Subtractive morphology in Mẽbengokre

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Contents

1 Introduction

Morphological processes that involve truncation have figured somewhat prominently in the phonological and morphological literature, since they seem irreducible to pure concatenation of morphemes, and, contrary to what happens in templatic morphology and mutations at the edges of stems, making the phonological representations of morphemes highly abstract (i.e., an empty skeleton, or partly specified ghost consonants) seems to be of little help in the general case.

Truncation processes have been classified at least since Weeda (1992) into "false" (i.e., templatic) truncation and "true" (i.e., subtractive) truncation. In the former, the melodic material of a base is mapped to a prosodic template that is of a fixed size. In the process of formation of geisha-house discretionary names described by Mester (1990), for instance, a first syllable from the base name is circumscribed, and mapped to a bimoraic template:

(1)	a.	saiki	o*sai*san
	b.	koNdo	o*koN*san
	c.	koono	o*koo*san
	d.	uno	o*uu*san

Example (1d) illustrates a common feature of templatic truncation, namely that it is often accompanied by augmentation, in the cases where the base is smaller than the fixed template.

In subtractive truncation, on the other hand, what is fixed is the size of the material that is subtracted; truncated forms do not have to conform to a fixed template. This is exemplified by a Javanese language game that truncates the first syllable of a word (Laycock 1972, apud Weeda 1992):[1]

(2) silit ku kɛpɛt dilaten → lit ku pɛt laten

Most recent approaches to subtractive truncation are extensions of the basic template-plus-mapping approach, that employ the additional device of circumscription. Thus, the following two derivations would apply to obtain the truncated form of di- and trisyllables:

[1] Monosyllables are unaffected by this game, fortunately for them. We omit discussion of this additional fact.

(3)	Base	kɛpɛt	dilaten
	Circumscription	↓	↓
		(kɛpɛt)	(dila)ten
	Mapping	↓	↓
		pɛt	la
	Merger	↓	↓
		pɛt	laten

First, an initial foot is circumscribed, to which an operation applies that maps the circumscribed constituent to a syllable. After mapping, the residue from the circumscription is reconcatenated.

One should ask whether the extension of the templatic approach to subtractive truncation is really justified by the data, given that (1) templatic truncation is found only in marginally morphological word formation, such as creation of hypocoristics,[2] and (2) subtractive processes, though often assumed to target any prosodic constituent, in most cases don't involve strings longer than a rime. Of the cases that involve truncation of a rime, all but a few not clearly productive cases (v.g., final truncation in the Muskogean languages) seem to derive the longer truncation from deletion of segments one at a time, by separate rules or constraints.[3]

In the present paper, we will claim that templatic and subtractive truncation belong to two quite different classes of phenomena. Though we will not address all the range of subtractive truncation processes described in the literature, we will describe one case of initial subtractive truncation in depth, arguing that it has a concatenative origin that is still the best description for its synchronic behavior. In addition, we maintain that subtractive truncation more generally conforms to the expectations that derive from a concatenative origin, namely in displaying phonological locality to the sites of morpheme adjunction, and being expressible in terms of the primitives of segmental phonology.

[2]Weeda (op. cit., p. 208) notes that subtractive aphaeresis is also not known to be used paradigmatically.

[3]It should be noted nevertheless that truncation by mapping to a template requires no theoretical primitives beyond what is required for the templatic treatment of other morphology that is clearly used "paradigmatically," such as reduplication and semitic root pattern alternations. It is therefore not clear how to limit prosodic morphology from applying in "paradigmatic" truncation. This is a question that we leave for future research.

1.1 Initial truncation

The initial truncation alternation is one of a series of phenomena found in the Jê languages[4] that have been vaguely described as indicating the contiguity or non-contiguity between a head[5] and an overt dependent. Among these one encounters syncope, initial truncation, consonantal mutations and vowel assimilation across word boundaries:

(4)

	"Contiguous"	*"Non-contiguous"*
Mẽbengokre truncation	jamak	amak
Timbira nasal deletion	ntɔ	tɔ
Timbira mutation	tʃʌr	hʌr
Timbira truncation	tʃwɤr	wɤr
Kĩsedje mutation	tʌr	sʌr
Xerente "rendaku"	zasi	sasi
Panará mutation	jutĩ	sutĩ
Panará assimilation	Ṽtɔ	ĩtɔ
Panará intrusion	tõ	ĩtõ
Xikrin syncope	kdʒo	kudʒo

In a long excursus in this paper, we show that these phenomena fall into two broad classes: several of them are prosodic "juncture" phenomena, while others, which constitute the main focus of our analysis, necessitate a morphological treatment.

1.2 Essential features of the analysis

To account for Mẽbengokre initial truncation, we postulate prefixation of an abstract element {H-} '3rd person', and a phonological fix of the disallowed sequence of /H/ followed by a palatal, consisting in the deletion of the latter segment:

[4]The Jê languages are (or were) spoken in a very vast geographical area of that extends from just east of the mouth of the Amazon to the extreme south of Brazil, encompassing the Eastern limits of the Amazon rainforest and most of what is known as the *cerrado* (savanna) of the Central Brazilian Highlands. Currently surviving Jê languages are grouped into a northern branch which includes Timbira, Panará, Mẽbengokre, Kĩsedje (Suyá) and Apinayé, a central branch with Xavante and Xerente, and a southern branch, that groups Kaingang and Xokleng. Several other languages in Brazil have been related to Jê, but are not part of Jê proper. The name Jê comes from a word for "team" used in the self-denomination of several northern Jê groups.

[5]The relevant heads are those that can inflect for person; cf. section 2.2.

(5)

	/H + jajkwa/	/H + dʒur/	/H + krʌ̃/
Prefixation	Hjajkwa	Hdʒur	Hkrʌ̃
Onset fix	Hajkwa	Hur	krʌ̃
Surface form	[ajkwa]	[ur]	[krʌ̃]

As can be seen, the effect of the onset-fixing rule is the deletion of the initial segment of the stem if it is palatal, but of /H/ itself if the following segment isn't palatal. The phonetic implementation of /H/ is zero in this case, but we'll have more to say about this below.

In the abstract, the approach that we have adopted here seems to have no obvious advantage over approaches where truncation is postulated as a morphological primitive, other than the potential conceptual preferability of not duplicating in the morphology processes that already exist in the phonology — i.e., segment deletion —, of making representations rather than grammar carry the burden for the peculiarities that are observed in a language's morphology, and of making morphological primitives be the same as syntactic ones, i.e. pieces, even if this requires postulating empty morphs.

These conceptual advantages are unconvincing if there are no empirical gains to be had. We will nevertheless see that in this case gains come in the form of greater consistency with the independently established phonological rules of the language, and in comparative evidence for the abstract elements that are chosen.

2 What are the initial alternations?

Though our aim is to provide a framework for describing all processes in (4), we will concentrate on Mẽbengokre truncation in this section. That this process consists of truncation rather than insertion will be argued at length below. Our most obvious argument is that, were it insertion, the consonant inserted is not predictable from the form of the rest of the stem. This can be seen in the following near-minimal pairs (see also Reis Silva and Salanova, 2000):[6]

[6]This contrast hasn't been previously acknowledged in the literature, and we will return to the issue more than once in what follows, in particular in section 3.4.

(6)

dʒa	a	'branches'
jaka	aka	'white'
amɤ	amɤ	'to hug'
dʒir	ir	'to put'
ɲirej	irej	'to divide up'
dʒumar	umar	'to listen'
pɯma	uma	'to fear'

In what follows, we will first show that initial truncation is not prosodically conditioned but has to be the instantiation of a morphological feature. Then, we argue that truncation is the instantiation of third person inflection. After the nature of initial truncation is established, we explore the facts in greater detail, and describe the phonological processes that give independent evidence in support of our analysis.

2.1 Prosody versus morphology

To argue that truncation has a morphological source, we will sketch and then deconstruct a potential alternative analysis analogous to the prosodic treatment of phenomena such as French *liaison*, exemplified by adjectives and adverbs in phrase-final and non-phrase-final position:

(7) a. gʁo 'big'
b. gʁos ami 'big friend'

(8) a. tʁo 'too'
b. tʁop amuʁø 'too much in love'

(9) a. meʃɑ̃ 'evil'
b. meʃɑ̃t ami 'evil friend'

Whatever the correct analysis of liaison is, the generalization that interests us is that the final consonant of a stem is dropped in certain environments, and the precise characterization of these involves considering the prosodic phrasing projected from syntactic structure. The empirical domain of such phonological processes that apply within phonological phrases but fail to apply across phrase boundaries is amply described in works such as Selkirk (1995) and Nespor and Vogel (1986).

If we wish to pursue a prosodic solution to Mẽbengokre initial truncation, we may begin by assuming that the third person is always null, and that the environment for truncation is to be initial in a certain domain, which we will call Phonological Phrase, in anticipation of the fact that it is approximately coterminous with a maximal projection in syntax.[7] The rule may be stated thus:

(10) *Prosodic truncation*
Words of the adequate sort (i.e., those that begin with palatal consonants or /pɯ-/) suffer apheresis when initial in a Phonological Phrase.

To see how this will work, we begin with the following examples, the first of which exhibits several embeddings of words that contain "linking consonants" (i.e., that don't undergo truncation):

(11) a. kubẽ **ɲ**iŋet **j**amak **dʒ**ur **j**aɲĩ
barbarian MB ear pus pick up
"To pick up the pus of the ear of the uncle of the white man."

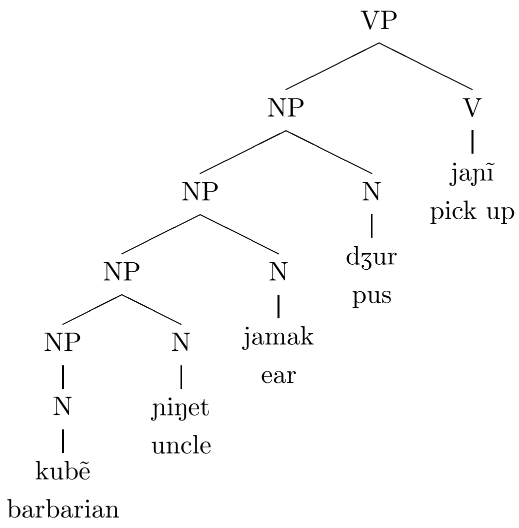
[7] We should exclude the possibility that what goes on in (11a) is analogous to compound formation, and that the linking consonant is preserved (or inserted) only within the domain of the word. A model for this would be the initial voicing of obstruents (rendaku) in Japanese, argued by Ito and Mester (2003) to follow from a linking morpheme inserted by the morphology only between members of right-branching compounds.

This alternative is tempting in light of facts such as (9a), in which the presence of an adjective after the noun that heads the complement prompts the following head's linking consonant to be dropped. In an incorporation account, this fact would follow from stipulating that head nouns cannot incorporate out of a branching projection.

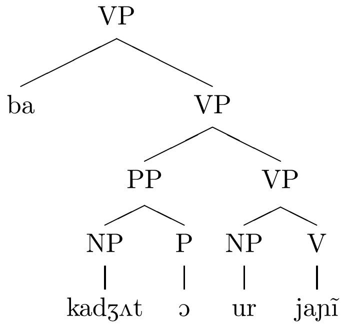
a. kaŋʌ̃ punu ɔmũ
snake bad see

b. kaŋʌ̃ ʔõ pumũ
snake some see

As example (9b) shows, though, the linking consonant (/p/) appears in cases where the preceding material is not just a bare noun, but a noun with a determiner, quantifier, or demonstrative, making the compounding approach unlikely. The fact that adjectives behave differently in these circumstances follows from independent facts about them discussed elsewhere (cf. Salanova, 2003), namely that there is no adjectival modification inside the DP (i.e., structures such as that in (9a) are best regarded as coordinated predicates). In this light, truncation (and third person inflection in general) becomes a useful tool to determine constituency, though it is not clear what structure is to be assigned to cases such as (9a).



b. ba kadʒʌt ɔ ur jaɲĩ
I cotton with pus pick up
"I picked up the pus with a piece of cotton."



The contrast in the behavior of truncation in left-branching versus right-branching structure is clear. A configuration [XP [Y $]_{\mathrm{YP}}$], i.e., where Y is initial within the projection that it heads, prompts initial truncation in Y, whereas [XP [Y] $]_{\mathrm{YP}}$, where Y is preceded by phonologically overt material within its projection, doesn't.

2.1.1 Truncation in prosodic phonology

For simplicity, we will assume that phonological phrasing into Major Phrases is effected by the following derivational algorithm, though the same results are easily obtained using a constraint-based syntax-to-prosody mapping such as described in Selkirk (1995) and Truckenbrodt (1999):

(12) *Construction of MaPhr*
Project a left parenthesis at the left of a maximal projection[8]

It seems that adopting the algorithm (12) will yield us the desired results: left-branching structure is put by the phonology into a single Phonological Phrase, and Phonological Phrase boundaries only arise after subjects and (left) adjoined XPs:

```
(13)  (                                    MaPhr
        (    (     (      (    (           PrW
      [[[[[kubẽ]ɲiŋet]jamak]dʒur]jaɲĩ]
```

Right-branching structure is also assigned an apparently correct parse:

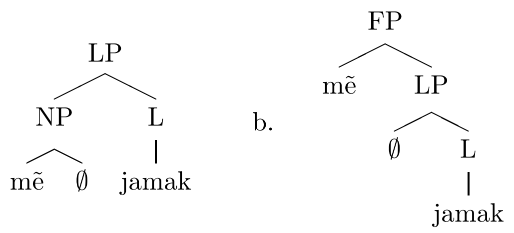
```
(14)  (  (        (          MaPhr
      (  (        (   (      PrW
      [ba[[kadʒʌt ɔ][ur  jaɲĩ]]]
```

A couple of problems arise for this approach. First, we should note the behavior of number particles:

(15) a. amak ‘his ear’
b. ijamak ‘my ear’
c. mẽ ijamak ‘our ears’
d. mẽ amak ‘their ears’

To account for the truncation of the initial /j/ in (15d), a Major Phrase boundary has to be introduced between {mẽ} and {jamak}. It is not wholly implausible that {mẽ} is outside of the (therefore null) constituent that is complement to {jamak}, i.e., such that the structure of (15d) is (16b) rather than (16a):[9]

(16) a.



[8]The phrase structure assumed above is of course extremely simplified, but there is probably no problem in assuming it, since our generalization about right- vs. left-branching structure can be stated in terms of any representation where the subject is outside of VP at the point of phonological spellout.

[9]In the trees, L represents any lexical category, and F the projection of {mẽ}.

The latter structure is made plausible by the fact that in transitive sentences, {mẽ} can be ambiguous in pluralizing either or both of the argument NPs, and equivalently from (15c) and (15d), in which it seems that {mẽ} has scope over both the possessor and the possessed. We conclude that this criticism does not pose a challenge to the prosodic analysis.

One second fact, though, seems fatal to any phonological approach. Since, as we discussed above, truncation applies following a Phonological Phrase boundary, it is expected that all palatal-initial words should be truncated in this environment. This is not the case with non-inflectable words, as we will show in section 2.4.2:[10]

(17) a. ɲʌk '(proper noun)'
b. ba ɲʌk pumũ 'I see Nhàk.'

One could argue that words where the palatal isn't dropped are just marked with a diacritic, just as in French one needs to mark certain adjectives for their special behavior:

(18) a. bɛt ɛlɛv 'dumb student'
b. lɛlɛv e bɛ**t** 'the student is dumb'

If one did this for Mẽbengokre, though, one would find that the only words so marked are those that can't be inflected (i.e., proper and unpossessed nouns, particles and adverbs, and finite intransitive verbs). Thus we would lose the important generalization that dropping an initial palatal is always a mark of third person inflection.[11]

We conclude, then, that truncation in Mẽbengokre has to be morphological.

2.1.2 Where prosody can be of help

In Timbira, a language closely related to Mẽbengokre, the following paradigm occurs, which we might be tempted to equate with the initial truncation discussed above (data and analysis from Alves, 1999):

[10] This contradiction would be resolved if the process could be seen as an insertion of the transitional consonant, rather than deletion. Yet, since the inserted consonants are not predictable from the rest of the stem, this would require marking each vowel-initial stem as belonging to a certain "prefix-class" (the solution adopted by the proponents of "relational inflection" — cf. section 2.4).

[11] The diacritic is also not justifiable on the basis of any difference in form between inflectable words and non-inflectable ones, even though an overwhelming majority of inflectable words are bisyllabic, and thus begin with a stressless syllable. For another argument against the possibility that the form of the stem might have to do with the ability to truncate it, see the discussion of proper nouns in section 2.4.2.

(19) a. /ntɔ/ 'eye (underlying form)'
b. /tɔ/ 'his eye (i.e., in the contexts for truncation)'
c. /rɔpti ntɔ/ 'the jaguar's eye'

Like in the case of initial truncation, an initial nasal of a homorganic /NC/ cluster is dropped (at least) in the cases where a stem is inflected for the third person. As with truncation, third person inflection is in complementary distribution with a full noun phrase.

We nevertheless propose that the deletion of an initial /N/ should not be viewed as the reflex of a morphological category, but rather as a phenomenon conditioned purely by the prosodic structure. In fact, we will maintain that the prosodic boundaries that are relevant as triggers of /N/ deletion are precisely those that we constructed in the previous section.

The rule we need is analogous to (10): /N/ in /NC/ clusters is dropped at the beginning of a prosodic phrase. It should be noted that this rule is immune to the main objection we raised against its application to truncation, since in the case of initial /NC/ in Timbira, contrary to the what happens with initial palatals in Mẽbengokre, there are no words that begin with an /NC/ sequence where it is 'stable' (i.e., no cases homologous to (17)).

The /N/ deletion rule has to be refined slightly, though. Alves argues that dropping of nasals in word-initial position follows from a fact about syllable structure in the language, namely that /NC/ is not a possible onset on the surface, even though it might be present in certain intermediate representations.[12] An /NC/ sequence surfaces in (19c) because the /N/ has an anchoring point in the coda of the preceding syllable. If this position were filled, in fact, the /n/ doesn't surface:

(20) rɔp tɔ 'the dog's eye'

Under the assumption that syllabification applies cyclically in Timbira, the rule that accounts for (19) and (20) becomes:

(21) *Stray segment deletion*
Melodic material that is not prosodically licensed is deleted at the Prosodic Phrase level.

Finally, since Timbira also displays truncation of the type discussed in the previous section, we can show that the environment for /N/ deletion does not

[12] Nasal + homorganic stop sequences in Timbira are the systematic correspondents of nasal stops in Apinayé and Mẽbengokre before oral vowels. We will later show that analyzing them synchronically as single nasals also presents advantages.

overlap completely with the environment for truncation of palatals. In fact, nasals do surface in positions where morphology (i.e. a third person feature) would require truncation, but where prosody tolerates them; cf. (22a) vs. (22b).[13] If we considered both initial truncation and dropping of initial nasals as part of the same phenomenon (third person inflection), this contrast is unexpected, whatever the relation between the element {tɔ} and the following verb is.[14]

(22) a. ku-tɛ pap tɔ mpɛj
3-ERG jirau make good
'He fixed the *jirau* (platform).'

b. mɛʔwɛj-tɛ hĩ tɔ h-ʌr
old woman-ERG meat make 3-cooked
'The old woman cooked the meat.'

The element {tɔ}, a light verb or postposition, is procliticized to the following prosodic word, though it doesn't form a syntactic constituent with it; by strict inclusion (i.e., the requirement that prosodic constituents lower in the hierarchy be entirely contained inside the constituents that dominate them) they are within the same Major Phrase. In these circumstances, /m/ is not deleted (cf. 22a), whereas the initial palatal of {tʃʌr} *is* truncated in (22b).[15] Thus the prosodic analysis seems correct for the deletion of nasals, while truncation is necessarily morphological.

When "left-edge processes" were introduced in (4) above, we anticipated that we would divide them into a prosodically conditioned class and a morphologically determined one. Though truncation was found to be morphologically conditioned, a prosodic conditioning is behind a series of other "left edge" phenomena that had previously been lumped together with initial truncation. The prosodic phrasing that is necessary to account for these processes coincides partly with the environment for morphological truncation, but has been teased

[13] These facts are from Alves (2003b). Note also the behavior of /NC/ clusters after number particles, which contrasts with (15d):

mẽ ntɔ 'people's eyes' (from Popjes and Popjes, 1986)

[14] This relation is certainly not a complement-head relation, since {tɔ} can precede all kinds of words, not only inflectable ones, and inflectable words to the right of {tɔ} always carry inflection.

[15] In Timbira, instead of complete truncation one has lenition to /h/ — or, alternatively, there is truncation and filling of empty onset positions with the default segment /h/ (cf. discussion of this below).

apart from it in several contexts, a result that should have important consequences for the study of the prosodic structure of the Jê languages.

2.2 Truncation is third person inflection

Now that we have established that the trigger for initial truncation is morphological, we will argue that the morphological category that is instatiated in truncation is third person inflection.

Mẽbengokre has relatively little inflectional morphology, and that which exists is remarkably homogeneous in form across word classes. The whole issue of morphological word classes is addressed in Reis Silva and Salanova (2000) and Reis Silva (2001) (for a different view in a related language, cf. Oliveira, 2002).

Person inflection interacts in a complex manner with the morphological class to which a word belongs. Certain words don't inflect at all; these include "particles" and alienably possessed nouns (whose posessor is expressed with the aid of an *ad hoc* postposition). Inalienably possessed nouns and postpositions always inflect (the first for their possessors, the latter for their complements). Verbs show a split pattern: finite forms of verbs only inflect for accusative arguments, so finite intransitive verbs don't inflect; non-finite forms of verbs inflect for the absolutive argument, so all non-finite verbs show inflection.[16]

The inflectional paradigm is identical for all of the preceding cases, except for a slight difference in the accusative, which we address below. Number is expressed by the particles {mẽ} 'plural', and {ar} 'paucal', which precede the person affixes and follow free pronouns and noun phrases, but, as said above, might not form a constituent with either of them. The person forms are as follows:

(23)	1	i-
	1+2	ba-
	2	a-
	3	∅; ku-

Third person inflection[17] is realized in several ways. For most inflectable words, third person is zero. For a relatively small class of transitive verbs (that

[16]The backdrop to this is the split-ergative system of Mẽbengokre, which is reflected not only in the argument that a verb inflects for, but also in the case marking of noun phrases, though in a limited way. Finite verbs head nominative-accusative clauses, whereas non-finite verbs head ergative-absolutive ones.

[17]Person inflection in Mẽbengokre, though it can be referential, is non-deictic. A series of independent pronominal forms with different properties are used to pick referents deictically.

can plausibly be defined on the basis of their meaning),[18] the third person prefix is {ku-}, but only when they are in their finite forms; when non-finite, these verbs behave like any other inflectable word. For this reason we refer to the {ku-} form as *accusative* third person inflection. Person morphemes are in complementary distribution with noun phrases in object position:

(24)	a.	ku-bĩ	'killed him'
	b.	mrɯ bĩ	'killed an animal'
	c.	mrɯ ku-bĩ	'the animal killed him' (not: 'killed the animal')

This pattern is not unfamiliar, as it is attested in Swahili object markers, in Romance dialects which don't permit clitic doubling, and in several Amazonian languages from different families. A curious fact about Mẽbengokre, though, is that object inflection appears even when the object is moved (i.e., for *wh*-questions or focus):[19]

(25)	a.	mrɯ nẽ ku-bĩ	'killed an *animal* (focus)'
	b.	mɤj nẽ ku-bĩ	'what did he kill?'

For facts like these, third person inflection, or rather its absence, has been termed "contiguity marker" in much literature on related languages.[20] That {ku-} is person inflection and not some marker of non-contiguity is suggested by its complementary distribution with other persons, and particularly from the fact that it shows partial agreement with subjects:

(26)	a.	ba ku-bĩ	'I killed it'
	b.	ga a-bĩ	'You killed it'
	c.	ba a-bĩ	'I killed you'

Initial truncation has a distribution that is exactly complementary to the distribution of the overt person marker; when the object is present and contiguous, no truncation occurs, whereas there is truncation both when the object is discontiguous and when it's omitted:

(27)	a.	ipej	'made it'
	b.	kʌ ɲipej	'made canoe(s)'
	c.	kʌ nẽ ipej	'made *canoe(s)* (focus)'

[18] C. Oliveira (p.c.) offers the interesting alternative that {ku-} agreement attaches only to monosyllabic stems, or, more accurately, monomoraic ones, since the corresponding non-finite forms of {ku-} verbs eschew {ku-}.

[19] We know of no cases of A-movement where presence of inflection would be detectable.

[20] The idea of a "contiguity marker" is more naturally appealing in connection with inflection by truncation, since it makes the morphology be additive rather than subtractive, as it is under our approach. We will address this class of proposals in section 2.4.

For this reason, we argue that truncation (or, more precisely, the affixation of the abstract element /H-/ which causes certain initial consonants to be dropped) is a reflex of third person inflection.

It should be pointed out in addition that truncated forms truly contain non-deictic third person reference. Inalienable nouns like 'ear', 'eye' and 'father' in Mẽbengokre always have an implicit possessor. For these nouns to be unpossessed or non-referential, constructions with generic possessors are required, like {mẽ ʔõ nɔ} 'someone's eye' or {mrɯ nɔ} 'animal's eye'. Thus, even in cases where third person is non-overt (i.e., his eye = eye), it is clear that in the citation form third person reference is implied.

2.3 Initial truncation in detail

Truncation affects inflectable words from all classes. Truncation can be seen in the following partial paradigms:[21]

(28)

1st person	*3rd person*	*stem*	
ijamak	amak	jamak	'ear'
idʒur	ur	dʒur	'pus'
iɲikra	ikra	ɲikra	'hand'
ipɯtʌ	utʌ	pɯtʌ	'to adopt'

Contrary to what happens in {ku-} verbs, the class of palatal-initial (and /pɯ/-initial) words cannot be defined on the basis of their semantics. This has to be qualified by the fact that most lexical stems belong to different prefix-classes that have some sort of semantic homogeneity (the analogy could be made with the German "inseparable" verbal prefixes); in these cases, the initial consonant of the stem is given by the "classifier" prefix rather than by the root. The following examples show these prefixes in action in verbs, where their classificatory function is more evident:

(29)
a. ɲi-pej to make
b. ku-pej to work at something
c. dʒʌ-pej to work
d. ka-pej to handle

(30)
a. ku-ŋrĩɲ to scoop up
b. ka-ŋrĩɲ to pack up
c. ja-ŋrĩɲ to tie up
d. ɲũm-ŋrĩɲ to bundle up

[21] Note the /pɯ-/ class, introduced here for the first time.

In any case, since there are pairs of verbal prefixes that share the same initial consonant, and palatal-initial verbs that don't have one of these prefixes, the relationship between palatal-initial words and any semantically relevant classes is at best indirect.

Describing the process that implements third person inflection is straightforward for the case of words started with palatal consonants: the first consonant is simply elided. For the case of /p/-initial words, the process is slightly more complex, and in fact the paradigm is not completely uniform:

(31)	*1st person*	*3rd person*	*stem*	
	ipɯma	uma	pɯma	'to fear'
	ipudʒu	udʒu	pudʒu	'to hide'
	ipumũ	ɔmũ	pumũ	'to see'

The case of {pɯma} is the general case for this class of words. Callow (1962) suggests that in words like {pudʒu}, the first vowel rounds under the influence of the second (stressed) one, but nothing bears on this for our analysis. {pumũ → ɔmũ} is a unique lexical exception.

We propose that in this class of words third person inflection is still truncation, but with the perseverance of the [labial] feature of the dropped /p/, which attaches to the following vowel, making it round. No other labial consonants are dropped.[22]

2.4 Discarding alternatives to truncation

Before we proceed, we will address one alternative treatment of the truncation phenomena in (27) that has figured prominently in the previous literature on Jê and other lowland south-american language families, namely that the palatal is not part of the stem but one of two "relational prefixes" (the other being what we call third person inflection) that "marks contiguity between a verb and its complement, a noun and its possessor, a preposition and its complement, etc." (Rodrigues, 1990; cf. Rodrigues, 1999 for a published source).[23]

[22]This includes /p/ before any vowel other than /ɯ/, and all instances of /m/ and /b/. We have no examples of inflectable words that are /w/-initial on the surface. We should note that there are three idiosyncratic exceptions to initial truncation: {tʃet} 'burnt', {jet} 'hung', and {punu} 'bad'. We'll have something to say about each of these below.

[23]A clear example of what has been called "relational prefix" by Rodrigues might well be the following paradigm from Tupinambá (an extinct Tupi-Guarani language spoken in the 16th century along most of Brazil's coast):

a.	oka	'house (citation form)'
b.	Ira r-oka	'Ira's house'
c.	s-oka	'his/her house'

This descriptive label might be interpreted as a series of things. Wiesemann (1986) suggests that the prefixes are valence-changing morphology, though Wiesemann herself recognizes that there is no valence change, since verbs that suffer truncation "are not true intransitives, and are used anaphorically when the object has already been stated. They still have all the syntactic characteristics of a transitive verb, i.e., they occur with the ergative in non-indicative clauses." (p. 369) This seems synonymous to person inflection, whose special behavior in Mẽbengokre we charted in section 2.2.

Other options seem to be either indistinct from the phonological approach that we discarded above, or identical to the truncation approach. A final option is to be agnostic about what the function of the relational prefix actually is,[24] but still contend that it's *added*, rather than a part of the root that is subtracted under certain conditions. We will therefore present some additional facts in defence of the latter position, in addition to what we said in (6).[25]

2.4.1 Palatals appear inside derivational morphology

There are at least a few clear cases where derivational morphology adds a morpheme to the left of a palatal-initial stem. In these cases, the palatal seems to undergo fortition to /tʃ/, but in any case is still there:

(32) *Intransitive verb formation*

a. /bi/ + /kamẽɲ/ 'push' → /bikamẽɲ/ 'to drag oneself'

b. /bi/ + /jadʒwɤrɤ/ 'set down' → /bitʃadʒwɤrɤ/ 'to come down'

c. /bi/ + /jaere/ 'startle' → /bitʃaere/ 'to play around'

d. /bi/ + /jabjere/ 'seek' → /bitʃabjere/ 'to run around'

This differs crucially from all that we have seen in the Jê family in that there is a three way opposition between ∅ : {r-} : {s-} (in fact, though "prototypical", the preceding paradigm is considered to be marginal for this reason), but the analysis might be only slightly more complex than what we have sketched for Jê, necessitating one morpheme ({s-}) and the phonology to either insert or delete initial /r/ in the appropriate environments. Discussion of Tupian is beyond the scope of this paper.

[24] The linking morpheme argued to be behind rendaku by Ito and Mester (2003) seems like a particularly compelling case of morphology that is purely "relational", in the sense of reflecting only structural relations, rather than a morphological feature. Linking morphs have been observed in many languages (cf. the survey by Andrea Krott in http://linguistlist.org/issues/10/10-1477.html), but are characteristically limited to occur within compounds.

[25] Though in Rodrigues's work which consonant is inserted is an idiosyncratic property of each particular vowel-initial stem, the idea of relational inflection was often predicated on the assumption that the quality of the inserted consonant can be predicted from the shape of the stem (cf. Borges, 1995). We will return to this claim below.

The presence of the palatal consonant here would be a problem if these consonants were inserted as contiguity-marking inflection, since in this case it seems to occur inside a derivational morpheme. On the other hand, if the palatal consonants are part of the stem, their appearance in (32) is unproblematic.

2.4.2 Palatals appear in uninflected forms

We begin by noting an important generalization over the Mẽbengokre lexicon: whereas there exist plenty of uninflectable words that begin in palatal consonants or /pɯ-/ which never get truncated, virtually no inflectable word begins with a palatal consonant or /pɯ-/ that fails to undergo truncation.[26] The following are some examples of uninflectable words that begin with palatals or /pɯ-/:

(33)	a.	pur	garden
	b.	pɯka	earth
	c.	dʒwɤ	manioc flour
	d.	ɲuɲ	hummingbird
	e.	jʌt	yam

Aside from this fact, which is in itself quite suggestive of truncation (since otherwise there would be an important unexplained gap in the possible shape of inflectable words), there are a few cases of words that actually alternate between inflectable and uninflectable forms, where the 'stability' of the palatal in the uninflectable form versus its instability in the inflectable form is evident. These cases fall into three categories:

Alienably and inalienably possessed nouns Most nouns in Mẽbengokre are either alienably possessed or inalienably possessed; the latter inflect for a possessor, whereas the former indicate the possessor by means of a special postposition. A small set of nouns can belong to either class. As can be seen in the contrast between (34a) and (34b), if the noun in question is /dʒ/-initial, the /dʒ/ is stable in the uninflectable form, whereas it drops when the inflectable form is inflected for third person.

(34)	a.	(iɲõ) dʒudʒe	'(my) bow (alienably possessed or unpossessed)'
	b.	udʒe	'his weapon (inalienably possessed form of {dʒudʒe})'
	c.	idʒudʒe	'my weapon'

[26]This argument is the inverse of a claim made in connection with "insertion" approaches to the phenomenon at hand, namely that palatal consonants are inserted in front of vowel-initial stems. As we saw in (6), though, there exist (quite a few) vowel-initial stems, both inflectable and non-inflectable, that don't alternate with palatal-initial forms.

Finite intransitive verbs Since Mẽbengokre has a split-ergative system, and only absolutive and accusative arguments are marked by inflection on the verb, intransitive verbs have no inflection when in a nominative-accusative clause (i.e., when they are finite). Thus, for a couple of intransitive verbs that begin with a palatal, we observe that in the finite form the palatal is stable, while in the non-finite form the palatal is truncated in the third person:

(35) a. ɲɯ̃ 'sit (finite; all persons)'
b. iɲɯ̃r 'I sit (non-finite)'
c. ɯ̃r 'he sits (non-finite)'

(36) a. dʒa 'be standing (finite)'
b. idʒam 'I'm standing (non-finite)'
c. am 'he's standing (non-finite)'

Again, this is a problem for an "insertion" analysis, since there is no context for insertion in cases such as (35a) and (36a), but follows straightforwardly if we assume the palatal consonants to be part of the stem.[27]

Proper nouns Proper nouns are often formed from parts of the body and other inalienable nouns. What is curious is that when terms for body parts appear within proper nouns there is no truncation:[28]

(37) a. ɲĩakrɛ kam pĩ 'wood in the nose (ɲĩakrɛ)'
b. ɲõ mrɯrɛ 'with (ɲõ) animals'
c. jamɯ biŋrĩɲ 'curly tail (jamɯ)'
d. dʒe tirɛ 'large bodily ornament (dʒe)'

One may well ask why this should be so. A plausible story would be to say that nominal components of proper nouns don't have to be referential, and thus are spared of the requirement of inflecting for a possessor.[29] Whatever the story is, it is obvious that postulating insertion of palatals in the context of proper nouns adds one more incongruent conjunct to the already awkward description of the contexts of insertion.

[27] Another way to put it is that if {dʒ-} and {ɲ-} are prefixes, then their function (one can only very metaphorically talk about "meaning" in this case) is characterized by a disjuction: they are markers of contiguity and of finiteness in certain intransitive verbs. In a truncation approach, no such disjunction is necessary, because it's the *absence* of the initial consonant that is meaningful, and quite literally so: it indicates third person inflection in every case.

[28] In a database with almost 1800 Mẽbengokre proper names, generously provided to us by Dr. Vanessa Lea, practically all proper names involving palatal-initial body-part words are not truncated, with only three possible exceptions.

[29] The exceptions mentioned in the preceding footnote suggest that they *can* in some instances be referential: *wa kam pɯ* 'onotto in his tooth' (rather than *dʒwa kam pɯ* 'onotto-in-tooth').

To sum up, in the three cases reviewed above, a palatal consonant appears in the uninflected form of a stem, in an environment where insertion isn't motivated (i.e., by contiguity of a preceding complement). If the alternation between palatal-initial and vowel-initial forms results from insertion of a palatal, the context of insertion has to be stated in terms of a complicated disjunction (insert the palatal if the stem is preceded by a complement, or is in the finite form, or is in a proper name, etc.); if, instead, the alternation is due to deletion, it can be captured by the simple statement that initial truncation reflects third person inflection. A final alternative, where inflectable and uninflectable forms of a stem are listed separately in the lexicon, is clearly undesirable, since at least the use of uninflected stems in proper nouns seems fairly productive.

3 The abstract prefix analysis

Our model for the analysis sketched in the introduction is the form of third person inflection in Panará and Xokleng:[30]

(38) *Panará (from Dourado, 2001)*
  a. jakoa mouth' (uninflected)
  b. sakoa his mouth'

(39) *Xokleng (from Henry, 1948)*
  a. jo in front of' (uninflected)
  b. ðo in front of it/him/her'

The /s/ ∼ /j/ and the /ð/ ∼ /j/ alternations are very straightforward from the point of view of the phonology of Jê languages: in all of the languages of the family, there is a ban on identical articulator features in onset consonants. Thus, in Mẽbengokre, even though up to three consonants are allowed in an onset, sequences such as *tr, *pw, *nj, *dʒr, etc. are unattested.[31] The ban on identical articulators is not simply a passive morpheme structure constraint. Several fixes, that include fortition and deletion, occur in Mẽbengokre when suffixes (cf. (40)) or enclitics (cf. (41)) that prompt resyllabification of a stem consonant are concatenated:

(40) a. /mak/ + /rɛ/ → [ma.krɛ] 'little scorpion'

[30] Panará, like Mẽbengokre, belongs the northern branch of the Jê family; Xokleng belongs to the southern branch, the most divergent of the three extant subdivisions of Jê.

[31] Other onset clusters are banned by sonority sequencing requirements: *jw, *kp, *pn and so on. The only CCC onsets allowed are /krw/ and /ŋrw/, illustrating the ban on identical articulators and the sonority sequencing that the language requires: {nasals and oral stops} ≺ {liquids} ≺ {glides}.

b. /amʌt/ + /rɛ/ → [amʌt.tɛ] 'little piranha'
c. /kweɲ/ + /rɛ/ → [kweɲ.nɛ] 'little bird'

(41) a. /tam/ + /ja/ → [tã.mj̃ã] 'this one'
b. /tam/ + /wa/ → [tã.w̃ã] 'that one'

Alves (2003a) discusses a constraint in Timbira that prevents resyllabification in precisely the cases where Mẽbengokre opts for fortition.

Another case of deletion is observed in the formation of non-finite forms of verbs, when the affixation of a consonant to a stem whose final syllable already has the coda position filled (by a glide) prompts the "crowding-in"[32] of the other segments of the syllable, resulting in some onset deletions, as in (42d) and (42e):

(42)	a.	/aj-kij/ + /r/ → /bi-kjer/	to divide out'
	b.	/dʒupij/ + /r/ → /dʒupjer/	to carry on the shoulders'
	c.	/ka-ɲuw/ + /r/ → /ka-ɲwɤr/	to pierce'
	d.	/krij/ + /r/ → /kjer/	to pull' (*krjer)
	e.	/muw/ + /r/ → /mɤr/	to cry' (*mwɤr)

In the case of Panará and Xokleng at hand, an onset consisting of two coronals would be formed by the prefixation of {s-} or {ð-} 'third person',[33] and the fix consists in dropping the second of them.

3.1 Panará

To illustrate the point, we sketch a proposal that accounts for all of the Panará third person paradigm. The patterns found in Panará, as described by Dourado (1993), are the following:

(43)		*Contiguous*	*Non-contiguous*	
	Default case	tɛ	ĩtɛ	leg
	j- initial	jũkje	sũkje	arm
		jutĩ	sutĩ	heavy
		jĩkja	sikja	hand
	V- initial	Ṽtɔ	ĩtɔ	eye

[32] Essentially, a stem that ends in an already bimoraic syllable gets an affix that has to be attached to a moraic position. The syllable is then reparsed so that the melodic material originally attached to the first mora ends up as part of the onset. The nucleus then dissimilates, due to an independent constraint banning *ji and *wu sequences. More extensive discussion of this phenomenon is found in Salanova (2004).

[33] This prefixed third person form differs from the freestanding forms {ti} and {ði} (the latter found only in Xokleng, for third person feminine) in that it can only be used anaphorically.

The V-initial pattern refers to a class of words where an initial nasal vowel assimilates the place features of a preceding one, if the word to which it belongs is the complement of the V-initial word. The full paradigm (which incidentally illustrates a many-to-one mapping in vowel height, due to the smaller inventory of nasal vowels over oral ones) is as follows:

(44)	a.	wɯsĩ ĩtɔ	mother's eye	ĩtɔ	his/her/its eye
	b.	tɔputũ ũtɔ	old man's eye		
	c.	jɔjɔ õtɔ	butterfly's eye		
	d.	jowpɯ̃ ɯ̃pa	jaguar's liver	ĩpa	his/her/its liver
	e.	wʌro ũpa	parakeet's liver		
	f.	põpõ õpa	socó's liver		
	g.	kjanasʌ ɯ̃prẽ	old cutia	ĩprẽ	(he/she/it is) old
	h.	kukrɛ ẽprẽ	old house		
	i.	sase ĩtui	new hammock	ĩtui	(he/she/it is) new
	j.	mara ãsipiʌ	his wife	ĩsipiʌ	his (anaphoric) wife

In our account, third person has the allomorphs {ĩ-} and {s-}. The latter is selected when the initial segment of the stem is greater in sonority than /s/, while the former is selected elsewhere. Since there seem to be no /w/ or V-initial inflectable stems in the language except for those that undergo the "assimilation pattern," the {s} allomorph is selected only before /j/-initial stems.[34] In these cases, though, the /j/ is dropped due to the onset constraint mentioned above. This accounts for all patterns but (44).[35] We will return to it below, after we discuss the Timbira pattern.

Panará and Xokleng /s/ have as correspondents /h/ in Timbira, and ∅ in Mẽbengokre.[36] This is our initial motivation for postulating an abstract prefix {H-} in Mẽbengokre, seen in the derivations in (5), repeated here:

[34] Though no data for this is presented in Dourado (1993), we presume that the {s-} allomorph is not selected before nasal-initial stems. This would be consistent with the fact that nasals behave like obstruents in all Jê languages as far as syllabification goes. There is also no data on /r/-initial stems. The full consonantal inventory of Panará is given by Dourado (2001) to be: /p/, /t/, /k/, /ʔ/; /s/, /h/; /m/, /n/; /w/, /r/, /j/.

[35] Note also the denasalization in /sikja/ 'his/her hand', one of several morphophonological issues which we will only partially address.

[36] The only systematic attempt at showing sound correspondences in the Jê family was made by Davis (1966), and neither Panará, Mẽbengokre nor Xokleng were taken into account there. The correspondences can nevertheless easily be established by comparing Mẽbengokre and Xokleng to Apinayé and Kaingang, respectively, which are very closely related to each and were present in the original sample. Correspondences between Panará and the other Jê languages are more tentative, but see Ribeiro (2003). It should be noted that the reconstructed form for the sound in question is *z at least in those cases where it appears word-medially.

(45)

	/H + jajkwa/	/H + dʒur/	/H + krʌ̃/
Prefixation	Hjajkwa	Hdʒur	Hkrʌ̃
Onset fix	Hajkwa	Hur	krʌ̃
Surface form	[ajkwa]	[ur]	[krʌ̃]

Before we go into the details of this analysis for Mẽbengokre, let us provide an analysis for the third person inflection facts for Timbira, where the person prefix is expected to have a reflex {h-}.

3.2 Timbira

In Timbira, Popjes and Popjes (1986) give {ih-} and {in-} as third person markers. These markers are optional (i.e., in Popjes and Popjes's mindset, third person can also be $\emptyset$), but, interestingly, they do not appear at all before stems that can undergo truncation:

(46) a. ihkra ∼ kra his son
b. intɔ ∼ tɔ his eye

(47) a. hʌr roast it (← /tʃʌr/)
b. * ihtʃʌr, ihhʌr

We propose instead that the third person prefix is {h-}, that an onset fix homologous to (though not as transparently motivated as)[37] that proposed for Panará and Xokleng is what's responsible for truncation, and that the purported {ih-} and {in-} markers are no more than the result of /i/ epenthesis to rescue a segment that is stranded after all other onset fixes have applied. This segment can be either the third person prefix {h-} itself, or a nasal that is part of the stem (cf. example (19c) in section 2.1).[38]

The full facts are as follows:

1. /in-/ appears before certain lexically idiosyncratic stems beginning in /p/, /t/ or /k/.

[37]The motivation for the fix is affected by two historical processes that have obscured the simplicity of the Panará and Xokleng pattern in Timbira and the other northern Jê languages. The first of these is the diferentiation of initial palatals, which were originally only glides, into affricates, glides and nasals. The second is the historical lenition of /s/ to /h/ or $\emptyset$. The conjunction of these two processes have made the statement of the onset fix rules quite complex from a synchronic point of view, though not completely unrelated to other facts about onsets in the languages in question.

[38]The phoneme /h/ in Timbira has two realizations: /ʔ/ in codas, and /h/ in onsets. It has been considered a single phoneme in all analyses available to us (Popjes and Popjes, 1986; Alves, 1999). Note also that /h/ never appears in complex onsets.

2. /ih-/ appears before the remaining stems beginning with /t/ or /k/, and before all stems beginning with /k^h/ or /h/.
3. /i-/ appears before stems beginning in /p/ or /r/.
4. ∅ appears in words beginning with /m/, /n/, and possibly /w/ (we have only one example), and in those words where an initial palatal consonant is substituted by /h/.

There are some exceptions to the above generalization: /ih-pɛkpɛk/ 'to drip', and /ih-pɤpɤm/ 'to fall repeatedly', both of which we could put aside for being onomatopoeic. A more serious exception, though apparently unique, is /in-tʃer/ 'to pinch', in which the /(n)tʃ/, contrary to what is expected, doesn't get substituted by /h/.

The case of /r/ and /p/-initial stems is idiosyncratic: for no principled reason, /h/ gets deleted before a /p/ or /r/ after /i/-epenthesis occurs. The process itself should not surprise us, as it's no more than the opaque interaction of rules that is found throughout phonology, but we have no motivation for /h/ to be incompatible with /p/ or /r/. We'll also need to address the case of /m/ and /n/-initial stems.

All of this said, we seem to be stuck with stating the distribution of /in-/ vs. /ih-, i-/ as a matter of lexical idiosyncrasy, something which we have been trying to avoid in characterizing the stems that undergo initial truncation. We will nevertheless argue that this lexical idiosyncrasy is expected.

The consonant system of Timbira is given to be as follows in both of our sources:

(48)

	Labial	*Coronal*	*Palatal*	*Velar*	*Glottal*
Asp. stops				k^h	
Unasp. stops	p	t	tʃ	k	
Nasals	m	n			
Continuants	w	r	j		h

Nasals in onsets have a limited distribution. Though we find all other consonants before both nasal and oral vowels, /m/ and /n/ only occur before nasal vowels. It's clearly not the case that a non-nasal stop gets nasalized in this case, since we have minimal pairs such as /prõ/ 'wife' vs. /mrõ/ 'to dive'. What we believe happens instead is that words that are stop-initial and have the lexical idiosyncrasy of selecting /in-/ over /ih-/ when inflecting for third person should be represented as beginning with an underlying nasal consonant. Thus:

(49)

	/nɔ/	/nɔ/	/nõr/
Contour creation	/ntɔ/	/ntɔ/	/nõr/
Epenthesis	/intɔ/	—	—
Deletion	—	/tɔ/	—
Surface form	[intɔ]	[tɔ]	[nõr]

The rule of "contour creation" should be stated as follows:

(50) $N \rightarrow NC$ / _V[−nasal]

A stem of the form /NV/ (with V oral) can have two fates, after /N/ splits into a sequence of a nasal and a stop: in contexts for epenthesis or where it could phrase with a preceding vowel-final word, /N/ is preserved; elsewhere it is dropped.[39]

An extra (prosodic) segment is created by the rule of contour creation. This is slightly surprising, especially in light of the facts of other Jê languages, where "nasal" consonants surface as contour segments in the environment of oral vowels (though they are voiced throughout), but nevertheless behave as single segments (i.e., act as units in cases of deletion). The fact that the nasal is an extra prosodic segment is supported independently the paradigm in (19). Thus arguing that there's /i/-epenthesis to save it is some contexts is not a very daring move.[40]

All the expected predictions follow: there are no stems that select for /in-/ that consist of a stop followed by a nasal vowel (since in these cases the initial stop has to be an underlying voiceless stop); there are no words requiring /in-/ before anything but the stops, since these are the only consonants that can result from denasalization of a nasal consonant; no /in-/ is ever prefixed to words that begin with a (surface) nasal, since no unparsed segments are created in this case.[41]

[39]We are assuming that {h-}, if prefixed to nasal-initial words, is dropped without reflex — something that accords well with the fact that (surface) /m/ and /n/-initial words don't ever get /i/ epenthesis in Popjes and Popjes (1986). In other words, /i/ epenthesis in words like /ntɔ/ comes in only to save unsyllabified /N/, never unsyllabified /h/.

Also, we are operating under the assumption that [intɔ] and [tɔ] are identical in meaning in contexts where the latter is unambiguously inflected. Parts of the analysis of Timbira would have to be reformulated if this is not so, but our main point remains intact.

[40]This analysis is the one that is consistent with Alves (2003b). Another analysis of the [NC] ∼ [N] ∼ [C] alternation is possible that doesn't rely on prosodic licensing of [N], namely a segmental one where /N/ has the following allophones:

$$/N/ \begin{cases} [N] & /\_\tilde{V} \\ [NC] & /V\_V \\ [C] & \textit{elsewhere} \end{cases}$$

As shown above, the [NC] allophone is selected only if the preceding V is within the same prosodic phrase.

[41]Cf. note 39.

This analysis has as another welcome consequence that /k/ is analyzed as /ŋ/, and /k^h/ as /k/, making the Timbira consonant chart virtually identical to that of the closely related languages Apinayé and Mẽbengokre (aside from making it perfectly symmetrical). This is a consequence of the following: /k^h/-initial stems never take /in-/; /k/-initial ones always take /in-/ if the stress falls on the initial syllable. If the initial syllable is unstressed, /ih-/ is found with /k/: /ih-kak^{h}ok/ 'to speak'. Since [k^h] never appears in the onset of an unstressed syllable, one could either speak of a neutralization of the /k^h/ : /k/ contrast, or maintain that the contrast still exists, not being manifested in aspiration, but rather in the "selection" of /in-/ vs. /ih-/. If the latter were true, we'd expect cases where /in-/ precedes a /k/-initial stem; there are no examples of this in our data, but this might be accidental, as the inventory of syllables that can appear in pre-stress position, outside of stems with reduplication, is virtually restricted to the ten or so "classificatory" prefixes mentioned above.

3.3 Panará revisited

We are now in a position of explaining the Panará paradigm in (44).

Panará also disallows nasals before oral vowels in stressed syllables. We hypothesize that in these cases, the same type of /N/ + stop cluster is formed in an intermediate representation as in Timbira. Differently from Timbira, though, Panará always rescues the /N/ by epenthesizing a V. The features of this V are filled from a preceding vowel, if it is within a particular domain, or by the default /i/ otherwise.[42] The following is a possible analysis:

(51)

	/...##Ntɔ/	/...V_α#Ntɔ/
Epenthesis	##VNtɔ	V_α#VNtɔ
V-feature insertion	iN.tɔ	V_α#V_αNtɔ
Surface form	ĩtɔ	V#Ṽtɔ

/N/ in coda position is realized as nasality on the previous vowel. There is some pruning of the features of V_α when it gets nasalized, as there is one less height contrast in nasal vowels in Panará.[43]

[42] We are therefore predicting that the V assimilation process will behave like (22a) rather than (22b), i.e., it will be conditioned by prosodic phrasing rather than by the presence of the third person morpheme. We don't have the data to check this.

[43] A final question to ask about Panará is whether the allomorphs {ĩ-} and {s-} can be related to a common underlying form in a principled way. This is a discussion that is beyond the scope of this paper, but the analysis of the Timbira facts provides interesting leads as to how the two might be related.

To sum up, we have reduced the whole third person paradigm in Panará and Timbira to a single prefix, and in the process simplified the phonological system of the latter, but we have resorted to onset fix rules which, though well motivated comparatively, are quite stipulative synchronically. The plausibility of our analysis for Timbira awaits further evidence that the consonants singled out by the fixes act as a class elsewhere in the phonology of the language. In our ensuing discussion of Mẽbengokre, we push the comparative analysis a step further to attempt to overcome this weak link in our proposal.

3.4 Mẽbengokre

Let us once again repeat the paradigm in (45).

(52)		/H + jajkwa/	/H + dʒur/	/H + krʌ̃/
	Prefixation	Hjajkwa	Hdʒur	Hkrʌ̃
	Onset fix	Hajkwa	Hur	krʌ̃
	Surface form	[ajkwa]	[ur]	[krʌ̃]

In contrast with Timbira, there seems to be no exponence of {H-} at all in Mẽbengokre. There certainly isn't any process of epenthesis comparable to that described above to rescue stranded segments, something which reinforces the idea that the third person prefix has no segmental exponence.

Some data in Burgess and Ham (1968) seem to suggest that third person inflection in Apinayé, a language closely related to Mẽbengokre, is in some cases the prefixation of /ʔ/. In Apinayé, contrary to what occurs in Mẽbengokre, these clusters are tolerated (the "rescuing epenthesis" found in Timbira is not obligatory), even though they only seem to occur as a result of the prefixation of third person.[44]

(53) a. kvrɤ 'to dig out'
b. ʔkvrɤ 'to dig it out'

(54) a. prõ 'wife'
b. ʔprõ 'his wife'

[44] The presence glottal stop in (53b) and (54b) is not uncontroversially morphological: in previous versions of the present paper we raised the suspicion that it is inserted at prosodic phrase boundaries. The distribution of "boundary prosodies" in Apinayé is described in detail in Callow (1962), a source that wasn't available to us during the elaboration of this paper. Incorporation of these data therefore awaits further research. Note also that, differently from Mẽbengokre, Apinayé does have vowel epenthesis in some third person contexts. Since Burgess and Ham give no indication of the contexts for epenthesis or lack of it, we cannot fully compare this language to Mẽbengokre and Timbira.

The /ʔ/, if present in Mẽbengokre, might be just the glottal glide that we expect as the exponent of the third person prefix.

There is in our data no trace of an initial /ʔ/ in truncated words. In Mẽbengokre, as in Apinayé, there is a contrast in initial and intervocalic position that has previously been analysed as being between /ʔ/ and ∅. Under this analysis, truncated words are truly vowel initial (ex. (55b)):

(55) a. ʔɯ 'seed'
b. ɯ '(s)he goes'

(56) a. kaʔɯ 'to punch a hole in'
b. kaɯ 'to sew'

In fact, "vowel initial" words can be pronounced as [h]- or [ɦ]-initial where the contrast with /ʔ/ needs to be emphasized. Since the distribution of [h] is not completely free before vocalic segments — i.e., it occurs only before syllabic Vs, being unattested before /j/ and /w/ —, it could be argued that it's a reflex of an underlying segment /h/. This increases the number of contrastive segments in the language, but makes its syllable structure less marked in the underlying representation, with no onsetless syllables. The possibility that [h] is an epenthetic segment inserted to satisfy a surface constraint against onsetless syllables is diminished by the fact that [h] is often omitted.

The phoneme /h/ has a distribution that is nearly identical to that of /ʔ/: it only appears initially or intervocalically, never in initial or medial clusters (/ʔ/ does appear in initial onset clusters with /w/). Subject to prosodic phrasing conditions, the final consonant from a preceding word can resyllabify onto a /h/ or /ʔ/-initial word, causing the deletion of the initial segment.

Is the third person prefix in Mẽbengokre simply {h-}, then? For a phonological account that is consistent with the account given for Xokleng and Panará, the third person prefix would have to be an abstract coronal segment. This seems counterintuitive, since there would be nothing in its specification to distinguish it from a concrete coronal, unless we use diacritics. The "concrete" alternative is to assume that the third person prefix consists of a glottal glide.

If we go this way, the explanation for the dropping of the palatal in {jajkwa} could be found either in the independently motivated ban on sequences of glides (assuming that glottal and supraglottal glides are of equal sonority). We also expect {h-} to interact with /w/, the other glide in the language. In fact, it does give us some insight on initial truncation in /pɯ-/ words.

The glide /w/ cannot be found before high back vowels,[45] i.e., precisely those before which /p/ truncates. We propose that [p] in those cases is underlying /w/, which fortitions to avoid a clash of two identical dorsal gestures.[46] If this is so, it is expected that some words have an underlying /p/ that doesn't undergo truncation. This is the case of {punu}, mentioned above as an idiosyncratic exception. Thus:

(57)

	/H + wɯma/	/wɯma/	/H + punu/
Prefixation	Hwɯma	—	Hpunu
Onset fixes	Hɯma	pɯma	punu
Stability of [labial]	Huma	—	—
Surface form	[uma]	[pɯma]	[punu]

Despite this, in assuming that third person is no more than {h-} we have no explanation for the fact that *all* initial palatals drop, not just the glides. Diachronically, it seems that the differentiation of palatals into affricates, glides and nasals is an innovation in a few northern Jê languages. This is a conclusion to which we are driven by Ribeiro (2003)'s refinements to Davis (1966)'s reconstruction, and by the observation that this differentiation is only present in a close-knit subset of the northern Jê branch. We might ask ourselves if the synchronic phonology of Mẽbengokre could be argued to recapitulate the historic processes that led to this differentiation, and allow us to reduce truncation to the dropping of an initial glide. The negative answer to this comes from the partial overlap between /dʒ/, /ɲ/ and /j/ that was our first argument for truncation.

We are therefore stuck with the following: whether we believe that /h/ is an exponent of the third person morpheme or not, truncation is not phonologically straightforward in Mẽbengokre. The statement of the rules that drop certain segments initially can be made independently of diacritic features if we assume that third person is {h-} or an abstract C, but it would in any case be tailored to this situation, since the context for these rules is not given elsewhere.

Is there any advantange to this over a purely processual analysis?

[45]An exception is found in /kwɯ̃r/, where it appears as the second element in the onset. Even in this position it cannot appear before /u/.

[46]This idea gets some support from a perfunctory scanning of cognates in the closely related language Kĩsedje, which reveals that /w/ is a frequent correspondent of initial /p/ in Mẽbengokre; cf. dos Santos (1997).

4 General claims

In examining nonconcatenative morphological processes, we are led to ask ourselves what operations are to be permitted in morphology as productive processes.

One possible answer is given by Martin (1988), who concludes that "[t]he operations available to morphology are exactly the operations available to phonology." I.e., among other things, morphology is dissociation and metathesis-capable. Restating this in terms that make it easier to compare with other proposals, a morphological feature [F], present in a word's "feature-bag", can be the triggering environment for a phonological rule of any type. Other proposals, such as that made by Weeda (1992), essentially make the same claim, restricting it in an ad hoc manner to take into account the actual limits of what actually occurs.[47]

We claim that a morphological feature is never an environment for a phonological rule. Rather, triggers for morphophonological rules always have to be localized in a morpheme, as in the case we have examined. Thus, a rule of the form (58a) is possible, but not one like (58b):

(58) a. $C \rightarrow \emptyset \ / \ \emptyset_{past}+\_$
     b. $C \rightarrow \emptyset \ / \ [\text{past}]$

This distinction might seem tenuous, but option (58a) constrains nonconcatenative processes to be phonologically local to the docking point of morphemes (i.e., typically edges, modulo infixation). In rules of the form in (58b), the morphological feature is accessible from anywhere in the string, so nothing prevents the formulation of a rule that affects segments that are not local to the edges, i.e.:

(59) $C \rightarrow [+\text{voice}] \ / \ [\text{past}]$

Clearly an undesired result.

[47] We are refering here to his Weak Morphological Dissociation Constraint, which states (p. 295) that:

> Morphological dissociation is prohibited for metrical constituents, except that a word-final mora is subject to depletion by morphological rules.

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