

Element Iteration Respecification: Unstressed Word-Final [u] in Portuguese

João Veloso

jveloso@letras.up.pt

*Faculdade de Letras da Universidade do Porto,
Centro de Linguística da Universidade do Porto*¹ (Portugal)

ABSTRACT.

This study assumes that the internal structure of vowels consists of the combination of elements which can be iterated. According to previous research, it is also assumed that element iteration in Portuguese provides vowels with inherent weight; word-finally, such vowels are stress-attractors. Notwithstanding, Portuguese has a great amount of words with unstressed final [u] (i.e., a vowel consisting of the iteration of {U}), as it is the case of inflected forms of nouns and adjectives. After analysing diachronic and morphological data, it is proposed that element iteration can have different representations at the lexical and the post-lexical levels. On the basis of this observation, it is proposed that element iteration functions as a weight- and stress-assigner only when lexically specified.

KEYWORDS.

Element iteration; phonological weight; element specification; element respecification.

RESUMO.

Este artigo assume que a estrutura interna das vogais resulta da combinação de elementos, que têm uma natureza iterativa. De acordo com estudos anteriores, assume-se ainda que a iteração de elementos em português confere peso inerente às vogais e que vogais formadas por iteração de elementos são obrigatoriamente portadoras de acento quando em posição final. No entanto, o português apresenta uma elevada quantidade de palavras com [u] átono final (uma vogal formada com iteração de {U}), como sucede nas formas flexionadas de muitos nomes e adjetivos. Analisando informação diacrónica e morfológica, propõe-se aqui que a iteração de elementos possa ter representações diversas no nível lexical e no nível pós-lexical. Com base nesta observação, é então formulada a proposta de que a iteração de elementos só funcione para efeitos de atribuição de peso e de acento quando for lexicalmente especificada.

¹ Research funded by FCT – Fundação para a Ciência e a Tecnologia, Portugal, through the Centre of Linguistics of the University of Porto (FCT/CLUP-UIDB00022/2020), and by Fundação Calouste Gulbenkian, Portugal, through the Project “Is Portuguese a Heavy Language?” (FCG-PGLCP065/207457).

PALAVRAS-CHAVE.

Iteração de elementos; peso fonológico; especificação de elementos; reespecificação de elementos.

Dedicado à Professora Doutora Ana Maria Brito

1. Introduction

In this paper, it is our wish to return to a question that was presented and discussed in a previous volume of this journal under the editorship of Prof. Ana Maria Brito, the academic whose career is celebrated in this special issue: the relationship between element iteration (EI), inherent weight of segments (IWS) and primary stress assignment in Portuguese (see Veloso 2017). In this study, we shall look more carefully at two questions that were not sufficiently taken into consideration in the aforementioned article: (i) whether element iteration can be derivationally respecified, and (ii) if the mismatch between lexical and post-lexical EI specification can somehow explain how Portuguese words ending with [u] behave differently in respect to stress assignment.

Two main reasons explain our motivation for choosing this topic, as we explain next.

First and beforehand, element iteration is an interesting subject in phonological research, since it can shed some light on the much-debated issue of whether phonology can (or cannot) admit any type of recursion. As we shall see in more detail in section 2, many theoretical developments – both in syntax and in phonology – have insisted on trying to find “what keeps phonology and syntax apart”. Recursion is often mentioned as the critical linguistic property that traces the border between the syntactic and the phonological modules of grammar. As part of a volume in tribute to a leading syntactician like Ana Maria Brito – the author’s first Linguistics teacher, more than 30 years ago! –, it seemed appropriate to explore this topic, also as a memory of the unforgettable, endless talks that Prof. Brito and I had about, precisely, how syntax and phonology can be (un)related as grammatical domains particularly prone to formal approaches in linguistic description.

Secondly, we would like to address a question that was not wholly scrutinised in our previous study of 2017: how to explain that iteration in

Portuguese vowels seems to function differently with {I} and {A}, by the one hand, and {U}, by the other hand. Namely, we shall try to find an explanation for the discrepancy between Portuguese word-final phonetic stressed and unstressed [u] concerning our previous proposal, which claims that word-final vowels built upon element iteration behave as stress attractors in Portuguese. This paper will propose that such a claim is valid exclusively when EI is found at the lexical representation level. According to the arguments that will be presented below, post-lexical {U}-iteration is irrelevant to stress-assignment, and the different prosodic behaviour of words with final [u] might be explained by postulating that stress-assignment based on EI is bound to lexically specified representations only.

We will start by reviewing, in section 2, some fundamental assumptions related to element iteration. In the same section, some short notes on the distinction between iteration and recursion will also be formulated. In section 3, we will focus on the relationship between element iteration and weight- and stress-assignment in Portuguese. Section 4 will focus on the central issue of this paper: why can final [u] (a vowel that surfaces {U}-iteration) behave as stressed or unstressed in Portuguese? After reviewing some diachronic and morphological information, it will be proposed that phonetic final [u] can correspond, lexically, to /u/ or to /o/. This conclusion makes it mandatory to accept that the lexical specification of elements of one given phonetic vowel might not always be the same. Both in section 4 and in section 5, we shall insist on the need of viewing elements and the elemental representation of vowels differently when we look at lexical or post-lexical levels. The different accentual behavior of final [u] in Portuguese will be explained, in sections 4 and 5, mainly, as the result of this lexical/post-lexical dyadic representation of vowel elements.

2. Element Iteration

2.1. Element Iteration and the Internal Structure of Vowels in Element Theory

In this study, we assume one of the most fundamental tenets of Element Theory (ET): element iteration, i.e., the possibility of one given element

occurring more than once within a given vowel segment² (e.g., Schane 1984: 151; Brandão de Carvalho 1993: 66, 67). EI has led to phonological descriptions of the “universal vowels” /a i u / as the best exemplars of iteration, since they are the result of nothing else than the iteration of, respectively, {A}, {I} and {U} (Schane 1984; Van Der Hulst 1989; Boltanski 1999; Angoujard 2003; 2006; Brandão de Carvalho et al. 2010; Backley 2011). In (1), we show how these vowels are built upon EI solely. Per Kaye, Lowenstamm & Vergnaud’s (1985: 309 ff.), Van Der Hulst’s (1989: 257 ff.), Scheer’s (1998: 141 ff.), Brandão de Carvalho’s (1993: 70), Angoujard’s (2003: 176; 2006: 37) and Veloso’s (2012; 2013; 2016; 2017) assumption that each vowel consists of a {Head, Operator} relation, these vowels show the same element in both structural positions. As a consequence of this, these vowels have also quite often been called “pure vowels” (Schane 1984: 131; Lass 1984: 275; Kaye, Lowenstamm & Vergnaud 1985: 306; Van Der Hulst 1989: 260; Boltanski 1999: 78-79; Brandão de Carvalho et al. 2010: 87; Angoujard 2006: 37 ff.; Backley 2011: 17 ff.).

(1). /a i u / as the “pure vowels” resulting from element iteration

/a/ = {A, A}

/i/ = {I, I}

/u/ = {U, U}

2.2. Iteration and Recursion in Phonological Structure

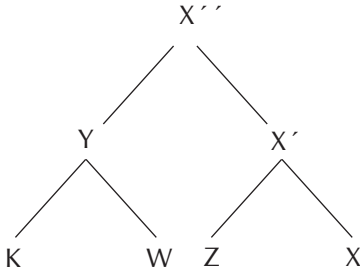
In the sense exposed in 2.1, iteration should not be equated with recursion, even though some relationship between these two concepts could be accepted.

Recursion, which is often referred to as the property that distinguishes (nonrecursive) phonology from (recursive) syntax (see below), is the possibility of a given structure *n* of a level *N* licensing iteratively endless *n*-structures as dependencies of other consecutive (iterative) *n*-structures

² This paper deals with vowels exclusively; consonants are excluded from the central discussion here.

(e.g., Baker 2001: 267 ff.). (2) tries to give a simple example of recursion from an abstract point of view.

(2). X-Recursion



As it is shown in (2), any X is recursively licensed by a higher-level X; any higher X commands all the lower Xs (X'' commands X' , X' commands X), and this cascade – at least theoretically – can run endlessly: $X \rightarrow X'$, $X' \rightarrow X''$, $X'' \rightarrow X'''$, $X''' \rightarrow X''''$, ..., and so forth.

A typical example of this is found in the successive $S \rightarrow VP \rightarrow CP$ embeddings that are common in many languages (see (3)).

(3). An example of $S \rightarrow VP \rightarrow CP$ syntactic recursion (from Baker 2001: 267)

- Mary likes Bill.
- John thinks that Mary likes Bill.
- Bill thinks that John thinks that Mary likes Bill.
- Mary thinks that Bill thinks that John thinks that Mary likes Bill.
- John thinks that Mary thinks that Bill thinks that John thinks that Mary likes Bill.

From this view, it emerges that iteration – the “mere repetition” of a unit or a structure within a larger domain – is a necessary condition for recursion. However, it is not a sufficient condition for it (for a distinction between both, see, for example, Luuk & Luuk (2012), Van Werven (2015), Huybregts (2019) and Pöchtrager 2020). The several Xs in (2) are recursive not only because they are iterated within a higher, more complex structure, but also because they are hierarchically ordered as hierarchically *dependent* within a multi-level scale where an X_{n+1} always dominates an X_n .

Recursive organisation, which is typical in syntax, is generally presented

as unallowed in phonology, and this is generally accepted as the major linguistic property that keeps phonology and syntax apart. The quotes in (4) witness this interpretation:

(4). Phonology is allegedly non-recursive

“[...] [phonological] structures, though hierarchical, are not recursive, in that, unlike syntactic structures, they cannot be embedded indefinitely deeply in other structures of the same type. [...] For example, a rhyme cannot be subordinate to a syllable that is in turn subordinate to another rhyme.”

(Jackendoff 2007: 39)

“Independently of the answer to these last questions, the introduction of recursivity blurs what has been considered a fundamental difference between morpho-syntactic structure and phonological structure. While the former is widely viewed as permitting indefinite depth via recursivity, the latter was argued to be crucially flatter in this regard, an issue that has recently been brought into focus again.”

(Nespor & Vogel 2007: viii)

“In relation to the difference between the morpho-syntactic and prosodic hierarchies, it should be noted, furthermore, that the two differ not only in the way they divide a given string into constituents. They also differ with respect to depth. That is, since the rules that construct the phonological hierarchy are not recursive in nature, while the rules that construct the syntactic hierarchy are, the depth of phonological structure is finite, while the depth of syntactic structure is, in principle, not finite.”

(Nespor & Vogel 2007: 2)

However, despite being very common, this view admits some discussion, too (Schreuder & Gilbers 2004; Van Der Hulst 2010; Nasukawa 2014; Van Werven 2015; Huybregts 2019; Bradfield 2019; Pöchtrager 2020; Dikken & Van Der Hulst 2020). This is not our central issue for now. Nonetheless, we will sum up here some of the most important arguments that are found in the phonological literature allowing us to accept, even if very limitedly,

the possibility of any type of recursive organisation in the phonological architecture of languages: (i) within some autosegmental models, it is admitted that features might be recursively organised (Nasukawa 2014); (ii) in strict CV models, which refuse the metric Onset-Rhyme model, surface VC sequences are described as embedded CVs governed by higher CVs (Van Der Hulst 2010, a.o.); (iii) Pöchtrager's (2020) analyses of English diphthongs show that elements function as hierarchised autosegmental bundles recursively organised through binding relations; (iv) Brandão de Carvalho's (2011) and Pöchtrager's (2020) analyses of Portuguese Vowel Reduction (both in European and in Brazilian Portuguese) show that iterated elements are recursive by nature, as the deletion of a superordinate element also implies the deletion of lower-leveled elements or bundles of elements. Even authors who refute phonological recursion (e.g., Nespor & Vogel 2007; Vigário 2010) accept, under certain conditions, some recursive-like limited functioning of prosody. An example is found when these authors discuss constituents such as the phonological phrase or the accommodation of clitics and the clitic group within the universal set of hierarchical prosodic levels (namely through SLH Weakening) (Nespor & Vogel 2007: xvi ff., 2).

As we said in the introductory remarks, the role of recursion for a robust distinction between phonology and syntax, very often present in the talks between Prof. Ana Maria Brito and the author, was an important motivation for this study. In a way, this is also the main reason for these brief considerations about the notion and essential distinctions such as phonological structure vs syntactic structure or iteration vs recursion. As for the former, we should also mention that many ET-based descriptions are closely related to syntactically-oriented phonological models, like Dependency Phonology and Government Phonology (Anderson & Ewen 1980; 1987; Ewen 1982; Kaye, Lowenstamm & Vergnaud 1985; Van Der Hulst 1989). The syntactic orientation of these models becomes apparent in view of the considerable number of "syntactic" principles like Command, Headedness, Binding, Merge, etc., as phonological principles, too. The importance of these models and the theoretical arguments on which they are grounded feed a highly interesting debate about the architecture of grammar and the borders between grammatical modules – namely, between syntax

and phonology. This is not, however, the very issue of this study. For the sake of our central purposes, we only shall make it clear that *iteration* – the core focus of this study – and *recursion* (to which no explanatory status will be given in the present study) are regarded as independent, yet inter-related, properties. As an example of how iteration can be dealt with without any reference to recursion, we could recall here, among many others, Halle & Idsardi's (1995) description of iterative stress assignment rules (with no reference to recursion at all) in languages like Warao, Weri and Maranungku.

3. Element Iteration and the Inherent Weight of Segments

Another founding ground of this work is the assumption that certain segments are intrinsically specified for weight. To be more precise, we assume that weight is not only a function of the internal organisation of prosodic constituents (such as rhyme branching, for instance): it can also depend on some autosegmental properties of the segments themselves, which can determine the prosodic weight of their licensing constituents. As proposed elsewhere, vowels' sonority and consonants' palatality (Veloso 2017; 2018a; 2018b; 2019; 2021a) are among the autosegmental properties that make open/mid-open vowels (i.e., vowels with {A} as their elemental Head) and palatal consonants (“{I}-consonants”) “inherently heavy”, with observable consequences at the level of stress-assignment in Portuguese: sonorous vowels, when found in the Word-Final Primary Stress Three-Syllable Window of Portuguese, are stress attractors or perceived as stressed by native listeners of the language (Veloso 2018a; 2018b). As for palatal consonants, it is widely acknowledged that, when they are found as the (phonetic) onset of a final syllable, they attract stress to the penultimate, prohibiting proparoxytonic stress (Veloso 2019; 2021a). According to Wetzels (2000), this is explained through viewing palatal consonants as lexical geminates; in a slightly different way, we interpret these consonants as “complex segments”, with Palatality ({I}) functioning as an “additional autosegment” that renders these consonants inherently heavy (for more details, see Veloso 2019).

Within this general framework, element iteration was previously

suggested (Veloso 2017) as another linguistic property capable of assigning inherent weight to the vowels that result from the iteration of the same element ($\{A\}$, $\{I\}$ or $\{U\}$) as their Head *and* as their Operator (therefore, it applies to $[a](= \{\underline{A}, A\})$, $[i](= \{\underline{I}, I\})$, or $[u](= \{\underline{U}, U\})$).

As already mentioned, the main argument for accepting these vowels as inherently heavy has to do with the fact that, when found word-finally, they are always stressed, inhibiting (safe a very few, dubious counter-examples) paroxytonic and proparoxytonic stress. The examples of (5), most of them from Veloso (2017), illustrate this view.

(5). Words with a “pure vowel” (with element iteration) in final, stressed position

$[a]=\{\underline{A}, A\}$	$[i]=\{\underline{I}, I\}$	$[u]=\{\underline{U}, U\}$
<i>jacarandá</i> [ʒəkərɐ̃ˈda], ‘jacaranda tree’	<i>abacaxi</i> [əbakaˈʃi], ‘pineapple’	<i>canguru</i> [kɛ̃guˈru], ‘kangaroo’
<i>sofá</i> [suˈfa], ‘sofa’	<i>colibri</i> [kɔliˈbri], ‘hummingbird’	<i>peru</i> [pɨˈru], ‘turkey’
<i>sabiá</i> [saˈbja], ‘thrush’	<i>rubi</i> [ruˈbi], ‘ruby’	<i>gabiru</i> [gəbiˈru], ‘ill-behaved boy’
<i>oxalá</i> [oʃeˈla], ‘inshallah’	<i>aquí</i> [ɐˈki], ‘here’	<i>tabu</i> [taˈbu], ‘taboo’
<i>maracujá</i> [mərəkuˈʒa], ‘passion fruit’	<i>javali</i> [ʒəvɐ̃ˈli], ‘wild boar’	
<i>maná</i> [mɐˈna], ‘manna’	<i>nazi</i> [naˈzi], ‘nazi’	

Most examples from Veloso (2017). Final [a] stress can also be related to sonority (Veloso 2017).

After briefly explaining the importance, according to our proposal, of IWS and, what is more, the importance of EI for IWS, we shall return, in the next section, to a particular issue that remained unexplained after Veloso (2017): in Portuguese, we find a vast amount of inflected forms ending with the an unstressed final [u] (for instance, in nouns and adjectives like *menino* [miˈninu], ‘little boy’, and *alto* [ˈaʎtu], ‘tall/high’), apparently in contradiction with our proposal of viewing EI as a mandatory stress attractor when [u] is found word-finally in this language. This contradiction is, in fact, the main topic we want to discuss for now, and it will be developed in the following section.

4. Element Iteration and the Inherent Weight of Final Vowels in European Portuguese: The Case for /u/

4.1. Some data regarding word-final (stressed/unstressed) [u] in European Portuguese

The examples in (5) offer us evidence that EI assigns weight to vowels in European Portuguese (EP), making them, consequently, stressed when they occur word-finally (see the summarising remarks above and see, for further details, Veloso 2017). As far as [a] and [i] are concerned, little has to be said in addition to this. Indeed, unstressed final [a] is never found in EP. Unstressed final /i/ is found in a very few words that are often subject to repair strategies like reduction to [ĩ], especially in the colloquial realisations of Northern dialects (*biquíni* [bi'kini]/[bi'kini], 'bikini'; *táxi* ['taksi]/['taksi], 'taxi'; *júri* ['ʒuri]/['ʒuri], 'jury'; *penálti* [pɛ'nałti]/[pɛ'nałti], '[football] penalty').

As for final [u], though, it has to be noticed that, at the phonetic level, we find a considerable amount of what could be seen as counter-examples of word-final EI as a stress-attractor: these correspond mainly to inflected forms where unstressed [u] is found word-finally. In (6) we gather some examples of nouns and adjectives that illustrate this condition.

(6). Portuguese nouns/adjectives with unstressed final [u]

menino [mi'ninu], 'little boy'

livro ['livru], 'book'

vaso ['vazu], 'vase'

alto ['ałtu], 'tall/high' [masc. sg.]

rico ['riku], 'rich' [masc. sg.]

Comparing the examples of (6) with the examples of (5), some remarks emerge. Next, we shall comment on them, considering separately diachronic information and morphological information.

1) *Diachronic information*

All the examples of (5), and all other identical forms in EP, are recent words in the history of the Portuguese lexicon. Most of them are relatively recent loanwords. They do not belong to the hereditary lexicon of the language. In fact, a vast majority of them were borrowed from other languages, mainly from African, Asian and American languages. Therefore, they did not undergo the constraints of Portuguese phonology that ruled the regular phonetic changes which incorporated Latin etyma to the core lexicon of the earliest stages of Portuguese.

On the contrary, the words in (6) are part of the hereditary lexicon and entered Medieval Portuguese through the regular phonological processes applied to Latin etyma to make them fit within the principal language phonological rules.

Contrarily to what happens with the stressed final [u] that is found in the words of (5), the final [u] of the words in (6) corresponds, etymologically, to a final Latin *ŭ* (e.g. Lat. *altŭ* > MedPort. *alto*), whose regular result in Portuguese is [o] (Maia 1986: 517 ff.; Teyssier 1990: 8). It seems highly credible that, in Medieval Portuguese, the final vowel of these Portuguese words was not a phonetic [u], as it happens in most dialects of Contemporary European Portuguese, but, instead, a phonetic [o]. Language historians admit this possibility, even if only partially or accepting a period in the past when both options possibly showed some fluctuation, as attested by old written forms (Maia 1986: 414 ff., 525-526; Mattos e Silva 2008: 496-497). In this respect, Teyssier (1990) is more categorical, saying that, before the 18th century, final <o> (i.e., in words like the examples of (6)) was mainly realised as [o] (Teyssier 1990: 57-58). This could explain, indeed, why the modern spelling conventions still preserve <o> instead of <u> to write this final, unstressed vowel. In this respect, it is worth noting that such [o]-realisations, quite interestingly, are still kept in many variants of (Northern) European³ and Brazilian Portuguese.

In our view, these data are relevant because they give us an important hint about the nature of the unstressed final [u] found in the examples of (6): at least diachronically, its phonetic realisation as [u] (i.e., as surface {U, U})

³ According to the author's empirical observations, final [o] in words like the examples given in (6) are still produced by speakers from Vinhais, Bragança, Chaves and Montalegre (Northern Portugal).

corresponds to a relatively later stage of the history of the language. Until relatively late, this vowel phonetically corresponded to [o] (= surface {U, A}, i.e., *without element iteration*, at least phonetically), as it is still found in some Portuguese dialects.

The same cannot be postulated for the stressed final [u] of the words found in (5), for which we do not have any reliable historical information suggesting that it ever had a phonetic (or phonological) form different from [u]/u/.

2) Morphological information

Another important difference between the words of (5) and (6) has to do with their internal structure and, accordingly, with the morphological status of the final [u] in both cases.

In the examples of (6) (unstressed final [u]), [u] is always the phonetic manifestation of an inflectional morpheme, the gender/class marker, as shown in the morphological analysis in (7).

This contrasts with the morphological status of the final vowel of the words of (5). Even though the morphological status of stressed [u] in these cases seems a little more obscure and has been subject to various analyses (see, for instance, Schwindt 2018), it is usually interpreted as a root-internal segment. Indeed, most conservative approaches propose that nouns with a final stressed vowel correspond to “athematic nouns”, interpreting such vowel as part of the root. This is the description found in Camara (1970), as sketched out in (7)⁴.

(7). Morphological status of final [u] in Portuguese noun forms (according to Camara 1970)

Unstressed final [u] “Thematic Nouns”	Stressed final [u] “Athematic Nouns”
<i>menino</i> [miˈninu], ‘little boy’ [[menin]Root+[o([u])]ClassMarker]Noun	<i>canguru</i> [kɛ̃guˈru], ‘kangaroo’ [[canguru]Root+[∅]ClassMarker]Noun

⁴ In (7), we assume Camara’s (1970) morphological proposals both for “[u]-thematic” and “athematic” nouns.

4.2. Discussion

The remarks made in 4.1 about some crucial differences between words ending with stressed [u] and words ending with unstressed [u] allow us to see that such differences go beyond the mere grouping of these words into two different sets just according to the traditional division between “oxytones” and “paroxytones”. They allow us to relate in a minimally systematic way each group with some historical and grammatical regularities, as summarised in (8). These regularities are understood here as a valid cue for accepting that the words belonging to (5) and (6) correspond to different phonological realities.

(8). Summary of the main differences between unstressed and stressed final [u] in Portuguese inflected forms

	Unstressed final [u] “[u]-Thematic Nouns” (example:) <i>menino</i> : [[<i>menin</i>] _{Root} +[[<i>o</i>] _([u])] _{ClassMarker}] _{Noun}	Stressed final [u] “Athematic Nouns” (example:) <i>canguru</i> : [[<i>canguru</i>] _{Root} +[[<i>∅</i>] _{ClassMarker}] _{Noun}
Diachronic Information	-Hereditary lexicon -Regular change Lat. <i>ū</i> > MedPort > [o] - Realized as [o] until relatively late (cf. modern orthography and contemporary dialects). (→ Possible phonologisation as /u/: recent)	-Recent “exotic” lexical borrowings -No evidence of a different realisation ever. (→Probably phonologised as /u/ ever since)
Morphological information	Final [u]: -Inflectional morpheme -Root-external	Final [u]: -Non-Inflectional morpheme -Root-internal

Taken as a whole, all these data sustain some critical differences related to the nature and behaviour of the final [u] of words where it is stressed and in words where it is unstressed.

In contrast with stressed final [u], unstressed final [u] has evolved from a vowel different from [u] ([o], elementally non-iterative). Its alignment in the word forms results from post-lexical inflectional procedures and takes place outside the word root. We do not assume that underlying representations correspond to ancient forms found in diachrony. However,

it seems reasonably acceptable that phonologisation – the process through which “‘low-level’ [...] phonetic tendencies attain the status of phonological generalisations in a specific language” (Carr 2008: 129) – expands slowly over time. Even if speakers are not aware, obviously, of the past forms of the words/morphemes, the grammar itself finds many ways of preserving at unobservable levels some past characteristics of linguistic forms. This could be the case of inflectional [u] of forms like the ones we find in (6): notice that recent phonological descriptions of the language, such as Mateus (1982: 33) or Mateus & Andrade (2000: 66 ff.), still consider that the underlying form of this morpheme is a phonological /o/.

None of these conditions applies to the words of (5), for which no hint exists suggesting that the phonological specification of [u] should be different from /u/(= {U, U}).

In our view, the coincidence between the regularities that have been mentioned so far distinguishing stressed final [u] from unstressed final [u] provides a reasonable amount of information that cannot be neglected.

The first remark that has to be drawn from these observations is that, at the lexical level, final stressed [u] and final unstressed [u] *are not the same*, indeed. Even if they are phonetically identical, phonologically they differ in important aspects: their different historical origins (hence, their different phonologisation paths) might have led to different lexical statuses. The same can be said regarding their different morphological nature. To the best of our understanding, the arguments reviewed so far seem sufficient, thus, to propose different lexical representations for each of them, as in (9).

(9). The lexical representation for stressed final and unstressed final [u] in Portuguese

	Stressed final [u]	Unstressed final [u]
	<i>canguru</i> [kɛ̃gu'ru], 'kangaroo' <i>peru</i> [pi'ru], 'turkey' <i>gabiru</i> [gɐbi'ru], 'ill-behaved boy' <i>tabu</i> [ta'bu], 'taboo'	<i>livro</i> [ˈlivru], 'book' <i>vaso</i> [ˈvazu], 'vase' <i>alto</i> [ˈaltu], 'tall/high' [masc. sg.] <i>rico</i> [ˈriku], 'rich' [masc. sg.]
Lexical Representation	[u]=/u/={ <u>U</u> , U}	[u]=/o/={ <u>U</u> , A}

If these representations prove adequate, it is possible to maintain our previous proposal, with an additional restriction: EI is responsible for assigning IWS to “pure vowels” – and this is particularly evident when such vowels occur as the last vowel of Portuguese word forms – under one necessary condition, that is, **EI has to be phonologically represented at the lexical specification of these vowels.** In other terms, it is not sufficient that EI is present at the phonetic level. Only vowels lexically specified as built upon phonological EI correspond to inherently heavy (stress-attractors) vowels.

Apart from the descriptive consequence of this, a theoretical aspect that should be emphasised is that this kind of examples allow us to accept that ET-based segment descriptions may differ across different derivational levels. In fact, what is being proposed here is that for final [u] in Portuguese, in the forms that have been observed so far, the same phonetic, post-lexical specification ([u] = {U, U}) can correspond to two different lexical, abstract specifications (stressed final [u] = /u/ = {U, U}; unstressed final [u] = /o/ = {U, A}). The latter, i.e.,

$$|/o/ = \{\underline{U}, A\} \rightarrow ([u] = \{\underline{U}, U\})|$$

corresponds, therefore, to a possible example of respecification, since one phonological property ({A} as Operator of the abstract /o/) is “reshaped”,

being replaced at the surface level by {U}, and this has no impact on weight- and stress-assignment.

To put it shortly, this is the core of our proposal, as summarised in (9) and (10). Keeping the key point that was proposed in Veloso (2017), we suggest that EI is relevant for weight and stress if, and only if, EI is found lexically; post-lexically, it is entirely invisible to these prosodic processes.

(10). Summary of lexical and post-lexical elemental structure of stressed and unstressed final [u] in Portuguese

	Stressed final [u]	Unstressed final [u]
	<i>canguru</i> [kẽ̃gu'ru], 'kangaroo' <i>peru</i> [pi'ru], 'turkey' <i>gabiru</i> [gɐbi'ru], 'ill-behaved boy' <i>tabu</i> [ta'bu], 'taboo'	<i>livro</i> [l'ivru], 'book' <i>vaso</i> [vazu], 'vase' <i>alto</i> [a'tu], 'tall/high' [masc. sg.] <i>rico</i> [riku], 'rich' [masc. sg.]
Lexical Representation	[u]=/u/= { <u>U</u> , U} LEXICAL ITERATION → HEAVY SEGMENT → STRESSED	[u]=/o/= { <u>U</u> , A} NO LEXICAL ITERATION → LIGHT SEGMENT → UNSTRESSED
Post-lexical Representation	[u]={ <u>U</u> , U} IRRELEVANT FOR WEIGHT- AND STRESS-ASSIGNMENT	[u]={ <u>U</u> , U} IRRELEVANT FOR WEIGHT- AND STRESS-ASSIGNMENT

If this proposal is accepted, an additional consequence has to be considered: most phonological models that assume segments within ET-based representations – Declarative Phonology, Government Phonology, Dependency Phonology, to mention but the most outstanding – are non-derivational. This proposal introduces the possibility of combining models that are essentially “monostratal” (Veloso 2021b) with derivationalist assumptions and explanations. At a rather theoretical level, this could be seen as a secondary contribution of this study, to be developed in the future.

5. Final Remarks

Throughout this paper, we tried to address the question of why final [u] in Portuguese can be stressed or unstressed. The motivation for this question is the assumption that element iteration provides vowels with inherent weight which, in turn, attracts weight when “element-iteration vowels” are found in the last syllable. This generalisation is almost exceptionless as far as final [a] and [i] are concerned in Portuguese; however, final [u] can be unstressed in many cases, namely when it corresponds to an inflectional morpheme. In these cases, we think we had the possibility of gathering suggestive evidence that element iteration is subject to post-lexical respecification. Its role as a weight-assigner and stress-attractor is effective only when final [u] is lexically specified as {U, U}. In the cases when, according to our analysis, its lexical specification is {U, A} – without element iteration, then – such prosodic function is absent. Apart from explaining the different behaviour of final [u] regarding stress-assignment, this proposal also leads us to emphasise the view that elements can be lexically specified and subject to post-lexical respecification, even if most phonological models that assume elemental approaches are non-derivational.

MAIN ABBREVIATIONS

EI = Element Iteration

EP = European Portuguese

IWS = Inherent Weight of Segments

REFERENCES

- Anderson, J. M. & Ewen, C. J. 1980. Introduction: A sketch of dependency phonology. In: J. M. Anderson, C. J. Ewen (Eds.). *Studies in Dependency Phonology*. Ludwigsburg: R.O.U. Strauch, 9-40.
- Anderson, J. M. & Ewen, C. J. 1987. *Principles of dependency phonology*. Cambridge: Cambridge University Press
- Angoujard, J.-P. 2003. Phonologie et diachronie. In: J. P. Angoujard et al. (Eds.). *Phonologie: Champs et perspectives*. Lyon: ENS Editions, 173-194.

- Angoujard, J.-P. 2006. *Phonologie déclarative*. Paris: CNRS.
- Backley, P. 2011. *An Introduction to Element Theory*. Edinburgh: Edinburgh University Press.
- Baker, M. 2001. Syntax. In: M. Aronoff, J. Rees-Miller (Eds.). *The Handbook of Linguistics*. Oxford: Blackwell, 265-294.
- Boltanski, J.-E. 1999. *Nouvelles directions en phonologie*. Paris: Presses Universitaires de France.
- Bradfield, J. 2019. Recursivity in phonology – what can it mean below the word?. *RecPhon2019*. Universitat Autònoma de Barcelona.
- Brandão de Carvalho, J. 1993. De quoi sont faites les voyelles? Phonologie tridimensionnelle des particules et harmonie vocalique. In : B. Laks, M. Plénat (Eds.) *De natura sonorum: Essais de phonologie*. Saint Denis: Presses Universitaires de Vincennes, 65-100.
- Brandão de Carvalho, J. 2011. Contrastive hierarchies, privative features, and Portuguese vowels. *Linguística*. 6(1): 51-66.
- Brandão de Carvalho, J.; Nguyen, N. & Wauquier, S. 2010. *Comprendre la phonologie*. Paris: Presses Universitaires de France.
- Camara Jr., J. M. 1970. *Estrutura da Língua Portuguesa*. Petrópolis: Vozes.
- Carr, P. 2008. *A Glossary of Phonology*. Edinburgh: Edinburgh University Press.
- Dikken, M. d & Van Der Hulst, H. 2020. On Some Deep Structural Analogies between Syntax and Phonology. In: K. Nasukawa (Ed.). *Morpheme-Internal Recursion in Phonology*. Berlin: De Gruyter, 57-116.
- Ewen, C. J. 1982. The internal structure of complex segments. In: H. Van Der Hulst, N. S. H. Smith (Eds.). *The Structure of Phonological Representations*. Dordrecht: Foris, II, 27-67.
- Halle, M. & Idsardi, W. 1995. General Properties of Stress and Metrical Structure. In: J. A. Goldsmith (Ed.). *The Handbook of Phonological Theory*. Cambridge MA: Blackwell, 403-443.
- Huybregts, M. A. C. 2019. Infinite Generation of Language Unreachable From a Stepwise Approach. *Frontiers in Psychology. Language Sciences*. 10: 1-9.
- Jackendoff, R. 2007. *Language, Consciousness, Culture. Essays on Mental Structure*. Cambridge MA: The MIT Press.
- Kaye, J., Lowenstamm, J. & Vergnaud, J.-R. 1985. The internal structure of phonological elements: a theory of charm and government. *Phonology Yearbook*. 2: 305-328.
- Lass, R. 1985. *Phonology: An introduction to basic concepts*. Cambridge: Cambridge University Press.
- Luuk, E. & Luuk, H. 2012. Natural language – no infinity and probably no recursion.

- Proceedings of the Annual Meeting of the Cognitive Science Society*. 34: 1942-1947.
- Maia, C. A. *História do Galego-Português. Estado linguístico da Galiza e do Noroeste de Portugal desde o século XIII ao século XVI (Com referência à situação do galego moderno)*. Coimbra: INIC.
- Mateus, M. H. M. 1982. *Aspectos da Fonologia Portuguesa*. 2.ª ed. Lisboa: INIC.
- Mateus, M. H. & Andrade, E. 2000. *The Phonology of Portuguese*. Oxford: Oxford University Press.
- Matts e Silva, R. V. 2008. *O Português Arcaico. Uma Aproximação. Volume II. Sintaxe e fonologia*. Lisboa: INCM.
- Nasukawa, K. 2014. Features and Recursive Structure in Phonology. *Proceeding of Phonology 2013*, 1-11.
- Nespor, M. & Vogel, I. 2007. *Prosodic phonology*. With a new foreword. Berlin: Mouton de Gruyter.
- Pöchtrager, M. 2020. Recursion and GP 2.0. In: K. Nasukawa (Ed.). *Morpheme-Internal Recursion in Phonology*. Berlin: De Gruyter, 237-266.
- Schane, S. A. 1984. The Fundamentals of Particle Phonology. *Phonology Yearbook*. 1: 129-155.
- Scheer, T. 1998. La structure interne des consonnes. In: P. Sauzet (Ed.). *Langues et Grammaire (II-III): Phonologie*. Saint Denis: Université de Paris 8, 141-172.
- Schreuder, M. & Gilbers, D. 2004. Recursive Patterns in Phonological Phrases. *Speech Prosody 2004*.
- Schwindt, L. C. 2018. Exponência de gênero e classe temática em português brasileiro. *DELTA*. 34(2): 745-768.
- Teysier, P. 1990. *História da Língua Portuguesa*. Lisboa: Sá da Costa.
- Van Der Hulst, H. 1989. Atoms of Segmental Structure: Components, Gestures and Dependency. *Phonology*. 6(2): 253-284.
- Van Der Hulst, H. 2010. A note on recursion in phonology. In: H. Van Der Hulst (Ed.). *Recursion and Human Language*. Berlin: Mouton de Gruyter, 301-342.
- Van Werven, J. F. 2015. *Reconsidering Recursion*. MA Thesis. Utrecht University.
- Veloso, J. 2012. Vogais centrais do português europeu contemporâneo: Uma proposta de análise à luz da fonologia dos elementos. *Letras de Hoje*. 47(3): 234-243.
- Veloso, J. 2013. Redução do vocalismo átono do português europeu contemporâneo: Assimetria dos elementos de tonalidade e interação entre diversos tipos de redução vocálica. *Textos Seleccionados do XXVIII Encontro Nacional da Associação Portuguesa de Linguística*. Coimbra: APL, 655-672.

- Veloso, J. 2016. O sistema vocálico e a redução e neutralização das vogais átonas em português europeu contemporâneo. In: A. M. Martins, E. Carrilho (Eds.). *Manual de Linguística Portuguesa*. Berlin: De Gruyter, 636–662.
- Veloso, J. 2017. Monossílabos CV do português: leves e degenerados? Sonoridade vocálica e iteração de elementos na atribuição de peso e na preservação da minimalidade em português. *Linguística*. 12: 201-226.
- Veloso, J. 2018a. Vowel Reduction, Vowel Assimilation, and Inherent Vowel Weight in European Portuguese: Element Asymmetries and Elements for Prosody. *Elements – State of the Art and Perspectives*. Université de Nantes.
- Veloso, J. 2018b. Sonority and Word Primary Stress by Native Listeners of European Portuguese. *The SALT Launch – An Interdisciplinary Workshop on Syllable Structure and Sonority*. Tromsø, UiT The Arctic University of Norway.
- Veloso, J. 2019. Complex Segments in Portuguese: The Unbearable Heaviness of Being Palatal. In: I. Epelde Zendoia, O. Jauregi Nazabal (Eds.). *Bihotz ahots. M. L. Oñederra irakaslearen omenez*. Bilbao: Universidad del País Vasco, 513-526.
- Veloso, J. 2021a. Segment Complexity and Segment Inherent Weight: The Behaviour of Palatality in Portuguese. *54th Annual Meeting of the Societas Linguistica Europaea*.
- Veloso, J. 2021b. Declarative Phonology and Suppletion: Non-stratal, Non-Derivational Models of Phonology and Morphological Alternation. *Preprints 2021*.
- Vigário, M. 2010. Prosodic structure between the prosodic word and the phonological phrase: Recursive nodes or an independent domain? *The Linguistic Review*. 27: 485-530.
- Wetzels, W. L. 2000. Consoantes palatais como geminadas fonológicas no Português Brasileiro. *Revista de Estudos da Linguagem*. 9(2): 5-15.