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Abstract

In many analyses of Bantu reduplication, one puzzling aspect is the absence of correspondence between the final vowel (FV) of the reduplicant (RED) and the FV of the base. In Zulu, the default FV for a verb is the -a found throughout Bantu, but certain forms, such as the recent past and subjunctive, take an FV of -e, and a final -i is correlated with negation, all of which are barred from appearing on RED. This systematic mismatch between the RED and base is difficult to account for within Optimal Theory, where it is necessary to formulate constraints that penalize including ‚inflectional,‘ material in RED, or have different rankings for RED-Base Faith constraints for root material (high-ranked) vs. non-root material (low-ranked). In Distributed Morphology, the absence of correspondence between the FV of RED and the FV of the base follows straightforwardly from the nature of the derivation, as the FV -a is taken to be an intermediate spell-out of the v (verbalizing) head that attaches to an acategorical root. In the RED+base verb complex as a whole, this -a gets overwritten as the verb moves up to higher syntactic projections (such as mood, aspect, and negation), but at this point, RED is no longer accessible as a privileged constituent, and its -a FV cannot be targeted.

Explaining the Final Vowel Mismatch in Zulu Reduplication

Toni Cook*

1 Introduction

In many analyses of Bantu reduplication, one puzzling aspect is the absence of correspondence between the final vowel (FV) of the disyllabic reduplicant (RED) and the FV of the base. Focusing on Zulu, the default FV for a verb is *-a* (as is the case throughout Bantu), but certain forms, such as the recent past and subjunctive, take an FV of *-e*, and the present negative takes an initial *a-* and final *-i*, all of which are barred from appearing on RED. Reduplication consists of a disyllabic CVCV constituent prefixed to the verb, with the meaning that the action denoted by the verb is performed ‘here and there, without much skill’ (the RED+base complex is bracketed in the examples below, tone is omitted):

- (1) a. *u-cul-a* → *u-[cul-a+cul-a]*
“You sing...” “You are doing a bad job of singing...”
b. *u-cul-e* → i. *u-[cul-a+cul-e]*
“You sang...” (recent past) ii. **u-[cul-e+cul-e]*
“that you sing” (subjunctive)
c. *a-wu-cul-i* → i. *a-wu-[cul-a+cul-i]*
“You aren’t singing” (neg. pres.) ii. **a-wu-[cul-i+cul-i]*

This systematic mismatch between the RED and base is difficult to account for within Optimal Theory (OT), where it is necessary to formulate constraints that penalize including “inflectional” material in RED (Hyman et al. 2009), or have different rankings for RED-BASE FAITH constraints for root material (highly ranked) vs. non-root material (low ranked) (Downing 2001).

In a derivational theory such as the one implemented here (Distributed Morphology (DM), Halle and Marantz 1993, Embick 2010), the absence of correspondence between the FV of RED and the FV of the base follows straightforwardly from the nature of the derivation, as the FV *-a* is taken to be an intermediate spell-out of the *v* (verbalizing) head that attaches to an acategorical root. In the RED+base verb complex as a whole, this *-a* gets overwritten as the verb moves up to higher syntactic projections (such as mood, aspect, and negation), but at this point, RED is no longer accessible as a privileged constituent, and its *-a* FV cannot be targeted.

2 Previous Accounts

In analyses of nearly identical data from Ndebele, Hyman et al. (2009) and Downing (2001) claim that the (ii) examples from (1) above are ungrammatical because inflectional material is included in the reduplicant, and this is not allowed.

However, in these analyses, the distinction between inflectional material and non-inflectional material is simply stipulated. That is, the *-e* final vowel marking the recent past or the subjunctive, and the *-i* of the negative, are not permitted to appear on the reduplicant because there is a constraint barring inflectional material in the reduplicant, but the motivation for labeling these morphemes as inflectional comes principally from how they behave under reduplication. Consequently, in Zulu and Ndebele there is no reason beyond the reduplication data to justify the inflectional label that is applied to morphemes like the recent past, subjunctive, and negative.

We know that underlying structure must be taken into account, because there are other examples when a reduplicant is permitted to end in an *-e* or *-i*, when the verb root is larger than the

*Thanks to Nosipho Khumalo and my Zulu informants in South Africa for their generosity and patience in sharing their language with me.

disyllabic template and must be truncated to yield a well-formed reduplicant:

- (2) a. *u-ya-hlébez-a* → *u-ya-[hlébe+hlebez-a]*
 “You are whispering”
 b. *u-ya-gigitheka* → *u-ya-[gigi+gigithek-a]*
 “You are giggling”

What (2) shows is that a strictly phonological requirement requiring that the reduplicant not end in *-i* or *-e* is insufficient, since these vowels are allowed if they part of the root.

3 A Derivational Analysis

Rather than stipulating certain morphemes as “inflectional”, the derivational approach implemented here allows for the mismatch between the final vowel of the base and the reduplicant to happen as a natural consequence of the derivation. We no longer need to resort to applying the somewhat arbitrary label “inflectional” to a class of morphemes.

The claim is that the final vowel *-a* is the phonological realization of the category defining *v* verbalizing head, which attaches to an acategorical root (Embick 2010). The RED morpheme, a bare prosodic template $[\sigma]$, in turn attaches outside the verbalizing morpheme, and the root+*v* is mapped left-to-right to the template (Marantz 1982), as the examples in (2) clearly demonstrate.

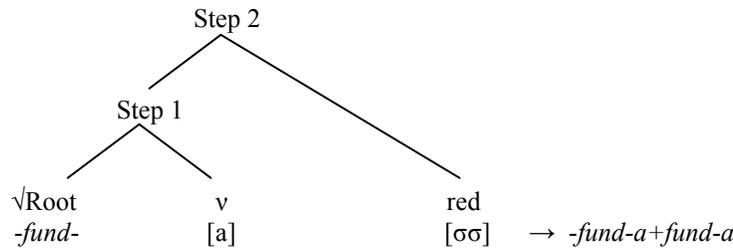


Figure 1: Reduplication within VP.

For roots with a prosodic shape of CVC, the reduplicant and the base are identical at this point in the derivation. In all the examples in (1), this is what the RED+base complex looks like before the verb moves out of VP and onto higher syntactic projections (Chomsky 1995)—it is only when the verb moves to these higher projections that the final vowel on the base is changed from *-a* to *-e* (recent past, subjunctive), or *-i* (negative).

I argue that movement out of VP plays a crucial role in delineating phonological domains; once the verb has moved out of VP, the RED+base complex is an unanalyzable chunk. Consequently, it is not surprising that we only see the exponents of these higher syntactic morphemes on the base and not on the reduplicant, since the reduplicant is no longer a privileged or accessible object once the verb has left VP.

Figure 2 below shows that in this analysis, all the changes we see as the verb (the RED+base complex) moves up out of VP are marked peripherally to the constituent which is formed in VP. None of these morphemes (the inflectional morphemes in Hyman and Downing’s work) occur internally to the RED+base complex, by virtue of the fact that the reduplicant is no longer recognizable as a sub-constituent once the complex has left VP. The output of Figure 1 is then the input to Figure 2, and the morphemes that exist as distinct exponents in VP lose their status as separate morphemes once the verb exits VP.

Another way of thinking about this is that the base-RED relationship is essentially voided once the verb moves out of VP. When the peripheral inflectional morphemes appear in the structure, they are not attaching to the base (as the base exists in the RED+base complex). Instead, they are attaching to the full complex, so the final vowel mismatch between the reduplicant and the base is in fact a mismatch between the final vowel of the reduplicant and the final vowel of the RED+base complex as a whole.

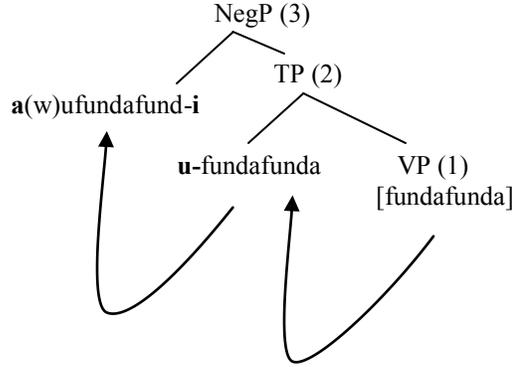


Figure 2: Movement to higher projections

4 What is the Morphosyntactic Status of the Final Vowel of the Reduplicant?

One important feature of the widespread absence of correspondence between the final vowel of the base and reduplicant is the source of the *-a* on the reduplicant. In the Distributed Morphology analysis proposed here, I have claimed that it is the spell-out of the verbalizing head (Halle and Marantz 1993). A glance at noun-formation strategies in Zulu supports the claim that category-defining morphology is reflected in word-final vowels, where an *-o* indicates a plain nominal, and an *-i* an agentive noun (Doke 1943):

- (3) a. *-cul-* → *-cul-a* ‘sing’ → *um-cul-o* ‘music’ → *um-cul-i* ‘singer’
 b. *-dlal-* → *-dlal-a* ‘play’ → *um-dlal-o* ‘game’ → *um-dlal-i* ‘player’

In the well-known OT analyses, the final *-a* is a “default verbal morpheme” (Downing 1997), and a RED+base complex like *-fund-a+fund-e* is seen as two occurrences of a verb stem (Downing 2003). The final *-a* is the most common verbal ending throughout Bantu, so in reduplication it has been interpreted as essentially signaling that the reduplicant is a verb, without expressing any additional information (an idea first put forward in Mutaka and Hyman 1990).

Since the reduplicant minimally consists of a root + a grammatical morpheme,¹ it satisfies Downing’s (2006) definition of a stem, and reduplication is then stem-stem compounding (Inkelas and Zoll 2005). This connection—that the reduplicant is an occurrence of a verb stem, meaning that the RED+base complex is a compound verb stem—is first established in Downing (2003), though the formal definition that a “stem” is necessarily made up of a root and a grammatical morpheme comes in Downing (2006). Because the reduplicant is argued to be a verb stem in its own right, when it ends in the default verbal *-a* this segment receives the status of “final vowel”, normally reserved only for the final segment in full verb words (Meeussen 1967).

In some ways, the DM version of things looks similar to how they’re analyzed in OT, but in others there are important differences that are quite clear. In DM, we have an acategorical root that merges with a *v* verbalizing head to yield what ultimately gets reified as a reduplicant, and in OT, there’s a constituent (the reduplicant) which is required to be a verb stem, and the way this is achieved is by adding a morpheme (the final vowel *-a*) that characterizes a constituent as a verb elsewhere in the grammar. But what this scenario fails to acknowledge is the role of prosody in defining morphological constituents in OT; while a stem is composed of two morphemes, this theory makes an explicit connection between a stem and disyllabicity, i.e., between two morphemes and two syllables (McCarthy and Prince 1995).

In OT, the prosodic output drives the morphology in a way that is unavailable for a DM-based approach. For DM, the prosodic shape of the reduplicant is built into the lexical representation of the RED morpheme, as a bare CVCV template. Although the prosody receives what might be seen

¹The exception to this is when the root is prosodically larger than CVC; in these cases, the requirement on the reduplicant is that it fully parse the root, and there is no segment that does not belong to the root.

as a more straightforward analysis in OT, for practitioners of this theory, it's difficult to account for the failure of non *-a* final vowels to appear in the reduplicant. If RED is a verb stem, its inability to be conjugated like one is puzzling, and the result is the not very compelling *INFLECTIONAL constraints that don't hold up very well under scrutiny.

Even in cases where there appears to be perfect correspondence between the final vowel of the reduplicant and the base, Downing, Hyman, and Inkelas claim that this phonological match is in fact deceiving.

- | | | | | |
|--------|--------------------|---------------------------------|---|-----------------------------|
| (4) a. | <i>u-be-fúnd-a</i> | “You were studying | → | <i>u-be-[fúnd-a+fund-a]</i> |
| b. | <i>wá-fúnd-a</i> | “You studied (a long time ago)” | → | <i>wá-[fúnd-a+fund-a]</i> |
| c. | <i>u-zo-fúnd-a</i> | “You will study” | → | <i>u-zo-[fúnd-a+fund-a]</i> |

These authors argue that the superficial phonological correspondence between the two final vowels is an accident in that in fact the final *-a* occurring on the base is a different *-a* from that occurring on the reduplicant. The final vowel on the base is said to *always* carry inflectional information that cannot, by definition, occur on the reduplicant.

This view contrasts with the one presented here. Although the final *-a* (the phonological realization of the *v* head) may get overwritten during the course of the derivation— if no other morpheme that receives phonological expression in the final vowel is introduced— the *-a* we see merging with the root in VP is the same *-a* that is present on both the reduplicant and the base once the full verb complex is assembled. The other claim put forward in the OT literature is strange in some key respects: the argument goes that reduplicants of CVC roots must end in *-a* because this is the default vowel for verb stems, but if there is never a genuine match between the FV of RED and the FV of the base, the only place we ever see the reduplicant-final *-a* is on reduplicants. In other words, according to the OT analyses, throughout the grammar, in all the other verbal paradigms where we see a final *-a* it contains inflectional features that are absent from the RED-final *-a*.

For instance, in the examples in (4) above, the final *-a* in (a) does not just carry a [+verb] feature, but also [past] and [progressive]. However, the past progressive tense is not distinguished by its final vowel, but instead by the *-be-* morpheme that occurs between the subject marker *u-* and the verb root *-fúnd-*. Implicitly then, there is a great deal of redundancy inherent in how the OT approach handles morpheme exponence in the Bantu verb. In DM, a 1:1 relationship between an underlying feature and how it's encoded in the surface structure is built into the theory by virtue of its item-based nature. OT's insistence on the final *-a* of the base being inflectional compromises much of what it gains in linking morphology and prosody through the “two morpheme-two syllable homology” it proposes for verb stems, because reduplicants are the only place we ever find this relationship genuinely intact. In every other occurrence of a disyllabic verb stem throughout the verbal paradigm, it must contain at least *three* morphemes, 1) the root, 2) [+verb], and 3) some sort of TAM marking that is necessarily inflectional.

5 How Does the *-a* Get Overwritten?

In Figure 2, when the verb moves from TP up to NegP, the *-a* that was previously present as the final vowel on the full verb complex vanishes, and is replaced by an *-i* — part of the realization of the negative morpheme along with an initial *a-*:

- (5) *-cul-a+cul-a* → *u-cul-a+cul-a* → *a-(w)u-cul-a+cul-i*

Although there is a rough sketch of the derivation in (5), the details of the process remain somewhat unclear. Is the *-a* still “around” but for some reason fails to surface, or is it deleted and entirely replaced by the *-i*?

If the *-a* were still present, we would expect vowel coalescence to occur, and [a+i] → [e], as in Sibanda (2009):

- | | | | | |
|--------|--------------------|---|-------------------|------------------|
| (6) a. | <i>u-ya-isab-a</i> | → | <i>u-ye-sab-a</i> | “you are afraid” |
| b. | <i>wa-intombi</i> | → | <i>we-ntombi</i> | “of the girl” |

Since we do not observe any vowel coalescence, we might be tempted to assert that the *-a* has deleted.

However, a significant point of the analysis proposed here is that the morphosyntactic status of morphemes is lost, or no longer accessible, as the verb moves out of VP, and that the RED+base complex (as it exists when it moves up from VP) is just an unanalyzable chunk of phonological material. If the original final *-a* on the base is introduced as early in the derivation as I argue it to be, then we can't claim that it gets treated exceptionally when the higher structure receives phonological form. The *-a* shouldn't have any special status regarding the morphophonological rules we would expect to apply in a given environment, i.e., a word-internal sequence of [a+i] should coalesce to form an [e].

What this means is that if the *-a* is indeed present when the *-i* gets added, by the application of the rule of vowel coalescence, the final vowel on the full verb complex in the present negative should be an *-e*. But this is not what we find; the final vowel is an *-i*. In light of the failure of vowel coalescence to apply, the morphemes that realize certain TAM and negation features suffixally do not have a segmental phonological realization in the traditional sense. Instead, they are realized via adjusting the final vowel that is already present, an *-a*, via a readjustment rule (Embick 2010). In the negative, this *-a* is changed to *-i*, and in the subjunctive and recent past, it is changed to an *-e*.

6 Reconciling Late Insertion with Filling of the RED Template and Exponence of TAM Morphemes

This account of Zulu reduplication is couched in the framework of Distributed Morphology (DM), which has as a key tenet the notion of “late insertion.” In DM, there is an important distinction between root morphemes and functional morphemes, and the point in the derivation when they receive phonological form; essentially, the phonology of roots, like the verb roots *-cul-* ‘sing’ and *-fund-* ‘study, read’ is present from the start, from when the building of a complex object first begins. Functional morphemes on the other hand— like the category defining head *v* which attaches to an acategorical root and makes it a verb— are supposed to wait until “spell-out” before getting a phonological realization.

In DM, the principles that underlie syntactic processes are taken to underlie morphological processes as well. This can be seen in the diagrams given in Figures 1 and 2, which use the conventions of syntactic trees to model even the earliest stages of word formation. When the functional morphemes get their phonology is related to the notion of “phases” in minimalism (Chomsky 1995); certain morphemes are “cyclic,” meaning they trigger spell-out (Embick 2010). In other words, non-cyclic functional morphemes that have merged prior to the cyclic morpheme receive phonological form upon merging of the latter.

The number of cyclic morphemes (i.e., the number of morphemes that trigger spell-out) is closely tied to the number of strong phase heads in minimalist syntax. The category-defining heads, like verbal *v* or the *n* that attaches to an acategorical root to make it a noun, are taken to be cyclic, as well as the C of CP which is the topmost node for many projections.² What this means is that the number of morphemes that have cyclic status is a closed set, and the RED that plays an important role in the analysis presented here is not among them. In what has been laid out so far, the relationship between the underlying representation of a functional morpheme and its phonological form has been straightforward and to some extent, trivial.

In the trees given above, the final vowel *-a* supplied by the *v* head is shown to be present as soon as the morpheme merges, but DM tells us this isn't quite how things work. Instead, the category-defining verbal head isn't supposed to get phonological form until the *following* cyclic head merges. For *a-(w)u-fund-a+fund-i* ‘you don't study,’ we would have something like what's shown below:

²Although the little *v* (voice) that introduces an agent argument (Kratzer 1994) and defines the *vP* projection is considered a phase head in Minimalist syntax, it is considered to be a non-cyclic head in DM (Embick p. 81).

- (7) *-fund-* + *v* (verbalizing) + RED + *v* (introduce subject) + T (subj. agreement, present) + NEG

Not until the NEG morpheme merges, which presumably possesses complementizer features in this construction, will all the material between verbalizing *v* up to and including NEG get spelled out and receive phonological form.

The picture drawn here is then dramatically different from the one laid out in Figures 1 and 2. There, the movement out of VP was used to motivate the inaccessibility of the final vowel of the reduplicant from bearing phonological exponence of higher morphemes like tense, aspect, and negation. However, if we follow the theory of Distributed Morphology to the letter, there is no principled justification underlying making the domain of VP “special” (a domain which I argued included the root, verbalizing morpheme, and the RED morpheme). Specifically, the $[\sigma]$ template of the reduplicant shouldn’t receive phonological material until the cyclic NEG morpheme has merged to force spell out of everything from (and inclusive of) *v* to NEG.

A crucial point in the analysis presented earlier relied on the *v* verbalizing head receiving phonological form, as an *-a*, before the higher TAM heads were merged. But now, if spell-out is a function of a second cyclic head merging, we lose much of the evidence involved in making the argument explaining the mismatch between the final vowel of the reduplicant and the base. What’s key is that because DM relies on cyclic heads to trigger spell-out, the verbalizing *v* that attaches to the root, the bare CVCV $[\sigma]$ template of RED, and the morphemes indexing subject marking and negation will all receive phonological form at the same point in the derivation, i.e., when NEG merges.

Previously, before strict adherence to the DM model was implemented, the analysis presented here relied on a delay in derivational timing such that the relevant morphophonological processes proceeded like a series of ordered rules:

- | | |
|---|---------------------------|
| (8) <i>fund</i> + <i>v</i> | (verbalizing head merges) |
| <i>fund-a</i> + RED | (RED merges) |
| <i>fund-a</i> + <i>fund-a</i> + 2 ^{SG} | (subject agreement) |
| <i>u-fund-a</i> + <i>fund-a</i> + NEG | (negation merges) |
| <i>a-(w)u-fund-a</i> + <i>fund-i</i> | |

But the stepwise 1:1 process of morpheme merger : morphophonological process is absent under a rigorous implementation of DM. The main problem that emerges is how to justify the *-a* final vowel as an intermediate spell-out that ultimately gets overwritten if the verbalizing *v* head and negation (which is expressed in the initial *a-* and final *-i*) are in the same cycle of spell-out. Essentially, it’s difficult to motivate having *any* phonological realization of *v* if it is co-present with negation.

So, where does that leave the analysis put forward in Figures 1 and 2? The insight that the *-a* is the spell-out of the category-defining *v* head seems worth keeping, as does conceptualizing the RED+base complex as an unanalyzable chunk once certain syntactic movements have taken place. However, the account presented above is, in many ways, better suited to a Lexical Phonology interpretation (Kiparsky 1982), where there was more freedom in assigning morphophonological processes to various levels of the phonology.

7 Beyond the Final Vowel

Up to this point, there has been an easily identifiable link between the type of morphology that we expect to come from syntactic projections above VP, and the ungrammaticality of including these morphemes in the reduplicant. However, when we widen the pool of data, these correlations become less clear.

We have only examined roots with a prosodic shape of CVC, and only looked at TAM morphology that surfaces on the final vowel (with the exception of the initial *a-* in the negative). With sub-minimal roots, those with a prosodic shape of C or VC, the results are somewhat different since there is a need to recruit more prosodic material to fill out the inviolable $[\sigma]$ template of RED:

- (9) a. *u-ya-dl-a* “You are eating” → *u-[ya-dl-a+ya-dl-a]*
 b. *u-y-enz-a* “You are making” → *u-[y-enz-a+y-enz-a]*

As we can see, the *-ya-* prefix is pulled into the reduplicant to satisfy disyllabicity. This morpheme is sometimes compared to the present progressive in English (Botne and Kershner 2000), but it’s more closely tied to the syntactic frame in which the verb appears. If the verb is final in some XP constituent, long-form or disjunctive morphology is required (Buell 2009), and in the present, long-form marking is expressed by *-ya-*.

- (10) a. *u-ya-dl-a* “You eat/are eating” vs. *u-dl-a kahle* “You eat/are eating well.”
 b. *u-ya-fund-a* “You read/are reading” vs. *u-fund-a kahle* “You read/are reading well.”

We have seen that the recent past is marked with the final vowel *-e*, but this is only for the short form of this tense. Long form marking is realized by the morpheme *-il-* which occurs between the verb root and the final vowel, which remains an *-e*.

- (11) a. *u-dl-il-e* “You ate.” vs. *u-dl-e kahle* “You ate well.”
 b. *u-fund-il-e* “You studied.” vs. *u-fund-e kahle* “You studied well.”

It seems then that *-ya-* and *-il-* are serving the same function, they mark long form morphology signaling that the verb is final in an XP; *-ya-* is the long form marker for the present, and *-il-* for the recent past.

Since we saw in (9) that *-ya-* can be included in reduplications of sub-minimal roots, it would be logical to expect the same to be true of *-il-*. But, this isn’t the case— *-il-* is never acceptable on reduplicants, either with sub-minimal or fully syllabic CVC roots:

- (12) a. *u-dl-il-e* “you ate” → i. **u-[dl-il-e+dl-il-e]*
 ii. **[u-dl-i+u-dl-il-e]*
 reduplication is impossible
 b. *w-enz-il-e* “you made” → i. *[w-enz-a+w-enz-il-e]*
 ii. **[w-enz-a+w-enz-il-e]*
 iii. **we-[nz-il-e+nz-il-e]*
 c. *u-fund-il-e* “you studied” → i. *u-[fund-a+fund-il-e]*
 ii. **u-[fund-i+fund-il-e]*

If *-il-* and *-ya-* serve the same syntactic function (which it appears that they do— marking a long form verb), we may presume they appear at the same point in the phrase structure and should be equally accessible for prosodic circumscription into the reduplicant. However, *u-[ya-dl-a+ya-dl-a]* given in (9) shows that the reduplicant is not closed off when the verb leaves VP, but it’s not clear whether this implies that this is always the case (i.e., that the reduplicant may be modified after the RED+base complex moves out of VP), or only in instances when the root is sub-minimal.

If these long form morphemes are entirely comparable structurally (a claim which may be open to discussion), then they should be equally accessible for filling out the prosodic template of the reduplicant. When we compare the examples in (9) and (12), we see this is not so; *-ya-* is permissible in the reduplicant while *-il-* is not. Since this contrast does not receive a straightforward structural explanation, it is necessary to appeal to questions of morpheme alignment and placement to account for the data. Principally, the question of why material at the left edge is available, while material at the right is not.

8 Left vs. Right Asymmetries in Morphemes Available for Reduplication

The mismatch between *-ya-* on the left and *-il-* on the right is found throughout the grammar of reduplication in Zulu. The distinction between the morphemes is twofold; “inflectional” morphemes appearing at the *right* edge, like long form *-il-* and the final vowels marking present negation or subjunctive, are always barred from appearing in the reduplicant. However,

“inflectional” morphemes at the left edge, like *-ya-* and the aspectual marker *-sa-* meaning ‘yet’ or ‘still’ are permitted in reduplications of sub-minimal roots and appear on both RED and the base, this double appearance of certain morphemes on both reduplicant and base is known as “backcopying” (McCarthy and Prince 1995). We can see this with *-sa-* and object markers,³ which both occur immediately to the left of the root (note also that in (12b) above, the glided subject marker ($u \rightarrow w / _ V$) is included in the reduplicant, but this is only permitted for glided SMS, vocalic SMs are not allowed):

- (13) a. *u-sa-dla* “You are still eating” → *u-[sa-dl-a+sa-dl-a]*
 b. *u-zi-dla* “You eat them” → *u-[zi-dl-a+zi-dl-a]*

However, these morphemes are only available in cases of sub-minimal roots, never with those CVC or larger:

- c. *u-sa-funda* “You are still reading” → *u-sa-[fund-a+fund-a]*
 **u-[sa-fu+sa-fund-a]*
 d. *u-zi-funda* “You are reading them” → *u-zi-[fund-a+fund-a]*
 **u-[zi-fu+zi-fund-a]*

Since morphemes of the same broad morphological type (i.e. inflectional) are treated differently vis à vis reduplication based on what side of the root they occur, the issue seems to be more phonological than morphological in nature.

This problem is especially interesting because Hyman (2009) argues that we should expect reduplicants to stretch *rightward* in their search for morphemes to circumscribe. He uses data from Odden’s (1996) work on Kikerwe to support the hypothesis that from the most restrictive form of reduplication we see in Bantu, which involves pulling material exclusively from the root, the next step in permissiveness is to expand the domain of reduplication from the root alone to the stem, or the root plus suffixal material.

- (14) *n-dimile* “I cultivated” → *n-[dimile+limile]* (Odden 1996:130, ex. (51))⁴

The *-ile* ending on the verb is the same as the *-ile* in Zulu; both are perfective morphemes. Although it is barred from appearing on Zulu reduplicants, it is acceptable in Kikerewe. The examples from Kikerewe are the best known from a larger trend found in a range of Bantu languages wherein reduplication is actually *more* permissive of morphemes to the right of the root than those on the left—the exact opposite of what we see in Zulu.

One obvious reason in support of rightward expansion has to do with the importance of the stem (the root + everything that follows = the stem) in the morphophonology of the Bantu verb (Meeussen 1967). In many languages, the stem forms a tonal domain distinct from prefixal material, and there are segmental and autosegmental phonological processes that apply to the stem but not prefixes (many examples can be found in Hyman 2008). The data from Zulu that flout this trend merit close analysis to understand why TAM / agreement morphemes at the left edge are available for reduplication despite the prediction from Hyman (2009) that, beyond the root, reduplication should first expand to include morphemes to the right of the root.

There are a number of potential explanations: although there is evidence from CVC and larger

³The *-sa-* and *-ya-* morphemes are considered prefixal (distinct from the verb stem), but object markers have been shown to be in a closer relationship with the stem than other prefixal constituents. This was first demonstrated for Digo in Kisseberth (1984), where the object marker and stem form a single domain for tonal phenomena while other prefixal material is in another domain. Due to the fact that object markers are intermediate between being part of the prefixal material and part of the root, the OM+stem constituent is dubbed the Macrostem, and discussion of object markers appearing in Ndebele reduplications is found in Hyman et al. (2009).

⁴Following the nasal 1^{SG} subject marker, the initial /l/ of the verb root *-lima* ‘farm’ undergoes fortition to become a [d]. Additionally, reduplication in Kikerewe is constrained to be minimally but not maximally disyllabic, so the trisyllabic reduplicant in (14) is grammatical without truncation (Odden 1996).

roots that mapping from the root to the bare CVCV [σσ] template proceeds L → R (as shown by the examples in (2)), it's feasible that when there is insufficient prosodic material in the root domain, filling of the template can "wait" until more material becomes available. Since it's TAM and syntactic agreement morphemes at the left (like subject and object markers) that are pulled in, a strictly derivational argument would be forced to contend that these are the morphemes that are available because these are the morphemes that are merged first, and enter the derivation earliest. However, this would still need to be combined with a requirement explicitly referencing the phonology due to the asymmetry between the long form markers for the present and perfective, respectively the lefthand *-ya-* that's allowed in, and the righthand *-il-* that isn't.

Additionally, the requirement that perfect alignment between RED and the base is required on the left but not on the right needs to be accounted for. As Ketner (2008) argues, the only kind of alignment permitted by the grammar (in any language) is on the left, but it's not necessary to have a purely phonological explanation for the "backcopying" phenomenon we see in (10) and (13). The morphemes in question, like *-ya-*, aspectual *-sa-*, and object markers like *-zi-* may first appear on the base for feature-checking purposes (so *-zi-* would be the phonological reflex of the verb agreeing with an object agreement head) and are then copied into the reduplicant to render the constituent disyllabic (suggested for Ndebele by Frampton 2009).

9 Conclusion

We have seen that a derivational framework, such as that provided by Distributed Morphology, naturally lends itself to accounting for the vowel mismatch in Zulu reduplication, a problem that is found throughout the Bantu languages. I first argued that the mismatch derives from the fact that the reduplicative template is filled when the verb is in VP, and the morphemes which affect the final vowel on the base are not introduced until later in the derivation, when the final vowel slot of the reduplicant is no longer accessible. In reconciling this account with the exact details of phonological spell-out proposed within DM, there were some difficulties, mostly revolving around when key morphemes should be receiving phonological form. If the TAM and negation morphemes (like the final vowel *-e* for the subjunctive and *-i* present negative) are getting spelled out in the same cycle as the category-defining verbal head *v*, it's not clear how to motivate the root + *v* shape (like *fund-a*) that characterizes reduplications of CVC roots.

Separately, looking at the long-form markers, lefthand *-ya-* and righthand *-il-*, that are not final vowels, a strictly hierarchical explanation breaks down to some extent. It appears that matters of morpheme alignment are also relevant, as the grammar of reduplication for sub-minimal roots is far more permissive of TAM / agreement morphemes to the left of the root than of those to the right. Developing a detailed picture of the structure of the relevant higher syntactic projections and understanding exactly which prefixal morphemes may be pulled in to the reduplicant will help further illuminate the issue, which presents an interesting counterpoint to the more common trend of rightward expansion in reduplication.

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