Emergent syllable types in Brazilian Portuguese

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ABSTRACT

This paper considers the emergence of syllable types in Brazilian Portuguese (BP). Studies on syllable inventory show that open syllables are the most frequent, corresponding to 78% of the syllables in BP words, whereas closed syllables occur in 22% of cases [23]. These syllable patterns are frequently assumed to reflect the phonotactic patterns of the language. We challenge this view and intend to show that closed syllables are becoming a common pattern in BP.

Our claim is supported by the analysis of different phonological processes which were empirically examined. We show that unstressed high vowel weakening and loss triggers the emergence of consonant-final syllables. Such a phenomenon is implemented phonetically and lexically in a gradual fashion. The emergent syllable types in BP may be similar to those from European Portuguese (EP). However, as the vowel which is weakened and lost in each language differs, the outcome for each language varies considerably. We argue that phonetic and phonological properties must operate together in order to promote the emergence of new syllable types in the language.

Keywords: vowel reduction, syllable types, emergent patterns, emergence, Portuguese.

1. INTRODUCTION

This paper considers the emergence of syllable types in Brazilian Portuguese (BP) based on works which examined unstressed high vowel weakening and loss in the language. Studies on syllable inventory show that open syllables are the most frequent, corresponding to 78% of the syllables in BP words, whereas closed syllables occur in 22% of cases [1]. These syllable patterns are frequently assumed to reflect the phonotactic patterns of the language. We challenge this view and show that closed syllables are becoming the most common pattern in BP. In this paper we argue that independent phonological processes may affect syllable structure yielding to the emergence of new syllable types.

In order to understand our proposal, it is important to consider consonantal clusters in BP. BP has tautosyllabic and heterosyllabic clusters [2]. Tautosyllabic clusters are formed by stops or labiodental fricatives followed either by a tap or a lateral (1a-d). Heterosyllabic clusters must have either a sibilant, a rhotic, a lateral (which may be vocalized as [w]), and a nasal element /N/ (which is not phonetically manifested), as illustrated in (1e-h).

(1) Tautosyllabic clusters

a.	[ˈfrakʊ]	*fraco*	‘weak’
b.	[ˈkɔbrə]	*cobra*	‘snake’
c.	[ˈbluzə]	*blusa*	‘blouse’
d.	[ˈãplʊ]	*amplo*	‘ample’

Heterosyllabic clusters

e.	[ˈfɛstə]	*festa*	‘party’
f.	[ˈkaɾtə]	*carta*	‘letter’
g.	[ˈsɛlvə]	*selva*	‘jungle’
h.	[ˈsãtʊ]	*santo*	‘saint’

Segmental restrictions define that tautosyllabic clusters may occupy any position within a word and be stressed or unstressed. The only restriction is that /vl/ is restricted to loans and /vr/ does not occur word-initially. /dl/ does not occur and /tl/ is restricted to few lexical items.

Heterosyllabic three-consonant clusters may exceptionally have two consonants in coda position, in which case a sibilant is always the final consonant of the syllable: *per**s**picaz* ‘insightful’, *sol**s**tício* ‘solstice’ and *tran**s**porte* ‘transport’. There is a considerable amount of variability in coda position depending on regional varieties: sibilants may be alveolar or alveopalatal and agree in voicing with the following consonant; rhotics can be either a back fricative or a tap as a consequence of neutralization (phonological contrast is observed intervocalically and lost in coda position), laterals may be vocalized in coda position. The nasal element /N/ is usually not pronounced but triggers the nasalization of the preceding vowel [3]. These constraints apply to BP as well as EP.

Another relevant constraint to the present discussion is the set of consonants that may traditionally occur word-finally. Consider (2).

(2) Word-final consonants

a.	[ˈlus]	*luz*	‘light’
b.	[ˈmaɾ]	*mar*	‘sea’
c.	[ˈsaw]	*sal*	‘salt’

Only sibilants, rhotics and laterals may occur word-finally in BP where similar segmental constraints apply as to heterosyllabic clusters. An epenthetic vowel has been posited to adjust syllable structure in cases a word-final consonant occurs, as in: [ĩtɛɾˈnɛtʃi] 'internet' or [iuˈtubi] 'YouTube' [4]. The epenthetic vowel is a short high front vowel that mainly occurs in unstressed position but may also occur in stressed ones [5].

Finally, a few consonantal clusters occur word-finally being that the final consonant is always a sibilant.

(3) Word-final consonantal clusters
a. [ˈtɔɾaks] *tórax* 'chest'
b. [ˈbisɛps] *bíceps* 'biceps'

The segmental patterns observed word-finally for BP also apply to European Portuguese (EP). However, a wider range of consonants may occur word-finally in EP as apocope has suppressed word-final unstressed vowels. Vowel loss is also observed in unstressed pretonic position which triggers consonantal clusters to occur: [dɨlɨˈgadʊ] ~ [dɨlˈgadʊ] *delegado* 'delegated' [6, 7, 8]. Vowel reduction and loss in EP affected mostly unstressed /e/ which is reduced to [ɨ]. It is a well-advanced phenomenon that may be assumed to be under completion.

In recent years it has been observed that vowel weakening and loss is becoming recurrent in BP, being favoured to occur when a sibilant is adjacent to an unstressed high front vowel. In the next section we examine those studies to have an overall view of vowel weakening and loss in BP. We suggest that phonological processes may affect syllable structure yielding to the emergence of new syllable types.

2. VOWEL LOSS ACROSS WORD POSITIONS

Data presented in this section come from several works which examined unstressed high vowel weakening and loss in BP.

2.1. Word final consonants

Word-final consonants have been reported in several varieties of BP. Word-final vowel loss triggers any BP consonant to appear word-finally [9, 10, 11].

(4) Word-final consonants
a. [ˈlãʃ] *lanche* 'snack'
b. [ˈʃav] *chave* 'key'
c. [ˈʃɛk] *cheque* 'cheque'

Assis [10] claimed that the vowel weakening and loss is gradient and leaves fine phonetic detail traces in the acoustic signal. According to her, the loss of the word-final vowel triggers the shortening of the primarily stressed vowel. Thus, examples as /pas/ *paz* 'peace' and /ˈpasi/ *passe* 'entry ticket' which apparently sound the same, in fact present different pronunciations. She showed that when a word-final vowel occurs, as in [ˈpa:si] *passe* 'entry ticket' the primarily stressed vowel is longer than when apocope takes place: [ˈpas] *passe* 'entry ticket'. This result is in accordance with the general tendency for vowels to shorten in closed syllables [12]. She also showed that when a word-final sibilant occurs, as in [ˈpas] *paz* 'peace', the primarily stressed vowel presents the shortest durational values when compared to [ˈpas] or [ˈpasi] *passe* 'entry ticket'.

The main finding of this study is that several consonants may occur word-finally in BP and that vowel weakening and loss is gradient. She experimentally only examined sibilants occurring word-finally and found results compatible with previous studies [13, 14].

2.2. Word final consonantal clusters

Soares [5] examined regular plural forms in BP where the singular form ends in an unstressed word-final front vowel and is followed by [s] which is the suffix for regular plural in BP.

(5) Word-final consonantal clusters
a. [ˈʃavis] ~ [ˈʃavs] *chaves* 'keys'
b. [ˈpahtis] ~ [ˈpahts] *partes* 'parts'
c. [ˈklubis] ~ [ˈklubs] *clubes* 'clubs'

He found that the high front vowel did not occur in 67% of the cases. He examined cases of word-final consonantal clusters, as in [ˈtɔɾaks] tórax 'chest' in contrast with word-final clusters in plural forms, as in [ˈʃɛks] *cheques* 'cheques'. No vowel was observed between the word-final cluster in the former group whereas in the latter group zero-vowel alternation occurred. He found a very high rate of [ks] (96%) which seems to indicate the sound change is towards completion at least for [ks] sequences. Other works had also reported high rates of consonant-sibilant sequences word-finally in BP [16,17].

He expected to find evidence for fine phonetic detail in cases where vowel weakening and loss took place. However, no evidence to it was found which may be attributed to the fact that the phenomenon is well advanced. This result may suggest that phonetic stability may be achieved when a sound change is fully implemented.

2.3. Word-internal consonantal clusters

Leite [17] and Ivo [18] examined cases where an unstressed high vowel was weakened and lost in pretonic position. In both studies a sibilant was adjacent to the high vowel. In Leite's [17] work the sibilant followed the high front vowel as in (6a-b) and in Ivo [18] the sibilant preceded the high vowel, as in (6c-d).

(6) Word-internal consonant clusters
a. [kõdˈsõɪs] 'conditions'
b. [batˈzadʊ] 'baptized'
c. [kapasˈtadʊ] 'capable'
d. [motosˈklɛtə] 'motorbike'

In (6a-b) a consonant-sibilant cluster occurs whereas in (6c-d) a sibilant-consonant cluster occurs following unstressed high vowel loss. Whereas the absence of a vowel was observed in 62% of cases where a consonant-sibilant cluster occurred (6a-b), a rate of 33% lack of a vowel was observed when a sibilant-consonant cluster occurred (6c-d). Although there might be methodological differences, it appears that consonant-sibilant clusters are favoured when compared to sibilant-consonant clusters.

Ivo [18] experimentally analysed sibilant-consonant clusters, i.e., [sC] and heterosyllabic clusters where a sibilant was the first consonant. She considered the duration of the sibilant-consonant sequences. She found that consonant-sibilant clusters which emerge from high vowel deletion, as in [ãtesiˈpadə] ~ [ãtesˈpadə] *antecipada* 'antecipated', have a greater duration than sibilant-consonant clusters which are traditional in the language, as in [ispaˈsadə] *espaçada* 'spreaded out'. Her results show that although in both cases a sibilant-consonant occurs, they are in fact different with regards to fine phonetic detail as sibilants are longer in emergent sibilant-consonant clusters than in similar clusters that do not result from vowel loss.

2.4. Word-initial consonantal clusters

Cristófaro Silva and Freitas [19] analysed word-initial sC consonantal clusters. Consider (7).

(7) Word-initial consonants
a. [isˈpasʊ] ~ [ˈspasʊ] *espaço* 'space'
b. [isˈtradə] ~ [ˈstradə] *estrada* 'road'
c. [isˈkɔlə] ~ [ˈskɔlə] *escola* 'school'
d. [isˈpɾeɪ] ~ [ˈspɾeɪ] *spray* 'spray'
e. [isˈtɛs] ~ [ˈstɛs] *stress* 'stress'
f. [isˈkeɪtʃi] *skate* 'skate'

They observed that a vowel may or may not occur in both cases. The lack of a vowel presented higher rates (75.8%) in cases of loans as in (7a-c) and the presence of a vowel was favoured (39%) in cases as in (7d-f).

Experimental data showed that when a vowel is pronounced it is shorter in loans (7.1%) than in native words (9.7%). Their results also indicated that sibilants have a longer duration in loan words when a vowel does not occur (16.8%), than when a vowel was produced (14.2%). A similar result was observed in native words where sibilants displayed a greater duration when a vowel was not produced (16.9%), than when a vowel was produced (13.9%).

In sum, their results showed that sibilants in sC-clusters are longer when the vowel is not produced (16.8% and 16.9%), than when the initial vowel is produced (14.2% and 13.9%), and this result was statistically significant. Furthermore, the different durational properties of vowels in loan and native words, as well as the lengthening of the sibilant when the vowel does not occur are evidence for the relevance of phonetic detail in the implementation of sound changes.

3. RESULTS

The works reported in section 2 considered cases where an unstressed high vowel may or may not occur. When the vowel is suppressed an emergent syllable type occurs.

These emergent syllable types are not considered as part of the typological inventory of PB syllables. They are understood as a consequence of phonological processes and thus not part of phonological representations. We challenged this view and intent to show that closed syllables are becoming a common pattern in BP. Based on Exemplar Models principles [20, 21, 22] we suggest that fine phonetic detail and specific paths of sound changes lead BP towards emergent syllable types.

The studies we considered had a sibilant adjacent to the unstressed high vowel, except in the case of word-final consonants which could have any BP consonant adjacent to the high front vowel. Although sibilants may offer the appropriate articulatory and acoustic conditions to accommodate vowel loss [9] and conform to the segmental limitations on complex codas, we claim that unstressed high vowel loss reflects a pathway of change that affects BP phonology in general. What triggers the loss of the vowel is its intrinsic short duration when compared to other vowels in general [23]. Our argument is strengthened as the high back vowel [u], which also has an intrinsic short duration, may be weakened and lost in BP as in [busˈkãdʊ] ~ [ˈbskã.dʊ] *buscando* 'searching' and [hobusˈtes] ~

[hobsˈtes] *robustez* ‘robustness’ [24]. We suggest that the combination of the short duration of high vowels together with the lack of stress offer the conditions for vowel weakening and loss to take place in BP. And the emergent consonantal clusters converge with the phonotactic typology of the language, since Portuguese is complex-onset and complex-coda language, although the latter with strict segmental limitations.

Furthermore, we claim that the accountability of fine phonetic detail in the implementation of those sound changes promote the emergence of new syllable types – as for example several word-final consonants, expansion of Cs syllables (cf. (3)), word-medial Cs and s.C and sC word-initially. It might be the case that in the final stages of the implementation of a sound change - for example the 96% rate for word-final Cs sequences we discussed by Soares [15] – fine phonetic detail is accommodated within the system and less variability is attested. This would account for why once a sound change is completed previous generations do not have access to it. Once a sound change is completed lexical representations are permanently affected since sound changes cannot be undone [20: p. 59]. This view is in accordance with Exemplar Models which claims that fine phonetic detail is part of phonological representations [20]. It also accommodates the claim that phonological development follows from pathways of sound changes. All case studies we presented showed that the pathways of sound change are phonetically and lexically gradual [20, 21, 22].

A final word has to be said about vowel loss in EP and BP. In the beginning of this paper we pointed out that EP has an advanced process of vowel weakening and loss which triggers several consonantal clusters to occur [6, 7, 8]. Interestingly, although EP and BP are closely related language varieties, the emergent clusters may be similar in terms of their segmental content or syllable types, however the lexical outcome may be different. This is because the vowel which is weakened and lost in EP is /e/ which is phonetically manifested as [ɨ]. In BP the vowel which is weakened and lost is /i/ (and /e/ which undergoes vowel raising to [i]) [3].

Consider, for example, the word *tessitura* ‘tessiture’. In EP the leftmost vowel may be deleted yielding [tsiˈturə] ~ [tɨsiˈturə]. In BP, the vowel that may be deleted is /i/ so that [tesˈturə] ~ [tesiˈturə] occurs. However, word-finally the same outcome happens in both languages. A word as *chave* ‘key’ will be pronounced as [ˈʃav] in EP and BP. Alternative pronunciations with a word-final vowel are: EP [ˈʃavɨ] and BP [ˈʃavi].

The facts discussed in this section provide us with evidence that a combination of phonetic and phonological factors trigger the emergence of new syllable types in BP. Unstressed short vowels are subject to weakening and loss in EP and BP. Additionally, an adjacent sibilant appears to contribute to vowel loss in BP, which can be due to articulatory, acoustic and phonotactic reasons. We have seen that vowel loss is implemented gradually, where fine phonetic detail plays a role in the implementation of the sound change. From a phonological perspective, the unstressed vowels /e/ in EP and unstressed /i/ in BP have exemplars in competition and the most common exemplar becomes more robust so that emerging syllable types appear as a consequence of vowel loss.

4. CONCLUSIONS

This paper considered the emergence of syllable types in BP. Open syllables represent 78% of syllable types whereas closed syllables number 22% of cases [1]. We challenged this result and showed that complex syllables are becoming the most common pattern in the language. The syllable patterns which come from high front vowel deletion all have a sibilant. We showed that independent phonological processes which trigger unstressed high front vowel weakening and loss in BP may affect syllable structure yielding to the emergence of new syllable types.

Our claim is supported by the analysis of different phonological processes which were empirically examined. We showed that the emergence of new syllable types is implemented phonetically and lexically in a gradual fashion.

We also showed that emergent syllable types in BP may be similar to those from EP. However, as the vowel which is weakened and lost in each language differs, the outcome for each language may vary, although pronunciations would merge in some instances. We argue that phonetic and phonological properties must operate together in order to promote the emergence of new syllable types.

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