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11 Prosodic evidence for syntactic phrasing in Zulu

1 Introduction

The conjoint/disjoint (CJ/DJ) alternation in Zulu (Nguni; S42) is marked segmentally only in the present and the recent past tense, and most existing analyses of the alternation therefore focus on these tenses. Our paper differs from this work in that it is concerned with two tense forms that do not show segmental morphological marking of the CJ/DJ alternation, namely the future and remote past tense. We report the results of a study in which we examined the tonal and durational properties of these “non-alternating” tenses, which we then compared to the phonological properties of verbs in the CJ and DJ form in the present tense. A key question behind our study was whether any of the phonological properties we observed with the non-alternating tenses in different syntactic environments in Zulu should be interpreted as grammatical markers of the CJ/DJ alternation, or whether they simply follow from general phonological principles of the language (see Kula this volume, who investigates the same question for Bemba).

The CJ/DJ alternation in Zulu is generally analyzed as a reflex of syntactic constituency: the CJ form is licensed only when followed by overt vP-internal material; the DJ form signals that the verb is final in vP. In the present tense, these different syntactic contexts are associated with different phonological properties: the tonal and durational characteristics of verbs in phrase-medial position are different from those of verbs in phrase-final position. In this tense, the phrase-medial and phrase-final distinction is also marked by special CJ/DJ morphology. Our objective was to establish if, or to what extent, verbs in the future and remote past tense also exhibit the relevant phonological properties when they appear in phrase-medial and phrase-final positions, even though the verbs are not morphologically marked as either CJ or DJ.

As we discuss in the sections that follow, we find that with respect to their durational properties, phrase-medial and phrase-final verbs in the future and remote past tense behave like their counterparts in the present tense. To some extent, verbs in the non-alternating tenses also behave as expected with respect

We would like to thank our research participants for their time and their contribution to the study. We also thank the editors of this volume and three anonymous reviewers for helpful comments and suggestions. All errors remain our responsibility.

DOI 10.1515/9783110490831-011

to H tone movement, but here our study also reveals some unexpected tonal patterns (particularly in the remote past) that do not follow straightforwardly from regular phonological principles. A particularly interesting finding is the sporadic occurrence of a H tone that some Zulu speakers associate with the final syllable of phrase-medial verbs in the remote past and future tense. A hypothesis that we put forward in this paper is that this final H tone is the realization of a tonal morpheme that (optionally) marks the CJ form in the relevant tenses in Zulu.

In Section 2, we present an overview of the CJ/DJ alternation in Zulu and motivate our research question. Section 3 describes our study, and Section 4 presents our results, which are discussed in Section 5. Section 6 offers a brief conclusion.

2 The conjoint/disjoint alternation and object marking in Zulu

In Zulu, the CJ/DJ alternation is marked by segmental morphology in two tenses. In the present tense affirmative, the DJ form is expressed by the prefix *ya-*, (1b); in the recent past tense affirmative, the DJ suffix *-ile* replaces the past tense marker *-e*, (2b):^{1,2}

- (1) a. *Ngi-fund-a* *i-n-cwadi*.
 1SG.SM-read-FV AUG-9-book
 ‘I’m reading a book.’
- b. *Ngi-ya-fund-a*.
 1SG.SM-DJ-read-FV
 ‘I’m reading.’
- (2) a. *Ngi-fund-e* *i-n-cwadi*.³
 1SG.SM-read-PST AUG-9-book
 ‘I read a book.’

1 All examples in this paper are from Zulu, unless otherwise indicated. High tone is marked by an acute accent on the syllable; low tone is unmarked. In some examples, we have underlined the tone bearing units (TBU), i.e. the vowels to which H tones are underlyingly linked. Note that we have not marked tone on the examples provided in Section 2, since the tonal properties of the CJ/DJ alternation in Zulu are the topic of our empirical study, the results of which we report in Section 4. We have occasionally adjusted the glosses of examples that were adopted from the literature to this system.

2 These tenses can also be marked on the complements of certain auxiliary verbs, such as the so-called exclusive auxiliary *se-* (cf. *sengibuya naye*, ‘I am now returning with him’ vs. *sengiyabuya*, ‘I am now already returning’) or the continuous past tense auxiliary *be-* (cf. *bengihambe naye*, ‘I had been walking with him’ vs. *bengihambile*, ‘I had been walking’). See Ziervogel, Louw and Taljaard (1985: 179, 182).

3 The recent past CJ suffix is slightly lengthened and pronounced with a high tone (see Section 5 for discussion).

- b. *Ngi-fund-ile.*
 1SG.SM-read-PST.DJ
 ‘I read.’

It is by now firmly established that the CJ/DJ alternation in Zulu is an indicator of syntactic constituency. The CJ form is only possible if the verb is followed by overt material inside the *vP*; when no *vP*-internal material follows the verb, the DJ form must be used (Van der Spuy 1993; Buell 2005, 2006; Halpert 2012 a.o.). (3) contrasts with (1b), and (4) with (2b):

- (3) **Ngi-fund-a.*
 1SG.SM-read-FV
 Intended: ‘I’m reading.’
- (4) **Ngi-fund-e.*
 1SG.SM-read-PST
 Intended: ‘I read.’

The DJ form can be followed by postverbal material, but there is evidence that this material is always outside the *vP* (Van der Spuy 1993; Buell 2005, 2006; Cheng and Downing 2009; Adams 2010; Zeller 2012). For example, Buell (2006) shows that the question particle *na*, which only occurs outside the *vP* and which therefore cannot appear between the verb and a following constituent when the verb is in the CJ form, can intervene when the verb is in the DJ form (Buell 2006: 15):

- (5) a. *Ba-dlal-a phandle na?*
 2SM-play-FV outside Q
 ‘Are they playing outside?’
- b. **Ba-dlal-a na phandle?*
 2SM-play-FV Q outside
- c. *Ba-ya-dlal-a na phandle?*
 2SM-DJ-play-FV Q outside
 ‘Are they playing outside?’

Buell (2006) also shows that only elements following the CJ form of the verb can be focused in Zulu. (6a) can therefore function as a response to a question like “Where are the boys playing?”, and the adverb can also be contrastively focused. In contrast, Buell (2006: 21) notes that *phandle* cannot be in focus when it follows the DJ form of the verb, as in (6b). Rather, (6b) would be an appropriate answer to a question such as “What are they doing outside?”:

- (6) a. *Ba-dlal-a* *phandle*.
 2SM-play-FV outside
 ‘They’re playing OUTSIDE.’
- b. *Ba-ya-dlal-a* *phandle*.
 2SM-DJ-play-FV outside
 ‘They’re playing outside.’

Based on Cheng and Downing (2009), we take the *vP* to be the domain of focus in Zulu; consequently, the unavailability of adverb focus in (6b) follows directly from *phandle* being outside the *vP*.

When the object-NP of a monotransitive verb agrees with the verb, and no other material is present in the *vP*, the DJ verb form is obligatory in Zulu. In this case, the object-marked NP cannot be focused and is therefore incompatible with a focus marker such as *kuphela*, ‘only’, as shown in (7c):

- (7) a. *Ngi-bon-e* *i-kati* (*kuphela*)
 1SG.SM-see-PST AUG-5.cat only
 ‘I saw (only) the cat.’
- b. **Ngi-li-bon-e* *i-kati*.
 1SG.SM-5OM-see-PST AUG-5.cat
- c. *Ngi-li-bon-ile* *i-kati* (**kuphela*).
 1SG.SM-5OM-see-PST.DJ AUG-5.cat only
 ‘I saw it, (*only) the cat.’

The implication is that object-marked NPs in Zulu are always dislocated to a *vP*-external position (see Van der Spuy 1993; Buell 2006; Cheng and Downing 2009; Adams 2010; Zeller 2012):

- (8) *Ngi-li-bon-ile*_{*vP*} *i-kati*.
 1SG.SM-5OM-see-PST.DJ AUG-5.cat
 ‘I saw it, the cat.’

The claim that material following the DJ verb form in Zulu is dislocated is also supported by phonological evidence. In Zulu, the penultimate vowel of the last word within a prosodic phrase is lengthened (Khumalo 1987; Van der Spuy 1993). As shown by Cheng and Downing (2007, 2009), the right edge of a prosodic phrase always coincides with the right edge of a syntactic phrase (*vP* or CP) in Zulu. Therefore, the fact that the penultimate vowel of verbs in the DJ form is lengthened in Zulu shows that these verbs are final in their phrase. Material following the DJ form follows the right edge of the relevant phrase boundary and is therefore outside the *vP*:

(9) *ba-ya-dla:la ## pha:ndle* → *ba-ya-dlala*_{vp} *phandle*

Penultimate lengthening in Zulu is correlated with high (H) tone movement (i.e. H tone shift or spread)⁴. In the present tense indicative, a lexical H tone originating on a prefix moves to the right as far as the penult when the verb is medial in its phrase. This is illustrated in (10) with the verb *-hlabelela*, ‘sing’, which is lexically toneless. If this verb appears in the CJ form and in phrase-medial position, as in (10a), the H tone originating on the subject prefix spreads to the penult, as shown in (10b).

(10) Verb is phrase-medial – H tone spreads to penult:

a. *I-zin-gane* *zi-hlabelel-a* *i-n-goma*_{vp}.
 AUG-10-child 10SM-sing-FV AUG-9-song
 ‘The children are singing a song.’

b. *zihlabéléla ...*]

However, when the verb is phrase-final and therefore appears in the DJ form, as in (11a), the H tone of the object marker spreads only as far as the antepenult, while the penult is lengthened, (11b) (Downing 1990; Cassimjee and Kisseberth 2001; Buell 2005):

(11) Verb is phrase final – H tone spreads to antepenult:

a. *I-zin-gane* *zi-ya-yi-hlabelel-a*_{vp} *i-n-goma*.
 AUG-10-child 10SM-DJ-9OM-sing-FV AUG-9-song
 ‘The children are singing it, the song.’

b. *zíyáyíhlábéle:la*]

As noted in Cassimjee and Kisseberth (2001: 340), H tone movement to the antepenult is probably a consequence of the tendency to avoid the alignment of the right edge of an H tone domain with a metrically prominent syllable.⁵ Since the lengthened penult is prominent, the H tone domain can only be extended to the antepenult (see Cassimjee 1998; Buell 2005: 67).

⁴ Varieties of Zulu differ in showing either high tone shift or spread. The tone pattern in (10) and (11) reflects Durban Zulu, where prefix-induced H tone movement is typically realized as H tone spread, while stem-induced H tone movement is realized as shift (Cassimjee and Kisseberth 2001; Downing 2001a). In contrast, Zululand Zulu is reported to have tone shift in all environments (Cassimjee and Kisseberth 2001: 329). See also Section 4.2.1.

⁵ However, Cassimjee and Kisseberth (2001: 341) discuss data from the Nguni language Phuthi, where H tone shift to the penult is blocked even in environments in which the penult is not lengthened. We return to this point in Section 5.

In this paper, we examine and compare the phonological properties of phrase-medial and phrase-final verbs in tense forms which do not mark the CJ/DJ distinction segmentally in Zulu (we henceforth refer to these forms as *non-alternating tenses*). The two non-alternating tenses we focus on are the future tense and the remote past tense:

- (12) a. *I-zin-gane* *zi-zo-hlabelel-a* *i-n-goma*]_{vP}.
 AUG-10-child 10SM-FUT-sing-FV AUG-9-song
 ‘The children will sing a song.’
- b. *I-zin-gane* *zi-zo-yi-hlabelel-a*]_{vP} *i-n-goma*.
 AUG-10-child 10SM-FUT-9OM-sing-FV AUG-9-song
 ‘The children will sing it, the song.’
- (13) a. *Ng-a-siz-a* *u-Sipho*]_{vP}.
 1SG.SM-RPST-help-FV AUG-1a.Sipho
 ‘I helped Sipho.’
- b. *Ng-a-m-siz-a*]_{vP} *u-Sipho*.
 1SG.SM-RPST-1OM-help-FV AUG-1a.Sipho
 ‘I helped him, Sipho.’

The examples in (12) are in the future tense; (13) shows the remote past tense. The verb in each sentence is followed by an object-NP. The crucial difference between the (a)- and the (b)-examples is that the object agrees with the verb in the latter. Given the evidence discussed above, this means that the objects in (12b) and (13b) must be located outside the vP (as indicated by the bracketing). Note that the object-marked NPs in (12b) and (13b) can follow elements such as *na* and that they cannot be focused, which confirms that they are indeed dislocated:

- (14) *U-zo-yi-hlabelel-a*]_{vP} *na* *i-n-goma*?
 2SG.SM-FUT-9OM-sing-FV Q AUG-9-song
 ‘Will you sing it, the song?’
- (15) **Ng-a-m-siz-a*]_{vP} *u-Sipho* *kuphela*.
 1SG.SM-RPST-1OM-help-FV AUG-1a.Sipho only
 Intended: ‘I helped him, Sipho only.’

Since the object-NPs in (12b) and (13b) are in vP-external positions, the verbs in these examples are phrase-final. In contrast, the objects of the non-agreeing verbs in the (a)-examples are inside vP, and the verbs are hence in phrase-medial position. Because the future and the remote past are non-alternating tenses, the difference between clauses with phrase-medial and phrase-final verbs is

not marked by segmental CJ/DJ morphology. However, given the phonological processes associated with the CJ/DJ alternation that were discussed above, it is worth asking whether these processes can also be observed in constructions such as those in (12) and (13). If penultimate lengthening and H tone shift/spread to the antepenult are properties of verbs that are final in their (prosodic and syntactic) phrase, then the syntactic representations diagnosed in (12b) and (13b) above predict that these properties are also attested with verbs that agree with their objects in non-alternating tenses. In the following sections, we discuss the experiment in which we have tested these predictions, as well as our results.

3 Methodology

Data were collected by means of a read-production study. Based on the existing literature and the discussion in Section 2, we predict the following durational and tonal characteristics of the verb words in our target sentences:

Independent of morphological marking of the CJ/DJ distinction on the verb, penultimate lengthening is expected to occur on the verb word if it is immediately followed by an object-marked, right dislocated object, because in this case, the verb is in phrase-final position. If the following object is not object-marked/right-dislocated, and the verb is therefore in phrase-medial position, no penultimate lengthening is expected to occur.

As for tonal characteristics, a H tone originating on the verb word is expected to shift (or spread) to the antepenultimate position if the verb is followed by an object-marked, right-dislocated object. If followed by an object inside the vP, shift (spread) to the penultimate syllable is expected to occur. Again, these expectations are independent of whether or not the CJ/DJ distinction is morphologically marked on the verb in the respective tense form.

3.1 Target sentences

A reading task was administered to the participants. Target sentences were constructed with transitive verbs in the present, the future and the remote past tense whose objects either occurred vP-internally (verb = phrase-medial) or in a right-dislocated position (verb = phrase-final), as indicated by the presence of an object marker.

As noted in Section 2, the present tense is one of the tense forms which has morphological marking of the CJ/DJ alternation and therefore serves as a control

structure for which durational and tonal differences have firmly been established in the literature. The future tense and the remote past are two non-alternating tense forms, as exemplified in (12) and (13).

The future tense marker is *zo-*. Diachronically, it can be analyzed as a contracted form involving the auxiliary *za* (from the root *z-* ‘to come’; Puhersch 2005: 34), and an infinitive, e.g. *ngi-za-uku-thanda* > *ngi-zo-thanda*, ‘I shall love’ (Doke 1931: 162). It now represents the usual form of the future (Buell 2009: 74). The morpheme itself is toneless (Khumalo 1982: 43).

The marker of the Remote Past is *áa-*, which contracts with the subject marker. The vowel is long and realized with a HL tone pattern (Khumalo 1982: 37). Referring to Taljaard (1989: 36), Puhersch (2005: 67) states that this morpheme does not have any tonal allomorphs, which means that it is always realized with a HL contour. Khumalo (1982: 44) also mentions a specific tone pattern HLL associated with the final vowel *-a* in the remote past (see Section 5).

An overview of one verb word in all six morphosyntactic contexts is given in Table 1.⁶

The morphosyntactic structures in Table 1 were repeated with seven different verbs, yielding 42 utterances per speaker. The target sentences were checked with the participants before recording took place. A list of sentences showing the seven different verbs is presented in Table 2 (present tense and phrase-medial verb only), with underlying H tones on verbs only. The verbs were chosen from the list provided by Buell (2004); the tone marking was checked against Rycroft (1981), given that Doke et al. (1990) provide the tonal forms of the imperative in which H- and low (L)-toned verbs converge on the same tone pattern. A full list of target sentences is provided in the appendix.

In order to bring out the tonal differences on the verb word as outlined in Section 2, the verb words had to comply with a number of phonological properties. First, due to an interdependence of the syllable count of the stem and the syllable targeted by tone movement, verb stems had to be longer than two syllables. Practically any work on Nguni tonology reports the alternating target for H tone shift/spread which was already mentioned in Section 2 and which depends on the position of the word in a phrase (Khumalo 1987; Downing 1990; Cassimjee 1998). In phrase-final position, H tone shift is to the antepenultimate syllable; in phrase-medial position, H tone shift targets the penultimate syllable, as shown in (16).

⁶ Table 1 shows the examples how they were presented to our speakers, i.e. in standard Zulu orthography (but note that vowels with underlying H tones are underlined in the verb words in the table). As mentioned above, the remote past marker in Zulu is *áa-*, which contracts with the subject marker *zí-* in the examples in Table 1. The resulting past tense subject marker is *záa-*, which is written as *za-* in Zulu.

Table 1: Morphosyntactic contexts of target sentences.

Tense	Phrase-medial verb	Phrase-final verb
Present	lzingane zihlabelela ingoma.	lzingane ziyayihlabelela ingoma.
Future	lzingane zijohlabelela ingoma.	lzingane zijoyihlabelela ingoma.
Remote past	lzingane zahlabelela ingoma.	lzingane zayihlabelela ingoma.

Table 2: Target sentences based on seven verbs.

Zulu	English
1 l-zi-ngane z _i -hlabelela i-ngoma.	The children sing a song.
2 U-mfundi u-namathiselisa i-phepa odongeni.	The student sticks paper to the wall.
3 U-John u-lekelela a-ba-zali ba-khe.	John assists his parents.
4 U-dokotela u-phefumulisa i-si-guli.	The doctor makes the patient breathe. [i.e. by means of a machine in a hospital]
5 U-dokotela u-fiphalisa i-si-guli.	The doctor causes the patient to lose hope.
6 Ba-minyanisa a-ba-ntu.	They make the people squash together.
7 I-si-phepho si-paqulukisa i-sakhiwo.	The storm causes the building to collapse.

(16) Zulu (Downing 1990: ex. [6], [7], [12])

- a. phrase-final; H tone from subject prefix
ba-ya-límisa 'they help plow'
u-ya-hlékisa 's/he amuses'
u-ya-namathélisa 's/he makes stick'
- b. phrase-final; H tone from object prefix
si-ya-m-límisa 'we help him plow'
si-ya-wa-namathélisa 'we make them stick'
- c. phase-medial; H tone from subject prefix
ba-límisa... 'they help plow'
u-namathelisa... 's/he makes stick'

However, H tones which are sponsored by the antepenult syllable generally shift one syllable rightward to the penult, even when the verb is in phrase-final position:

(17) Zulu (Downing 1990: ex. [14]; slightly adapted)

- u-yá-lwa* 's/he fights'
u-ya-wa-bála 'you count them'
si-ya-yi-líma 'we plow it'

Therefore, in order to avoid rightward tone shift of the kind illustrated in (17), the H tone must be contributed by a syllable earlier than the antepenultimate syllable. We ensured this by selecting only verbs for our study which were at least four syllables long.

A second phonological property of the verbs selected in our study is determined by the fact that the target of H tone spread/shift with phrase-final verbs has been reported to be influenced by the origin of the H tone. In Durban Zulu (Downing 2001a), a H originating on a verbal *prefix* of a phrase-final verb spreads to the antepenultimate syllable, as in (18) (see also [11b] above). However, a *verb stem-initial* H tone shifts to the penultimate syllable in this context, as shown in (19). Similar data exist from the Cele dialect of Zulu (Natal Coast Zulu in Khumalo 1981) and Ngoni (Cassimjee and Kisseberth 2001: ex. [14]).

- (18) Durban Zulu: pre-stem H tones target antepenultimate of phrase-final verbs
(Downing 2001a: ex. [2])

*ú*kú-kaka ‘to surround’
*ú*kú-kákisa ‘to cause to surround’
*ú*kú-kákisana ‘to cause each other to surround’

- (19) Durban Zulu: verb stem-initial H tones target penultimate of phrase-final verbs
(Downing 2001a: ex. [2])

si-ya-thénga ‘we buy’
si-ya-thengisa ‘we sell’
si-ya-thengiséla ‘we sell to’

Thus, in order for a H tone to spread to the antepenultimate syllable if the verb is final in a phrase, the H tone should originate on a verbal prefix, but not on the verb stem-initial syllable. As a consequence, only L-toned (toneless) verbs were selected for the study, and H tones were contributed by subject and object markers.

Finally, it is well-documented that in the Nguni languages, depressor consonants influence the realization of H tones in various ways (for a detailed phonetic study, see Traill et al. 1987). Given the various interactions of depressor consonants and tone, depressors have been avoided in the target sentences wherever possible,⁷ but especially in the antepenultimate and penultimate syllables of verb words which serve as the target for H tone shift/spread.

3.2 Speakers

Three speakers were recorded, two female and one male. They were all students at the University of KwaZulu-Natal, and around 24 years of age at the time of recording. Speaker LM (female) is from the Tongaat-area, approximately 40 km

⁷ Note that the future marker <zo> unavoidably contains a depressor consonant. However, as the future marker never occurs in the syllable that is the target of H tone shift, it is expected that it does not interfere with it. Furthermore, it should be noted that the bilabial implosive, represented by in orthography is not a depressor, despite being voiced (Cassimjee and Kisseberth 2001: 331).

north of Durban, but lives in Durban now. She says, “back home” they speak “deep” Zulu. According to her, people from Durban can hear that she is not from Durban because of the way she speaks and the words she uses. However, another participant could not tell where LM was from just by listening to her recordings. Speaker RM (also female) is from Durban and grew up there. Speaker PB (male) is from KwaMashu, a former township of Durban. He has lived there all his life.

It is thus expected that speakers RM and PB show the tonal characteristics of Durban Zulu. LM’s variety might be more mixed. However, due to the phonological and tonal make-up of the stimuli (see Section 3.1), the only tonal difference, if any, is predicted to be in the occurrence of H tone spread as opposed to H tone shift (with H tones originating from verbal prefixes). As this does not impede on the research questions concerning durational properties and the respective targets of H tone movement in the non-alternating tenses, the origin of the speaker did not lead to her exclusion.

3.3 Procedure

The recordings were done in a quiet office at the University of KwaZulu-Natal (Durban). The target sentences were given in Zulu orthography (which implies that tones are not indicated, and dislocated phrases are not separated by a comma, as would be necessary in English). They were presented in seven sets (corresponding to the seven different verbs used). Each set contained the six test sentences plus four additional filler sentences to provide some variation. Some of the fillers included the verb *phúmelela*, which is lexically H-toned.

There was a short break before each set so that the participant could familiarise him/herself with the data. Participants were instructed to read clearly but not unnaturally, e.g. like a newsreader or for teaching material.

It has been shown that speakers only disambiguate structures reliably if they are aware of differences between them (see Snedeker and Trueswell 2003; Breen et al. 2010 for English focus prosody). Taking this into account, we opted against randomization of the target sentences and directly contrasted the same verbs in different tenses and syntactic constructions in order to encourage prosodic disambiguation.

3.4 Data analysis

3.4.1 Length

For penultimate lengthening as an acoustic cue to phrase boundaries, the penultimate syllable of the verb word was delineated manually and saved in a Praat text grid, applying common acoustic cues to segment boundaries (see

Turk et al. 2006). The duration of the penultimate syllable was extracted automatically using a Praat Script. The descriptive and inferential statistics of the length measurements are provided in Section 4.

Khumalo (1987: 196) describes penultimate lengthening in Zulu (which he calls “prepausal lengthening”) as a *vowel* being lengthened penultimately in a phrase. Some phonetic work on lengthening in Bantu languages also measures the duration of the penultimate vowel (see e.g. Downing and Pompino-Marschall 2013), while others have measured the duration of the penultimate *syllable* (Myers 1999, 2003). Both approaches find penultimate lengthening confirmed in the respective units measured. It thus remains an open empirical question if only the vowel or the entire syllable is lengthened when occurring in penultimate position. In the current study, the length of the penultimate syllable was measured. Compared to other acoustic studies that measure vowel length, we expect to find a longer absolute duration (given that two instead of one segments were measured). However, the relational aspect, i.e. lengthening in penultimate position, is not expected to be affected. (A non-systematic measure of the length of the penultimate vowel in a subset of our data confirmed the general pattern we found based on syllable length that we report in Section 4.1).

3.4.2 Tone annotation

Tone annotation was done for the verb words only and was based on auditory impression. Of central interest in tone annotation was the target of H tone movement. It was also noted if spread or shift occurred, although this question was not central to our research. Each author listened to the recordings (either alone or in groups of two), and transcribed the tone of the verb word. If necessary, pitch tracks were inspected in addition to the auditory impression. Agreement between the three annotators was reached concerning the tone pattern of nearly all verb words, at times including extensive discussion and re-listening.

4 Results

4.1 Length

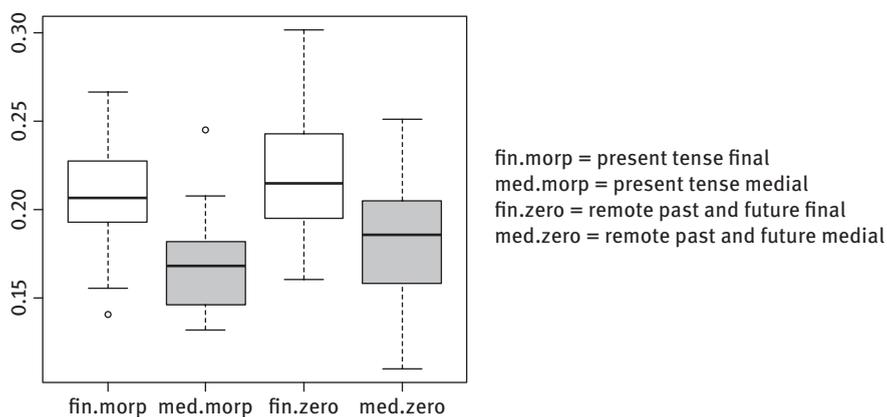
As discussed in Section 2, a noted feature of the phrase-final verb form is prepausal lengthening of the penultimate syllable. Table 3 below gives the average length of the penultimate syllable in seconds (with its standard deviation) for each phrasal context, for each tense, and for each speaker. For each speaker, the relative penult length follows the exact same order, with the present medial

Table 3: Average length (in seconds) and standard deviation (in parentheses) of the penultimate syllable per tense, position and speaker.

		LM	PB	RM
Present Tense	medial	0.165 (0.028)	0.190 (0.026)	0.151 (0.018)
	final	0.233 (0.023)	0.217 (0.020)	0.175 (0.020)
Future Tense	medial	0.191 (0.039)	0.202 (0.022)	0.167 (0.022)
	final	0.242 (0.037)	0.232 (0.034)	0.185 (0.017)
Remote Past	medial	0.170 (0.026)	0.195 (0.024)	0.159 (0.028)
	final	0.235 (0.024)	0.227 (0.017)	0.185 (0.021)

being the shortest and the future final the longest. The data show that future and remote past verb forms behave similarly to the present, in that phrase-medial forms that are followed by a *vP*-internal object have shorter penults than the corresponding phrase-final forms which contain an object marker and co-occur with a right-dislocated object NP.

Figure 1 is a visual summary of the distribution. It shows the duration of the penultimate syllable of final (white boxes) versus medial forms (grey boxes) in morphologically marked (Present Tense) and unmarked tenses (Future and Remote Past) across all speakers. The bold-typed horizontal line in each box represents the median (i.e. a central tendency in the data, namely the breakdown point of 50% of the data). The boxes delineate the 75%- and 25%-quartiles. The whiskers (error bars) represent the largest and smallest values that are not more than 1.5 interquartile ranges away from the box. Individual dots represent data points outside this range.

**Figure 1:** Boxplots showing the distribution by position and morphological marking.

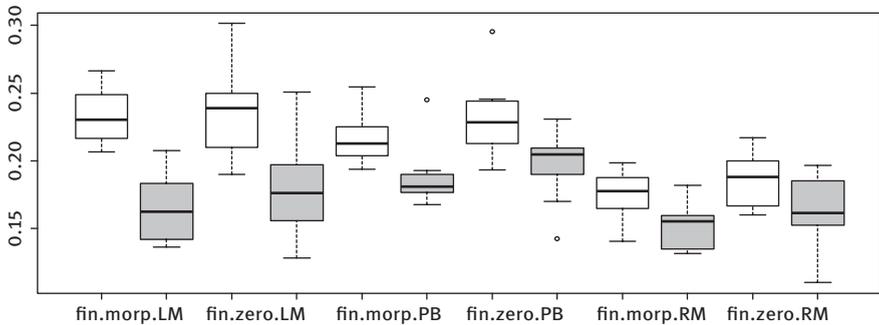


Figure 2: Boxplots showing the distribution by position, morphological marking, and speaker (white boxes represent final forms, grey boxes represent medial forms).

Visual inspection of the data shows that in general, in the morphologically marked present tense, medial and final forms differ more clearly in the length of the penultimate syllable, whereas there is a slightly larger overlap in morphologically unmarked forms.

Figure 2 shows the distribution per speaker. Visual inspection of the per-speaker distribution shows:

- for final versus medial forms: In morphologically marked present tense, the white and grey boxes for final and medial forms do not overlap for any speaker, thus suggesting a relevant difference between these conditions. For the morphologically unmarked forms, there is some overlap in the error bars (for LM and PB) and even in the boxes for speaker RM, being indicative of a somewhat closer distribution. Position and morphological marking are included in the statistical model as fixed factors.
- the medians and overall distribution of boxes differ across speakers, indicating individual differences in speech tempo. E.g. RM produces shorter syllables in nearly all conditions. Speaker is included as a random factor in the statistical model and random intercepts are calculated per speaker.
- the variance in duration differs, depending on speaker and tense, showing less variance e.g. for RM than for LM. Random slopes per speaker were added to the statistical model.

The visual inspection of the results suggests that the process of penultimate lengthening is directly associated with phrase-finality of a verb form, regardless of whether or not the Cj/Dj alternation is segmentally marked in the respective tense of the verb.

We also tested the results inferentially for significance. For the inferential analysis, R (R Development Core Team, 2010, version 2.12.0) and lme4

Table 4: Results of linear mixed model evaluating the ratings against the fixed factors “position”, “morphological marking” and their interaction.

Coefficient	Estimate	Std. Error	t-value
Position	-0.0397	0.0132	-3.010
Morphological marking	0.0095	0.0066	1.442
Position x morph.marking	0.0025	0.0086	0.287

(Bates et al. 2011) were used to perform linear mixed effects analyses of the relationship between duration of penultimate syllable, position (final, medial) and morphological marking (marked, zero). As fixed effects, position and morphological marking (with interaction) were entered into the model. As random effects, intercepts for subjects and items, as well as by-subject and by-item random slopes for the effects of position and morphological marking were calculated (Cunnings 2012). Table 4 summarizes the results of the model.⁸

The mixed effects model with position, morphological marking and interaction of the two effects shows a statistically significant main effect for position ($t = -3.01$) but not for morphological marking nor for an interaction of position and marking.

We conclude that the process of penultimate lengthening is directly associated with phrase-finality of a verb form, regardless of whether or not the *CJ/DJ* alternation is segmentally marked in the respective tense of the verb.

4.2 Tone

In this section, we discuss our findings for the tone patterns for the present, future, and remote past, focusing specifically on the extent to which (ante) penultimate shift (Sections 2 and 3) characterizes the tenses that lack a segmental alternation between medial and final forms, i.e. future and remote past tense. Although our intention is to present our data largely descriptively, we adopt the domain-marking conventions of Optimal Domains Theory (ODT) as employed in Cassimjee (1998), Cassimjee and Kisseberth (2001), and articulated in Leben (2006). A H domain is defined as “a sequence of moras, the leftmost of which is H in underlying representation and the rightmost of which is H on the surface” (Leben 2006: 4). We use brackets to demarcate H domains, the underlying position of a H tone is underlined, and its surface position is marked with an acute accent.

⁸ Since determining the precise degrees of freedom is non-trivial in linear mixed models, the t-values are approximations. An absolute t-value of 2 or greater indicates statistical significance at $\alpha = 0.05$.

4.2.1 Present tense

In the present, the CJ form is distinguished from the DJ by the presence of the *ya*-morpheme in the latter. As laid out in the methodology section, our CJ stimuli consisted of toneless stems with a H-toned subject marker. It is well-established for Zulu phonology that in the CJ verb form, the H tone targets the penultimate syllable of the verb complex (Khumalo 1981, 1982; Downing 1990). This prediction was borne out for all of our speakers.

However, we encountered variation in whether the penult was the object of tone shift or spread. In Durban Zulu, H tones originating in the prefix domain are documented as spreading in Downing (2001a) and Cassimjee and Kisseberth (2001) (see footnote 4). Example (20) shows the more common pattern of H spread from the H tone of the subject marker, and (21) shows H shift. Two speakers (PB, RM) were categorical for H tone spread, and one (LM) varied between shift and spread.⁹

(20) a. *ú-phéfumúlisa* ... (LM, PB, RM)

b. *ú-fíphálisa* ... (PB, RM)

(21) a. *ú-fíphalísa* ... (LM)

b. *si-paqulukísa* ... (LM)

The patterns observed in the DJ form also largely confirmed our expectations. Due to prepausal lengthening of the penult, H tone movement targets the antepenult instead, and the penult is lengthened and realized with a falling tone. It is important to note that there are two H tone domains (HTDs) in DJ verb forms containing an object marker, the first encompassing prefixal material to the left of the object marker, and the second beginning with the object marker (Downing 1990; Cassimjee and Kisseberth 2001).¹⁰

⁹ Phonetically, the distinction between H tone shift and H tone spread may not always be quite as clear. Cassimjee and Kisseberth (2001: 333) note with respect to Zululand Zulu that “[i]n tone ‘shift’ from an initial syllable to a later position in the word, all the syllables up to the landing site are quite raised in pitch if none of the syllables from the point of origin to the landing site have a depressed onset.” This formulation would also be compatible with spread. However, as a difference in the pattern between the speakers was clearly discernible, we transcribe it as a difference between spread and shift.

¹⁰ We have indicated the falling tone on the penultimate syllable in (22), but it should be kept in mind that this syllable is underlyingly toneless. Cassimjee and Kisseberth (2001: 331) describe different fall patterns that can be perceived on the penultimate syllable and which stem from an underlying H tone, L tone (= phonologically toneless) and a syllable containing a falling tone. They note that “[a] lengthened, non-depressed syllable which is toneless from a phonological point of view shows a very clear fall in pitch when immediately preceded by a H tone. [...] this falling pitch is predictable and is also quite distinct from the true falling-toned syllables (which have a somewhat greater duration of the H portion of the fall)”.

- (22) a. [sǐ-yá][lí-námáthísé]lí:sa (LM, PB, RM)
 b. [ǔ-yá][bá-léké]lê:la (LM, PB, RM)

Since the adjacent H tones on *ya-* and the following object markers (*lí, bá*) are created by spread onto *ya-* rather than underlyingly adjacent tone-bearing units (TBUs), it is not an environment for downstep, and the series of level H tones is expected (Cassimjee and Kisseberth 2001: 329). Interestingly, our speaker (LM), who varied between shift and spread in the CJ form, exhibited only H spread in the DJ.

4.2.2 Future tense

Our data confirm an analysis of the tone in the future tense in Zulu that was previously suggested for mutually intelligible Ndebele by Downing (2001b), and that is related to the diachronic status of the future morpheme as a formerly separate auxiliary verb. As noted in Section 3, the future tense is marked by the toneless future morpheme *zo-*, which is transparently derived from the verb *ukuza* ‘come’. Notably, *zo-* behaves differently from other verbal prefixes in that it establishes its own prosodic domain, probably because it is historically derived from an auxiliary verb. In both the medial and final forms, *zo-* is final in this prosodic domain and therefore blocks rightward tone spreading from prefixal material to its left (as shown for Ndebele in Downing [2001b]). Due to the prosodic boundary established by *zo-*, the H from the subject marker cannot target any syllables within the stem, nor can it surface on the *zo-* itself. In the phrase-medial form of the verb, this means that the only syllable bearing a H tone is the subject marker, which is underlyingly H-toned.

- (23) a. [sǐ-zo]namthiselisa ... (LM, PB, RM)
 b. [ǔ-zo]lekelela ... (LM, RM)

We also encountered an unexpected pattern in which the final syllable of the medial CJ verb bears a H tone.¹¹ This was common for speaker PB, and present in one example for RM:

¹¹ One could perhaps argue that the H tone on the final syllable of the verb can somehow be linked to the tonal properties of the postverbal noun, which possibly influences the tones on the preceding verb word. Nouns in Zulu have both a pre-prefix and a prefix whose segmental shape is determined by the noun class to which the item belongs. The pre-prefix is underlyingly H-toned (cf. Buell 2009, citing Rycroft 1979), whereas the prefix is toneless. However, note that for nouns, the same rules of tone shift/spread apply as for verbs: shift/spread away from the point of origin towards the penult or antepenultimate. Thus, the H tone of a pre-prefix does not necessarily surface on the initial syllable. In addition, the postverbal context is comparable in all examples, but the final H tone on the verb surfaces only in some cases. We therefore assume that the final vowel in examples such as (24) is not in any way related to the presence of an (underlyingly H-toned) pre-prefix on the object.

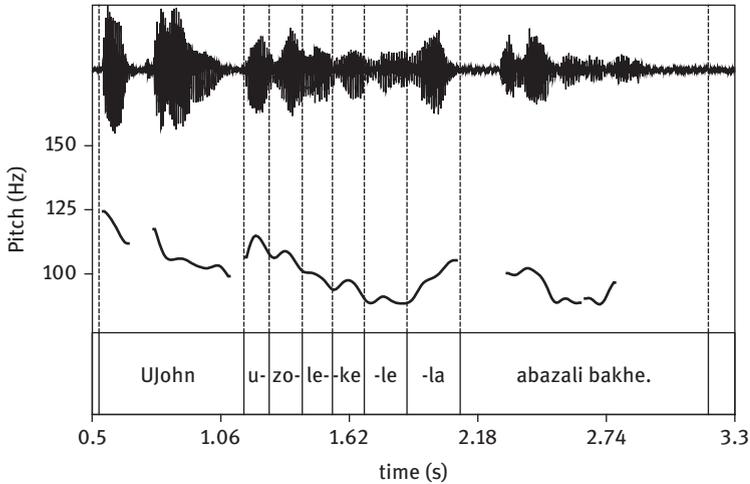


Figure 3: Pitch track for phrase-medial verb in the future tense (PB, male speaker).

- (24) a. [ú-zo]lekelelá ... (PB), see Figure 3
 b. [bá-zo]minyánísá ... (PB, RM)

Our stimuli also included the H-toned stem *phúmelela*. Due to the prosodic boundary established by *zo-*, the *phúmelela*-examples we recorded demonstrate that a stem H targets the penult of the phrase-medial verb in the future tense, as expected based on the data from the present tense.

- (25) [zǐ-zo][phúmelé]la ... (LM, PB, RM)

To some extent, the tonal facts from the phrase-final future agree with what was found for the present DJ. That is, the H from the object marker targets the antepenult of the verb complex and the penult is realized with a falling tone:

- (26) a. [sǐ-zo][lí-namathisé]lí:sa (LM, PB, RM)
 b. [bá-zo][bá-minyá]nî:sa (LM, PB, RM)

However, notice that the H of the subject marker is restricted to appear only on the subject marker itself, as attested in the future medial forms; it does not shift to the future tense marker. In this respect, the examples in (26) differ from the corresponding examples in the present DJ, where the H tone from the subject marker spreads to the DJ marker *ya-* (compare [22]). As noted above, we assume that this difference is due to the fact that *zo-* establishes its own prosodic domain and therefore blocks H tone movement from prefixal material to its left.

There are also a number of examples taken from the final future forms where the tonal patterns are considerably less clear. Recall that in the present DJ, all

speakers uniformly had a H tone plateau (spread) from the subject marker through the antepenult, whereas the examples in (26) show shift rather than spread. Yet, this is not the case for all future DJ examples; in this tense, there is considerable variation between shift vs. spread from the H tone of the object marker to the antepenult. In certain constructions, we seem to find a little of both; that is, the H of the object marker does not surface where it is underlyingly linked, nor does it target only the antepenultimate syllable:

(27) [ú-zo][sì-phefúmú]li:sa (LM, RM)

In others, antepenultimate shift does not seem to be at work at all, and we see a shift to the penult instead:

(28) [sì-zo][sì-paqulukí:]sa (PB)

4.2.3 Remote past tense

In the remote past, the subject marker merges with the bimoraic remote past marker *áa-* (see Section 3.1). In this process, vocalic subject markers are replaced by glides and CV-shaped subject markers undergo vowel deletion; in all cases, the mora of the subject marker is lost:

(29) $sí + á: \rightarrow sǎ: \quad ú + á: \rightarrow wǎ:$

Our subjects realize the H of the resulting syllable either as a rising tone (as Cassimjee [1998: 229] reports for Xhosa), or as a H tone. Khumalo (1982: 39) analyzes the rising tone in this case as a result of a dissimilatory process.

We observed a good deal of variation regarding the tone pattern of phrase-medial verbs in the remote past, and some of the tonal properties we observed are unexpected. All together, we identified four distinct tonal patterns:

Pattern 1: The H tone associated with the remote past marker does not shift or spread to the stem; all syllables following the combined subject prefix/tense marker are L-toned. This option is only attested three times:

(30) a. [wǎ:]namathiselisa ... (LM, RM)
 b. [zǎ:]hlabelela ... (LM)

Pattern 2: As in pattern 1, no H tone movement to the stem is observed, and all syllables following the tense marker are L-toned, except for the final vowel, to which a H tone is added. With LM, we observed the addition of the final H in more than half of all instances:

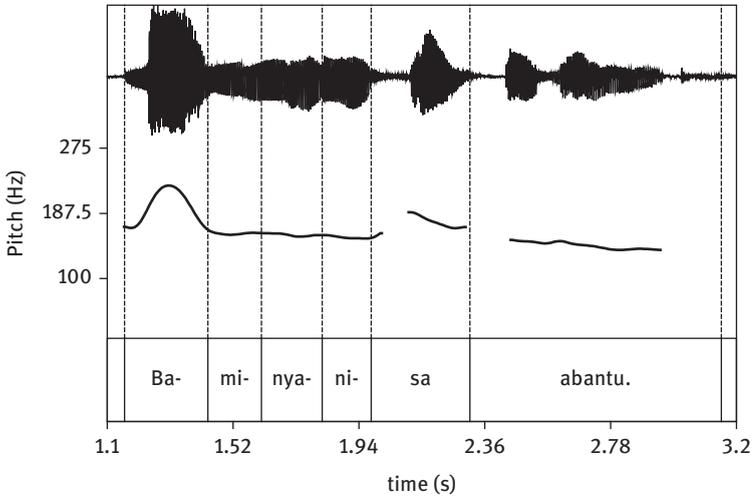


Figure 4: Pitch track of the phrase-medial verb in the remote past tense (LM; female speaker).

- (31) a. [zǎ:]paquluki[sá] ... (LM)
 b. [bǎ:]mínyani[sá] ... (LM), see Figure 4

Recall from Section 4.2.2 that a similar final H was found in some examples of phrase-medial verbs in the future tense.

Pattern 3: A third tonal pattern, attested with all three speakers, shows the H tone spreading from the remote past marker to the verb stem. However, contrary to what we expected in light of the tonal properties of phrase-medial verbs in the present and future tense, the H tone does not spread to the penult, but only as far as the antepenult:

- (32) a. [wǎ:námáthisé]lisa ... (PB)
 b. [wǎ:phéfúmú]lisa ... (RM)

H tone spread to the antepenult does not seem to be restricted to lexically toneless verbs where the H tone originates on a prefix, but appears to be a general pattern of the remote past (where spread occurs at all): with the lexically H-toned verb *phúmelela*, the H tone that originates on the verb stem also surfaces only on the antepenult, and does not spread to the penult, as we would have expected:

- (33) [zǎ:][phúmél]lela ... (LM)

Compare (33) to the tone pattern in (34), with a present tense phrase-medial verb:

- (34) [zi-phúmélél]la ... (LM)

Pattern 4: The fourth pattern combines pattern 3 with the final H that was observed as part of pattern 2. The H tone of the tense marker spreads to the antepenult, the penult has a falling contour, but the final vowel is H again. This pattern was attested twice with speaker PB:

(35) [bǎ:mínyá]ní[sá] ... (PB)

In the phrase-final verb forms, we expected the H tone of the object marker to move only as far as the antepenult. Pre-stem H tones in (Durban) Zulu surface on the antepenult when the verb is phrase-final (Cassimjee and Kisseberth 2001; Downing 2001a), and this pattern is familiar from the present and future.¹² Our results confirmed this expectation: the H tone of the object marker spreads to the antepenult, and the tone on the lengthened penult is falling. Note that the pitch of the H tone on the object marker is slightly lower than the pitch of the adjacent remote past (subject) marker, which suggests that downstep has occurred. Unlike the examples in (22), the H tones that surface on adjacent syllables are sponsored on underlyingly adjacent TBUs, satisfying the environment for downstep (Cassimjee and Kisseberth 2001: 329).

(36) a. [zǎ:][!yí-hlábé]lé:la (LM, PB, RM)
 b. [wǎ:][!bǎ-léké]lé:la (LM, PB, RM)

However, we also encounter a number of examples in this paradigm where no downstep is perceptible, despite its environment being met:

(37) a. [wǎ:][sí-fíphá]lí:sa (LM, PB, RM)
 b. [sǎ:][sí-páqúlú]kí:sa (PB, RM)

5 Discussion

With respect to the tonal and durational characteristics of verb forms in the present tense, future tense and remote past in Zulu, our study confirms most of the predictions we derived from existing analyses in the literature (see Section 2). Regarding penultimate lengthening, we observed that the duration of the penultimate syllable of a verb followed by an object-marked object is consistently longer than the penult of a verb followed by an object complement. This is independent of a simultaneous morphological marking of these verb forms as CJ/DJ. Correspondingly, we observed that a H tone originating on a verbal prefix that

¹² Recall from Section 3.1 that stem-initiated H tones in Durban Zulu always shift to the penult, even with phrase-final verbs.

shifts/spreads into the stem targets the antepenultimate syllable of the verb when the following object is object-marked. These findings are consistent with the assumption (discussed in Section 2) that object-marked objects in Zulu are vP-external and that verbs immediately preceding an object-marked object are always phrase-final, even in tense forms in which phrase-finality of verbs is not marked by segmental DJ-morphology. With the exception of some tonal patterns in the remote past which we discuss below, the tonal and durational characteristics that we observed can be accounted for solely by phrasing, given that prosodic and syntactic phrasing coincide.

In the remainder of this section, we discuss some of our findings that we regard as particularly noteworthy.

5.1 Length

Our comparison of the length of the penultimate syllable between phrase-medial and phrase-final forms shows a difference which, depending on speaker, is around 50 ms (LM), 30 ms (PB) or 25 ms (RM). We have interpreted this stable difference as indicative of a phrase boundary between the verb and a right-dislocated object (cf. Cheng and Downing 2009 and Section 2). However, it is notable that the observed difference, although consistent, is rather small, considering that the length of the whole syllable is measured. This is evident when we compare our data with the results of another study on penultimate lengthening, that conducted by Downing and Pompino-Marschall (2013). The authors investigate penultimate lengthening as a cue to phrasing in the Bantu language Chichewa.¹³ In their study, they measured the length of only the penultimate *vowel* on each constituent in a sentence like *mulimi wapatsa bambo tambaala* (“The farmer has given father a rooster”). According to their data, the difference in length between the penultimate vowel of the sentence-medial verb (*wa-patsa*; no object marking) and the penultimate vowel of the sentence-final noun (*tambaala*) is more than 85 ms.¹⁴ The saliently lengthened penultimate vowel of the sentence-final word in Chichewa has been interpreted as culminative prominence at intonation

13 We are not aware of any comparable empirical study on length in Zulu which we could use as a basis for a comparison, and it is for this reason that we discuss the data from Chichewa here.

14 This value reflects the comparison of averages across all speakers and all focus conditions which are reported by Downing and Pompino-Marschall (2013) taken from the published results of the second set of the two sets of sentences that they investigated. In the first set of sentences no difference between the length of the penultimate vowels of verb and object emerges (cf. Downing and Pompino-Marschall 2013, [18]).

phrase (IP-) boundaries, which is conventionally transcribed by means of a colon or a doubled vowel. The length difference that we find in our study, however, is clearly not as salient, even though we measured syllables, and not vowels. This raises the question if a phrase-final verb and a right-dislocated object are indeed separated by an IP-boundary in Zulu or rather by another type of prosodic phrase, which induces a lengthening that is less salient than that found with sentence-final words (cf. Kanerva 1990, who suggests that two different levels of phrasing in Chichewa, namely IP and a Phonological Phrase [PP], can be distinguished by different degrees of length). In light of this question, it would be interesting to test whether the length differences increase when the durational properties of phrase-medial verbs in Zulu are compared to those of *sentence*-final verbs (i.e. phrase-final verbs that are not followed by right-dislocated material).¹⁵ We intend to explore this issue further in future research.

Even though the length difference we observed in Zulu is perhaps less salient than expected, it nevertheless seems that a correlation between length and the target of H tone movement emerges: In the short penultimate syllables of the phrase-medial verbs, we find H tone movement to the penultimate position, whereas H tone movement to the penult seems to be blocked by the longer penultimate syllables of the phrase-final forms. As noted in section 2, Cassimjee and Kisseberth (2001: 334) propose that H tone movement to the antepenult results from the tendency to avoid the alignment of the right edge of a H tone domain with a metrically prominent syllable. It seems that the lengthening of the penult associated with phrase-final verbs is less salient when the verb is followed by right-dislocated material, but nevertheless salient enough to be regarded as metrically prominent and to block H tone movement.

5.2 Tone

Our study confirmed that a H tone sponsored by a subject marker moves to the right as far as the penult if the verb is in the present tense and phrase-medial in Zulu (Section 4.2.1). The fact that we did not observe this H tone spread or shift from the subject marker in the future tense (Section 4.2.2) follows from the status of *zo-*. As noted above, *zo-* is diachronically related to an auxiliary that has undergone

¹⁵ We thank a reviewer for raising this point. The reviewer also notes that right-dislocated objects can take scope under negation (Buell 2008; Zeller 2012), which can be interpreted as evidence that dislocated material is realized in a relatively “low” vP-external position, and is therefore presumably still located inside the constituent that corresponds to a major prosodic phrase (i.e. IP).

grammaticalization. The prosodic domain that blocks tone spread from the subject marker across *zo-* and into the stem can be regarded as evidence that this process, which would turn *zo-* into a prefixal tense morpheme, has not been fully completed. Otherwise, the non-alternating future tense shows the same phonological processes as the present tense, which marks the *CJ/DJ* alternation segmentally (the occurrence of a final H in some of our future tense examples is discussed below).

The tonal patterns in the remote past medial are somewhat involved. It was shown in Section 4.2.3 that we distinguished four patterns, which we repeat here for expository purposes:

(38) Tone pattern of the remote past tense

Pattern 1: [*wǎ:*] *namathiselisa* ...

The remote past marker bears a rising tone, and the remainder of the syllables are toneless.

Pattern 2: [*zǎ:*] *paquluki[sá]* ...

As in Pattern 1, but with a H on the final syllable.

Pattern 3: [*wǎ:námáthisé*] *lisa* ...

Rising tone on tense marker, all stem syllables through the antepenult are H

Pattern 4: [*bǎ:mínyá*] *ni[sá]* ...

As in pattern 3, but with a falling tone on the penult and a final H.

With respect to the H tone of the remote past marker *áa-*, the four patterns in (38) show two options: one in which the H of the tense marker does not spread off the syllable to which it is underlyingly linked, and another in which it spreads through to the antepenult. These two options then independently co-occur with the final H, resulting in the four patterns in (38).

We therefore suggest that the difference between patterns 1 and 2 on the one hand and patterns 3 and 4 on the other is based on the optional spread of the H from the remote past tense marker *áa-*. In mutually intelligible Ndebele, this morpheme's H never spreads or shifts, and also suppresses the expression of any other H tones that may be underlyingly present in the verb complex, such as the H of an object marker or of a H-toned stem (Sibanda 2004: 278). Patterns 1 and 2 are then reminiscent of Ndebele, whereas patterns 3 and 4 show an instance of divergence from how the remote past tense behaves in Zulu's closely related cousin.

What is surprising about the patterns 3 and 4, though, is that the H should only spread to the antepenult. As discussed in previous sections, it is widely accepted that H tones target the penult phrase-medially, because the penultimate syllable of the verb is not lengthened. We would therefore expect the subject

marker's H tone to spread all the way to the penult in the phrase-medial forms of the remote past. Herman (1996: 44) argues for the mutually intelligible Nguni language Swati that penultimate lengthening can be analyzed as the construction of a foot at the right edge of a verb complex. Following Herman, it is tempting to posit the existence of some sort of prosodic structure in this position in the remote past that would block the spread of the H to the penult. However, there is no penultimate lengthening in the remote past medial, so whatever is behind this pattern does not manifest itself beyond the blocking of H spread to the penult.

There also remain some lingering questions about the antepenultimate spread (as opposed to shift) shown in patterns 3 and 4. We hypothesize that the dominance of spread is due to the requirement that the remote past marker surfaces with its H, which necessarily creates an environment for spread and not shift because it creates a link between sponsor and target.

We turn next to the final H tone which was observed in patterns 2 and 4 of the remote past. Patterns 2 and 4 were only attested with two of the three speakers we recorded (LM and PB), and even these speakers did not systematically pronounce the final syllable of verbs in phrase-medial position with a H tone. The final H also appeared in some examples of phrase-medial forms of the future tense (see Section 4.2.2). In the following, we offer some speculations on the nature of this "occasional" final H, which are based on a comparison of different tonal analyses of the remote past that have been proposed for Zulu and related Bantu languages. The hypothesis that we will eventually put forward below is that this H tone may in fact be a grammatical marker of the CJ-form that speakers can optionally use in some tense forms in Zulu.

Khumalo (1982) claims that the remote past in Zulu is realised by the prefix *áa-* and a suffix *-a* that introduces a grammatical H tone. With verbs in phrase-final position, whose penult is lengthened, this H tone gives rise to the tone pattern HLL on the lengthened penult and the final vowel. This is shown in (39), adopted from Khumalo (1982: 49):

(39) *wâ:thùkù'thê:lâ*

The grammatical H tone causes the lengthened penult to be pronounced with a falling tone, followed by a low final vowel.

Khumalo's analysis may indeed be able to explain some of the different tone patterns that we observed in the remote past. We found that with object-marked phrase-final verb forms, the H of the remote past is indeed realised as a falling tone on the penult, exactly as in (39). In contrast to (39), however, the H-toned object marker causes the intervening syllables to be H as well, due to the spread of the object marker's H to the antepenult. (40) repeats our example (36a) from Section 4.2.3:

(40) [zǎ:][!yí-hlábé]lê:la

The final H tone we observed in patterns 2 and 4 with verbs in phrase-medial position can now be analysed as the realisation of Khumalo's grammatical H in contexts where there is no penultimate lengthening: With phrase-medial forms, the grammatical H would be realised on the final vowel. Since Khumalo does not include examples of remote past verbs phrase-medially, it is possible that his suffixal HLL is in fact simply a final H. Phrase-finally, the final syllable is extra-prosodic, so it is inaccessible and the H is assigned instead to the penult. The penult in turn lengthens, and is realized as a falling tone. Although phonetically similar to the fall of final penults which are phonologically low (see footnote 10), the remote past penults are phonologically falling.

Such an analysis of the remote past also connects with other past tense morphologies in Bantu. A grammatical H associated with the final syllable of the remote past tense is also found in Umbundu (R11, spoken in Angola). Umbundu uses a general L-toned past tense marker *-a-*, and distinguishes between the near and the remote past through different suffixes: The remote past suffix in Umbundu is *-á*, the recent past is *-éle*:

- (41) a. *tw-a-land-éle* 'we (have) bought (near past)'
 b. *tw-a-land-á* 'we (have) bought (far past)'

[Umbundu; Nurse and Philippson 2006: 158]

A related, but slightly different, account of the tone pattern of the remote past tense in Zulu could incorporate the idea that the final H tone of patterns 2 and 4 does not originate on the final vowel, but on the verb stem. Cassimjee (1998) argues that in the closely related Nguni language Xhosa, a grammatical H tone is associated with the second mora of the verb stem in the remote past.¹⁶ Although she does not provide examples of phrase-medial verbs, her discussion [p. 230] suggests that this H is expected to shift and to surface on the final syllable in these contexts. (Cassimjee [p. 230] argues that the constraint that prevents H tones on final syllables from being realised, which operates in the present tense medial, does not hold

¹⁶ This grammatical H seems to be related to a phenomenon briefly discussed in Kisseberth and Odden (2003: 61–2), Nurse and Philippson (2006: 165) and Nurse (2007: 173), which is referred to as a “melodic H”. The melodic H is characterized as a grammatical tone attested in several Bantu languages which is preferably assigned to the second or final mora of the verb stem, “in contexts that are not well understood” (Nurse and Philippson 2006: 165). The examples discussed by Kisseberth and Odden (2003) include Yambasa, which marks the remote past by a H tone which spreads from the second to the final syllable of the stem, and Namwanga, which uses a grammatical H on the final vowel as a marker of the potential tense.

in the remote past.) Similarly, Donnelly (2007: 598, footnote 93) notes that in the Nguni language Phuthi, the remote past is formed by means of a grammatical H tone on the stem which spreads to the final syllable (presumably only with phrase-medial verbs). The segmental marker for the remote past in Xhosa and Phuthi is the prefix *áa-*, as in Zulu. One could therefore postulate that the remote past in Zulu is similar to Xhosa and Phuthi in that a grammatical H is associated with the stem in the remote past tense. According to this alternative, the final H of patterns 2 and 4 would be the realisation of this grammatical H tone, which has shifted to the right.¹⁷

We noted above that, according to Khumalo's (1982) analysis, the falling tone on the penultimate vowel of the phrase-final verb in our example (40) would be the result of the same grammatical H tone that is realised as an H on the final vowel with phrase-medial verbs. However, one problem for this analysis is raised by the fact that it does not account for the *absence* of the final H in patterns 1 and 3. In order to explain the variation we observed with respect to the remote past medial, we would have to stipulate that speakers can freely omit the grammatical H that is otherwise associated with the final vowel in patterns 2 and 4. But although one and the same speaker can sometimes shift between these different patterns in the remote past medial (e.g. PB alternates between patterns 3 and 4), all speakers consistently realise the phrase-final forms with a falling tone on the penult, including the speaker RM, who never produced a final H in any examples of the phrase-medial remote past. It is therefore not entirely clear that the tonal pattern of the remote past final forms really involves the same underlying H tone that is associated with the final vowel in the phrase-medial verb forms.

We therefore want to consider one more alternative analysis of the final H in patterns 2 and 4. This alternative is based on the assumption that the final H of the phrase-medial forms is not related to the falling tone on the penult in examples such as (40). According to this assumption, only the H of the object marker is present in the macrostem constituent when the verb is phrase-final in the remote past, and it is this H that spreads to the antepenult, producing a falling tone on the penult. This implies that the grammatical H tone observed in patterns 2 and 4 is only associated with phrase-medial, and never with phrase-final, verbs.¹⁸

This idea is interesting in the light of the tonal pattern of the recent past in Zulu, a tense form that we have not examined in our study. As noted in Section 2,

17 To explain pattern 4, one would have to assume that the spreading of the H of the subject prefix to the antepenult does not prevent the grammatical H from shifting to the final syllable.

18 Admittedly, this assumption does not explain the falling tone on the penult in Khumalo's example (39). Since we have not collected any original data with phrase-final verbs without object markers, we have to leave this point open.

the recent past distinguishes segmentally between a CJ and a DJ form. In the CJ form, the phrase-medial verb carries a H-toned suffix *-é*, while the DJ form is marked by the suffix *-ile*:

- (42) a. *Ngi-fund-é* *i-n-cwadi*.
 1SG.SM-read-PST AUG-9-book
 ‘I read a book.’
- b. *Ngi-fund-ile*.
 1SG.SM-read-PST.DJ
 ‘I read.’

The final H tone in (42a) is commonly assumed to be associated directly with the tense suffix that marks the CJ form of the recent past (see e.g. Khumalo 1982). However, Cassimjee (1998: 202) provides evidence (for Xhosa) that the grammatical H associated with the CJ form of the recent past does not originate on the tense marker, but on the second syllable of the verb stem, from where it shifts to the end of the word (see also Donnelly 2007: 598, footnote 93, for Phuthi).¹⁹ Importantly, this grammatical H is only associated with the CJ form of this tense in both Xhosa and Zulu. This means that the H tone should not be analysed as a part of the recent past tense morphology; rather, it seems to be *a marker of the CJ form*.

We therefore propose that the grammar of Zulu includes a grammatical H tone that marks the CJ form of the recent past. The occurrence of this grammatical H in Zulu is for the most part morphologically conditioned – it is systematically observed only in the recent past –, which is of course not uncommon in Bantu (cf. Creissels’s [this volume] discussion of various tense forms in Tswana in which the CJ/DJ alternation is marked solely by tone). However, we consider it possible that the existence of a grammatical H tone that systematically marks the CJ form in one tense can lead to a situation in which speakers use the same grammatical H tone to mark the CJ form in other tenses, albeit not systematically. We therefore would like to put forward the hypothesis that the grammatical H that marks the CJ form of the recent past in Zulu is also used occasionally to mark the CJ form of tenses in which the CJ/DJ alternation is not marked by segmental morphology, i.e. the remote past and the future tense. According to this hypothesis, patterns 2 and 4 above combine the segmental remote past tense marker *áa-* with a grammatical H on the second mora of the verb stem which specifically marks the CJ form.

19 The final vowel in both the recent and the remote past tense is slightly lengthened and is realised as a falling tone. Cassimjee (1998) analyses this tone pattern in Xhosa by suggesting that the final suffix in the recent past is bisyllabic /*éé*/ (a contracted form of the long form suffix *-ile*), with the H realised on the penultimate syllable. Correspondingly, the final H that we observe in the remote past could be analysed as slightly lengthened with a falling tone (/*áá*/).

The H shifts to the right, and surfaces on the final vowel. This hypothesis, although perhaps not unproblematic, is consistent with the observation that the final H tone does not consistently appear in our remote past tense data, but also shows up in some instances of the future tense. We consider the idea that there may be a tonal morpheme in Zulu that is correlated exclusively with a verb in phrase-medial position a promising area for future research.²⁰

6 Conclusion

Our study raises some interesting questions which deserve further research. Although the length data clearly suggest a boundary intervening between DJ-forms and postverbal material, it remains an open question as to which prosodic level this boundary belongs. In this article we only looked at two of the most well-known phonological correlates of phrasing in Nguni, namely tonal alternations and length. Further research could also take other segmental and tonal processes related to phrasing into consideration. Lanham (1960: 83), e.g., reports downstep to take place within a phrase. This means that in a sequence of high and low tones, a H tone following a low tone is lower in pitch than any earlier H tone (Lanham 1960: 83). However, after a phrase boundary, the pitch of H is “reset” (Lanham 1960: 90). Rycroft (1980: 6, footnote 20) also addresses this issue and suggests that downstep in Nguni occurs “irrespective of whether L tones intervene”. Cross-linguistically, a further common cue to prosodic phrasing is preboundary lengthening (Vaissière 1983) in which a vowel preceding a word and/or phrase boundary is lengthened. Further research should take these further cues to phrasing into consideration.

As we noted in Section 3.3, the data for our phonetic analysis were elicited in a way that might make speakers aware of the relevant differences and thus might have prompted prosodic disambiguation. Therefore, another potential topic for future research would be to investigate to what extent our findings are representative of ordinary language use and whether speakers also realize the observed prosodic differences in more natural contexts.

The real challenge in understanding the relationship between lengthening on the one hand, and the target for H tone movement on the other, are the tone patterns from the remote past medial. Here, all accounts would predict tone

20 As a reviewer points out, it would be interesting to compare the tone movement patterns in the recent past to those that we observed in the remote past and future tenses, in order to see if these patterns provide further evidence for our idea that the final H observed in these different tenses is in fact the same morpheme.

movement to the penultimate syllable, but we find movement to the antepenultimate only, as if there was a phrase boundary intervening between verb and object. However, an intervening phrase boundary would not be predicted by syntax nor is it backed up by the length data. It therefore remains a puzzle.

As we noted in the introduction, a major question that motivated our study was whether any of the phonological differences that we observed between verbs in phrase-medial and phrase-final position can be interpreted as grammatical markers of the CJ/DJ alternation. In Section 5.2, we put forward the hypothesis that the final H tone that regularly appears on phrase-medial verbs in the recent past tense, but occasionally also in the remote past and future tense, may be considered a tonal morpheme marking the CJ form in Zulu. Apart from this final H, most of the regular durational and tonal patterns we observed can presumably be explained with reference to independent principles that operate at the interface between phonology and syntax (as Kula this volume also finds for Bemba). However, the variation we noted regarding the tonal properties of the remote past medial are again difficult to explain on the basis of regular phonological processes, and could be a symptom of a rather different scenario. For example, one alternative hypothesis (which was suggested to us by an anonymous reviewer) could be that at an earlier stage, the CJ/DJ alternation in Zulu was marked more systematically in various tenses, but by different tonal strategies (something which still seems to be the case in present-day Tswana; see Creissels [this volume]). According to this hypothesis, our findings, and in particular the lack of a uniform pattern in the remote past, could then be the result of this tonal system undergoing a change in Zulu, perhaps towards a strategy that employs a melodic H tone (see footnote 16). However, as the reviewer points out, before this hypothesis can be substantiated, more empirical work would be required that includes an extension of our study to other tense forms in Zulu. Since our research so far has only focused on the properties of the future and the remote past tense, our hypotheses and conclusions regarding the phonological regularities underlying the CJ/DJ alternation in Zulu can only be tentative. However, we hope that future research can shed more light on some of the ideas we have discussed here and answer some of the remaining questions that have arisen from our study.

Abbreviations and symbols

Following standard practice, we mark Bantu noun class prefixes and corresponding agreement markers through numbers. High tone is marked by an acute accent on the syllable; low tone is unmarked.

1SG, 2SG first, second person singular

AUG	augment	OM	object marker
CJ	conjoint verb form	PST	recent past tense
DJ	disjoint verb form	Q	question particle
FUT	future tense	RPST	remote past tense
FV	final vowel	SM	subject marker

Appendix

Full list of target sentences

- (1) Izingane zihlabelela ingoma. ‘The children sing a song.’
 Present Tense CJ: Izingane zi-hlabelela ingoma.
 Present Tense DJ: Izingane zi-ya-yi-hlabelela ingoma.
 Future Tense CJ: Izingane zi-zo-hlabelela ingoma.
 Future Tense DJ: Izingane zi-zo-yi-hlabelela ingoma.
 Remote Past CJ: Izingane z-a-hlabelela ingoma.
 Remote Past DJ: Izingane z-a-yi-hlabelela ingoma.
- (2) Umfundi unamathiselisa iphepa odongeni. ‘The student sticks paper to the wall.’
 Present Tense CJ: Umfundi u-namathiselisa iphepa odongeni.
 Present Tense DJ: Umfundi u-ya-li-namathiselisa iphepa odongeni.
 Future Tense CJ: Umfundi u-zo-namathiselisa iphepa odongeni.
 Future Tense DJ: Umfundi u-zo-li-namathiselisa iphepa odongeni.
 Remote Past CJ: Umfundi w-a-namathiselisa iphepa odongeni.
 Remote Past DJ: Umfundi w-a-li-namathiselisa iphepa odongeni.
- (3) UJohn ulekelela abazali bakhe. ‘John assists his parents.’
 Present Tense CJ: UJohn u-lekelela abazali bakhe.
 Present Tense DJ: UJohn u-ya-ba-lekelela abazali bakhe.
 Future Tense CJ: UJohn u-zo-lekelela abazali bakhe.
 Future Tense DJ: UJohn u-zo-ba-lekelela abazali bakhe.
 Remote Past CJ: UJohn w-a-lekelela abazali bakhe.
 Remote Past DJ: UJohn w-a-ba-lekelela abazali bakhe.
- (4) Udokotela uphefumulisa isiguli. ‘The doctor makes the patient breathe.’
 Present Tense CJ: Udokotela u-phefumulisa isiguli.
 Present Tense DJ: Udokotela u-ya-si-phefumulisa isiguli.
 Future Tense CJ: Udokotela u-zo-phefumulisa isiguli.
 Future Tense DJ: Udokotela u-zo-si-phefumulisa isiguli.
 Remote Past CJ: Udokotela w-a-phefumulisa isiguli.
 Remote Past DJ: Udokotela w-a-si-phefumulisa isiguli.

- (5) Udokotela ufiphalisa isiguli. ‘The doctor causes the patient to lose hope.’
 Present Tense CJ: Udokotela u-fiphalisa isiguli.
 Present Tense DJ: Udokotela u-ya-si-fiphalisa isiguli.
 Future Tense CJ: Udokotela u-zo-fiphalisa isiguli.
 Future Tense DJ: Udokotela u-zo-si-fiphalisa isiguli.
 Remote Past CJ: Udokotela w-a-fiphalisa isiguli.
 Remote Past DJ: Udokotela w-a-si-fiphalisa isiguli.
- (6) Baminyanisa abantu. ‘They make the people squash together.’
 Present Tense CJ: Ba-minyanisa abantu.
 Present Tense DJ: Ba-ya-ba-minyanisa abantu.
 Future Tense CJ: Ba-zo-minyanisa abantu.
 Future Tense DJ: Ba-zo-ba-minyanisa abantu.
 Remote Past CJ: B-a-minyanisa abantu.
 Remote Past DJ: B-a-ba-minyanisa abantu.
- (7) Isiphepho sipaqulukisa isakhiwo. ‘The storm causes the building to collapse.’
 Present Tense CJ: Isiphepho si-paqulukisa isakhiwo.
 Present Tense DJ: Isiphepho si-ya-si-paqulukisa isakhiwo.
 Future Tense CJ: Isiphepho si-zo-paqulukisa isakhiwo.
 Future Tense DJ: Isiphepho si-zo-si-paqulukisa isakhiwo.
 Remote Past CJ: Isiphepho s-a-paqulukisa isakhiwo.
 Remote Past DJ: Isiphepho s-a-si-paqulukisa isakhiwo.

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