PRODUCTIVE AND UNPRODUCTIVE STRESS PATTERNS IN BRAZILIAN PORTUGUESE

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Abstract
In this paper, we provide a constraint-based analysis of main stress location in Brazilian Portuguese (BP) non-verbs, departing from the assumption that stress is quantity sensitive in non-verbal words. Based on the native speakers' treatment of newly created vocabulary, we separate productive and unproductive stress patterns. In BP, main stress respects a three-syllable window, which we interpret at the theoretical level as a left-dominant main-stress constituent, which must be aligned with the right edge of the word. Universal conditions on branching structure restrict the maximal size of the main-stress constituent to three syllables. Within our proposal, there is no need for mora-extrametricality or non-finality, at least in BP.

Keywords
Productive stress, Unproductive stress, quantity-sensitive stress, Brazilian Portuguese

0. Introduction

In Brazilian Portuguese (henceforth BP), words that do not belong to the class of verbs — such as nouns, adjectives, and adverbs — normally receive their main-stress on the penult (*ca'neta* 'pen') when their final syllable is light, while stress generally falls on the final syllable, when this syllable is heavy (*mu'lher* 'woman'). The given description of the BP main-stress rule suggests that this language has a quantity sensitive stress system that applies to non-verbs, a view that is defended by phonologists such as Bisol (1992), Magalhães (2004), Massini-Cagliari (2005), Wetzels (1992; 2007), and others, but see Lee (2007) for a different view. A problematic factor for the hypothesis of a productive stress rule in BP, regardless of whether it is defined with reference to syllable weight, is the existence of various types of exceptions. For example, there is an (albeit limited) class of words in which stress 'skips' a final heavy syllable (e.g. *útil* 'useful') and in a handful of words of this type stress is even on the antepenult (*ínterim* 'interim'). Furthermore, antepenult stress is relatively common in words ending in two light syllables (*abóbora* 'pumpkin') and a fairly large class of words, many of which are borrowings, have stress on their final light syllable (*jacaré* 'cayman'). Therefore, one could ponder whether the existence of these exceptional stresses does not challenge the idea of a productive stress rule in BP. Câmara (1970: 55), for example, denies the relevance of the phonological structure of the word for the distribution of stress, when he states: "...the accent is still free in the sense that its position does not depend on the phonemic structure of the word. There are no word-final sequences of phonemes in Portuguese that impose a particular accentuation" (our translation[1]: LW). Another property of BP stress is that it respects a three-syllable window, a property that it shares with a number of other languages (cf. van der Hulst, 1984). We thus find words with final, penult, and antepenult stress, but there are no words with stress on the pre-antepenult syllable (or further to the left). In this paper, we will particularly focus on two aspects. We will explicitly argue in favor of a productive primary stress rule for this language, as is globally defined in the first lines of this introduction. We will also discuss the three-syllable window as an attempt to provide at least a partial answer to the question as to why a stress rule as the one attested in BP can tolerate the exceptional antepenult pattern, but disallows words that are exceptionally stressed beyond the third syllable counting from the right word-edge.

In order to settle the productivity problem, we will turn to three sets of vocabulary items that represent newly created words in BP. One set of examples are acronyms, also used in Wetzels (1996; 2002; 2007) to argue in favor

[1] Por outro lado, o acento é livre ainda no sentido de que a sua posição não depende da estrutura fonêmica do vocábulo. Não há em português terminações de fonemas que imponham uma dada acentuação.

of the productivity of the main-stress rule in BP. The other two sets consist of newly coined first names and names for new drugs. The idea is that these forms, precisely because they are newly created, cannot be sensitive to lexical idiosyncrasies of existing words. Consequently, if the distinction between 'regular' and 'exceptional' patterns is real, it must be the case that the native speakers' decisions, when it comes to assigning stress to these words, systematically favor the 'regular' patterns. As we will see below, the stress patterns of these words overwhelmingly testify to the existence of a productive rule of stress placement that favors heavy syllables over light ones, such that the penult syllable is stressed only if the final syllable is light, while, when the final syllable is heavy, it attracts the main-stress. In the unproductive part of the BP stress system, quantity sensitivity is overruled by lexically specified stresses. Consequently, it is possible for syllables to the left of a final heavy syllable to carry main-stress by virtue of their stress being lexicalized, as it is possible for words to have a stressed open final syllable or to carry stress on the antepenult syllable in their lexical representation. However, as we just saw, not any type of idiosyncratic stress is allowed in BP, since an underlying accent can only surface within the limits of the three syllable window. We account for the restricted appearance of exceptional and regular primary stress by subjecting exceptional stresses to the appropriate set of faithfulness constraints, in such a way that these constraints can only take effect in the domain of the last three syllables.

This study is structured in the following way. In section 1, we provide evidence showing that the distinction between productive and unproductive stress patterns in BP is a relevant one if we wish to explain why BP speakers adopt new vocabulary items with a clear preference for specific patterns over others. Subsequently, in section 2, we make explicit our assumptions regarding the formal representation of stress. We will mold our analysis in the widely accepted tree-cum-grid model, except that we represent head-dependency relations hierarchically, instead of linearly with brackets. This allows us to derive the three syllable window without resorting to special devices like extrametricality or non-finality, as we show in section 3. In section 4, we discuss how our analysis accounts for the unproductive stress patterns. The main points of our analysis will be summarized in section 5.

2. Productive stress patterns in Brazilian Portuguese: classes of newly created words

The productivity of a given phonological rule is usually visible in words that speakers have never heard before, and for which they have to decide how they are to be pronounced. In this section, we will consider three sets of words that have entered BP recently and which show the preference of BP speakers for specific stress patterns over others.

2.1. Acronyms

With regard to BP stress, we may use the notion 'heavy rhyme' in its most general interpretation, which is that any syllable that has two filled rhyme positions counts as heavy. The list of possible rhymes in BP is presented in (1)[2] :

(1) BP Heavy Rhymes

Possible rhymes	Illustrations final		prefinal	
Vl	anel	'ring'	Estocolmo	'Stockholm'
Vr	abajur	'lampshade'	alerto	'alert'
Vs	cortes	'courteous'	adestro	'spare'
oral diphthongs	heroi	'hero'	perfeito	'perfect'
nasal diphthongs	irmão	'brother'	cãibra	'cramp'
nasal vowels	irmã	'sister'	macúmba	'voodoo'

Non-sonorant codas, with the exception of /s/, are generally not tolerated and usually trigger the epenthesis of the high vowel /i/, as can be seen in the word *clube* [klubi] 'club', borrowed from English. The formation of acronyms is an important source of new vocabulary in BP. The following examples, taken from Wetzels (2007), represent only a small sample of the many hundreds of acronyms that are in use:

(2)

VN##	JOˈCUM
	FEˈBEM
	PROˈCON
	DEˈTRAN
VG##	IˈNEI
	FUˈNAI
	SUˈSAU
	SEˈNAI
Vs##	BEˈNES
	REIˈPLAS
Vr##	UˈFIR
	PROˈER
	ALUˈNOR
	COˈNAR
Vl##	VARˈSUL
	ANˈPOL
UˈFAL	
VC(C)##	VAˈPESP([i])
	VALˈMET([i])
	TEˈLERG([i])
	TEˈLESP([i])
	AˈPRAG([i])

[2] We disregard rhymes in which /s/ functions as part of a complex coda. In the syllable coda, <l> is pronounced [w] in most, but not all, dialects of BP. In all dialects, underlying /l/ often is recoverable morpheme-finally through the existence of alternations, as is the case of *anel* [an w] 'ring': cf. *anelão* 'big ring', *anelado* 'curly', *aneleira* 'ring case', etc.

All the possible (as well as many 'impossible') codas are represented in the acronyms provided in (2). As a matter of fact, prefinal stress is extremely rare in acronyms that end in a heavy syllable[3]. On the other hand, in acronyms that end in a light syllable stress is systematically prefinal: 'ONU, 'OVNI, SI'ESI, BA'NESPA, FI'NASA, 'UFBA, CO'DAMA, TE'LASA, BRA'DESCO, TE'XACO, etc. The regular distribution of stress in the words in (2) suggests that there is indeed an unmarked stress rule for BP non-verbs, despite the relatively large number of exceptions in the existing vocabulary.

2.2 First names

Brazilian parents sometimes create novel first names for their children. These new names often consist of a sequence of (first or last) syllables taken from the parents or other relatives' first or last names. For example, a couple called *Gus*ˈ*tavo* and *Ma*ˈ*ria*, could call their son *Gus*ˈ*mar*, with stress on the final syllable (Souto Maior 1991: 22). An oft-cited example is *Tospericar*ˈ*gerja*, the name given to a boy born in Manaus, which is composed of the first syllables of the names of six soccer players who were part of the team that won the world cup in 1970: ***Tos****tão*, ***Pe****lé*, ***Ri****velino*, ***Car****los Alberto*, ***Ger****son*, ***Ja****irzinho*, as reported by Souto Maior (1992: 91). Some more examples are given below. In the left column we present the forms ending in a heavy syllable. The forms in the right column all end in a light syllable.

(3)

VN##	Chiˈnem	Tospericaˈgerja
	Eˈdum	Traziˈbulo
	Froˈin	Chanaˈneco
	Dieˈran	Ghadaˈdara
	Jurupiˈtan	Holofonˈtina
Vs##	Harpaˈlus	Acheroˈpita
	Emiˈpas	Presolˈpina
	Vulˈpas	Japinoˈbaldo
	Yoˈpros	Antiˈnarbe
	Mesreˈlaz	Eteˈcleife[4]

[3] We have found a single example *VÁRIG(i)* [várigi], with stress on a non-final closed syllable. In BP, vowel epenthesis after illicit (non-sonorant) codas, although productive, is neutralizing, because words that end in unstressed /i/ exist: *álibi* 'alibi', *cáqui* 'khaki', *júri* 'jury', *míni* 'mini', *ravióli* 'ravioli', *táxi* 'taxi', etc. One may therefore consider the possibility that word-final [i] is lexicalized in this word. However, under the epenthesis account as well as under the underlying account of final [i], stress is exceptional in *VÁRIGi*, although, under the latter analysis, it would not constitute a counterexample to the final-heavy-stressed hypothesis.

[4] It could be argued that in names like *Eteˈcleife* the last lexical syllable is *kleif* instead of *fe* (see note 2), with final <e> (= [i]) being epenthetic. Since i-epenthesis is neutralizing, we will assume here that the underlying representation is really with a final vowel. Notice that main-stress would be appropriately assigned under either hypothesis.

Vr##	Na'bor
	Azio'nor
	Hepila'zir
	Adalga'mir
	Dola'ir
	Fe'dir
	Zarifebar'bar
	Paltaq(i)'mer
Vl##	Baru'el
	Derme'val
	Galeno'gal
	Avo'al
	Idela'zil
	Fran'cel
	Gines'tal

In the words in (3) we observe the same distribution of final and prefinal stresses that we have seen in acronyms, which are selected in function of the weight of the word-final syllable. Names with stress on a final open syllable sometimes arise when the last syllable of the newly created name corresponds with the stressed syllable of one of the model names, as in *Marimé* from ***Mari****a* ***Amé****lia, or Marichá* from ***Mari****'ano* '***Cha****gas.* Some other newly made first names with an exceptional final stress look like compounds of which the right part also carries final stress when used in isolation, such as *Frantomé* from ***Fran****cisco* and ***Tomé****.* Otherwise, names with stress on a final open syllable are extremely rare, and so are names with a prefinal stressed syllable followed by a heavy syllable or names with antepenult stress[5]. This is to be expected, since these names being newly created, they should not carry any idiosyncratic markings.

2.3. Drugs

The ever-expanding pharmaceutical market requires a steady influx of new brand names to enter the BP language. The following is just a small sample of the more than one hundred examples of commercial names for anesthetic drugs that are sold in Brazil, gathered from an online corpus.

(4)	VN##	Aro'tin	Algi'rona
		Fena'ren	Fel'dene
		Meta'don	Celes'tone
		Pon'stan	Pon'dera
	Vs##	De'press	I'mipra
		Dor'less	Clop'sina
	Vr##	Efe'xor	'Citta

[5] But see below for names in which a prefinal high vowels stands in hiatus, as in Amélia.

	Eu'for	Cym'balta
	Pame'lor	Levo'zine
Vl##	Bese'rol	Pro'gresse
	Le'gil	
	Tra'mal	
VC(s)##	Pax'trat(i)	
	Nisu'lid(i)	
	Pro'zac(i)	
	Teno'tec(i)	
	Co'dex(i)	
	Mir'tax(i)	

As expected, all the words above that end in a heavy syllable have stress on that syllable, while the ones that end in a light syllable carry stress on the penult syllable.

The three sets of vocabulary we have considered in order to test whether BP adult native speakers acquire a default stress rule all exemplify newly-created words without any obvious internal morphological structuring. A single, weight-based generalization has allowed us to predict the location of main-stress in all of these classes. We therefore believe that the words that belong to these classes reveal the productive (default) aspects of the BP stress system for underived non-verbs. It does not come as a surprise that the great majority of traditional BP words comply with the stress rules that emerge as the productive ones in the newly-created vocabulary. In section 3 we propose a formal analysis of this productive pattern.

2. Assumptions regarding the formal modeling of stress

In most theories of stress, prominence relations are expressed in terms of bracketed, prominent positions on the grid. Representations of this type have been proposed in Halle and Vergnaud (1987), where one encounters configurations like the following:

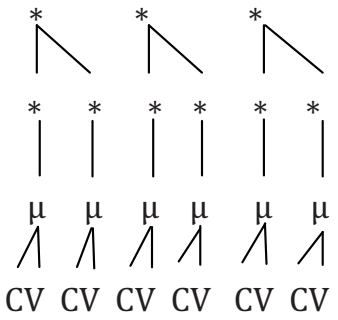
(5)	*	Line3 (word)
	(* * *)	Line2 (feet)
	(* *)(* *)(* *)	Line1 (syllables)
	σ σ σ σ σ σ	

On the basic line, here called Line1, syllables are projected by way of asterisks which are grouped into headed constituents. In this abstract example, the first asterisk of each constituent on Line1 is considered the head. The heads are projected onto Line2, where they create themselves a constituent, of which the rightmost asterisk is defined as the head, represented on Line3. In this way a prominence profile is created from which stress can be read off. Phonetically the representation in (5) is realized with main-stress on the penult syllable

and with secondary stresses on the first and third syllable from the left.

The analysis that we will elaborate in this paper must be understood as part of this tradition. However, we will express the head-dependency relations in terms of a hierarchical structure, very much in the way Hammond (1984) proposed in what he called the 'Lollipop model'. It must be said, however, that the differences between Halle and Vergnaud's representations and those proposed by Hammond are purely notational. We furthermore assume that the units projecting the basic line are moras. Onsets are dependents of the mora, as originally proposed in Hyman (1985), rather than being adjoined to the syllable, as in Hayes (1989), but this is not crucial for the purposes of this exposition. Leaving the main-stress line aside, we translate the representation in (5) in the way provided in (6):

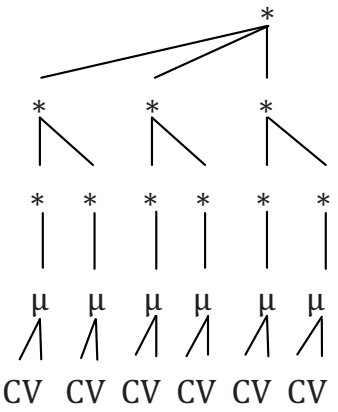
(6)



The reason why we represent head-dependency relations in terms of a hierarchical structure is because conditions on branchingness constitute an important aspect of our analysis. Since in bracketed representations it is sometimes unclear whether a constituent branches or not, we prefer the more explicit hierarchical representations of the kind given in (6).

One example of a condition on branchingness that we will propose controls the maximal size of prosodic constituents. We assume that every constituent is maximally binary branching. There are no unbounded constituents, not even at the level of the main-stress constituent. This means that in our view the main-stress constituent on Line3 in the representation in (5) is ill-formed. If directly translated into our notation, we obtain the following structure:

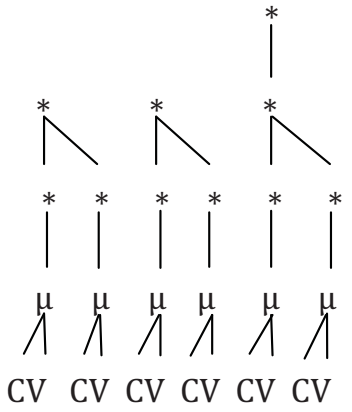
(7)



The main-stress (Line3) constituent in (7) has three daughters, which, as we claim, represents an illicit structure.

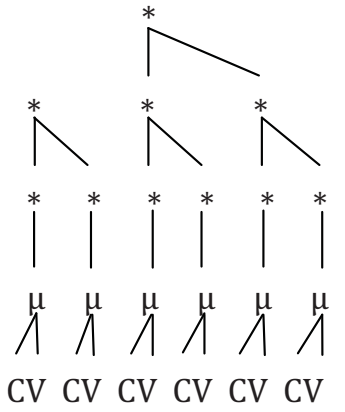
It is our hypothesis that, in a language where the main-stress gravitates towards the right edge of the word, there is no right dominant, unbounded main-stress constituent, as in (7). Instead, we claim, the constituent containing the main-stress is left dominant and is aligned with the right edge of the word. Instead of the representation in (7) we therefore propose:

(8)



The above-proposed characteristics of right-edge oriented stress do not exclude by themselves the possibility of a main-stress constituent that is larger than the one in (8). Again, the limits on the size of the main-stress constituent are restricted by conditions on branchingness. One important condition disallows a daughter constituent to branch in a dependent (i.e. non-head) position. Thus the following representation is illicit:

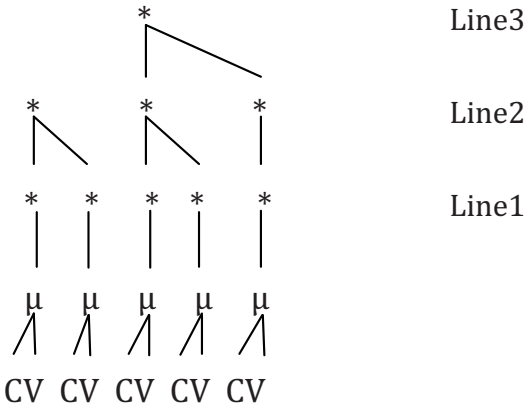
(9)



Although in (9) the main-stress constituent is binary branching on Line3, the overall structure is ill-formed, because its right daughter, which is in a dependent position, branches. We assume that this is universally excluded. Therefore, in a Line1 and Line2 configuration as given in (8-9), only a non-branching main-stress constituent is acceptable, as in (8). Its non-branching nature is a consequence of the fact that it dominates a single binary foot, which is therefore not in a dependent position.

From the above exposition it follows that any constituent can only have a non-head daughter if that daughter does not branch. The leaves room for a representation as in (10), which is well-formed according to the criteria discussed:

(10)



Here the main-stress is located on the antepenult syllable. In a system where the main-stress constituent is left dominant, this can only happen if the final syllable is parsed as a non-branching foot. Being non-branching, this foot can occupy a dependent position in the main-stress constituent.

In the approach outlined here, the maximal left-dominant main-stress constituent can only dominate three positions on Line1. This, of course, is reminiscent of the three syllable window. However, we derive the three syllable window without any device that is specifically designed to account for it, like ternary feet (Rice 1992, Hyde 2001, 2002) or non-finality (Prince and Smolensky 1993, Hyde 2007, Wetzels 2007). We only need to stipulate that a dependent daughter cannot branch. As we will show later in this study, this stipulation can be motivated independently.

In this section we have made explicit our most important assumptions with respect to the representation of stress in general. Some more assumptions will likewise be made explicit in the next section, where we develop our analysis of the BP stress system.

3. Productive stress patterns in Brazilian Portuguese: a formal analysis

As was stated above, we assume that in BP the (left dominant) main-stress constituent (the Line3-constituent) is aligned with the right edge of the word (cf. McCarthy and Prince 1993a on the family of alignment constraints). We express this fact with the following constraint:

(11) ALIGN(PrWd,R,Const-Line3,R)
The Right Edge of a Prosodic Word must be aligned with the right edge of a Constituent on Line3 (= the Main-stress constituent).

This constraint plays a key role in our analysis as it must be satisfied under all circumstances. We will therefore leave it out from the tableaux, taking it for granted that there will always be some candidate which harmonically bounds a candidate violating the alignment constraint. The head of the Line3-constituent is left dominant, so its head is at its left edge.

The domain of the Line3-constituent is maximally large, but other factors may reduce its size. Line3's maximality is induced by a constraint of the PARSE-family (viz. McCarthy and Prince 1993b for the family of parse constraints).

(12) PARSE-Line1
A Line1-constituent must be parsed by a Line3-constituent

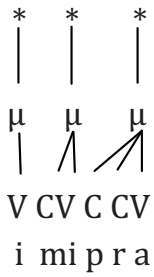
Another important element in our analysis of BP stress is that Line2-constituents (i.e. feet) are trochaic.

Two representative forms illustrating the productive stress patterns in BP are *Imipra*, consisting of three light syllables, and *Arotin*, consisting of two light syllables and a final heavy one; both were taken from the list of names for drugs (4). Consider first the form *Imipra,* which contains three moras. All three require projection on Line1 by PROJECT-μ.

(13) PROJECT-μ
A μ must occupy the head position of a constituent at Line1

PROJECT-μ creates the following representation:

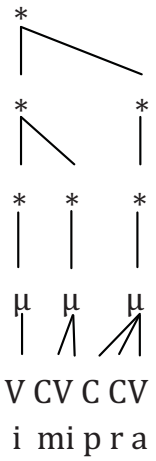
(14)



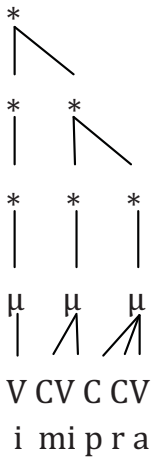
Line1 (basic line)

PARSE-Line1 requires that the whole word be parsed in a main-stress constituent at Line3. Since, like all constituents, the main-stress constituent is maximally binary branching, the correct parsing can only be achieved if two feet are constructed on Line2. For a word consisting of three light syllables, there appear to be two possible parsings, as illustrated in (15).

(15) a.



b.



In both representations every Line1 constituent is dominated by the main-stress constituent, so PARSE-Line1 is satisfied. In both cases stress is located on the antepenult syllable.

While antepenult stress is a possible pattern in BP, as we will see in the next section, it does not correspond with the actual stress pattern of the word under discussion, which has prefinal stress. Antepenult stress is excluded by two constraints, one of which was mentioned before, which takes the form of a condition on the well-formedness of representations. By hypothesis, it therefore holds in all languages and it controls the structure of all constituents. We formulate it as follows:

(16) NO-STRONG-DEPENDENT
If a constituent C branches, the immediate dependent of C may not branch.

NO-STRONG-DEPENDENT is violated by the representation in (15b), which is therefore unacceptable.

The following constraint is formally related to NO-STRONG-DEPENDENT, but it has the status of a violable constraint.

(17) NO-STRONG-HEAD
If a constituent C branches, the immediate head of C may not branch.

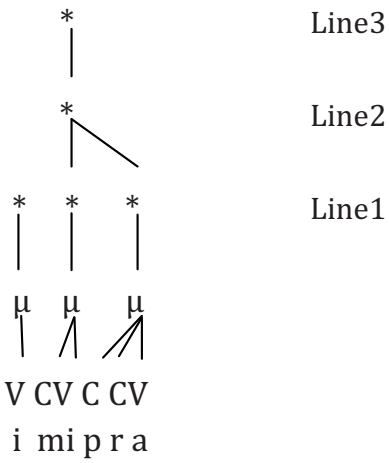
NO-STRONG-HEAD is violated in the representation in (15a), because not only is the main-stress constituent branching, but also its head, which is the leftmost foot at Line2.

There are good reasons to believe that NO-STRONG-HEAD can be independently motivated. If applied at the foot level, it has the effect of ruling out an uneven trochee. Although the uneven trochee was originally declared nonexistent (Hayes 1995), it now has the status of a possible, but marked foot

(Alber 1997). In our proposal it is NO-STRONG-HEAD, applied at the foot level, which gives the uneven trochee a marked status.

If we now rank NO-STRONG-HEAD above PARSE-Line1, the domain of the main-stress constituent is limited, so that NO-STRONG-HEAD can be satisfied, whereas PARSE-Line1 is violated. As the effect of this ranking penult stress is created. The representation of *Imipra* now looks as follows:

(18)



In this representation, the head of the main-stress constituent branches, but not at its maximal level (Line3). Therefore, NO-STRONG-HEAD is not violated. The tableau in (19) shows that NO-STRONG-HEAD must dominate PARSE-Line1.

(19) NO-STRONG-HEAD » PARSE-Line1

i mi pra	NO-STR-H	PARSE-L1
* * * * * * $((i\ mi)_{Ft}\ (pra)_{Ft})_{MSC}$	*!	
* * ☞ * * * $i\ ((mi\ pra)_{Ft})_{MSC}$		*

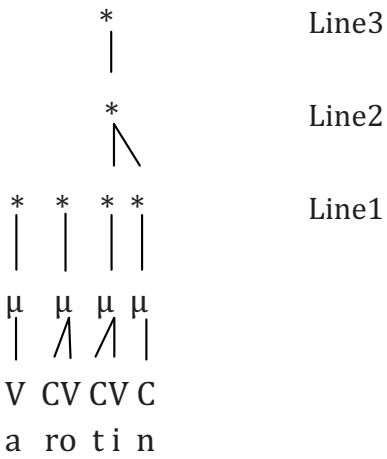
For reasons of simplicity, in the tableaux we represent hierarchical structure with brackets. Headedness is indicated with asterisks. The subscript abbreviation MSC used in the tableaux stands for 'main-stress constituent'.

The ranking in tableau (19) selects *Imipra* with penult stress as preferred over the antepenult pattern. BP word prosody preferably leaves one syllable unparsed by the main-stress constituent than making the main-stress constituent branching at both the head level and the maximal level.

Let us now consider the form *Arotin*, which ends in a heavy syllable. We have seen that a final heavy syllable attracts the main-stress of the word. It

is not so difficult to understand why this is the case. Since the final syllable is bimoraic, it projects two positions on the basic line. These two positions behave in exactly the same way as the last two syllables in the form *Imipra,* each of which project a single mora. The representation of *Arotin*, therefore, is as follows:

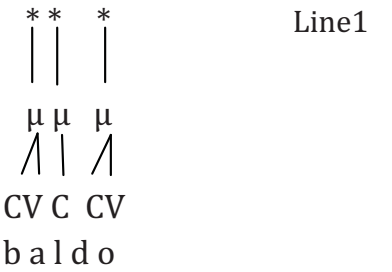
(20)



Since, in this study, we do not deal with the issue of secondary stress in BP, nothing will be said about the structure of the feet to the left of the Main-stress constituent (see Wetzels 2007 for some discussion of the different nature of primary and secondary stress in BP).

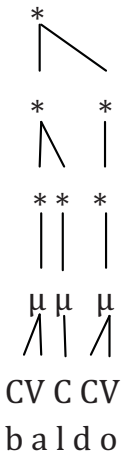
Words ending in a penult heavy syllable followed by a light final syllable are interesting, because they show that some of the constraints we have proposed so far must be ranked with respect to each other. Consider *Japinobaldo*, one of the forms occurring in our first name database. *Japinobaldo* ends in a light syllable, and main-stress is assigned to the heavy penult. Suppose that all the moras of the last two syllables would project a position on Line1.

(21)



If all Line1 constituents are parsed in a main-stress constituent, the following configuration is created.

(22)



Here the constraint NO-STRONG-HEAD is violated. As we have seen with regard to the structure in (19), in BP a main-stress constituent which branches both at the level of the head and the maximal level is avoided. We propose to solve this problem by ranking NO-STRONG-HEAD over PROJECT-μ. The effect is that now the syllable *bal* receives just one position on Line1, even though it is heavy, which is our way of formally modeling the observation that syllable weight in BP is generally irrelevant in prefinal position[6]. Now the last two syllables of *Japinobaldo* receive the following structure:

(23)

The necessity of the ranking STRONG-HEAD » PROJECT-μ is demonstrated in the tableau in (24).

[6] Below, we will extensively discuss the fact that antepenult stress does not precede a heavy penult.

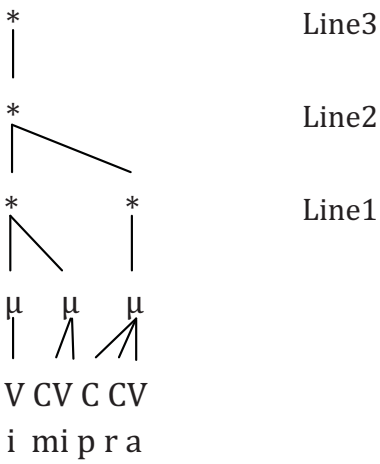
(24) NO-STRONG-HEAD » PROJECT-μ

...baldo	NO-STR-H	PROJECT-μ
* * * ** * $((bal)_{Ft}\ (do)_{Ft})_{MSC}$	*!	
* * ☞ * * $((bal\ do)_{Ft})_{MSC}$		*!

In the first candidate, the mora in coda position projects a position on Line1, creating a violation of NO-STRONG-HEAD. In the second candidate, the codaic mora does not project a constituent on Line1. This violates PROJECT-μ, but not NO-STRONG-HEAD. Given the ranking between these two constraints, the second candidate is optimal.

If it is possible to avoid a violation of NO-STRONG-HEAD by creating a violation of PROJECT-μ, we have to answer the question why the same cannot be done in words like *Imipra*. If, for instance, the mora of the second syllable would not project a position on Line1, then antepenult stress can be created without violating NO-STRONG-HEAD.

(25)



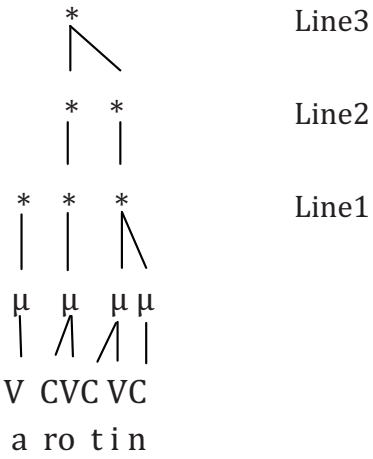
Since the mora of the second syllable is not represented on Line1, it is the dependent of the first Line1 constituent. As a result, all three syllables of this word can be integrated in the Main-stress constituent, because there is no violation of NO-STRONG-HEAD. Clearly this is undesirable, because antepenult stress is an unproductive pattern in BP.

We propose a different behavior for head moras and dependent moras. Only the latter can give up projection on Line1 under the pressure of other constraints. The former always project a Line1 position, and they never concede to the pressure of other constraints. Since in a word like *Imipra* all three moras are syllable heads, they must all project a Line1 position. In terms of

constraints and their ranking this means that there are two projection constraints, which are in a stringency relation: a general constraint and a specific one. The general one is PROJECT-μ, which, as we have seen, is dominated by NO-STRONG-HEAD. The specific one is PROJECT-μ(Head), which is always satisfied in BP. This explains why, in a word like *Imipra*, all three moras must be projected, making antepenult stress impossible.

If a dependent mora gives up its position on Line1, the effect will be that the heavy syllable of which it is a part acts as a light syllable with respect to prosodic structure. In a word like *Japinobaldo*, where the heavy syllable is located in penult position, the penult and the final syllable will therefore be parsed as a single foot, as we have seen in (23). On the other hand, if the heavy syllable is in final position, the dependent mora should not give up its position on Line1. If that happened, we would derive penult stress. Instead of the representation in (20) we would derive the one in (26).

(26)



The final syllable is itself a foot, because NO-STRONG-DEPENDENT does not allow it to be parsed as the dependent of the final foot. To the left of the monosyllabic final foot another monosyllabic foot is built. A polysyllabic foot is not optimal, due to the fact that NO-STRONG-HEAD dominates PARSE-Line1 in BP, as we have shown in the tableau in (19).

Although prefinal stress in words with a final heavy syllable is possible in BP, it is not the productive pattern. The forms in our database indicate that a final heavy syllable attracts the word stress. Clearly, then, in BP a final heavy syllable is productively assigned main-stress.

In order to ensure that a final heavy syllable receives main-stress, we have to rank PROJECT-μ over PARSE-Line1. Under this ranking it is better to give a mora, even a dependent one, its own position on Line1, then to construct a bisyllabic main stress foot. We demonstrate this with the following tableau.

(27) PROJECT-μ » PARSE-Line1

a ro tin	PROJECT-μ	PARSE-L1
* * * * * a ((ro tin)$_{Ft}$)$_{MSC}$	*!	*
* * ☞ * * ** a ro ((tin)$_{Ft}$)$_{MSC}$		**

So far we have seen that in BP the productive pattern is to assign main-stress to the penult syllable, but only if the final syllable is light. If the final syllable is heavy, then main-stress is on that syllable. There is only one systematic (productive) exception to this pattern. If the penult syllable contains a high vowel[7] immediately followed by another vowel, then the main-stress is generally on the antepenult. The following words from our database of first names illustrate this subregularity.

(28) Asifragégio
Exupéria
Orbiélio
Andrália

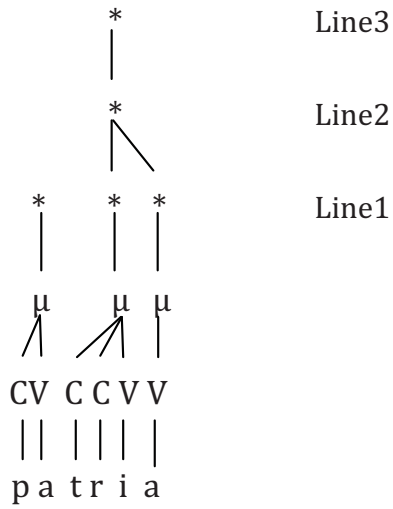
We propose to account for this pattern with the following constraint:

(29) *[V́high].V
A high vowel head position of the foot may not immediately be followed by another vowel.

The constraint penalizes a stressed high vowel if it is adjacent to a following vowel. As far as this constraint is concerned a configuration like the one in (30) is ruled out. This would be the representation of the form *pátria* 'homeland', with stress incorrectly assigned to the penult syllable *pa^{l}*tria*.

[7] There are quite a few proparoxytonic words in which the first vowel of a word-final VV sequence is a mid-vowel (variably but frequently pronounced as the corresponding high vowel) *mágoa* 'grief', *névoa* 'fog', *aérea* 'air', *áureo* 'golden', etc. It seems however, that in this case, the tendency to reject the stress in ^{l}V.V# is much less strong. Our database did not contain any words ending in {E,O}V. Closer examination of the traditional vocabulary, including the status of (some of) these sequences as a suffix, is necessary to get a clearer picture.

(30)



To prevent the creation of representations of this type *[V́high].V must be ranked higher than NO-STRONG-HEAD, because the preferred antepenult stress implies that the Main-stress constituent has a branching head. The required ranking is motivated in the tableau in (31).

(31) *[V́high].V » NO-STRONG-HEAD

pa tri a	*V@[high] V	NO-STR-H
* * * ((* *)Ft)MSC μ μ μ CV C C V V pa t r i a	*!	
* * * ☞ ((* *)Ft (*)Ft)MSC μ μ μ CV C C V V p a t r i a		*

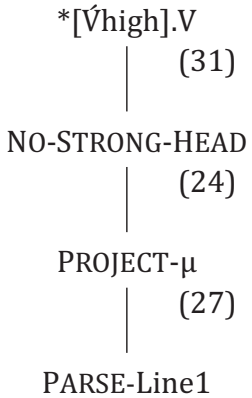
Forms like *pátria* have two consonants preceding the high vowel. This is an important difference with the words we have listed in (28), which have only one consonant preceding the high vowel. This difference corresponds with a

different pronunciation. Whereas, at a normal rate of speech, a word like *Andrália* is pronounced with a final rising diphthong, this is not the case for a word like *pátria*, in which the onset preceding the high vowel is complex. These words are more commonly pronounced with a final hiatus.

If we were to abstract away from the words in which a complex onset precedes the high vowel in hiatus, it would be possible to provide a different account of the surface stress in an underlying sequence …VC{i,u}V#, which could be explained as the consequence of obligatory glide formation of high vowels in hiatus, causing the shift of the stress to the preceding syllable. However, words like *pátria* 'homeland', *bíblia* 'bible', *supérfluo* 'superfluous', among many others. clearly show that such an analysis cannot be correct. In these forms, the underlying high vowel is *not* realized as a glide, obviously because ternary onsets are ruled out in BP (at least at a normal rate of speech), but stress nevertheless shifts to the antepenult position. This strongly suggests that the non-syllabic realization of the underlying high vowel cannot be the cause of the stress shift[8]. It is for this reason that we have proposed the constraint *[V́high].V in (29), which must be understood as a specific instance of hiatus avoidance. The general constraint would be of the form *V.V (cf. Casali 1996), which militates against two adjacent vowels that both occupy the head position of a syllable. The constraint *[V́high].V, is more stringent in two respects. Firstly, it controls the distribution of *high* vowels, and, secondly, it controls the behavior of *stressed* vowels. These two specific instances of hiatus avoidance are then amalgamated into the specific instance of hiatus avoidance we have proposed in (29). Obviously, our given interpretation of the specific constraint is only possible if the other two, less specific, constraints also exist, in the grammar of some language. Concretely, we would also predict the existence of *[Vhigh].V and *V́.V. Important though this issue might be, we have to leave it for further research.

In this section we have analyzed the productive part of the stress system of BP. Our analysis can be summarized with the constraint hierarchy in (32). The parenthetical numbers indicate the corresponding tableau in which we motivate the relevant domination relation.

(32)



[8] See also Wetzels (2007), where arguments are given that characterize post-stress gliding as a postlexical process.

Let us now turn to the unproductive part of the stress system of BP, the subsystem where lexical idiosyncrasies overrule the default system.

4. Unproductive stress patterns: an analysis

In this section we develop an analysis of the idiosyncratic properties of the BP stress system. These are the properties forcing the stress of a word to be located on a syllable not predicted by the constraint grammar proposed in the preceding section. For the analysis of exceptional stresses, we will proceed from right to left through the word domain, considering first the rightmost idiosyncratic stress position, and moving leftwards.

4.1 Stress on a word-final light syllable

One syllable that is beyond the reach of the constraint hierarchy in (32) is a *light* syllable in *final* position. Most words of this type are borrowed from other languages, mostly indigenous Brazilian languages, but also African languages, English, French, and others. Here are some examples, of which *camelô* is a loan from French, *canjarê* is probably from African origin, while all the other examples are borrowed from Tupí[9].

[9] Final stress on an open syllable is indicated in the orthography, where ^ simultaneously marks the upper mid pronunciation of <e, o>. However, final <i, u> do not carry an orthographic stress mark (unless preceded by a vowel: baú 'trunk', aí 'there (with you)'). Indeed, the great majority of words ending with the letters <i, u> have word-final stress, although counterexamples exist: táxi 'taxi', ravióli 'ravioli', álibi 'alibi', júri 'jury', cáqui 'khaki', etc. Two considerations seem relevant with regard to the question of how to deal with this part of the stress rule. Traditionally BP nouns, adverbs, and adjectives either end in a consonant or one of the theme vowels /e, o, a/, with few exceptions. The great amount of words ending in stressed /i, u/ that are part of the contemporary BP lexicon were taken from indigenous languages, mostly Tupí. One could wonder whether speakers of BP "feel" these words of indigenous origin as being "different" from the traditional Portuguese vocabulary. Aside from carrying word-final stress, these words have a predominant CV syllable structure and usually refer to toponyms, plants, or animals. A more in depth study of this part of the vocabulary and the way it functions, for example, with regard to the derivational morphology of BP, may point to the existence of a 'layered' lexicon, in which case the specific stress behaviour of word-final high vowels would be part of the 'Tupí' layer. Another relevant consideration is that unstressed word-final /e, o/ are raised to /i, u/ in most varieties of BP. Since words ending in <e, o> overwhelmingly carry prefinal stress, word-final unstressed vowel raising would render a rule that assigns stress to word-final /i, u/ opaque. It would also create many exceptions to such a rule to the extent that, for non-alternating word-final /i, u/ from historical /e, o/, the synchronic grammar would set up underlying structures with final high vowels in words that surface with prefinal stress. In our data-base of newly-created words we have found a small number of examples ending in <i, u>, the acronyms CIESI 'Centro Integrado de Ensino Professora Swely Imbiriba', encountered in the Yellow Pages of the city of Manaus, OVNI 'Objeto Voador Não Identificado', and ONU 'Organização das Nações Unidas' which are stressed on the prefinal syllable. Apparently, ONU is stressed on the final syllable in European Portuguese (cf. Pereira, 2007:70, who also cites IBILI as an acronym with final stress in EP).

(33)

abacaxi	[í]	pineapple
urubu	[ú]	vulture
canjarê	[é]	voodoo ritual
camelô	[ó]	street vendor
jacaré	[ɛ́]	alligator
igapó	[ɔ́]	swampland
maracujá	[á]	passion fruit

A final light syllable cannot be stressed in the system we have developed so far, because PARSE-Line1 ensures that a maximally large Main-stress constituent is built at the right edge, which encompasses two syllables of which the final light syllable occupies the dependent position in the foot. In order to allow the surfacing of stress on a word-final light syllable, we must provide words that carry such a stress with the appropriate lexical marking. A faithfulness constraint (McCarthy and Prince 1995) ensures that the lexically marked stress is maintained, which must overrule the default prefinal stress preferred by the constraint set that accounts for the productive system. The faithfulness constraint we need is formulated in (34).

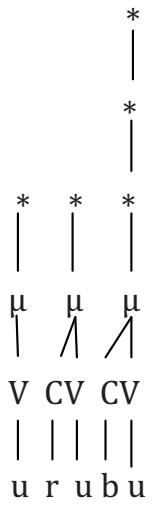
(34) MAX-Accent
If a vowel is located in a word's head position in UR,
it is located in a word's head position in SR.

This constraint specifies that a vowel which carries the main accent at the underlying level must also carry the main accent at the surface level. In other words, the underling accent may not change its position under the pressure of the constraints accounting for the productive stress patterns. The word *urubu,* for example, will have a lexical representation as in (35).

(35)

It is the task of the faithfulness constraint MAX-Accent to preserve the accent in the lexically specified position, as in the following surface representation:

(36)



The vowel that is in the word's head position in this representation is also in the word's head position at the underlying level. This is in agreement with MAX-Accent. In order for MAX-Accent to take effect, we have to rank it with respect to all the constraints that are in conflict with it, one of which is PARSE-Line1, which enforces the construction of a maximally large Main-stress constituent. In the case of BP this would lead to a binary foot dominated by a non-branching Main-stress constituent, as we have shown with the word *Imipra* in (18). We must therefore rank MAX-Accent above PARSE-Line1, as is shown with the tableau in (37).

(37) MAX-Accent » PARSE-Line1

* u ru bu	MAX-Accent	PARSE-L1
* * * * * u ((ru bu)$_{Ft}$)$_{MSC}$	*!	*
* * ☞ * * * u ru ((bu)$_{Ft}$)$_{MSC}$		**

The first candidate, which has the bigger Main-stress constituent, incurs a violation of MAX-Accent. The second candidate has a smaller Main-stress constituent, which is in conflict with PARSE-L1. Given the ranking we have proposed, the second candidate will be the optimal candidate.

Another constraint conflicting with MAX-Accent is the requirement on the maximal foot size. There is general agreement among specialists of prosody that feet in head position tend to be bimoraic (Hayes 1995, McCarthy and

Prince 1993b). Without wanting to work out the precise formulation of the minimal foot size requirement, it must be the case that this constraint is relatively low-ranked in the phonological grammar of BP, which has many words containing a single mora. Examples follow.

(38) pó powder
pá spade
pé foot
fé faith
chá tea
nu naked

Given its relative low position in the constraint ranking of BP, we may safely assume that MAX-Accent dominates the constraint that defines the minimal foot size.

4.2 Stress on a prefinal syllable followed by a heavy syllable

Another idiosyncratic stress position is the penult syllable in words ending in a heavy syllable[10]. Examples illustrating this pattern are given in (39).

(39) ˈdolar dollar
ˈforum forum
esˈteril sterile
ˈjovem young

[10] Although a number of productive subregularities appear to exist. Among the non-verbs that end in /er/, the nouns that are derived from verbs carry final stress, as predicted by our analysis (*poˈder* 'power' (cf. *poˈder* 'to be able'), *pareˈcer* 'review' (cf. *pareˈcer* 'to appear'), *saˈber* 'knowledge'(cf. *saˈber* 'to know'), *deˈver* 'duty' (cf. *deˈver* 'to owe'). Underived words ending in *–er* either have stress on the final syllable (*muˈlher* 'woman', *seˈquer* 'even', *taˈlher* 'flatware') or on the prefinal syllable (*gângster* 'gangster', *cadáver* 'corpse', *caráter* 'character'), with a statistical preference for prefinal stress. In proper names, however, one exclusively finds prefinal stress ˈ*Helder*, ˈ*Wagner*, ˈ*Kleber*, ˈ*Walter*, *Shuasˈneguer* (Schwarzenegger), ˈ*Renner*, ˈ*Brenner*, ˈ*Scherer*, ˈ*Sopher*, ˈ*Weber*, ˈ*Peter*, ˈ*Bohrer*, ˈ*Dreher*, *Ebeˈnezer*, etc. These and other subregularities that exist as part of the BP stress system deserve further study. Interestingly, BP has two morphemes that are specifically used to form proper names for boys, *–son* and *–ton,* which can be productively added to bases that are used themselves as proper names: *Joˈelson* (*Joˈel*), ˈ*Claudison* (ˈ*Claudio*), ˈ*Cleydson* (ˈ*Cleyde* (girl's name), *Eliˈvelton* (*Eliˈvel*)). Since the adjunction of *–son/–ton* does not alter the stress pattern of the word that functions as the base, bases with prefinal stress when used without *–son/–ton*, yield sequences with antepenult stress when *–son* or *–ton* is added. In the case of nouns ending in *–er* or any other closed syllable, this gives rise to a pattern in which the main stress precedes a prefinal heavy syllable, which is otherwise disallowed in BP: ˈ*Kleberson*, ˈ*Vanderson*, ˈ*Erick(i) son*. We suppose that names of foreign origin like ˈ*Anderson*, ˈ*Thomasson*, ˈ*Jackson*, ˈ*Jefferson*, ˈ*Nelson*, ˈ*Clayton*, etc., which one commonly encounters in Brasil, have served as a model for the Brazilian formations. Clearly, these words require a special formal treatment, which we will not discuss here.

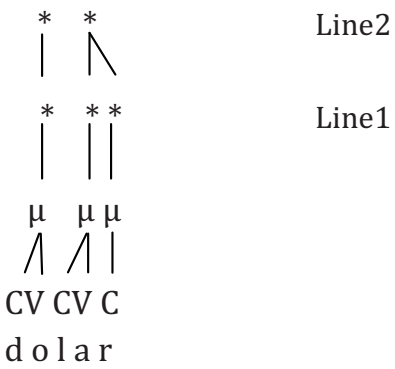
In the system we have developed so far, a penult syllable followed by a final heavy syllable is not stressable. This is the consequence of the fact that PROJECT-μ dominates PARSE-Line1. It is more important for a coda consonant to project a position on Line1 than it is to parse a Line1-constituent in the Main-stress constituent. We have demonstrated this in the tableau (27).

In order to account for the fact that main-stress does occur on penult syllables followed by a final heavy syllable, we have to mark the vowel in the relevant position with an underlying accent. A word like *dolar* thus has the following structure at the underlying level.

(40)

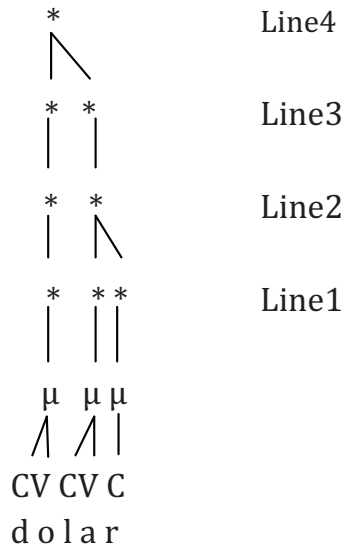
MAX-Accent requires the vowel of the penult syllable to surface with main-stress. This, however, conflicts with PROJECT-μ. To see this, consider the representation of this word at the line2 level.

(41)



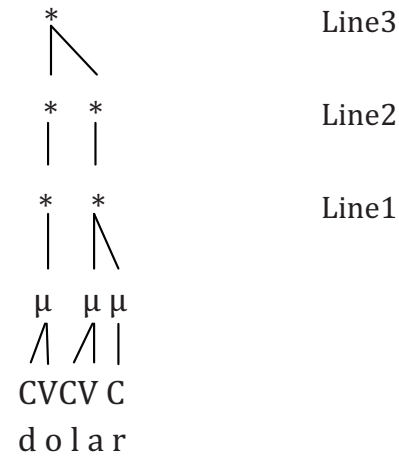
Both moras of the final syllable project a position on Line1, where they are grouped into a foot. The underlingly marked position projects to higher lines as well, because MAX-Accent requires that the word's head position be located on the syllable with the underlying accent. Consequently, the branching foot must become a dependent of the Main-stress constituent, of which the prefinal syllable is the head. We have seen that such a structure is militated against by NO-STRONG-DEPENDENT. In order to make the branching foot a dependent in the Main-stress constituent we could think of adding another line, as in (42) below:

(42)



Since the Main-stress constituent must be located on line three, the structure in (42) is illicit. There is therefore only one possibility to assign main-stress to the syllable containing the underlyingly marked vowel: the mora in the coda position of the final syllable should not project a position on Line1. This is shown in the following representation.

(43)



In the structure above, the coda of the final mora is represented as a dependent of the final syllable's head mora. The branching constituent on Line1 can now be incorporated in the Main-stress constituent through its intermediate non-branching mother on Line2, which is a dependent of the Main-stress constituent, in which the head is located on the syllable containing the underlyingly marked vowel.

It was shown that an underlyingly marked accent on the penult syllable that is followed by a heavy word-final syllable involves a conflict between MAX-Accent and PROJECT-μ. In these words the conflict is resolved in favor of MAX-Accent, showing that MAX-Accent dominates PROJECT-μ. We summarize the argument in the following tableau:

(44) MAX-Accent » PROJECT-μ

* do lar	MAX-Accent	PROJECT-μ
* * * ** do ((lar)$_{Ft}$)$_{MSC}$	*!	
* * * ☞ * * ((do)$_{Ft}$ (lar)$_{Ft}$)$_{MSC}$		*

4.3 Stress on a prefinal high vowel in hiatus

We have seen in Section 3 that prefinal high vowels in hiatus usually reject the word stress, as was illustrated with the words in (28). BP has a number of exceptions to the generalization, some examples of which are given in (45).

(45)		
	tera'pia	therapy
	ta'pua	monkey (species)
	ma'cio	soft
	ba'cia	basin
	fo'lia	revelry

To account for the type of words exemplified above, we have to rank the constraint MAX-Accent above the constraint *[V́high].V. Forms of the type given in (45) must have an underlying accent on the high vowel. While MAX-Accent preserves the surface accent in that position, *[V́high].V puts the accent on the antepenult syllable. These constraints therefore conflict, and MAX-Accent must dominate *[V́high].V. We show this in the tableau in (46).

(46) MAX-Accent » *[V́high]V

* tapua	MAX-Accent	*[V́high]V
* * * * * * ((ta pu)$_{Ft}$(a)$_{Ft}$)$_{MSC}$	*!	
* * ☞ * * * ta ((pu a)$_{Ft}$)$_{MSC}$		*

In the first candidate the underlying accent is not realized, in violation of MAX-Accent. On the other hand, this candidate satisfies *[V́high].V, because the stress is located on the antepenult syllable instead of on the high vowel. In the second candidate the opposite relation is obtained. Since the second candidate is optimal, the correct ranking is MAX-Accent » *[V́high].V.

4.4 Stress on the antepenult syllable

The system we have developed so far cannot deal with antepenult stress. In our analysis, this is a consequence of the fact that NO-STRONG-HEAD dominates PARSE-Line1. We have shown this in the tableaus (18-19). Nevertheless, there are a large number of words in BP that have stress on the third syllable from the right word-edge, as exemplified by the words in (47). We have arranged this stress type in four subclasses, depending on the presence and the position of a heavy syllable (in (47) H stands for a heavy syllable, whereas L indicates a light syllable).

(47)

a) ˈL L L ## (words that end in three light syllables)

abóbora	pumpkin
música	music
sábado	Saturday

b) ˈL L H ## (words that end in two light syllables followed by a heavy syllable)

cócegas	tickle
ônibus	bus
Lúcifer	Lucifer

c) ˈH L L ## (words that end in a heavy syllable followed by two light syllables)

helicóptero	helicopter
lámpada	lamp
árvore	tree

d) ˈH L H ## (words that end in a sequence of three syllables the first and last of which are heavy)

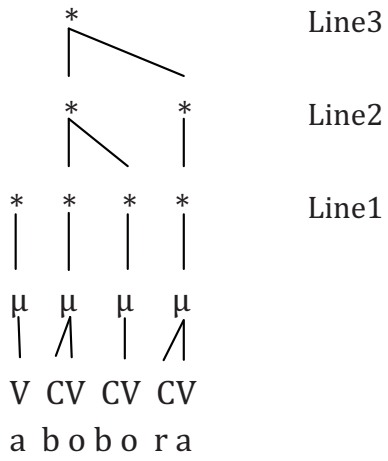
bérberis	barberry
ínterim	interim
Hércules	Hercules

All these words are lexically specified with an accent on the antepenult vowel. The form *abóbora*, for instance, has the following underlying accent specification:

(48)

This accent is subject to the constraint MAX-Accent. It must therefore become the main accent of the word. In order for an underlying accent in antepenult position to become the main-stress of the word the following representation must be created:

(49)



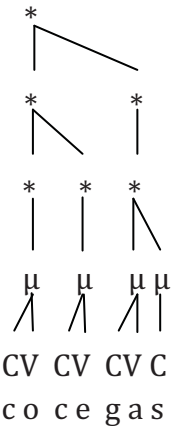
In this representation MAX-Accent is satisfied. However, the constraint which disfavors antepenult stress, NO-STRONG-HEAD, is not, because both the Main-stress constituent and its immediate head are branching. We must therefore rank MAX-Accent above NO-STRONG-HEAD. The argument is made explicit in the tableau in (50).

(50) MAX-Accent » NO-STRONG-HEAD

* abobora	MAX-Accent	NO-STR-H
* * * * * a bo ((bo ra)$_{Ft}$)$_{MSC}$	*!	
☞ * * * * * a ((bo bo)$_{Ft}$ (ra)$_{Ft}$))$_{MSC}$		*

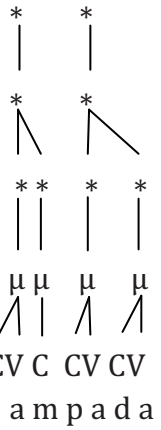
The words in the other three sets confirm our claim that MAX-Accent dominates PROJECT-μ. Words of the type given in the second set, where only the final syllable is heavy, are very much like words where the underlying stress is located on the vowel in the penult syllable. We have seen that in words like *dólar* the word-final (consonantal) mora cannot project a position on Line1. If it did, the word-final heavy syllable would reach all the way to Line3, as a consequence of which it could not be integrated as a dependent of the Main-stress constituent on Line3 (see the representation in (42) and compare it to the one in (43)). A word like *cócegas* has the representation in (51).

(51)



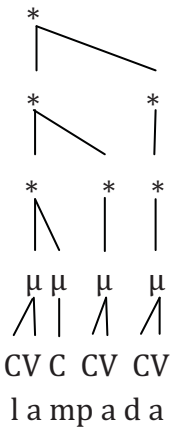
The words in the other two sets further confirm our claim that MAX-Accent dominates PROJECT-μ. Consider the words with an underlying accent on the vowel in the antepenult syllable where the antepenult is heavy. The mora in the coda of the antepenult syllable cannot project a position on Line1. If it did, it would become impossible to integrate the syllables following the antepenult heavy syllable into the Main-stress constituent. This is because the last two syllables form a branching foot. We show this with the representation in (52):

(52)



This problem disappears if the second mora of the antepenult syllable does not project a position on Line1. In (53) we provide the correct representation of *lampada*.

(53)

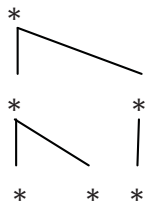


Let us finally turn to the words exemplified in set (47d). In order for the main-stress to be located in antepenult position, the consonantal mora cannot be projected onto Line1. We show this with the representation of *ínterim*.

(54)

It is important to see that the four word-types we have distinguished in (47a-d) all share the structure given in (55).

(55)



The importance of the structure in (55), which is the only one possibility to account for antepenult stress in our grammar, becomes relevant when we turn to a class of proparoxytonic words which is conspicuously absent in BP, which is the one with a heavy syllable in penult position[11]. Interestingly,

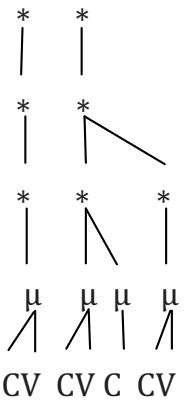
[11] One oft-cited counterexample is *pênalti,* borrowed from English 'penalty'. Observe that in this word final /i/ can be analyzed as the result of epenthesis. Several other examples exist, which lead a solitary live in dictionaries, and which are not part of the linguistic input of the average BP speaker, such as *cóferdã* 'cofferdam', mentioned in the *Aurélio* Dictionary (1986), with more than 100.000 entries, but not, for example, in the *Exitus* dictionary by Houaiss

in the system that we have proposed, it is impossible for the stress to be on the antepenult if the penult is heavy. This is because a branching penult can only be integrated into a constituent of which the antepenult is the head, if a higher-level non-branching constituent is built over it. This is necessary in order to evade the effects of NO-STRONG-DEPENDENT. However, this additional constituent makes it impossible to construct a Main-stress constituent on Line3, in which the underlyingly marked vowel corresponds with the word's head and which is also aligned with the right word edge. In other words, the Main-stress constituent cannot satisfy MAX-Accent, while simultaneously being aligned with the right edge, without become ternary branching or allowing a branching structure in a dependent position.

Let us consider how a proparoxytonic word with a heavy syllable in penult position could be represented. Two representations come to mind. In both representations the mora in the coda does not project a position on Line1 in order to ensure the construction of the maximal Main-stress constituent. As it turns out, if the penult is heavy, it is not possible to build a Main-stress constituent that contains the antepenult syllable and which is aligned with the right word edge, as part of a structure that respects the well-formedness conditions as embodied by the partial prosodic structure in (55).

(56) a)

b)



In the representation (56a) the heavy penult is incorporated in a constituent that also contains the syllable to its left. Due to NO-STRONG-DEPENDENT, this is only possible if a non-branching foot is built over the heavy penult. Accordingly, a constituent dominating the antepenult and the penult is constructed on Line3, which is not aligned with the right word edge as is required by the undominated constraint ALIGN(PrWd,R,Const-Line3,R). In the representation in (56b) the heavy penult forms a foot with the syllable on its right. Obviously, this foot branches. Therefore, in order to evade the effects of NO-STRONG-DEPENDENT, it can only form a constituent with a preceding head if a non-branching constituent is built over it. Since line3 is the ceiling for the word-level prosody, there is no level available for building a constituent of

and Every (1981), with over 60.000 entries. Others are morphologically complex, some of which were discussed in footnote 10.

which the antepenult is the head. The representation in (56b) violates MAX-Accent, because the syllable containing the vowel that is underlyingly marked for accent is not the head of the word.

We conclude that words with an antepenult accent preceding a heavy penult are disallowed by our grammar. Either they violate the undominated Align constraint or they violate MAX-Accent. We believe that this is an interesting result, particularly because in words with antepenult stress heavy syllables are possible as long as they do not occur prefinally. The important property of a heavy syllable in the penult position is that the additional, non-branching constituent that must be built over it to evade NO-STRONG-DEPENDENT makes it impossible for the Main-stress constituent to simultaneously satisfy MAX-Accent and alignment. This problem does not arise for the heavy syllables in the antepenult and final positions, provided the codaic mora does not project a position on Line1.

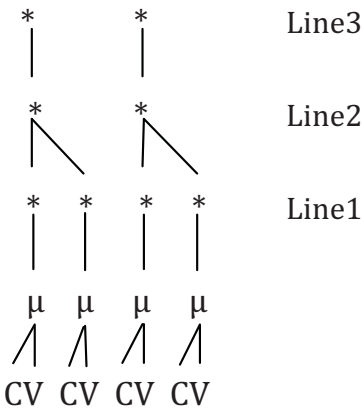
Apart from the positions we have surveyed so far there are no other positions where an underlying accent can surface. There is no way that an underlying accent can survive further to the left than the last three syllables of the word, at least not in morphologically simple words of the type under consideration here. BP is one of the languages where the "three syllable window" holds (Hyde 2001). In principle the language has "free accent", but only in the domain of the last three syllables of the word. How can we express this generalization in our system? Suppose we would have a form with an underlying accent in the preantepenult syllable. Schematically it would look as follows at the underlying level:

(57)


CV CV CV CV

To express the fact that the underlying accent cannot surface if it originates in the preantepenult position we have to rely again on the distinction between the two types of mora projection. A mora in head position has a stronger propensity to project than a mora in the coda of a heavy syllable. In the discussion of the representation of the form *Imipra*, we have already seen that it is necessary to make a distinction between two constraints that are in a stringency relation: PROJECT-μ(Head) and PROJECT-μ. We have argued that MAX-Accent dominates PROJECT-μ. We now add that the restricted version of mora projection, PROJECT-μ(Head), is ranked higher than MAX-Accent. With this ranking it is impossible for an underlying accent that originates to the left of the three syllable window to survive in the word's head position. The reason is that there is just too much structure to the right of the underlying accent. There will always be a branching constituent to the right of the underlying accent, necessitating an additional non-branching constituent to escape from the effects of NO-STRONG-DEPENDENT. Consequently it will be impossible to create a Main-stress constituent on Line3. We demonstrate this in (58).

(58)



At the right side there is branching foot. This can only be incorporated as a dependent in the Main-stress constituent if it is dominated by a non-branching constituent. This is necessary to escape from the effects of NO-STRONG-DEPENDENT. However, this non-branching constituent is located on Line3. In order to incorporate the non-branching constituent as a dependent in the Main-stress constituent, where the underlying accent is the head, a constituent must be built on a line which supercedes Line3. In other words, it is impossible to construct a Main-stress constituent where an underlying accent originating in the preantepenult syllable is the word's head. Such a Main-stress constituent can never reach the final edge of the word.

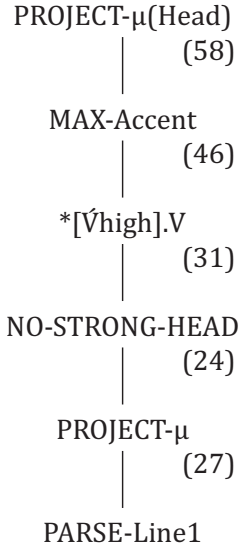
The argument that PROJECT-μ(Head) dominates MAX-Accent is made explicit in the tableau in (59). In the first candidate the mora of the second syllable does not project a position on Line1, violating PROJECT-μ(Head). A Main-stress constituent can now be built in which the underlying accent is the head, and which is still big enough to reach the final edge of the word. In the second candidate all head moras are projected. It is now no longer possible to build a Main-stress constituent where the underlying accent is the head, and which also reaches the final edge of the word. This candidate violates MAX-Accent. Since PROJECT-μ(Head) dominates MAX-Accent, the second candidate is optimal.

(59) PROJECT-μ(Head) » MAX-Accent

	PROJECT-μ(Head)	MAX-Accent
* CV CV CV CV		
* * * * * ((CV CV CV)$_{Ft}$ (CV)$_{Ft}$)$_{MSC}$	*!	
☞ * * * * * * * CV ((CV CV)$_{Ft}$ (CV)$_{Ft}$)$_{MSC}$		*

In this section we have developed an analysis of the unproductive part of the BP stress system. We have suggested that BP basically has a free accent system, in which certain positions are marked with an underlying accent. However, an underlying accent can only surface within the domain of the three syllable window. Furthermore, within the three syllable window it can never appear in antepenult position if the penult is heavy. The constraint system we have argued for is presented in (60).

(60)



Conclusion

In this paper we have provided an analysis of main stress assignment in non-verbs departing from the assumption that, in this part of the BP lexicon, stress is quantity sensitive. Based on the native speakers treatment of newly created vocabulary, we have been able to distinguish productive from unproductive stress patterns. We have then proposed an analysis of the productive patterns. We have subsequently shown how the grammar that accounts for the unmarked stresses must be adapted to account for the unproductive patterns in such a way that, within a sequence containing the last three syllables of the word, idiosyncratic stress may overrule the productive weight-sensitive patterns, which are limited to the last two syllables. Within the three syllable window there is one environment in which an underlying accent in antepenult position cannot surface: when the penult syllable is heavy, quantity sensitivity overrules an underlying accent on the antepenult syllable. Beyond the three syllable window an underlying accent has no chance to surface.

On the theoretical level we have interpreted the three syllable window as a left-dominant Main-stress constituent, which must be aligned with the right edge of the word. Universal conditions on branching structure restrict the maximal size of the Main-stress constituent to three syllables. At least in BP, there is no mora-extrametricality or Non-finality.

Let us finish with the observation that, even though, in our view, there exists a default main stress location for BP words, stress attribution clearly is a lexical phenomenon. The regularities we have found account for default stresses in non-derived words. Numerous exceptions to the unmarked patterns exist in this class, as we have seen. Moreover, the proposed generalizations are only valid for non-verbal lexical categories, with verbs having their own system of main stress distribution (see for instance, Lee (2007), Wetzels (2007)). Furthermore, morphology creates exceptions of the kind that exists in the non-derived vocabulary: for example, final stresses in open syllables are created in hypocoristic reduplication or truncation, prefinal stress in words with a final heavy syllable are created by pre-accenting suffixes that represent heavy syllables, proparoxytonic stresses are the result of the suffixation of accentless dissyllabic suffixes, proparoxytonic suffixes, or neoclassical compounding and there are even suffixes that create antepenult stress in words with a prefinal heavy syllable, as discussed in footnote 10. Finally, postlexical vowel epenthesis creates stresses outside of the three-syllable window. Nevertheless, complex as it is, the stress system of BP as a whole must be considered part of the adult speakers' linguistic competence for the simple reason that BP speakers do not deviate in how they assign main word stress, in verbs or in non-verbs, where new vocabulary follows the patterns that for derived words are predicted by the morphology and for non-derived words by a strong frequency-based preference, as we have shown in this paper.

HERMANS, B.; WETZELS, W. L. PADRÕES PRODUTIVOS E NÃO PRODUTIVOS DE ACENTO NO PORTUGUÊS BRASILEIRO

Abstract

Neste artigo, propomos uma análise baseada em restrições acerca da localização do acento primário dos não-verbos no Português Brasileiro (PB), partindo da ideia de que o acento é sensível ao peso nestas palavras. Tomando como base o tratamento dado pelos falantes nativos às novas palavras inseridas no vocabulário da língua, consideramos separadamente padrões produtivos e não produtivos de acento. No PB, o acento primário respeita a janela de três sílabas, interpretado no nível teórico como o constituinte do acento primário de domínio à esquerda, sempre alinhado com a borda direita da palavra. Condições universais sobre estrutura de ramificação restringem o tamanho máximo do constituinte do acento primário a três sílabas. Com esta proposta, não há necessidade de se fazer referência à extrametricidade da mora nem à não finalidade (non-finality), pelo menos no PB.

Keywords

Acento produtivo, acento não produtivo, sensibilidade ao peso, Português Brasileiro

References

Alber, B. (1997). Quantity sensitivity as the result of constraint interaction. In G. Booij and J. van de Weijer (eds.) *Phonology in progress – Progress in phonology*. *HIL Phonology Papers* III. The Hague: Holland Academic Press. pp. 1-45.

Bisol, L. (1992). *O acento: duas alternativas de análise.* Unp. Ms. UFRGS/PUCRS, Porto Alegre, Brazil.

Câmara, Jr. J. Mattoso (1970). *Estrutura da língua portuguêsa*. Petrópolis. Editora Vozes.

Casali, R. F. (1996). *Solving hiatus*. PhD. Dissertation, University of California, Los Angeles.

Ferreira, Aurélio (1986). *Novo dicionário da língua portuguesa*. 2a edição. Editora Nova Fronteira. Rio de Janiero.

Halle, M. and J.-R. Vergnaud (1987). *An essay on stress*. Cambridge, Massachusetts: MIT Press.

Hammond, M. (1984). *Constraining metrical theory*. PhD Dissertation, University of California, Los Angeles. [Revised version published by Indiana University Linguistics Club, Bloomington].

Hayes, B. (1989). Compensatory lengthening in moraic phonology. *Linguistic Inquiry* 20: 253-306.

Hayes, B. (1995). *Metrical stress theory: principles and case studies*. Chicago: The university of Chicago Press.

Houaiss, Antônio and Catherine Every (1981). *Dicionário Exitus das línguas inglesa e portuguesa*. Prentice Hall, Inc. Englewood Cliffs.

Hulst, H. van der. (1984). *Syllable structure and stress in Dutch*. Dordrecht: Foris.

Hyde, B. D. (2001). *Metrical and prosodic structure in Optimality Theory*. PhD Dissertation, Rutgers University, New Brunswick.

Hyde, B. D. (2002). A restrictive theory of metrical stress. *Phonology* 19: 313-359.

Hyde, B. D. (2007). Non-finality and weight-sensitivity. *Phonology* 24: 287-334.

Hyman, L. (1985). *A Theory of phonological weight*. Dordrecht: Foris.

Lee, Seung Hwa. 2007. O acento primário no português. Uma análise unificada na Teoria da Otimalidade. Araújo, Gabriel Antunes de (ed.), 2007. *O acento em português. Abordagens fonológicas*. *Lingua*$_{[gem]}$ 22. Parábola Editorial, São Paulo:121-143.

Magalhaes, J. (2004). *O plano multimensional do acento na Teoria da Otimidade*. Doct. Dissertation. PUCRS, Porto Alegre, Brazil.

Massini-Cagliari, G. (2005). *A música da fala dos trovadores. Estudos de prosódia do português arcaico, a partir das cantigas profanas e religiosas*. Tese de livre-docência em fonologia. Araraquara: Faculdade de Sciências e Letras. UNESP. Brazil.

McCarthy, J. and A. Prince (1993a). Generalized alignment. In G. Booij and J. van Marle (eds.) *Yearbook of Morphology*. Dordrecht: Kluwer. pp. 79-153 [Excerpts appear in J. Goldsmith (ed.) *Essential readings in phonology*. Oxford: Blackwell. pp. 102-136.].

McCarthy, J. and A. Prince (1993b). *Prosodic Morphology I: constraint interaction and satisfaction*. Manuscript, University of Massachusetts, Amherst and Rutgers University.

McCarthy, J. and A. Prince (1995). Faithfulness and reduplicative identity. In J. Beckman, L. Walsh Dickey, and S. Urbanczyk (eds.) *Papers in Optimality Theory. University of Massachusetts occasional papers in linguistics* 18. Amherst, Massachusetts: Graduate Linguistic Student Association.

Pereira, Maria Isabel, 2007. Acento latino e acento em português: que parentesco? Araújo, Gabriel Antunes de (ed.), 2007. *O acento em português. Abordagens fonológicas*. *Lingua*$_{[gem]}$, 22. Parábola Editorial, São Paulo: 61-83.

Prince, A. and P. Smolensky (1993). *Optimality Theory: constraint interaction in generative grammar. Manuscript*. Rutgers University, New Brunswick and University of Colorado, Boulder.

Rice, C. (1992). *Binarity and ternarity in metrical theory: parametric extensions.* PhD. Dissertation, University of Texas, Austin.

Souto Maior, M. (1992). *Nomes próprios pouco comuns. Contribuição ao estudo da antroponímia brasileira*. Third edition, Recife, Brazil. Without publisher.

Wetzels, W. L. (1992). Mid vowel neutralization in Brazilian Portuguese. *Cadernos de Estudos Lingüísticos* 23: 19-55.

Wetzels, W. L. (1995). Mid vowel alternations in the Brazilian Portuguese verb. *Phonology* 12: 281-304.

Wetzels, W. L. (1996). Syllable structure and stress in Brazilian Portuguese. Paper presented at the *Linguistic Symposium on Romance Languages*, Mexico City, 1996.

Wetzels, W. L. (2002). On the relation between quantity sensitive stress and distinctive vowel length: the history of a principle and its relevance for Romance. Wiltshire Caroline and Joaquim Camps (eds.), *Romance phonology and variation, selected papers from the 30th Linguistics Symposium on Romance Languages, Gainesville Florida, February 2000*: 219-234.

Wetzels, W. L. (2007). Primary word stress in Brazilian Portuguese and the weight parameter. *Journal of Portuguese Linguistics* 5/5: 9-58.