# GAPS AMONG COMPLEX ONSETS IN PORTUGUESE: A DIACHRONIC VIEW AND SOME CONSIDERATIONS RELATED TO PERCEPTION

Paulo Chagas de SOUZA*

▪ ABSTRACT: Although Portuguese admits syllables with complex onsets, there are several constraints on the kinds of actually occurring complex onsets. Firstly, the only kind of possible complex onset is the one formed by a non-sibilant obstruent followed by a liquid. Even within this smaller group of complex onsets there are still gaps. The onset /dl/ does not occur, whereas the onset /tl/ is hardly ever found, and only in the middle of words. There are also no /vl/ and /vɾ/ onsets at the beginning of native words in the standard language, except in the onomatopoeia *vrum*. The present article examines these gaps with the purpose of identifying why they exist. The conclusion reached is that the gaps in the onsets including the consonant /v/ as their first member are explained as a result of the conditions for the development of that consonant from Latin to Portuguese. The first two complex onsets, /tl/ and /dl/, on the other hand, are disfavored due to perceptual difficulties.

▪ KEYWORDS: complex onsets; Portuguese; phonology; diachrony; perception.

## Introduction

Portuguese is a language that admits complex, or branching, onsets, that is, onsets made up of more than one consonant. This statement, however, needs to be quite qualified, since the clusters admitted are considerably constrained, being essentially composed of an obstruent followed by a liquid. Nevertheless, even this definition is not sufficiently precise, because there are gaps: not any sequence of obstruent followed by liquid is admitted in Portuguese.

The purpose of the present paper is to identify the diachronic origin of complex onsets in Portuguese, in order to examine what factors have diachronically produced the kinds of gaps found among the 16 kinds of complex onsets expected, considering that synchronic formal explanations do no more than posit a filter which would erroneously block other complex onsets. With regard to one of the kinds of gaps, we will see in some detail questions related to perception.

* Universidade de São Paulo (USP). Faculdade de Filosofia, Letras e Ciências Humanas. São Paulo - SP - Brasil. pcsouza@usp.br. ORCID: 0000-0003-0600-8401.

The paper is organized as follows: firstly, I will present the position of Portuguese in the typology of the syllable proposed by Maddieson (2013). After that, I examine strictly consonantal complex onsets in Portuguese and what kinds represent gaps. Subsequently, I recapitulate the relationship between sonority and syllable structure. I then go on to discuss the arguments in Blevins (2004) in favor of a diachronic approach to phonology before reviewing two distinct diachronic perspectives, a prospective one, exemplified in the history of Portuguese by Williams (1975 [1938]), and a retrospective one, exemplified by Mattos e Silva (2006). The present paper uses a retrospective perspective as in Mattos e Silva, focusing, however, on complex onsets, not on isolated segments. Finally, I examine the gaps, attributing them to two kinds of factors. Gaps such as /vl/ and /vr/ are nothing but results of the conditions for the diachronic production of /v/ from Latin /u/. The gaps /tl/ and /dl/ are recurrent ones in languages in general, being due to perceptual factors. This is illustrated with examples from English, German and Nivacle. A section with final considerations closes the paper.

## Syllable typology

A concise typological classification of the types of syllables admitted by each language is found in Maddieson (2013). The author starts from the observation that the most recurrent type of syllable in the world's languages is the CV syllable. This is considered by him the canonical syllable. Although Breen and Pensalfini (1999) have argued that all syllables in Arrernte, a Pama-Nyungan language from Australia, are of the VC type, the CV syllable is regarded by most phonologists as the only type of syllable that apparently occurs in all the languages of the world, besides being the most common syllable type in several languages.

For Portuguese, the syllable type surveys made by Vigário, Martins and Frota (2006) of European Portuguese (EP), and by Viaro and Guimarães-Filho (2007) of Brazilian Portuguese (BP) show, respectively, 46.36% and 60.6 % of syllables as being CV.

Even in Dutch, which, like Germanic languages in general, allows syllables of great complexity (DE SCHUTTER, 1994), namely, the same complexity mentioned below for English (up to three consonants at the beginning of the syllable, and up to four at the end), the CV syllable accounts for 44.8% of the syllables in the corpus of van de Weijer mentioned in Levelt and van de Vijver (2004), with the CVC syllables representing 32.1%. All other types of syllables together do not even make up a quarter of the total syllables. Czech too, as is common among Slavic languages, has syllables of great complexity. Despite this, according to Bičan (2015), the CV syllable accounts for 48.05% of the total syllables in the language.

Further evidence that this is the canonical syllable type is the fact that in some languages it is the only allowed syllable type. These include Hawaiian and Mba (a Niger-Congo language spoken in Congo-Kinshasa). Apparently Maddieson does not distinguish vowels from diphthongs, because as stated by Alderete and MacMillan

(2015), the syllabic template of Hawaiian is (C)V1(V2). It can be concluded that the distinction he intends to make is the one between open syllables (with no final consonant) and closed syllables. Furthermore, according to Alderete and MacMillan (2015), Hawaiian does not require the syllable to have an onset, according to the template mentioned. But this does not change the classification of Hawaiian based on this typology.

The type of languages in which the syllable is also allowed to have no initial consonant is a little more frequent. Among these, Maddieson mentions Fijian, Igbo (a Niger-Congo language spoken in Nigeria), and Yareba (a language from Papua New Guinea). In this case, the canonical syllable can be represented by (C)V, with the parentheses indicating that the initial consonant is optional. Languages of these first two types, that is, strict CV and (C)V are classified by Maddieson as languages with simple syllable structure.

If, in addition to this basic type, a language admits a minimum expansion in each margin, that is, one more consonant either at the beginning or at the end of the syllable, or in both positions, this language is classified by Maddieson as having moderately complex syllable structure. This group includes languages in which the allowed consonant sequences at the beginning of the syllable are quite restricted. According to Maddieson, very often this second consonant is a liquid or a glide[1]. He mentions the Darai language (Nepal) as an example of this type, as the most complex type of syllable it admits is CCVC, as in /bwak/ '(his) father'. The second position of these onsets is always occupied by a /w/.

If a language allows more varied combinations of consonants in the onset, or a number greater than two consonants in the onset, or more than one in the coda, it is classified by Maddieson as a language with complex syllable structure. A clear example of this type of language, according to him, is English, which has syllables that can have up to three consonants at the beginning and four consonants at the end. Syllables with this maximum expansion are very few. An example is *strengths*, with the pronunciation /stɹɛŋkθs/, but it is not difficult to find examples of syllables starting with three consonants, like *split* and syllables with four consonants at the end, like *texts* (/tɛksts/). The latter number is only possible with morphologically complex codas. The coda in *strengths* comprises three morphemes (stre)ng-th-s, and the coda in *texts* comprises two: text-s.

In view of this classification, we can say that, in typological terms, Portuguese syllables are of moderate complexity. They admit combinations of two consonants in the onset or one consonant in the syllable coda. It should be noted that the question of whether Portuguese accepts complex codas or not is subject to controversy. Collischonn (1999) considers it does, but all the examples are *-ns*, which are not pronounced as two actual consonants, i.e. the analysis refers to an underlying level. Bisol (1999) considers that, since the only possible consonant as the second one in

[1] About *glides* and the fact that they should be considered consonants, vowels or something in between, see Levi (2011).

the coda is /s/, it is the result of an adjunction rule to the simple coda, the only one possible in Portuguese.

This classification of languages into three categories based on syllabic complexity abstracts from several aspects, such as the location of the syllable in the word and the frequency of the more complex type. If this type only occurs in recent loans, it has been disregarded by Maddieson. Although he does not go into these details, it is a very fruitful classification.

## Sonority sequence and syllable structure

Although one might consider it to have exceptions, among which Polish is a much-cited example (see e.g. BETHIN, 2011), a very robust generalization in phonology is that syllables are constructed based on the Sonority Sequence (SIEVERS, 1901; SELKIRK, 1984; HOOPER, 1976; KIPARSKY, 1979). This sequence appears in several versions, more compact or more detailed, the simplest of all being the following, with decreasing sonority levels:

(1) vocoids > liquids > nasals > obstruents.

It is sufficient to explain a wide range of phonological phenomena (see PARKER, 2011). There are, however, languages that demand more refined versions of the scale. A famous example is Imdlawn Tashelhiyt Berber, analyzed in Dell and Emedlaoui (1985, 1988, 2002), which requires the following scale:

(2) low vocoids > high vocoids > liquids > nasals > voiced fricatives > voiceless fricatives > voiced stops > voiceless stops.

The very broad generalization we have is that sonority grows from the beginning of the syllable to the nucleus and then decreases to its end. In this way, vocoids are the ideal nuclei, as they have the maximum sonority level. If the language admits complex onsets, they are most usually formed by a sequence of increasing sonority. If the language admits complex codas, they are most usually formed by a sequence of decreasing sonority.

BP admits several different complex onsets, but they can be grouped into a single category: onsets formed by an obstruent followed by a glide or liquid. The fact that glides can compose complex onsets in Portuguese is not often mentioned. The issue is far from simple, and is discussed in Simioni (2011). However, an onset that has a glide as its second member is not a strictly consonant complex onset. Henceforth, when referring to complex onsets, I will be referring to this specific subtype, strictly consonantal ones, the only type to be analyzed in this paper.

If we compare these onsets with the possibilities based on the sonority sequence, we see that Portuguese is quite restrictive in this respect, admitting only one type of complex onsets, more specifically those formed only by diametrically opposite types of consonants: one with minimal sonority followed by another with maximum sonority.

It is important to point out that this is a restriction of BP and not something universal, since languages such as classical Greek admitted both a stop followed by a nasal (*pneuma* 'breath') and sonority plateaux, that is, sequences of two consonants with the same sonority level: complex onsets composed of two stops (*pterón* 'wing') or two nasals (*mné:me:* 'memory').

There are also languages that admit onsets that even classical Greek did not allow, such as Czech, which has the adjective *mladý* 'young', started by a nasal followed by liquid.

Thus, we observe that BP does not allow complex onsets formed by consonants of equal sonority or by consonants with adjacent levels of the sonority scale (BISOL, 1999).

However, not every combination of obstruent and liquid is possible, either. If we have twelve phonemic obstruents in Portuguese and two liquids that can occur in the second position of complex onsets (the anterior lateral and the tap), at least theoretically we would have 24 different possible complex onsets. Based on this scale, there are five types of complex onsets not allowed in BP: obstruent + obstruent; obstruent + nasal; nasal + nasal; nasal + liquid; liquid + liquid. The first, third and last ones feature sonority plateaux.

This is still far, however, from capturing what is in fact grammatical in Portuguese. Among the fricatives, only non-coronal or non-sibilant /f v/ can be part of complex onsets. We are then left with the following eight possible obstruents in the first position: /p t k b d g f v/. Combined with the two admissible liquids in this position, the tap and the anterior lateral, we would have, in principle, sixteen possible combinations, presented in Table 1:

**Table 1** – Complex onsets made up of obstruent + liquid.

| | p | t | k | b | d | g | f | v |
|---|---|---|---|---|---|---|---|---|
| r | pr | tr | kr | br | dr | gr | fr | vr |
| l | pl | tl | kl | bl | dl | gl | fl | vl |

**Source:** Author's elaboration.

However, while theoretically possible, some of these combinations do not occur as complex onsets in BP, or are extremely restricted. They are: /tl/, /dl/ and /vl/, as well as /vɾ/ in word-initial position. In addition to the onomatopoeia *vrum*, the /vɾ/ onset occurs in variation in the form *vrido*, instead of *vidro* 'glass'. The three other of these four complex onsets have /l/ as their second element. As Loporcaro (2011) points out, consonant clusters with /l/ in general tended to be modified in Italian, Spanish and

Portuguese, although they have been preserved in languages such as French. Some examples he cites from Lausberg (1976) are: Italian *piano*, *chiave*, *fiamma*, from the Latin *planus*, *clavis* and *flamma* and their Spanish counterparts *llano*, *llave*, *llama*, in contrast to the French *plain*, *clé*, *flamme*, corresponding, respectively, to *chão*, *chave* and *chama*[2] in Portuguese. The fact that these clusters have not been eliminated from Portuguese is due to the constant reintroduction of learned latinisms. In fact, as Massini-Cagliari (2015) points out, in 100 *cantigas d'amigo* and *cantigas d'amor* she analyzed, the only example of complex onset with a lateral in second position is the proper name Clemenço, in the song 'Non vou eu a San Clemenço' by Nuno Perez. The other six examples found in the survey of archaic Portuguese made by the author come from the Cantigas de Santa Maria. Massini-Cagliari's hypothesis regarding this asymmetry is that the Cantigas de Santa Maria present a higher level of formality of expression, tending to preserve more complex onsets present in Latin.

It is important in this regard also to consider the observation made by Mattos e Silva (1989) and cited in Massini-Cagliari (2015), that all cases of graphic variation in question come from a Latin consonant followed by *l* and not by *r*, that is, the direction of change was in the sense of replacing the lateral by the tap.

The next two sections each detail the complex onsets with initial /v/ and those with an initial coronal stop, that is, /t/ or /d/.

## Blevins, synchrony and diachrony

For virtually the entire twentieth century, the predominant point of view in linguistics was the synchronic one. In this sense, it was Saussure who did an about-face from the eminently diachronic nineteenth century to a synchronic point of view. Saussure insisted on separating the two points of view, although he may have done this not so much to exclude the diachronic point of view as to include the synchronic one. The diachronic point of view was so prevalent that the synchronic one practically did not exist in the XIX century. This was reversed for most of the XX century, although towards the end of the century diachrony gradually regained a prominent place. Auroux (2000, p.xxxv) speaks of "the resurgence of historical linguistics in the second half of the 20th century, following its initial decline as a result of the 'Saussurean revolution', and its impact on synchronic studies."

Even so, it can be said that to a large extent the synchronic point of view still predominates in linguistic theory. In phonology, the most common procedure is to perform a completely synchronic analysis, without taking into account any diachronic aspect. But there are authors who have argued for the importance of diachrony for the understanding of synchronic phenomena.

---

[2] From Latin *planus* came the learned word *plano* as well. Besides /ʃ/, found in the examples *chão, chave* e *chama*, clusters with /l/ as their second member also underwent rotacism, such as *gluten* > *grude*.

Blevins (2004) considers that there are three fundamental types of explanation in phonology: historical, teleological and phonetic. In summary, we can consider that: historical explanations are based on characteristics of an earlier moment that determine characteristics of a later moment; teleological explanations address what will be obtained if they occur, that is, they look towards the future; and phonetic explanations are based on phonetic features that are phonologized, or grammaticalized.

According to Blevins, historical explanations were a fundamental component of neogrammatical thought, which included late nineteenth-century authors such as Hermann Paul, Karl Brugmann, August Leskien, Hermann Osthoff, among others. Paul (1920) famously asserted that the only scientific way to study language is historically.

In addition to the neogrammarians, Blevins mentions Baudouin de Courtenay (1845–1929) as another author who attributes a central role to history in determining sound patterns. Baudouin de Courtenay was probably the first author to treat exceptional sound patterns as "historical residues", and to identify lexical diffusion as a source of innovation. Although he emphasized the importance of characterizing synchronic grammars, Baudouin criticized other linguists for ignoring the historical perspective of grammar. That is what structuralism and generativism did: deal with isolated synchronic systems. Blevins considers the Chomskian conception of generative grammar to be Saussurean in the sense of being a synchronic system of rules detached from its history. That is, it maintains the separation between the two points of view and the synchronic prevails over the diachronic one.

In this framework, historical explanations are only sought when it comes to explaining peripheral or somehow anomalous properties of synchronic phonological systems.

However, according to Blevins, the extremely common parallels between synchronic phonological alternations and recurrent types of sound change have suggested to many authors, especially neogrammarians, that the latter are the origin of the former. As she claims, one of the most accepted explanations of the regularities found in phonological systems is that they result from the grammaticalization or formalization of previous phonetic patterns.

In short, Blevins (2004) argues that, *ceteris paribus*, simpler grammatical models are preferable to more complex ones, and that if there is already a diachronic explanation for a given phenomenon, it would be redundant to propose a synchronic explanation. It may be added that if there is a phonetic explanation for a phonological phenomenon, a purely formal explanation would be redundant.

## Two diachronic perspectives

Saussure (1975 [1916]) distinguishes two diachronic perspectives: a prospective one, which follows the course of time, that is, from a more remote moment to a more recent moment; and a retrospective one, which goes in the opposite direction, that is, from a more recent moment to a more remote one in the past.

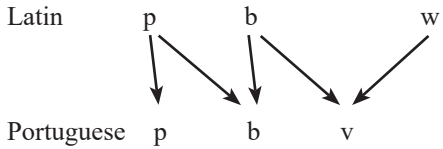
When studying the complex onsets of Portuguese, it is important to distinguish the two perspectives, because the first focuses on the fate of previously existing consonant clusters: whether they were maintained, altered or eliminated. The retrospective perspective, on the other hand, focuses on where the consonant clusters existing at a given stage of the language came from: whether they were maintained, altered or created. The two perspectives overlap but differ.

An example of the distinction between these perspectives, focusing only on simple consonants, helps us better understand the distinction. The examples illustrate correspondences regularly found between Latin forms and Portuguese forms. The term correspondences is used here in the sense it has as part of the comparative method in historical linguistics, sounds found in the same position at different historical stages of the same word or in cognates. It is not, therefore, something that intends to compare systems in the Saussurean sense that the "same" element /p/ can have different values in different systems. The correspondences are as follows:

| | | | |
|---|---|---|---|
| (3) | pede- | pé | p > p |
| (4) | lupu- | lobo | p > b |
| (5) | bonu- | bom | b > b |
| (6) | habere | haver | b > v |
| (7) | uinu- | vinho | w > v |

The correspondences between the segments in the examples mentioned when occurring in the syllable onset can be represented as follows:

(8)




From a prospective perspective, we can see that some /p/ remained as such, but others became /b/. Similarly, some /b/ remained as such, but others became /v/. In a retrospective perspective, on the other hand, we see that all /p/ in Portuguese come from a Latin /p/, while not all /b/ come from a Latin /b/. Some come from /b/, but others come from /p/.

As the intention in this work is to examine where the complex onsets of Portuguese came from, our perspective will be essentially retrospective.

Two important references in diachronic work related to Portuguese consonants are Williams (1975 [1938]) and Mattos e Silva (2006). We will see below a summary of what is presented in those two works about the correspondence between Latin and Portuguese consonants.

**Williams (1975 [1938])**

The perspective adopted by Williams is prospective. He studies what happened to Latin consonants in the formation of Portuguese. For example, what happened to simple initial consonants, which in most cases remained unchanged from Latin to Portuguese; to simple intervocalic consonants, which in general underwent weakening or lenition, voiceless stops becoming voiced, and voiced ones frequently being eliminated. He also studies what happened to initial consonant clusters, which had a varied fate, some remaining (e.g., clusters whose second element was [r]), others changing (somewhere the second element was a lateral, as *bl* and *gl*), and still others giving rise to simple consonants, such as *cl*, *fl* and *pl*, which were palatalized into [tʃ], which in turn later became simplified into [ʃ].

**Mattos e Silva (2006)**

Mattos e Silva (2006) presents a detailed survey of the origin of consonants in archaic Portuguese, whether they come from simple consonants or sequences of segments, in addition to those coming from semivowels. Her perspective can be considered eminently retrospective, like the one in this work, but focusing essentially on simple consonants in archaic Portuguese.

It deals with consonant clusters only insofar as they result in simple consonants, such as *-ty-* in medial position, which can give rise to an *-s-* or a *-z-*. (see MATTOSO CAMARA JR., 1975)[3]. The perspective adopted in this work is similar to that of Mattos and Silva, but instead of examining where simple consonants in BP come from, I will examine where complex onsets in BP come from. Before that, however, let us follow Mattos e Silva to identify where consonants in BP come from.

Mattos e Silva lists the Latin consonants as the stops /p t k b d g/, the constrictives /f s/, the nasals /m n/, the lateral /l/ and the vibrant /r/. Interestingly, Mattos e Silva does not mention /h/ among the consonants. A possible justification for this absence would be the fact that this /h/ was eliminated in Romance languages. The /h/ existing in current Romanian occurs in words of non-Latin origin, eg *hotar* 'frontier, boundary', from Hungarian *határ*.

In comparing the classical Latin consonant system with the Portuguese consonant system, a striking feature was the disappearance of the opposition between simple and geminate consonants. In Latin, as Mattos e Silva mentions, all consonants except /h/, which she did not include in the Latin consonant inventory, could be geminated. The examples given by her are the following: *suppa* > *sopa*; *abbate* > *abade*; *cattu* > *gato*;

[3] I have not included Mattoso Câmara Jr, 1970, in the references because the only reference he makes to possible complex onsets in when he mentions, in passing on p. 57, words such as *ptose*, *pneumático*, *psicologia* e *tmese*.

*additione* > *adição*; *bucca* > *boca*; *aggredire* > *agredir*; *officina* > *oficina*; *ossu* > *osso* [s]; *flamma* > *chama*; *annu* > *ano*; *caballu* > *cavalo*; *ferru* > *ferro* [R].

By observing the Latin consonant inventory, we may see that it did not have voiced fricatives (or constrictives, as Mattos e Silva names them), neither palatal or post-alveolar consonants, in which it differed from Portuguese.

For our purposes here, it will be important to retain from Mattos e Silva the information on where the consonant /v/ came from: in initial position it came only from asyllabic Latin /u/ followed by a vowel, as in *winu-* > *vinho*; *wano* > *vão*; *widere* > *ver*; in medial position, /v/ comes from asyllabic Latin /u/ surrounded by vowels (*lauare* > *lavar*) or from *-b-* surrounded by voiced sounds (*faba* > *fava*; *liber* > *livro*).

The process leading from semivocalic /u/ to /v/ is the same leading from semivocalic /i/ to /ʒ/, as in *iam* > *já*, that is, strengthening. Both /v/ and /ʒ/ come from semivocalic allophones of Latin high vowels.

## Complex onsets in Portuguese: the gaps

Recapping what was exposed in the opening section, we have that BP complex onsets are composed of a non-sibilant obstruent followed by a liquid. Let us take a closer look at the expected complex onsets and those actually found in initial and medial position in current Brazilian Portuguese (BP). The following tables detail the possibilities and gaps. The examples are my own.

**Table 2** – Word-initial complex onsets.

| | l | r |
|---|---|---|
| p | plano | prato |
| b | bloco | briga |
| t | --- | trigo |
| d | --- | drama |
| k | claro | crivo |
| g | globo | grito |
| f | flecha | frito |
| v | (Vladimir) | (vrum) |

**Source:** Author's elaboration.

**Table 3** – Word-internal complex onsets.

| | l | r |
|---|---|---|
| p | duplo | compra |
| b | ablativo | sombra |
| t | (atleta) | potro |
| d | --- | ladrão |
| k | declive | lacre |
| g | deglutir | negro |
| f | reflexo | cofre |
| v | (Pavlov)[4] | livro |

**Source:** Author's elaboration.

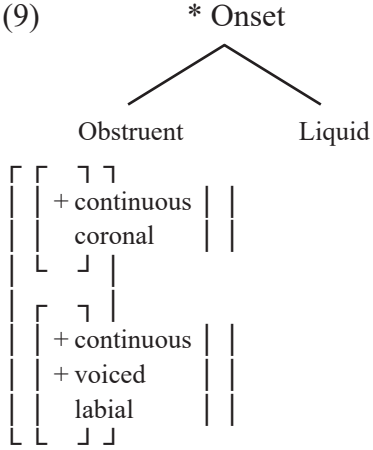
Although perhaps possible, some of these combinations do not occur as complex onsets in BP, or are very restricted. They are: /tl/, /dl/, /vl/, as well as /vɾ/ in word-initial position.

The main references on Portuguese phonology do not really explain these gaps. Among them, we can mention, first, Mateus and D'Andrade (2000), who barely go beyond listing which complex onsets occur and which ones do not in Portuguese. The work of Vigário and Falé (1993), mentioned by them in a note, proposes as a possible explanation a more refined sound scale than the one presented in example (1) of the present work. They use the same scale mentioned in example (2), based on Dell and Emedlaoui. It considers fricatives more sonorous than stops, and also voiced segments as more sonorous than voiceless ones. But the proposed additional distinction, which considers coronal fricatives more sonorous than non-coronal fricatives, is not based on argumentation and might be considered *ad hoc*.

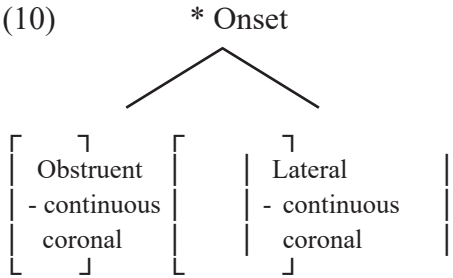
Collischonn and Wetzels (2015), on the other hand, propose two filters that account for unattested complex onsets. They are:

[4] Even though this word is usually pronounced with epenthesis of [i] between the [v] and the [l], the pronunciation with complex onset might be possible. In Russian, the pronunciation would be [pɐˈvlof]. In that case, there is indeed a complex onset in the second syllable.

(9)

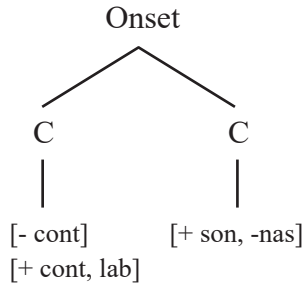



(10)




Bisol (1999) formulates a positive condition on complex onsets:

(11)




Although they delimit which complex onsets are grammatical and which are not, both the filters and the condition only go so far. What justifies the existence of these filters and this condition? Are they something arbitrary or are they based on some production or perception difficulty? The point of view defended in the present paper is that formalisms such as these fall short of an actual explanation.

A diachronic analysis is then proposed here to explain the gaps among the 16 types of expected complex onsets. They will be divided into two groups below, to be better

understood. The first is quite simple and can be explained in diachronic terms based on the surrounding context. The second can be explained based on the acoustic properties of this type of consonant cluster.

## Complex onsets with /v/

Classical Latin did not have /v/, as discussed in Meiser (2002) and McCullagh (2011). The latter lists the following consonant phonemes in Latin: the stops /p b t d k g $k^w$ $g^w$/, the fricatives /f s h/, the trill /r/, the lateral /l/, the approximants /j/ and /w/ and the nasals /m n ŋ /. Both McCullagh and Meiser find the status of /$k^w$ $g^w$/ as phonemes controversial. McCullagh does the same for the nasal velar /ŋ/. Note that there are no voiced fricatives, among which /v/ would be included.

Predominantly, Portuguese /v/ originates from a Latin /u/, which had the semivowel [w] as its allophone. I present here the details that Allen (1978) brings about Latin glides. The Latin letter <I> represented both the vowel [i] and the consonant or semivocalic [i]. The same can be said of <V>, which represented the two types of [u]. The distinction between vowel <U> and consonant <V>, and between vowel <I> and consonant <J> is from the Renaissance (BONFANTE, 1996). The difference between vowels and semivowels, according to Allen, is that the vowels were found in the nucleus, and the semivowels in the margin of the syllable. The assumption that the two semivowels had essentially the same pronunciation as the corresponding vowels is supported by the Greek transliteration of Latin words, e.g. *Iulium*, with semivocalic <i>, appeared in Greek as Ιουλιον, i.e. with an iota; while *Valerii*, with semivocal <u>, appears transliterated with the digraph <ου>, as in Οὐαλεριου[5].

Another evidence of the sound equivalence between vocalic and semivocalic pronunciations was the fact that sporadically semivowels were used as vowels in poetry and vice-versa. Examples cited by Allen are *Iulius* with four syllables (i-u-li-us) instead of three (iu-li-us), and *abiete* with three syllables (a-bie-te) instead of four (a-bi-e-te), illustrating the situation for <i>; and *silua* with three syllables (si-lu-a) instead of two (sil-ua), and *genua* with two syllables (ge-nua) instead of three (ge-nu-a), which illustrate the situation for <u>.

According to Allen, however, in the 1st century AD, confusion began to appear in the inscriptions between <V> and <B>, which indicates that the former had already begun to acquire a fricative pronunciation, probably close to the one found in Spanish *lavar*. Although Allen refers to this pronunciation of Spanish as a fricative, it is, strictly speaking, an approximant, as there is no noise production. In this sense, the change would be even smaller in relation to the classical pronunciation: just the passage from a labiovelar approximant to a bilabial approximant. In the second century, Velius Longus

[5] Allen does not simply show the forms of the Latin names mentioned transliterated to Greek, but the form of the corresponding case in Greek, with endings distinct from the Latin ones for the accusative *Iulium* and the genitive *Valerii*.

already describes the pronunciation of this sound as one performed with friction ('cum aliqua adspiratione'). In the fifth century the [w] pronunciation still survived in variation, but the fricative pronunciation was already so widespread that Priscian had to dictate rules of when to write with <u> or with <b>.

If Latin had no /v/, to identify the reason for the gaps /vl/ and /vɾ/ among complex onsets in Portuguese (the latter only constitutes a gap at the beginning of a word, as it occurs in the middle), we need to return to the contexts in that a /v/ arose in Portuguese from other Latin sounds, and to check for the possibility that /v/ appeared preceding /l/ or /r/ in the same syllable.

In fact, /v/ emerged in Portuguese as a result of two opposing processes from Latin. On the one hand, strengthening of /u/. On the other hand, lenition of /b/.
We will start from Mattos e Silva's observation that /v/ from Latin /u/ comes from initial asyllabic /u/ followed by a vowel[6] and from medial assyllabic /u/ surrounded by vowels (lauare > lava). This explains the non-existence of complex onsets with /v/ originating from /u/, as this /u/ originally had only vowels adjacent to it.

A /v/ coming from a Latin /b/, on the other hand, can lead to a complex onset. In addition to examples such as *liber*, *libri*, where *livro* comes from, which already had a complex medial onset, another possible origin of this type of complex onset would be a syncope process that eliminated the vowel following /v/, if this vowel was followed by a /l/ or an /r/. Examples of this type are *lavrar* from *labōrāre*, and *liber*, *libera*, *liberum*, from which comes the adjective *livre*.

This explains the existence of only one type of complex onset with /v/ followed by liquid in vernacular words and its absence in initial position. In short, we have the following list of informally represented correspondences, with V representing a vowel, C representing a consonant and S a voiced sound (S stands for *sonoro*, or *voiced*, in Portuguese):

(12) wV → vV
VwV → VvV
wC → uC
VwC → VuC
CwV → CuV
...SbS... → ...SvS...

Although a complex onset with /b/ can originate from a Latin word, it is always /vɾ/ and never /vl/ for two reasons. Even if there was a /v/ followed by a vowel followed by /l/ and that vowel was later elided, the /l/ would tend to change to /ɾ/ as in *gluten* > *grude*, or be deleted as in *populu-* > *povo*.

[6] Obviously, an asyllabic /u/ may only be followed by a vowel. In that case, it is a semivowel, which must have a vowel adjacent to it. If it were followed by a consonant, the /u/ would necessarily be syllabic.

A final important observation about complex /vl/ and /vɾ/ onsets, especially in view of what will be discussed in the next section, is that they do not present any production or perception difficulties, as in the case of words like *Vladimir* and *livro*. This fact demonstrates that it is not something in synchronic phonology that makes this type of complex onset rare. This occurs due to the combination of diachronic conditions necessary for the emergence of these clusters.

**Complex onsets with /t/ and /d/ followed by /l/**

Complex onsets involving /t/, /d/ and /l/ are made up of consonants that already existed in Latin. Did the onsets /tl/ and /dl/ exist in Latin? Marotta (1999) claims that they did not. In fact, tautosyllabic /dl/ does not occur in the entries of Latin dictionaries, e.g. Gaffiot (2016) and the Oxford Latin Dictionary (GLARE, 1968-1982). A **dlongus* form of the classical Latin adjective *longus* is reconstructed, but as is common with this type of complex onset, it has been simplified. As for /tl/, it did not occur as a complex onset in classical Latin in absolute word-initial position, but there are half a dozen words beginning with *stl*- listed in both dictionaries. With slight differences between them, the list includes: *stlata*, name of a type of vessel (term derived from the participle **stlatus*, then *latus*, from the verb *fero*, *ferre* 'to take'), and two adjectives derived from this word, *stlataris*, *stlatarius* (or *stlattaris*); 'slow' *stlembus*; *stlis*, then *lis*, 'quarrel'; and *stlocus*, then *locus* 'place'. In other words, Latin did have a few words starting in *stl*-, but this cluster was simplified to nothing but /l/. It is possible that there was a phase where these words started with *tl*-, but this is an unstable structure, eliminated just like the *dl*- in **dlongus*.

Words beginning with *tl*- properly in Latin were actually borrowings from Greek. Despite these few counterexamples, we can consider that /tl/ and /dl/ in classical Latin no longer existed. We may wonder why this happened.

As Marotta points out, a formal answer, such as the one based on a filter that excludes two coronal consonants in a row, would not work, as this would also exclude the clusters /tɾ/ and /dɾ/. I argue below that the inexistence of these two complex onsets is mainly due to perceptual difficulty, which makes /tl/ and /kl/, and /dl/ and /gl/ easily confused.

**The *Appendix Probi***

The first evidence concerning the difficulty in the perceptual distinction of /tl/ and /dl/ with regard to /kl/ and /gl/ is the *Appendix Probi*, which was an appendix to the Latin grammar of Probus. The text was found in an VIII century palimpsest called the *Instituta Artium* and lists 227 pairs of forms. Each pair initially contains a form

considered correct and then another vulgar one, considered incorrect. For this reason, the Appendix is an important source for knowledge of spoken popular Latin.

The Appendix contains numerous examples that reveal phonological characteristics of Vulgar Latin. One of them is the syncope of post-tonic vowels, a recurrent process also today in BP.

(13) tabula non tabla
(14) calida non calda

What interests us more closely in the Appendix is a set of three examples in which, as a result of syncope, a sequence *-tl-* would be produced. Note that instead of this sequence the sequence *-cl-* appears.

(15) vetulus non veclus
(16) vitulus non viclus
(17) capitulum non capiclum

That is, when a sequence [tl] was produced, it eventually changed into [kl]. The same phenomenon was reported on Portuguese by Cristófaro-Silva (2003), citing the form Aclético instead of Atlético[7]. As will be seen later in relation to English and German, Cristófaro-Silva observes that this pronunciation is not socially marked and that speakers are not aware of it.

In view of data like these, the initial hypothesis of this work was that, for reasons of perception, [tl] ended up changing to [kl]. Looking further away, however, often brings us important contributions to our analysis. This is what we will see in the next section.

## Beyond Portuguese and Latin

As stated by Sen (2015), gains have been obtained from the examination of Latin phenomena taking into account recent developments in phonetics and phonology, typological considerations and phonological theories.

The initial hypothesis of this work was that [tl] ended up becoming [kl]. Later, however, the contact with the 2009 article by Blevins and Grawunder, which deals with exactly the opposite change in German and English varieties (in which the onsets /kl/ and /gl/ changed into /tl/ and /dl /, respectively) forced the revision of this hypothesis. In view of what has been proposed here, namely that /tl/ and /dl/ are unstable complex onsets that would easily switch to /kl/ and /gl/, this seems contradictory.

[7] According to what an anonymous reviewer of the present paper pointed out, the form actually occurring is *Acrético*, and not *Aclético*. Even then, the existence of the form *Acrético* is only possible there being or there having been an intermediate stage (derivational or diachronic) in which the pronunciation is or was *Aclético*. *Atlético* would not immediately yield *Acrético*. The sequence of changes would be: tl > kl > kr.

Let us see, in some detail, the data Blevins and Grawunder bring about this change. Living in a region of Germany, Saxony (Sachsen), which includes Leipzig and Dresden, where the name *Klaus* is pronounced [tlaus] and when asking someone's opinion the form *glaubst* (do you think) is sometimes pronounced [dlaupst], the authors were surprised to find that there was little documentation of this phenomenon.

A first observation is that this change has occurred at least twice in the history of Germanic languages. At least once in what is now central Germany and once in XVII century English.

The following data are from a Chemnitz speaker. First, let us look at examples of the initial /kl/ that became /tl/ in the Ostvogtländisch dialect (GUNN, 2005). Blevins and Grawunder have a much longer list. Only a few were selected to illustrate the phenomenon here. Each line contains the pronunciation of the initial cluster transcribed, followed by the spelling of the word, which reflects its standard pronunciation, and its translation:

| | | | |
|---|---|---|---|
| (18) | [tl]ammern | *Klammern* | 'clothespins' |
| | [tl]ang | *Klang* | 'sound' |
| | [tl]ein | *klein* | 'small' |

Next we have examples of initial /gl/ which changed into /dl/ in the same region:

| | | | |
|---|---|---|---|
| (19) | [dl]as | *Glas* | 'glass' |
| | [dl]aube | *glaube* | 'believe (1sg.ind)' |
| | [dl]eich | *gleich* | 'straight away' |
| | [dl]ocke | *Glocke* | 'bell' |
| | [dl]ück | *Glück* | 'luck' |
| | [dl]impflich | *glimpflich* | 'mild, light' |
| | [dl]etscher | *Gletscher* | 'glacier' |

This change did not only occur at the beginning of a word, as there are examples of the same type with words beginning with unstressed prefixes such as *be-* and *ge-*:

| | | | |
|---|---|---|---|
| (20) | be[tl]ag | *beklag* | 'complain (1SG.IND)' |
| | ge[dl]aubt | *geglaubt* | 'believed' |

Unlike the documented change in the Appendix Probi had suggested in the initial elaboration of this work, Blevins and Grawunder (2009) consider that the difficulty is not exactly in the perception of onsets /tl/ and /dl/ in themselves, but in perceptual distinction between /tl/ and / dl/ with relation to /kl/ and /gl/, with which they are easily confused.

The authors did not just base their data on hearing pronunciation of the TL clusters. In addition to acoustic measurements, they performed static palatography to check the

point of articulation. Both the palatographic data and the acoustic data corroborated the auditory impressions that it was a [tl].

The same kind of change, with both velar stops, took place in XVII century English. Among other authors, it was discussed by Jespersen (1904). Blevins and Grawunder cite, among others, the examples below at the beginning of the word. The three columns contain examples from Windhill (located in Yorkshire), and Lorton and Penrith (located in Cumbria). The following columns have the corresponding Old English form and the current form, with the translation in parenthesis.

| | | | | | |
|---|---|---|---|---|---|
| (21) | tlap | tlap | – | klappjan | ‘clap’ |
| | tlɪŋ | tlɪŋ | tliŋ[8] | kliŋgan | ‘cling’ |
| | tlɪəz | tlɪəz | tliaz | kla:ðas | ‘clothes’ |
| | tlʊŋ | tlʊŋ | – | kluŋgen | ‘clung’ |
| | tlɑ:d | tləwd | tlu:d | klu:d | ‘cloud’ |
| (22) | dlad | dlad | dlad | glæd | ‘glad’ |
| | dlɪtər | dlɪtər | dlitə | gliterən | ‘glitter’ |
| | dlʊv | dlɪəv | dluvz | glo:f | ‘glove’ |

According to Blevins and Grawunder, a common characteristic of these processes is the absence of stigma in relation to the [tl] and [dl] pronunciations, present even in the speech of “educated people”, according to Wright (1905) and Brilioth (1913).

When dealing with independent phonetic changes common in different languages or dialects, Blevins and Grawunder refer to two types of factors that trigger them: phonetic factors, which include articulation, perception, or both; and structural factors (OHALA, 2003; BLEVINS, 2004).

The absence of a contrast can be a structural factor that catalyzes a sound change. As for phonetic factors, more than one study cited by them shows in different languages that there is coarticulation with anticipation of the alveolar gesture, resulting in a complex stop, with /kl/ being produced as [ktl], and /gl/ as [gdl]. But perception also plays an important role. Several authors claim that speakers do not perceive the difference between the pronunciation of [tl] and [kl]. According to the authors, a strong argument in favor of considering that perception plays an important role is the fact that change occurs in both directions.

Another extremely revealing case related to this type of complex onset, with a coronal stop followed by a lateral stop, is the one found in the Paraguayan language Nivacle, whose details are found in Fabre (2016) and Gutiérrez (2015).

Nivacle has a complex consonant, transcribed as /kl/. According to Gutiérrez’s hypothesis, this /kl/ originated from a /l/ diachronically through two stages. The first was

[8] The original text has the form *tliŋ*, probably a typo, as long as this final consonant would not be a retroflex nasal, non-existent in English, but a velar nasal.

a strengthening, which is the opposite of lenition. The latter represents the weakening in articulation of a consonant, as Vennemann defines in a personal communication quoted in Hyman (1975, p.165): "A segment X is said to be weaker than a segment Y if Y goes through an X stage on its way to zero". Strengthening would be the opposite process, which would include stopping as one of its possibilities. Gutiérrez assumes that /l/ was first strengthened by the pre-stopping process, changing to /tl/ and only after that to /kl/. In other words, this language would present the same type of process attested in the Appendix Probi.

As for the phonetic reasons for this change, Gutiérrez cites Flemming (2007), according to which the formant transition cues are more limited before [l] than before [r], so the contrast between different articulation points tends to to be more limited in front of [l]. He also cites Kawasaki (1982), who notes that many languages admit [pl, kl] / [bl, gl] in word-initial position but exclude [tl, dl]. According to Kawasaki (1982), the contrast between velar and coronal stops tends to be neutralized in front of the lateral one, and the most common result of the neutralization is a velar one.

The last work cited by Gutiérrez that I mention here is Hallé, Best & Bachrach (2003). They conducted a study in which French and Hebrew speakers heard the clusters /tl/ and /kl/. One important difference is that /tl/ and /dl/ are possible in Hebrew but not in French. French speakers tended to hear [tl] and [dl] at the beginning of utterances as [kl] and [gl], respectively, in addition to having difficulty discriminating between the pairs [tl] and [kl], and [dl] and [gl].

## Final Remarks

We have examined four gaps found among complex onsets formed by non-sibilant obstruents followed by liquids in Portuguese, namely /vl/, /vɾ/, /tl/ and /dl/.

The non-existence or near non-existence of the complex onsets /vl/ and /vɾ/, the latter being found in standard Portuguese practically only in the middle of a word, is apparently arbitrary, since these clusters do not present difficulties in terms of production or perception for speakers of Portuguese. However, as demonstrated, this inexistence or rarity is explained essentially by the conditions under which /v/ emerged in Portuguese from Latin /b/ and /u/.

The last two, on the other hand, may be explained by perceptual difficulties. As we have seen, there is a marked degree of difficulty in distinguishing /tl/ and /dl/, respectively, from /kl/ and /gl/. This is also proven by the occurrence of passages from /tl/ to /kl/ and from /dl/ to /gl/, and vice versa. An argument in favor of considering that the sequences /tl/ and /dl/ are in fact the disadvantaged among these four is that they are less frequent in languages in general[9].

[9] I thank Daniel Thomas Finbow for this argument.

**Acknowledgements**

I am very grateful for the help of Maria Cristina Fernandes Salles Altman, whose comments greatly contributed to improving the final text.

Thanks also to the anonymous ALFA reviewers, who also contributed greatly to improving the final version of the text.

SOUZA, P. Lacunas entre ataques complexos em português: um olhar diacrônico e algumas considerações relacionadas à percepção. **Alfa**, São Paulo, v.65, 2021.

- *RESUMO: Embora o português admita sílabas com ataques complexos, os tipos de fato atestados estão sujeitos a diversas restrições. Em primeiro lugar, o único tipo de ataque complexo possível é o constituído por uma obstruinte não sibilante seguida de uma líquida. Mesmo nesse grupo menor de ataques complexos ainda há lacunas. Não é encontrado o ataque /dl/, e quase não é encontrado o ataque /tl/, que só ocorre em meio de palavra. Também não são encontrados ataques de palavras nativas com /vl/, e /vr/ na língua padrão não ocorre em início de palavra, a não ser na onomatopeia vrum. Este artigo examina essas lacunas com o objetivo de identificar por que elas existem. A conclusão do trabalho é que as lacunas em português com relação a ataques que têm a consoante /v/ como primeiro membro são explicadas como consequência das condições de surgimento dessa própria consoante a partir do latim. Já os dois primeiros ataques, /tl/ e /dl/, são desfavorecidos por dificuldades perceptuais.*

- *PALAVRAS-CHAVE: ataques complexos; português; fonologia; diacronia; percepção.*

## REFERENCES

ALDERETE, J.; MACMILLAN, K. Reduplication in Hawaiian: variations on a theme of minimal word. **Natural language and linguistic theory,** Berlin, v.33, n.1, p.1-45, 2015.

ALLEN, W. S. **Vox latina**: a guide to the pronunciation of classical Latin. 2. ed. Cambridge: Cambridge University Press, 1978.

AUROUX, S. Editor's foreword. *In*: AUROUX, S. *et al*. (org.). **History of the language sciences**: an international handbook on the evolution of the study of language from the beginnings to the presente. Berlin: Nova York: Walter de Gruyter, 2000. v.1. p.XXV-XXXV.

BETHIN, C. Y. Glides. *In*: OOSTENDORP, M. Van (org.). **The Blackwell companion to phonology**. Oxford: Blackwell, 2011. p.2609-2630.

BIČAN, A. Kvantitativní analýza slabiky v českém lexikonu. **Linguistica brunensia**, Brno, v.63, n.2, p.87-107, 2015. Título em português: Análise quantitativa da sílaba no léxico tcheco.

BISOL, L. A Sílaba e seus constituintes. *In*: MOURA NEVES, M. H. de. **Gramática do português falado.** Campinas: UNICAMP/FAPESP, 1999. v.7. p.701-742.

BLEVINS, J. **Evolutionary phonology**. Cambridge: Cambridge University Press, 2004.

BLEVINS, J.; GRAWUNDER, S. *KL > TL sound change in Germanic. **Linguistic typology,** Berlin, v.13, n.2, p. 267–303, 2009.

BONFANTE, L. The scripts of Italy. *In*: DANIELS, P. T.; BRIGHT, W. (org.). **The world's writing systems**. Oxford: Oxford University Press, 1996. p.297-311.

BREEN, G.; PENSALFINI, R. Arrernte: a language with no syllable onsets. **Linguistic inquiry**, Cambridge, MA, v.30, n.1, p.1–25, 1999.

BRILIOTH, B. **A grammar of the dialect of Lorton (Cumberland) historical and descriptive**: with an appendix on the Scandinavian element, dialect specimens and a glossary. London: Cambridge University Press, 1913.

COLLISCHONN, G. A sílaba em português. *In*: BISOL, L. (org.). **Introdução a estudos de fonologia do português brasileiro**. 2.ed. rev. e aum. Porto Alegre: EDIPUCRS, 1999. p. 91-123.

COLLISCHONN, G.; WETZELS, W. L. Syllable structure. *In*: WETZELS, W. L.; COSTA, J.: MENUZZI, S. (org.). **The Handbook of Portuguese Linguistics**. Chichester: Wiley-Blackwell, 2015. p. 86-106.

CRISTÓFARO-SILVA, T. Sound change in tautosyllabic consonantal clusters in Brazilian Portuguese. *In:* INTERNATIONAL CONGRESS OF PHONETIC SCIENCES, 15., Barcelona. **Proceedings** [...], Barcelona, 2003. p.1675-1678.

DELL, F.; EMEDLAOUI, M. **Syllables in Tashlhiyt Berber and in Moroccan Arabic**. Dordrecht: Kluwer, 2002.

DELL, F.; EMEDLAOUI, M. Syllabic consonants in Berber: some new evidence. **Journal of African Languages and Linguistics,** Berlin, v.10, p.1-17, 1988.

DELL, F.; EMEDLAOUI, M. Syllabic consonants and syllabification in Imdlawn Tashlhiyt Berber. **Journal of African Languages and Linguistics,** Berlin, v.7, p.105-130, 1985.

DE SCHUTTER, G. Dutch. *In*: KÖNIG, E.; VAN DER AUWERA, J. (org.). **The Germanic languages**. Londres: Routledge, 1994. p. 439-477.

FABRE, A. **Gramática de la lengua nivacle:** familia mataguayo, Chaco paraguayo. Kangasala, 2016.

FLEMMING, E. Stop place contrasts before liquids. In: INTERNATIONAL CONGRESS OF PHONETIC SCIENCES, 16., Saarbrücken. **Proceedings** [...], Saarbrücken, 2007. p. 233–236.

GAFFIOT, F. **Dictionnaire illustré latin-français.** Revisado e aumentado por Gérard Gréco, Mark De Wilde, Bernard Maréchal, Katsuhiko Ōkubo. 2016.

GLARE, P. G. W. **Oxford Latin dictionary.** Oxford: Oxford University Press, 1968-1982.

GUNN, J. **Changes in consonant clusters**: how clusters change in the dialect of Vogtländisch. Leipzig: Universität Leipzig, 2005. Manuscrito

GUTIÉRREZ, A. **Segmental and prosodic complexity in Nivaĉle**: laryngeals, laterals, and metathesis. Advisor: Patricia A. Shaw. 2015. Thesis (Doctor in Linguistics) - University of British Columbia, Vancouver, 2015.

HALLÉ, P. A.; BEST, C. T.; BACHRACH, A. Perception of /dl/ and /tl/ clusters: a cross-linguistic perceptual study with French and Israeli listeners. INTERNATIONAL CONGRESS OF PHONETIC SCIENCES, 15., Barcelona. **Proceedings** [...], Barcelona, 2003. p.2893-2896.

HOOPER, J. B. **An introduction to natural generative phonology**. New York: Academic Press, 1976.

HYMAN, L. **Phonology:** theory and analysis. New York: Holt, Rinehart and Winston, 1975.

JESPERSEN, O. **Lehrbuch der Phonetik**. Leipzig: Berlin: B.G. Teubner, 1904.

KAWASAKI, H. **An acoustical basis for universal constraints on sound sequences**. Advisor: John Ohala. 1982. Thesis (Doctor in Linguistics) - University of California, Berkeley, 1982.

KIPARSKY, P. Metrical structure assignment is cyclic. **Linguistic Inquiry**, Cambridge, MA, v.10, p.421-441, 1979.

LAUSBERG, H. **Linguistica romanza**. 2. ed. Tradução de Nicolò Pasero. Milano: Feltrinelli, 1976.

LEVELT, C.; VAN DE VIJVER, R. Syllable types in cross-linguistic and developmental grammars. *In*: KAGER, R.; PATER, J.; ZONNEVELD, W. (org.). **Constraints in phonological acquisition**. Cambridge: Cambridge University Press, 2004. p.204-218.

LEVI, S. V. Glides. *In*: OOSTENDORP, M. Van (org.). **The Blackwell companion to phonology**. Oxford: Blackwell, 2011. p.341-366.

LOPORCARO, M. Syllable, segment and prosody. *In*: MAIDEN, M.; SMITH, J. C.; LEDGEWAY, A. (org.). **The Cambridge History of the Romance Languages**. Cambridge: Cambridge University Press, 2011. p. 50-108.

MADDIESON, I. Syllable Structure. *In*: DRYER, M. S.; HASPELMATH, M. (org.). **The world atlas of language structures online**. Leipzig: Max Planck Institute for

Evolutionary Anthropology, 2013. Disponível em: http://wals.info/chapter/12. Acesso em: 19 dez. 2019.

MAROTTA, G. The Latin syllable. *In*: VAN DER HULST, H.; RITTER, N. A. (org.). **The syllable: views and facts**. Berlin: Nova York: Mouton de Gruyter, 1999. p. 285-310.

MASSINI-CAGLIARI, G. **A música da fala dos trovadores**: desvendando a prosódia medieval. São Paulo: Ed. da UNESP, 2015.

MATEUS, M. H.; D'ANDRADE, E. **The Phonology of Portuguese**. Oxford: Oxford University Press, 2000.

MATTOS E SILVA, R. V. **O português arcaico**: fonologia, morfologia e sintaxe. São Paulo: Contexto, 2006.

MATTOS E SILVA, R. V. **Estruturas trecentistas**: elementos para uma gramática do português arcaico. Lisboa: Imprensa Nacional/Casa da Moeda, 1989.

MATTOSO CÂMARA JR, J. **História e estrutura da língua portuguesa**. Rio de Janeiro: Padrão, 1975.

MCCULLAGH, M. The sounds of Latin: phonology. *In:* CLACKSON, J. (org.). **A companion to the Latin language**. Oxford: Blackwell, 2011. p.83-91.

MEISER, G. **Historische Laut- und Formenlehre der lateinischen Sprache**. 2. ed. Darmstadt: Wissenschaftliche Buchgesellschaft, 2002.

OHALA, J. J. Phonetics and historical phonology. *In*: JOSEPH, B. D.; JANDA, R. D. (org.). **The Handbook of Historical Linguistics**. Oxford: Blackwell, 2003. p.669–686.

PARKER, S. Sonority. *In:* OOSTENDORP, M. Van (org.). **The Blackwell companion to phonology**. Oxford: Blackwell, 2011. p.1160-1184.

PAUL, H. **Prinzipien der Sprachgeschichte**. 5. ed. Halle: Niemeyer, 1920.

SAUSSURE, F. de. **Curso de linguística geral**. 7. ed. Organizado por Charles Bally e Albert Sechehaye, com a colaboração de Albert Riedlinger. Tradução de Antônio Chelini, José Paulo Paes e Izidoro Blikstein. São Paulo: Cultrix, 1975. Original de 1916.

SELKIRK, E. O. The syllable. *In*: VAN DER HULST, H.; SMITH, N. **The Structure of Phonological Representation**. Dordrecht: Foris, 1984. p.337–383. Part I.

SEN, R. **Syllable and segment in Latin**. Oxford: Oxford University Press, 2015.

SIEVERS, E. **Grundzüge der Phonetik**. 5. ed. Leipzig: Breitkopf und Härtel, 1901.

SIMIONI, T. **Uma análise dos vocoides altos em português brasileiro**: relações entre silabificação e atribuição do acento. Advisor: Gisela Collischonn. 2011. Thesis (Doctor in Letters) - Universidade Federal do Rio Grande do Sul, Porto Alegre, 2011.

VIARO, M. E.; GUIMARÃES-FILHO, Z. O. Análise quantitativa da freqüência dos fonemas e estruturas silábicas portuguesas. **Estudos linguísticos**, São Paulo, v.36, n.1, p.27-36, 2007.

VIGÁRIO, M.; FALÉ, I. A sílaba no português fundamental: uma descrição e algumas considerações de ordem teórica. *In:* ENCONTRO DA ASSOCIAÇÃO PORTUGUESA DE LINGUÍSTICA, 9, Coimbra. **Actas** [...], Lisboa, 1993. p. 465-477.

VIGÁRIO, M.; MARTINS, F.; FROTA, S. A ferramenta *FreP* e a frequência de tipos silábicos e classes de segmentos no português. *In:* ENCONTRO NACIONAL DA ASSOCIAÇÃO PORTUGUESA DE LINGUÍSTICA, 21., Lisboa. **Textos selecionados** [...], Lisboa: Associação Portuguesa de Linguística, 2006. p. 675-687.

WILLIAMS, E. B. **Do latim ao português**. 3. ed. Tradução de Antônio Houaiss. Rio de Janeiro: Tempo Brasileiro, 1975. Original de 1938.

WRIGHT, J. **The English dialect grammar**. Oxford: Clarendon, 1905.

Received on December 19, 2019

Approved on March 31, 2021