

## ON THE EMERGENCE OF CONTRAST

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### ABSTRACT

This paper discusses the emergence of contrast between alveolar stops and alveopalatal affricates in Brazilian Portuguese. Usage-Based Phonology [3] and Exemplar Models [11, 15] are the theoretical perspectives adopted. Alveopalatal affricates were formerly introduced in Brazilian Portuguese as a consequence of the process of palatalization according to which an alveolar stop would be manifested as an alveopalatal affricate when followed by a high front vowel: *tia* [tia]>[tʃia] ‘aunt’ and *dia* [dia]>[dʒia] ‘day’. Complementary distribution related to the process of palatalization predicts that affricates should only be followed by [i] and alveolar stops should be followed by vowels different from [i] and also appear in consonantal clusters. Nevertheless, unexpected patterns such as affricates followed by vowels different from [i] and alveolar stops followed by [i] started appearing in Brazilian Portuguese, leading to the emergence of contrast between alveolar stops and alveopalatal affricates. This paper suggests that lexical innovation related to neologisms and phonological phenomena involving sound changes is responsible to the emergence of contrast between alveolar stops and alveopalatal affricates in Brazilian Portuguese.

**Keywords:** contrast, phoneme, distribution, emergence, adaptive, complexity

### 1. INTRODUCTION

This paper suggests that lexical innovation is responsible to the emergence of contrast between alveolar stops and alveopalatal affricates in Brazilian Portuguese (henceforth BP). Alveopalatal affricates were formerly introduced in BP as a consequence of the process of palatalization of alveolar stops. Palatalization is a recurrent phenomenon in natural languages [12] and is productive in most BP dialects [9]. According to the palatalization process an alveolar stop is manifested as an alveopalatal affricate when followed by a high front vowel: *tia* [tia]>[tʃia] ‘aunt’ and *dia* [dia]>[dʒia] ‘day’. The

complementary distribution related to palatalization predicts that affricates followed by a vowel different from [i] and alveolar stops followed by [i] should not occur. The table below summarizes this distribution.

**Table 1:** Complementary distribution involving alveolar stops and affricates.

Pattern	High front vowel	Any vowel different from [i]
Alveolar stops	not expected *ti, *di	expected
Affricates	expected	not expected *tʃV, *dʒV

It follows from the complementary distribution illustrated in Table 1 that contrast is not expected between alveolar stops and alveopalatal affricates since these segments are predicted to occur in excluding environments. However, the unexpected patterns in Table 1 became productive in BP, giving rise to the emergence of contrast between alveolar stops and alveopalatal affricates which is discussed in this paper. The hypothesis to be tested is that lexical innovation is responsible to the emergence of contrast. It will be argued that mechanisms of lexical innovation were implemented through neologisms that entered the language together with phonological phenomena related to sound changes. Usage-Based Phonology [3] and Exemplar Models [11, 15] are the theoretical perspectives adopted in this paper. Within this view the units of memory storage are words and longer sequences of high frequency, as well as constructions, which are processed as chunks [2, 3, 4]. In this paper we will refer to words and chunks as lexical items and assume these are the units of storage and processing. Lexical items undergo sound change through patterns of lexical diffusion [3]. Lexical diffusion predicts that in the course of development of a sound change there will be gradual spread through the lexicon where all lexical items in the language may or may not be affected [3, 14, 16]. Thus, lexical items which will have undergone a given sound change will show innovative lexical patterns. Lexical innovation may appear through neologisms

which will accommodate new words in the language [10]. Lexical innovation may also appear through patterns of lexical diffusion involved in sound changes. We will show that the contrast between alveolar stops and alveopalatal affricates in BP emerged through lexical innovation that was implemented by neologisms together with phonological phenomena related to sound changes. The next section considers the mechanisms of lexical innovation which are relevant to the discussion of the emergence of contrast between alveolar stops and alveopalatal affricates in BP. Section three considers frequency effects in the emergence of contrast. Finally, section four summarizes the findings and indicates topics for further investigation.

## 2. MECHANISM OF LEXICAL INNOVATION

The next sections will describe the mechanisms of lexical innovation that we argue are responsible to the emergence of contrast between alveolar stops and alveopalatal affricates in BP.

### 2.1. Neologisms

Neologisms are responsible to introducing lexical innovation in languages [10]. In recent years many words with alveopalatal affricates became commonly used in BP, as for example: *Thatcher*, *Tchetchenia*, *Tchau*, *Gorbachev*, *cappuccino* etc. [5]. We suggest that neologisms provided the actuation of a new pattern in BP: alveopalatal affricates to be followed by any vowel, whereas formerly alveopalatal affricates occurred only followed by [i] as a consequence of palatalization. Neologisms also accommodated affricates followed by [i] as in the word *cappuccino*. New words in BP were created with affricates followed by any vowel. For example, a musical group was named *Tchan*; the word *tchurma* which comes from *turma* ‘gang’ (but has a different meaning, i.e., ‘one’s own gang’); proper nouns as *Djavan* ‘pop music singer’ or the word *lindja* which comes from *linda* ‘beautiful’ (but has a different meaning, i.e., ‘not so beautiful’). The sequence of letters *tch* and *dj* are commonly used in writing to register the voiceless and voiced alveopalatal affricates respectively, although these sequences of letters are not accepted normatively. Neologisms, thus, introduced lexical innovation which presented affricates followed by vowels different from [i]. Besides neologisms we will show that other

mechanisms related to sound changes in BP offered the conditions to lexical innovation. These sound changes will be discussed in the following sections.

### 2.2. Epenthesis in *dj*-sequences

Epenthetic vowels in BP are systematically a high vowel [6]. They appear in word initial and final position in loan words: *Sky* [is'kai] ‘Sky (TV channel)’ or *bife* ['bifi] ‘beef’. Epenthetic vowels also intervene between a sequence of obstruents [8]. The most frequent pronunciation nowadays for the word *apto* ‘apt’ is [ʼapitu], which presents an epenthetic high vowel occurring between the [pt]-stop sequence [6, 8]. This later case is of interest for this paper since we will consider epenthetic vowels that occur in *dj*-sequences. A *dj*-sequence consists of a voiced alveolar stop followed by a voiced alveopalatal affricate where an epenthetic vowel may appear between the two consonants. For example, a word such as *adjectivo* ‘adjective’ used to present a stop-fricative sequence: a[d.ʒ]etivo (pronunciation still observed in Portugal). As a consequence of epenthesis of [i] and palatalization of alveolar stops then *dj*-sequences were manifested as an affricate followed by a fricative: a[dʒiʒ]etivo. The epenthetic vowel was later suppressed due to gestural compression yielding to a sequence of a voiced affricate and fricative: a[dʒʒ]etivo. A sequence of voiced affricate and fricative ended up being manifested as an affricate a[dʒ]etivo. As a consequence of phonological phenomena involved in *dj*-sequences we observe that voiced affricates became productive when followed by any vowel as in: *adjetivo* a[dʒe]tivo ‘adjective’, *adjunto* a[dʒũ]to ‘deputy’, *adjacente* a[dʒa]cente ‘adjacent’. Thus, a voiced affricate followed by any vowel became productive due to phonological phenomena related to epenthesis and palatalization of alveolar stops. We suggest that *dj*-sequences, together with neologisms and another phonological phenomenon to be described in the following section offered the conditions for alveopalatal affricates followed by any vowel to become productive in BP.

### 2.3. High vowels and raised vowels in hiatus reduction

Contrast between a high front vowel and a mid front vowel is observed in BP in primarily stressed position: p[i]so ‘floor’ and p[e]so ‘weight’. In

unstressed position contrast is lost and a mid vowel may also occur as a high vowel: *perigo* p[e]rigo > p[i]rigo ‘danger’ or *área* ar[e]a > ar[i]a ‘area’. This phenomenon is known as vowel raising [14]. What is of interest for this paper are cases involving a hiatus starting with a high vowel or a raised mid vowel when preceded by an alveolar stop which will be palatalized as in forms such as *questionário* ques[tʃio]nário > ques[tʃo]nário ‘questionnaire’ or *idiota* i[dzi]o > i[dzo]ta ‘idiot’. In the cases of vowel raising we have forms such as *teatro* [tea]tro > [tʃia]tro > [tʃa]tro ‘theatre’ or *Deodoro* [deo]doro > [dʒio]doro > [dzo]doro ‘a proper name’. In sum, affricates followed by any vowel may also emerge from a sequence of a high vowel or a raised mid vowel in hiatus when preceded by an alveolar stop which will be palatalized. Affricates followed by any vowel became thus very productive due to hiatus reduction. We suggest that the phenomenon discussed in this section together with other mechanisms of lexical innovation already described, i.e., neologism and *dj*-sequences, offered the conditions for contrast to emerge between alveopalatal affricates and alveolar stops. The following section considers cases where alveolar stops followed by [i] started occurring.

#### 2.4. Cluster reduction

This section discusses cases where an alveolar stop occurs followed by a high vowel as a consequence of cluster reduction. Tautosyllabic clusters in BP are formed by an obstruent followed by a tap or a lateral: *prato* [pr]ato ‘plate’ and *plano* [pl]ano ‘plan’. Tautosyllabic clusters may be optionally reduced to a single consonant where only the obstruent remains: li[vr]o > li[v]o ‘book’ or exem[pl]o > exem[p]o ‘example’ [7]. Cluster reduction may yield to a sequence of an alveolar stop followed by a high front vowel to appear: *eletricidade* ele[tri]cidade > ele[ti]cidade ‘electricity’ or *padre* pa[dri] > pa[di] ‘priest’. We suggest that cluster reduction is a mechanism of lexical innovation which together with other mechanisms already described offers the conditions for contrast between alveolar stops and affricates to emerge. The following section aims to consider the emergence of contrast between alveolar stops and alveopalatal affricates.

#### 2.5. Contrast between alveolar stops and affricates

Palatalization of alveolar stops predicted that the following patterns should not occur: 1) affricates followed by a vowel different from [i] and 2) alveolar stops followed by [i] (cf. Table 1). However, we have seen in the preceding sections that these unexpected patterns in fact emerged through different mechanisms of lexical innovation. Affricates then became productive not only when followed by [i], as predicted by palatalization, but had a wider distribution so that contrast between alveolar stops and affricates are attested in unstressed position – *pato* [ˈpatu] ‘duck’ and *pátio* [ˈpatʃiu] > [ˈpatʃu] ‘patio’ – as well as in stressed position – *TAM* [ˈtã] ‘Airline’ and *Tchan* [ˈtʃã] ‘Musical Group’. Contrast is also observed between alveolar stops and affricates followed by a high front vowel in unstressed position – *padre* pa[dri] > pa[di] ‘priest’ and *PAD* pa[dʒi] ‘Grant programme’ – and also in stressed position – *tinta* [tʃĩ]ta ‘paint’ and *trinta* [trĩ]ta > [tĩ]ta ‘thirty’. Contrast is in fact the end result of various mechanisms of lexical innovation related to the introduction of new words through neologism as well as the result of various sound changes. In the next section we will discuss frequency effects involved in the emergence of contrast [2, 3, 4].

### 3. FREQUENCY EFFECTS

An emergent pattern, of course, should not be recurrent. However, it may become recurrent if it expands within the language. We suggest that frequency effects may be responsible to make an emergent pattern robust, thus productive, so that a greater number of words display the new pattern. This section will consider the impact of type and token frequency for the phenomena discussed in the preceding sections. Type frequency refers to the number of words that were identified for a given pattern. Token frequency refers to the count of all occurrences of the type in the corpus. Frequency counts come from a 233 million words corpus and search was done automatically [1, 13]. Table 2 presents data on type and token frequency for the phenomena considered in the previous sections. One observes that the unexpected pattern of affricates followed by any vowel presents a relatively small number of types and tokens in neologisms and *dj*-sequences. However, the case of hiatus consolidates the occurrence of affricates

followed by any vowel since it presents a larger count of types and tokens.

**Table 2:** Frequency effects of phonological patterns.

Pattern	Type Freq	Token Freq
Neologisms	572	8.986
dj-sequences	46	1.564
Hiatus	5.902	134.814

We suggest that affricates followed by any vowel became productive due to frequency effects related to sound changes and neologism. Regarding cluster reduction there were 1.522 word types which could potentially undergo the phenomenon with a 686.939 token count. Cluster reduction is a recent phenomenon in BP and appears to be rather lexically selective [7]. So, further investigation on frequency effects in cluster reduction should be considered in the future.

#### 4. FINAL REMARKS

This paper argues that lexical innovation is responsible to the emergence of contrast between alveolar stops and alveopalatal affricates in Brazilian Portuguese. It was shown that mechanisms of lexical innovation were implemented through neologisms that entered the language together with phonological phenomena related to sound changes. Lexical innovation in sound changes followed from patterns of lexical diffusion. It was also suggested that frequency effects contributed towards making a pattern robust and thus productive. An interesting issue for further research is the investigation of phonetic gradience in the cases of lexical innovations. This would follow from Usage-based Phonology and Exemplar Models which predict that sound changes are lexically and phonetically gradual.

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