ)'
rì-dùmèdìsètsànà	*re dumedisetsana* 'we greet people for each other (CJ)'

H-toned prefixes may create conditions in which the alternation triggered by the special word boundary ≠ becomes apparent in a greater number of cases. For example, when the stem

of the CJ form of the present positive immediately follows a H-toned SM, the alternations triggered by the special word boundary occur with H-toned stems comprising one, two or three syllables, and toneless stems comprising one or two syllables:

ó-dʒá/à	*ó ja* '(s)he eats (CJ)'
ó-rɛ́ká/à	*ó reka* '(s)he buys (CJ)'
ó-bɛ́rɛ́ká/à	*ó bereka* '(s)he works (CJ)'
ó-símʊ́lʊ́là	*ó simolola* '(s)he begins (CJ)'
ó-sírélédìwà	*ó sirelediwa* '(s)he is protected (CJ)'
bá-símʊ́lʊ́lɛ̀lànà	*ba simololelana* 'they begin for each other (CJ)'

ó-tɬá/à	*ó tla* '(s)he comes (CJ)'
ó-bálá/à	*ó bala* '(s)he reads (CJ)'
ó-tswɛ́lɛ́là	*ó tswelela* '(s)he progresses (CJ)'
ó-tɬʰálʊ́χàɲà	*ó tlhaloganya* '(s)he understands (CJ)'
bá-dúmédìsànà	*ba dumedisana* 'they greet each other (CJ)'
bá-dúmédìsètsànà	*ba dumedisetsana* 'they greet people for each other (CJ)'

However, the distinction between this type and that presented in Section 4.5.1 is always neutralized with H-toned stems of more than three syllables and with toneless stems of more than two syllables.

4.5.4. Verb forms in CJ contexts with a grammatical H tone and an alternating final

The tonal contour of the stem of CJ forms belonging to this type shows the following pattern:

	lex. H-toned stem	lex. toneless stem
monosyllabic stem	ó/ò	ó/ò
2-syllable stem	ó ó/ò	ò ó
3-syllable stem	ó ó ó/ò	ò ó ó/ò
4-syllable stem	ó ó ó ó/ò	ò ó ó ó/ò
5 syllables or more	ó ó ó ó … ó/ò	ò ó ó ó … ó/ò

This tonal type can be illustrated by the *sequential 2*:

à-dʒí	*a je* 'and (s)he will eat (CJ)'
à-bʊ́-dʒí/ì	*a bo je (bogobe)* 'and (s)he will eat it (the porridge) (CJ)'
à-rékí/ì	*a reke* 'and (s)he will buy (CJ)'
à-bérékí/ì	*a bereke* 'and (s)he will work (CJ)'
à-símʊ́lʊ́lí/ì	*a simolole* 'and (s)he will begin (CJ)'
à-sírélédíwí/ì	*a sirelediwe* 'and (s)he will be protected (CJ)'
bà-símʊ́lʊ́lɛ́lání/ì	*ba simololelane* 'and they will begin for each other (CJ)'

à-jí	*a ye* 'and (s)he will go (CJ)'
à-χʊ́-jí/ì	*a go ye* 'and (s)he will go there (CJ)'

à-bàlí   *a bale* 'and (s)he will read (CJ)'
à-tswèlélí/ì   *a tswelele* 'and (s)he will progress (CJ)'
à-tɬʰàlóχáɲí/ì   *a tlhaloganye* 'and (s)he will understand (CJ)'
bà-dùmédísání/ì   *ba dumedisane* 'and they will greet each other (CJ)'
bà-dùmédísétsání/ì *ba dumedisetsane* 'and they will greet people for each other (CJ)'

4.5.5. Verb forms in DJ contexts with neither a grammatical H tone nor a postfinal H tone

In non-prepausal position, if no H tone belonging to a prefixed formative exerts an influence, the tonal melody of the stem of DJ forms belonging to this type varies in the following way:[16]

	lex. H-toned stem	lex. toneless stem
monosyllabic stem	ó	ò
2-syllable stem	ó ó	ò ò
3-syllable stem	ó ó ó	ò ò ò
4-syllable stem	ó ó ó ò	ò ò ò ò
5 syllables or more	ó ó ó ò … ò	ò ò ò ò … ò

The DJ form of the present positive illustrates this tonal type:

kì-à-dʒá   *ke a ja* 'I eat (DJ)'
kì-à-rɛ́ká   *ke a reka* 'I buy (DJ)'
kì-à-bɛ́rɛ́ká   *ke a bereka* 'I work (DJ)'
kì-à-símólólà   *ke a simolola* 'I begin (DJ)'
kì-à-sírélédìwà   *ke a sirelediwa* 'I am protected (DJ)'
rì-à-símólólèlànà   *re a simololelana* 'we begin for each other (DJ)'

kì-à-tɬà   *ke a tla* 'I come (DJ)'
kì-à-bàlà   *ke a bala* 'I read (DJ)'
kì-à-tswèlèlà   *ke a tswelela* 'I progress (DJ)'
kì-à-tɬʰàlòχàɲà   *ke a tlhaloganya* 'I understand (DJ)'
rì-à-dùmèdìsànà   *re a dumedisana* 'we greet other (DJ)'
rì-à-dùmèdìsètsànà   *re a dumedisetsana* 'we greet people for each other (DJ)'

4.5.6. Verb forms in DJ contexts with a grammatical H tone and no postfinal H tone

In non-prepausal position, the stem of the DJ forms of this type shows the following pattern:

---

[16] This chart gives the tonal melody in non-prepausal position, but the reader must bear in mind that in prepausal position, H H sequences are automatically converted into HL L – see Section 4.1.

	lex. H-toned stem	lex. toneless stem
2-syllable stem	ó ó	ò ó
3-syllable stem	ó ó ó	ò ó ó
4-syllable stem	ó ó ó ó	ò ó ó ó
5 syllables or more	ó ó ó ó … ó	ò ó ó ó … ó

This pattern is only found in the DJ form of the perfect positive circumstantial (and this is why monosyllabic stems are not mentioned, since the perfect stem cannot be monosyllabic):

kí-dʒílé	*ke jele*	'having eaten (1sg, DJ)'
kí-rékílé	*ke rekile*	'having bought (1sg, DJ)'
kí-bérékílé	*ke berekile*	'having worked (1sg, DJ)'
kí-sírélédítswí	*ke sireleditswe*	'having been protected (1sg, DJ)'
rí-símólóléláɲí	*re simololelanye*	'having begun for each other (1pl, DJ)'

kí-tsìlé	*ke tsile*	'having come (1sg, DJ)'
kí-bàdílé	*ke badile*	'having read (1sg, DJ)'
kí-tsàmáílé	*ke tsamaile*	'having gone (1sg, DJ)'
kí-tɬʰàlóχántsé	*ke tlhalogantse*	'having understood (1sg, DJ)'
rí-símólóléláɲí	*re dumedisetsanye*	'having greeted people for each other (1pl, DJ)'

4.5.7. Verb forms in DJ contexts with a grammatical H tone and a postfinal H tone

With this tonal type of DJ forms (and only with this type), the only difference between prepausal and non-prepausal realizations is the falling realization of H-toned penultimate syllables in prepausal context.

	lex. H-toned stem	lex. toneless stem
monosyllabic stem	ó ~ ò	ó ~ ò
2-syllable stem	ó ò	ò ó
3-syllable stem	ó ó ò	ò ó ò
4-syllable stem	ó ó ó ò	ò ó ó ò
5 syllables or more	ó ó ó … ó ò	ò ó ó … ó ò

The indication of two possibilities with monosyllabic stems means that the L variant appears if and only if the stem is immediately preceded by a H-toned formative, as illustrated by the DJ form of the infinitive negative – see (7)

(7) a. *Go sa je go a bopamisa.*
    'Not to eat makes one thin.'

    χò-sà-dʒ-í   χó-à-búpám-îːs-à
    15-NEG-eat-FV(DJ)   15.SM-DJ-be_thin-CAUS-FV

   b. *Go sa bo je (bogobe) go a bopamisa.*
    'Not to eat it (porridge) makes one thin.'

24

χò-sà-bʊ́-dʒ-ì   χʊ́-à-bʊ́pám-îːs-à
15-NEG-14.OM-eat-FV(DJ)   15.SM-DJ-be_thin-CAUS-FV

This pattern can be illustrated by the DJ form of the sequential 2:

à-dʒí   *a je* 'and (s)he will eat (DJ)'
à-bʊ́-dʒì   *a bo je (bogobe)* 'and (s)he will eat it (class 14) (DJ)'
à-rékì   *a reke* 'and (s)he will buy (DJ)'
à-bérékì   *a bereke* 'and (s)he will work (DJ)'
à-símʊ́lʊ́lì   *a sirelediwe* 'and (s)he will be protected (DJ)'
à-sírélédíwì   *re a dumedisetsana* 'we greet people for each other (DJ)'
bà-símʊ́lʊ́lélánì   *ba simololelane* 'and they will begin for each other (DJ)'

à-jí   *a ye* 'and (s)he will go (DJ)'
à-χʊ́-jì   *a go ye* 'and (s)he will go there (DJ)'
à-bàlí   *a bale* 'and (s)he will read (DJ)'
à-tswèlélì   *a tswelele* 'and (s)he will progress (DJ)'
à-tɬʰàlʊ́χáɲì   *a tlhaloganye* 'and (s)he will understand (DJ)'
bà-dùmédísánì   *ba dumedisane* 'and they will greet each other (DJ)'
bà-dùmédísétsánì   *ba dumedisetsane* 'and they will greet people for each other (DJ)'

5. Correspondences between tone patterns in CJ and DJ contexts

Arithmetically, there are twelve possible combinations of the four tonal types of stems observed in CJ contexts and the three tonal types observed in DJ contexts**,** but six only are attested. Three of these combinations involve identical or similar tonal types in the contexts that make apparent a possible contrast between CJ and DJ forms, and therefore constitute the three possible tone patterns for the tenses with no tonal marking of the CJ/DJ distinction. The other three constitute the three possible tonal markings of the CJ/DJ distinction.

5.1. Tone patterns for the stem of tenses with similar contours in CJ and DJ contexts

The circumstantial form of the present positive is the only tense illustrating the pattern involving no grammatical H tone and the standard word boundary in all contexts.

The circumstantial form of the perfect positive is the only tense illustrating the pattern involving the grammatical H tone and the standard word boundary in all contexts.

The pattern with a grammatical H tone, the postfinal / ́ / in DJ contexts, and the special word boundary in CJ contexts if the following word is not a proper name nor a substantive, is by far the most common pattern for tenses that have similar tonal contours in CJ and DJ contexts. It is found in the following tenses:

indicative future negative
indicative potential negative
infinitive present negative
infinitive potential negative

circumstantial present negative
circumstantial perfect negative
circumstantial future negative
circumstantial potential negative
imperative positive
imperative negative
subjunctive positive
subjunctive negative
sequential 2

5.2. Tone patterns for the stem of tenses with different contours in CJ and DJ contexts

The pattern with no grammatical H tone either in DJ or CJ contexts, no postfinal / ´ / in DJ contexts, and insertion of the special word boundary ≠ in CJ contexts, is relatively common. It is found in the following tenses:

indicative present positive
indicative future positive
indicative potential positive
circumstantial future positive
circumstantial potential positive
infinitive present positive
infinitive future positive
infinitive potential positive
infinitive continuative
sequential 1

The pattern with the grammatical H tone both in CJ and DJ contexts, the postfinal / ´ / in DJ contexts, and the standard word boundary in all contexts, is found in two tenses: the indicative present negative and the indicative perfect negative

The pattern with no postfinal / ´ / and no grammatical H tone in DJ contexts contrasting with the insertion of the special word boundary and the grammatical H tone in CJ contexts is found in one tense only, the indicative perfect positive.

6. Conclusion

Tswana tenses can be classified into three groups of tenses with tonal structures resulting in similar contours in CJ and DJ contexts, and three groups with tonal structures resulting in three possible types of contrasts between CJ and DJ verb forms. Unfortunately, no obvious generalization emerges from this classification, which does not seem to be correlated to any grammatical or semantic feature. The DJ marker that occupies Slot –2 in the structure of the indicative present positive is the only uncontroversial morphological element to which the function of marking the CJ/DJ distinction can be attributed. The tonal phenomena that contribute to this distinction (presence *vs.* absence of the grammatical H tone, presence vs. absence of the postfinal / ´ / in DJ contexts, and possible insertion of the special word

boundary ≠ in CJ contexts) have a distribution that does not make it possible to analyze them as carrying a specific information by themselves.

It must however be noted that, among the possible correspondences between the contours of verb forms in CJ and DJ contexts, two only are attested by more than two tenses:

– the type with similar tonal melodies in CJ and DJ contexts, and with specific tonal processes affecting the final both in CJ and DJ contexts;
– the type with no specific tonal process affecting the final in the DJ form, and tonal processes triggered by the presence of the special word boundary ≠ in the CJ form.

Consequently, in CJ contexts, the type of tonal behavior that requires positing the special word boundary ≠ between the verb form and the following word constitutes the rule, whereas the type of tonal behavior attributable to the invariable presence of the standard word boundary constitutes the exception. By contrast, in DJ contexts, there is no marked imbalance between tenses with tone patterns that require positing a postfinal / ′ / in the DJ form, and tenses for which this postfinal must not be posited.

By way of a conclusion, I would like to briefly evoke the question of the existence of more or less similar systems in related languages. Unfortunately, apart from Southern Sotho, which according to (Letšeng 1995) has tonal contrasts between verb forms in CJ and DJ contexts that correspond almost exactly to those observed in Tswana, I have not been able to find a language with an involvement of tone in the CJ/DJ distinction whose comparison with Tswana could suggest a hypothesis about the emergence of such systems. For example, functionally, the CJ/DJ systems found in Nguni (S40) languages are to the best of my knowledge very similar to the Sotho/Tswana systems, but in Nguni languages, the CJ/DJ distinction seems to be limited to the tenses in which it is marked segmentally. No mention of tonal distinctions between DJ and CJ forms can be found in the literature, and my own field notes on Swati include no evidence of tonal distinctions comparable to those that mark the CJ/DJ distinction in Tswana or Southern Sotho. Tswana and its closest relatives seem to be unique in two respects. The first one is the imbalance between the very limited use of segmental marking (found in one tense only) and the proliferation of tonal marking of the CJ/DJ distinction. The second one is the remarkable heterogeneity of the tonal contrasts used to mark the CJ/DJ distinction, with two major types and four minor types that cannot be analyzed as the manifestations of underlying tonal morphemes that would be common to all the tenses that express the CJ/DJ distinction. Explaining the emergence of such a system will certainly constitute a major challenge for any attempt at elaborating a general hypothesis accounting for the development of CJ/DJ distinctions in Bantu languages.

Abbreviations

ADD = additive, CJ, CJ = conjoint, CL = noun class, CONT = continuative, CSTR = construct form marker, DJ, DJ = disjoint, FV = final vowel, H = high tone, IAV = immediate-after-verb, L = low tone, LOC = locative, NEG = negation, OM = object marker, PL = plural, SG = singular, SM = subject marker

References

Creissels, Denis, Anderson M. Chebanne and Heather W. Nkhwa. 1997. *Tonal Morphology of the Setswana Verb*. München: LINCOM Europa.

Letšeng, Makhauta. 1995. *Les tiroirs verbaux du sotho du sud, formes simples et formes complexes*. University of Grenoble. MA thesis.

Monich, Irina. 2013. Tonal processes in the Setswana verb. Paper presented at the 5th International Conference on Bantu Languages. Paris, 12–15 June.

Appendix 1: Subject markers and object markers

Four different sets of SMs (conventionally labeled here A, B, C, and D) must be recognized in Tswana. Apart from the SM of class 1, the four sets differ from one another in tone only, since set D can be analyzed as a portmanteau resulting from the fusion of the SM itself with a formative whose underlying form is /a/. In contrast to the SMs, the OMs have the same underlying form in all tenses, but show complex tonal alternations conditioned by the context – see Sections 3.9.4 and 3.9.5.

The following chart presents the OMs as they appear when immediately preceded by a L-toned SM and immediately followed by the verb root:

		SM(A)	SM(B)	SM(C)	SM(D)	OM
1st person	singular	kì, ŋ̀	kí, ŋ́	kì	kà	ŋ̀
	plural	rì	rí	rì	rà, rá	rí
2nd person	singular	ò	ó	ò	wà	ò
	plural	lò	ló	lò	lwà, lwá	ló
3rd person	cl. 1[17]	ó	á, ó	à	à	mò
	cl. 2	bá	bá	bà	bà, bá	bá
	cl. 3	ó	ó	ò	wà, wá	ó
	cl. 4	í	í	ì	jà, já	í
	cl. 5	lí	lí	lì	là, lá	lí
	cl. 6	á	á	à	à, á	á
	cl. 7	sí	sí	sì	sà, sá	sí
	cl. 8/10	dí	dí	dì	tsà, tsá	dí
	cl. 9	í	í	ì	jà, já	í
	cl. 11	ló	ló	lò	lwà, lwá	ló
	cl. 14	bó	bó	bò	dʒwà, dʒwá	bó
	cl. 15/17	χó	χó	χò	χà, χá	χó

The four sets of SMs have the following distribution:

– set A occurs in the indicative tenses, except those beginning with the negative marker *ga* [χà];

---

[17] In set B, the SM of cl. 1 shows a free variation between á and ó in the relative forms; in all the other forms using this set of SMs, the SM of cl. 1 can only be á.

– set B occurs in the indicative tenses beginning with the negative formative *ga* [χà], in the subjunctive, in the circumstantial forms, and in the relative forms;
– set C occurs in the *sequential 2*;
– set D occurs in the *sequential 1*; its two tonal variants may well be dialectal variants, but for some speakers at least, they are in free variation.

Appendix 2: Morphological characterization of the tenses of Tswana verbs

(a) Tenses in which the CJ/DJ distinction is not limited to tonal alternations affecting the last syllable of the verb form

Indicative present positive: final vowel a; SM of set A; no grammatical H tone.
DJ: /a/ in Slot –2, no postfinal H tone
CJ: Slot –2 empty, alternating final

Indicative perfect positive: final vowel e~ι; SM of set A; /il~J/ (PRF) in Slot +2.
DJ: no grammatical H tone, special boundary = after the SM, no postfinal H tone
CJ: grammatical H tone, no special boundary after the SM, alternating final

(b) Tenses with a CJ/DJ distinction limited to tonal alternations affecting the last syllable of the verb form

A CJ/DJ distinction manifested in tonal alternations affecting the last syllable of the verb form may result from two distinct combinations: either a postfinal H tone in DJ contexts and a non-alternating final in CJ contexts, or no postfinal H tone in DJ contexts and an alternating final in CJ contexts.

Indicative present negative: final vowel ι; SM of set B; /χa/ (NEG) in Slot –4; grammatical high tone.
DJ: postfinal H tone
CJ: non-alternating final

Indicative perfect negative: final vowel a; SM of set B; /χa/ (NEG) in Slot –4; /a/ (PRF) in Slot –2; grammatical high tone.
DJ: postfinal H tone
CJ: non-alternating final

Indicative future positive: final vowel a; SM of set A; /tɬaa/ (FUT) in Slot –2; no grammatical H tone.
DJ: no postfinal H tone
CJ: alternating final

Indicative potential positive: final vowel a; SM of set A; /ká=/ (POT) in Slot –2; no grammatical H tone.
DJ: no postfinal H tone
CJ: alternating final

Circumstantial future positive: final vowel a; SM of set B; /tɬaa/ (FUT) in Slot –2; no grammatical H tone.
DJ: no postfinal H tone
CJ: alternating final

Circumstantial potential positive: final vowel a; SM of set B; /ká=/ (POT) in Slot –2; no grammatical H tone.
DJ: no postfinal H tone
CJ: alternating final

Infinitive present positive: final vowel a; /χʊ/ (CL15) in Slot –3; no grammatical H tone.
DJ: no postfinal H tone
CJ: alternating final

Infinitive future positive: final vowel a; /χʊ/ (CL15) in Slot –3; /tɬaa/ (FUT) in Slot –2; no grammatical H tone.
DJ: no postfinal H tone
CJ: alternating final

Infinitive potential positive: final vowel a; /χʊ/ (CL15) in Slot –3; /ká=/ (POT) in Slot –2; no grammatical H tone.
DJ: no postfinal H tone
CJ: alternating final

Infinitive continuative: final vowel a; /χʊ/ (CL15) in Slot –3; /sá=/ (CONT) in Slot –2; no grammatical H tone.
DJ: no postfinal H tone
CJ: alternating final

Sequential 1: final vowel a; SMs of set D; no grammatical H tone.
DJ: no postfinal H tone
CJ: alternating final

(c) Tenses with similar contours in CJ and DJ contexts

The lack of an apparent distinction between a DJ and a CJ form may result from two distinct combinations: either no postfinal H tone in DJ contexts and a non-alternating final in CJ contexts, or a postfinal H tone in DJ contexts and an alternating final in CJ contexts.

Circumstantial present positive: final vowel a; SM of set B followed by the special boundary = in contact with a H-toned stem; no grammatical H tone.
DJ: no postfinal H tone
CJ: non-alternating final

Circumstantial perfect positive: final vowel e~ɩ; SM of set B; /il~J/ (PRF) in Slot +2, grammatical high tone.
DJ: no postfinal H tone
CJ: non-alternating final

Indicative future negative: final vowel ɩ; SM of set A; /tɬaa-sɩ/ (FUT-NEG) in Slot –2; grammatical high tone.
DJ: postfinal H tone
CJ: alternating final

Indicative potential negative: final vowel ɩ; SM of set A; /ká-sɩ/ (POT-NEG) in Slot –2; grammatical high tone.
DJ: postfinal H tone
CJ: alternating final

Infinitive present negative: final vowel ɩ; /χʊ/ (CL15) in Slot –3; /=sa/ (NEG) in Slot –2; grammatical high tone.
DJ: postfinal H tone
CJ: alternating final

Infinitive perfect negative: final vowel a; /χʊ/ (CL15) in Slot –3; /=sa/ (NEG) in Slot –2; grammatical high tone.
DJ: postfinal H tone
CJ: alternating final

Infinitive future negative: final vowel ɩ; /χʊ/ (CL15) in Slot –3; /tɬaa-sɩ/ (FUT-NEG) in Slot –2; grammatical high tone.
DJ: postfinal H tone
CJ: alternating final

Infinitive potential negative: final vowel ɩ; /χʊ/ (CL15) in Slot –3; /ká-sɩ/ (POT-NEG) in Slot –2 ; grammatical high tone.
DJ: postfinal H tone
CJ: alternating final

Circumstantial present negative: final vowel ɩ, SM of set B, /=sa/ (NEG) in Slot –2, grammatical high tone.
DJ: postfinal H tone
CJ: alternating final

Circumstantial perfect negative: final vowel a; SM of set B; /=sa/ (NEG) in Slot –2; grammatical high tone.
DJ: postfinal H tone
CJ: alternating final

Circumstantial future negative: final vowel ɪ; SM of set B; /tɬaa-sɪ/ (FUT-NEG) in Slot –2; grammatical high tone.
DJ: postfinal H tone
CJ: alternating final

Circumstantial potential negative: final vowel ɪ; SM of set B; /ká-sɪ/ (POT-NEG) in Slot –2; grammatical high tone.
DJ: postfinal H tone
CJ: alternating final

Imperative positive: final vowel a or ɛ[18]; no SM; grammatical H tone.
DJ: postfinal H tone in the singular, postfinal /ŋ´/ in the plural
CJ: alternating final in the singular, postfinal /ŋ´/ in the plural

Imperative negative: final vowel ɪ; no SM; /sɪ/ (NEG) in Slot –2; grammatical H tone.
DJ: postfinal H tone in the singular, postfinal /ŋ´/ in the plural
CJ: alternating final in the singular, postfinal /ŋ´/ in the plural

Subjunctive positive: final vowel ɛ; SM of set B; no grammatical H tone.[19]
DJ: postfinal H tone
CJ: alternating final

Subjunctive negative: final vowel ɪ; SM of set B; /sɪ/ (NEG) in Slot –2; grammatical high tone.
DJ: postfinal H tone
CJ: alternating final

Sequential 2: final vowel ɪ; SMs of set C; grammatical high tone.
DJ: postfinal H tone
CJ: alternating final

Relative forms: in general, the only differences between the relative forms and the corresponding circumstantial forms are the presence of the postfinal /=ŋ́/ (REL) in Slot +5 and the free variation between SMs of sets A and B. The only particular case is the present positive, in which the SM is followed by the special boundary = in the circumstantial form, but not in the relative form. In all cases, there is no distinction between a CJ and a DJ form.

---

[18] In the imperative positive, the choice between the two possible finals depends on the presence of OMs.
[19] In the subjunctive positive, if no OM or reflexive marker is inserted, stems including three syllables or more show a tonal contour contradicting the regularities observed in other tenses – see Section 3.5, Footnote 12.