

# THE PRONUNCIATION OF THE BRAZILIAN ALVEOLAR TAP BY FRENCH LEARNERS

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**Abstract:** The learner of a foreign language usually pronounces its phonemes in a way conforming to how they are pronounced in his/her first language, especially those that are not common to both languages. After reviewing the acoustic and articulatory characterization of the alveolar tap, this paper focuses on some strategies used by French learners of Brazilian Portuguese in the pronunciation of that consonant, which is not included in the French phonemic chart. The strategies are the use of a vocalic element, and the replacement of the tap either by a uvular fricative, or by a glottal fricative.

**Keywords:** Alveolar tap. Brazilian Portuguese. French. Second language acquisition.

**Resumo:** O aprendiz de uma língua estrangeira normalmente pronuncia seus fonemas da forma como eles são pronunciados em sua língua materna, especialmente aqueles que não são comuns a ambas as línguas. Após revisar a caracterização acústica e articulatória do tap alveolar, este artigo focaliza algumas estratégias utilizadas por franceses aprendizes do português brasileiro na pronúncia dessa consoante, que não se inclui no quadro fonêmico do francês. Essas estratégias são o uso de elemento vocálico e a substituição do tap ou por uma fricativa uvular ou por uma fricativa glotal.

**Palavras-chave:** Tap alveolar. Português brasileiro. Francês. Aquisição de segunda língua.

## Introduction

When thinking about the teaching of the phonetics of a foreign language, one of the first points to consider is the articulatory difficulty that L2 phoneme members that are not phoneme members of a learner's L1 pose for the learner. Initially, the identification of these phonemes can be made by overlapping the phonemic framework of the L2 and the phonemic framework of the L1 (STEIN 2011, p. 359). In principle, the intersections (i.e., the phonemes common to both languages) will offer no difficulties. Attention should be directed, then, to the L2 phonemes that have no intersections with the L1 phonemes. Considering Portuguese and French, the case is that of the consonant alveolar tap, present only in Portuguese.

The phonetic realization of the alveolar tap consonant [ɾ] is considered of great complexity due to the specificity of its articulatory gesture. For native speakers of Portuguese, as indicated by Oliveira et al. (2004, p. 169), its complete acquisition occurs only later. At

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onset of the word medial syllable, the child dominates its gestures only at the age of 4 years and 2 months and in complex onset, only at 5 years of age. It is the last phonological acquisition made by the native child. Naturally, its acquisition by a foreigner, whose native linguistic system does not incorporate it as a phoneme, tends to be a greater challenge, as is the case for French speakers.

This paper reviews the acoustic and articulatory characterization of the alveolar tap, and identifies the articulatory strategies that some French speakers used while learning Brazilian Portuguese (BP) to correctly pronounce that phoneme.

### **Production and perception of phonemes not belonging to L1 by the learner of L2**

A comparison between the L2 and the L1 phonemic charts of a learner enables awareness of how difficult the process of articulatory acquisition of the L2 will be. One must consider the complexity of the acquisition of phonemes by the native speaker of the L2 (in this case, the BP speaker), but, more importantly, also consider the complexity of this acquisition by the L2 learner (in this case, the French speaker). This learner will assume the reference acquisition of his/her own L1, in which that target phoneme could be inserted in a larger phonemic category.

According to Oliveira et al. (2004, p. 169), the hierarchy of acquisition of Portuguese phonemes by a Brazilian child follows the simplified sequence (from the earliest to the latest acquisition): vowels > plosive / nasal > fricatives > liquids. As previously indicated, the acquisition of the alveolar tap will, therefore, be one of the last to occur.

The consonant alveolar tap (a liquid consonant) is part of the group of rhotics. It is necessary to consider that, although rhotics are present in several natural languages (MADDIESON, 1980), they can be the last segments to be acquired by the speakers of those languages, such as in English (BALL et al., 2001) and BP, as indicated above (cf. also HERNANDORENA, 1990). In French, the only rhotic is the uvular fricative consonant [ʁ]. According to Yamaguchi (2007), this segment is completely acquired by native French children by the same time the consonantal segments [b, d, g, f, s] are. This acquisition is previous to the acquisition of [v, z], [ʃ], [ʒ], and [ɲ], in that order. Although this rhotic acquisition by a French speaker is not, therefore, late, the non-existence of other rhotics, such as the tap, in the phonological system tends to offer some difficulty when another rhotic is being acquired as part of an L2.

This comparison, considering these acquisition scales, suggests a hierarchy of articulatory complexity levels involved in the phonemes exclusive to the L2.

For the realization of an L2 phoneme that is strange to the L1, the learner, based on a categorical proximity, will try an articulation for that phoneme that is closer to some segment that integrates the phonemes of the phonemic chart of the L1. This is based on the phonemic premise that sounds tend to fluctuate. The vocalic triangle of Spanish, for example, has five oral tense vowels (CELDRÁN, PLANAS, 2007, p. 184), while the Portuguese one has seven. Portuguese, unlike Spanish, uses two open-mid vowels. A Spanish-speaking learner of Portuguese (beginner level) hearing the word pair “vovô/vovó” [vo'vo] [vɔ'vɔ] ('grandfather'/'grandmother'), will not be able to notice the phonic distinction between them. As his/her phonetic-phonological inventory lacks open-mid vowels, his/her perception will be that both words were produced with close-mid vowels, and both will sound like [vo'vo], not establishing a semantic difference between them. In short, when a learner does not recognize an audio segment that belongs to the phonetic-phonological inventory of his/her L1, to meet the needs of understanding/communication, he/she will seek in his/her L1 a sound phonetically similar that can replace the L2 segment. This lasts, of course, until the time this L2 segment acquisition is consolidated.

In this way, it is possible to infer the learner's capacity to recognize discrete sounds in the L2 and to attribute identities to them, even if those identities do not initially correspond to what actually occurs in the L1. That capacity is directly related to the (unconscious) perception that the learner has of the articulatory movements involved in the realization of each phoneme. Best (1995, quoting Browman and Goldstein) recognizes the perceptual primitive of speech as being the articulatory gesture, which is simultaneously categorical and gradient. It is able to build the unique identity of a phonic segment, as well as reveal a gradual transition between the adjacent phonemic categories. The articulatory gesture is characterized, then, by the movements of the articulators, but is regarded also as the representation of those gestures themselves. By recognizing that gesture, the L2 learner will try to reproduce it. In this sense, the principles assumed by the Articulatory Phonology, as reviewed by Albano (1999), apply.

Perceptually, it is possible that two distinct behaviors happen. The L2 learner can, by means of an assimilatory process, categorize both phonemes in L1 and in L2 as identical, even if one of them presents a different specific characteristic (ECKMAN, 2004). Another behavior is connected to Zimmer's proposal (ZIMMER, 2007): if there is not perceptual assimilation to

an existing category in L1, the L2 phonemes will be better identified and, according to her, correctly produced. Nevertheless, it is necessary to consider, with Eckman (2004), that the capacity of recategorization of L2 phonemes, which are different in L1, as well as the motor capacity for new articulatory gestures can diminish with aging.

## **Methodology**

The data to be analyzed were produced by four female French students learning BP. The students were, at the time, affiliated with the Linguistic and Cultural Program for Foreigner Students (PLEI — Programa Linguístico-Cultural para Estudantes Internacionais) at the Federal University of Paraíba (Universidade Federal da Paraíba) and were ranked, respectively, in the basic, pre-intermediate, intermediate, and advanced levels of learning.

The main goal was to identify which BP phonemes presented a major articulatory complexity to these students. They were asked to read out loud some texts and sentences, which were phonetically balanced. Because a soundproof environment was not available at the moment, the data was collected during a period of the day in which there was no environmental noise. A Marantz PMD 660 recorder and a cardioid microphone Yoga 320-A were used.

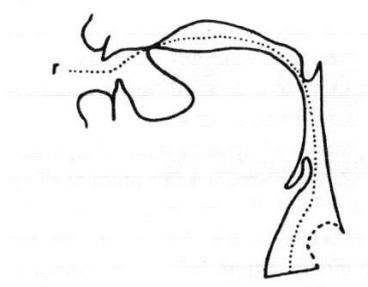
The recorded words in which phonemes were improperly articulated were isolated. In the sequence, the articulatory strategies used for those phonemes were identified. An acoustic inspection of those strategies was performed by means of a computer program for acoustic analysis, Praat (BOERSMA, WEENINK, 2006).

The most productive strategies were the use of a vowel between the tap and the preceding vowel, in consonantal clusters; its substitution by a uvular fricative consonant [ʁ]; and its substitution by a glottal fricative consonant [h].

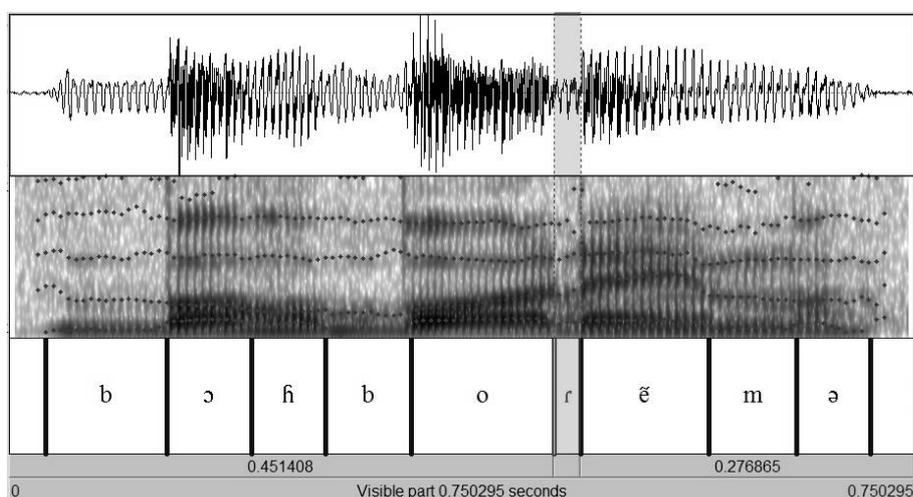
## **Acoustic and articulatory characterization of the alveolar tap [ɾ]**

Acoustically, the spectrographic inspection shows evidence of a spectral discontinuity for the tap. That discontinuity represents the moment when a fast occlusion of the vocal tract takes place as a result of the contact between the active articulator (the apex of the tongue) and the dental or alveolar region (cf. Figure 1). Once there is a direct contact between the active and the passive articulators, there is a reducing of the vocal tract area. The intensity

also tends to be smaller, and the decrease of energy is represented in the spectrogram by lighter tones of grey, or perhaps a blank. Considering the intervocalic tap, the energy concentration through the vowels is high (very dark tones); the spectrographic representation of energy vanishes during the tap realization (much lighter tones, due to the occlusion). Immediately after the contact of the apex of the tongue with the dental or alveolar region, it is possible to notice a burst, which represents the explosion of the energy retained during the occlusion. From that point on, the dark tone produced by the higher intensity of the second vowel is recovered (LADEFOGED, MADDIESON, 1996; SILVA, 1996) (cf. Figure 2).



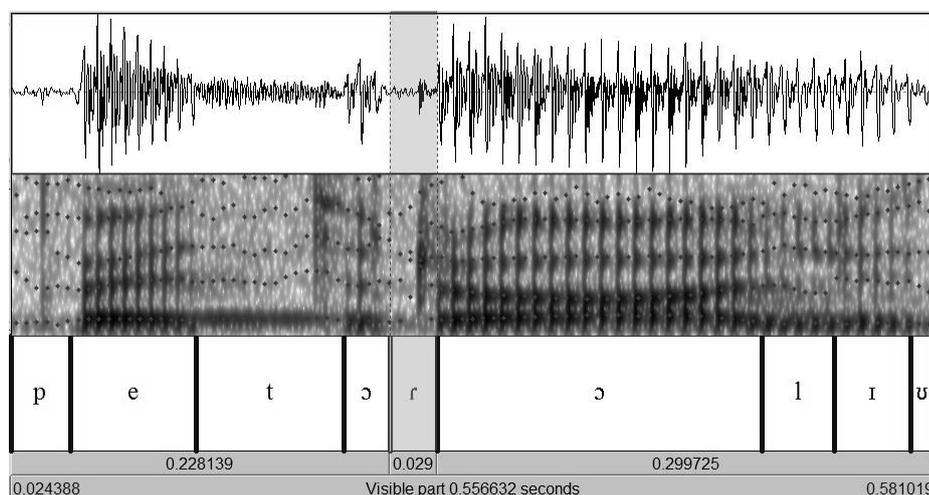
**Figure 1:** Contact between the active and passive articulators to produce the alveolar tap [r] (FANT, 1970, p. 163)



**Figure 2:** Spectrographic representation, with acoustic signal, of the word "borborema", as pronounced by a Brazilian born in the state of Paraíba, Brazil. Note the alveolar tap in the intervocalic context.

In Portuguese (and in other languages, such as Spanish), the tap occurs in intervocalic environments, but also in consonantal clusters, whose phonological sequence must be constituted of an obstruent consonant + tap + vowel, such as in “prato” (‘dish’), “frase” (‘phrase’), and “petróleo” (‘oil’) (cf. Figure 3). The intervocalic environment can be

exemplified with “caro” ('expensive') or “para” ('to'). There is, still, the possibility of a syllabic coda environment (such as in the pronunciation of “par” ('pair') by some speakers [SILVA, 1996]).



**Figure 3:** Spectrographic representation, with acoustic signal, of the word "petróleo" ('oil'), as pronounced by a Brazilian born in the state of Paraíba, Brazil. Note the alveolar tap in the consonant cluster context and the vowel between [t] and [r]. The first segment [ə] shows a duration of 27 msec, the segment [r], 29 msec, and the second segment [ə], 195 msec.

### Acoustic and articulatory strategies

During the realization of the alveolar tap [r] in BP, the French students, most frequently, inserted a vocalic element (traditionally known as an epenthetic vowel) between the tap and the preceding consonant in the consonantal clusters. In intervocalic environments, the most useful strategies were articulating the segment with characteristics of the uvular fricative consonant [ʁ] and the use of the glottal fricative consonant [h].

### Vocalic element insertion

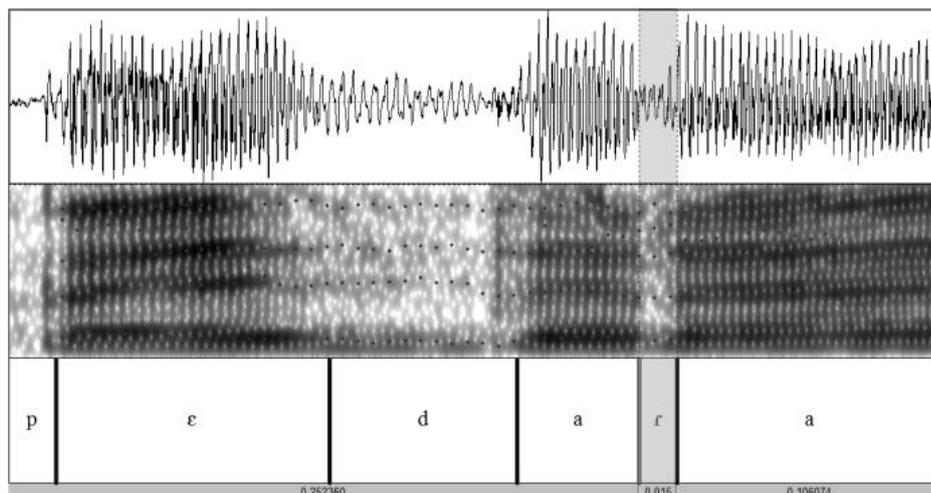
The tendency for languages with consonantal clusters is towards the liquid consonants being positioned close to the syllable nucleus (SILVA, 1996). The liquid consonants (among them, the alveolar tap) have acoustic characteristics which locate them intermediately between the vowel and the consonant sounds. According to Quilis (1981), the liquid consonants and the vowels present very similar formant structures, differing in global

intensity (smaller for the liquids) and in the fundamental frequency (also lower for the liquids).

It seems that a phonological system admitting the tautosyllabic combination of an obstruent with a liquid consonant is due to the fact that liquid consonants are acoustically very similar to vowels. Silva (1996) suggests that the alveolar tap is a “vowelized” consonant. That “vowelizable” nature of the tap, nevertheless, would not be enough to sustain its positioning immediately after a plosive consonant. The tap itself needs to rest on two vowels. The author noticed that, in consonantal clusters, there is a vocalic element (which she classified as “oral aperture”) anterior to the tap, similar to the stressed vowel in its formant nature. In a posterior study, Nishida (2005) suggests that, in BP, that vocalic element is effectively the same nuclear vowel of the group, interrupted by the tap, but with a smaller duration. That vocalic segment would be, then, the first (part of the) vowel on which the tap would rest, interrupting the phonological sequence obstruent consonant + liquid consonant typical of complex syllabic onsets. The first segment [ɔ] in Figure 3 illustrates how the vocalic element is spectrographically characterized.

In the same way that native speakers of BP use a vocalic element interrupting the consonantal cluster, the French students also used it. It suggests that the articulation of that segment becomes easier when between vowels. I suggest that what makes French students’ realizations different from those of native BP speakers is the duration of the vocalic element. The pronunciation of a BP native speaker, generally, does not allow the acoustic perception of that segment, due to its short duration. In Figure 3, for example, while the first segment [ɔ] shows a duration of 27 msec, the duration of the second segment [ɔ] is 195 msec. The duration of the vocalic segment corresponds to 14% of the nuclear vowel duration.

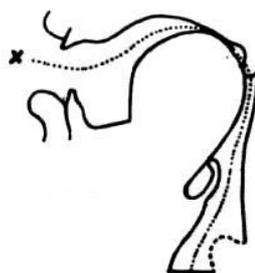
In the case of the realization of a consonant cluster by a French intermediate level learner of BP, as shown in figure 4, the vocalic element evidenced a 48 msec duration, while the nuclear vowel duration was 106 msec. The vocalic element presenting a duration equivalent to 45% of the nuclear vowel during the realization by the learner allowed its acoustic perception, which identifies the pronunciation as that of a foreigner. However, these percentage values should not be taken as a perceptual reference, because specific perception tests are necessary for that purpose.



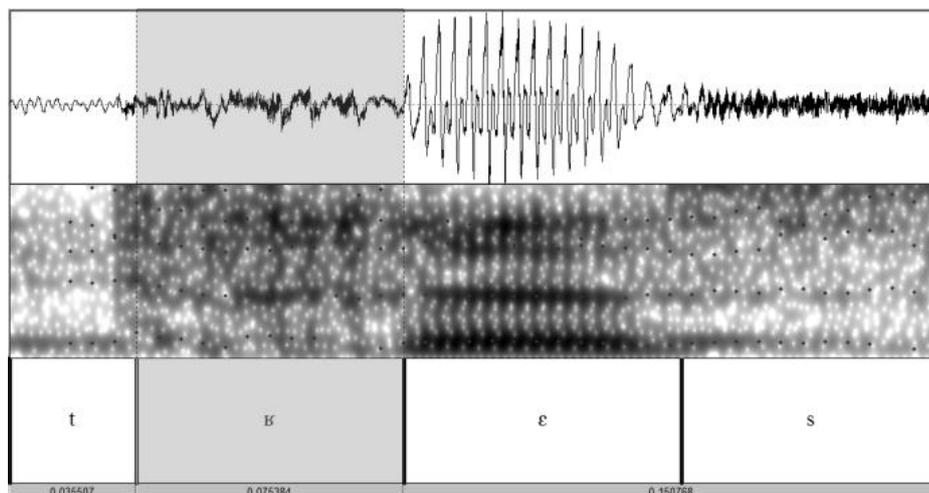
**Figure 4:** Pronunciation of the word “pedra” (‘rock’) by an intermediate level French student of BP. The first segment [a] shows a duration of 48 msec, the segment [r], 19 msec, and the second segment [a], 106 msec.

### Uvular fricative consonant [ʁ]

Ladefoged and Maddieson (1996) suggest that the uvular fricative consonants may demand the same vocal tract configuration as the uvular plosive consonants, but with an extra detail. For the uvular fricatives, the vocal tract configuration is such that it allows uvula vibration (cf. Figure 5). Because it is a fricative, it is possible to notice, in the oscillogram, the aperiodicity of the sound waves. Nevertheless, Delattre (1946) suggested that the French /R/ would not be far from being a vowel, because it produces a strong resonance and little friction noise. In figure 6, which represents the pronunciation of the French word “très” (‘very’) by a native French speaker, it is possible to notice that the realization of [ʁ] shows a tendency towards the concentration of energy in formant zones similar to the vowel [ε] following it. Also, there is a tendency for a certain periodicity in the vocal folds’ vibration, especially in the second half of the segment.

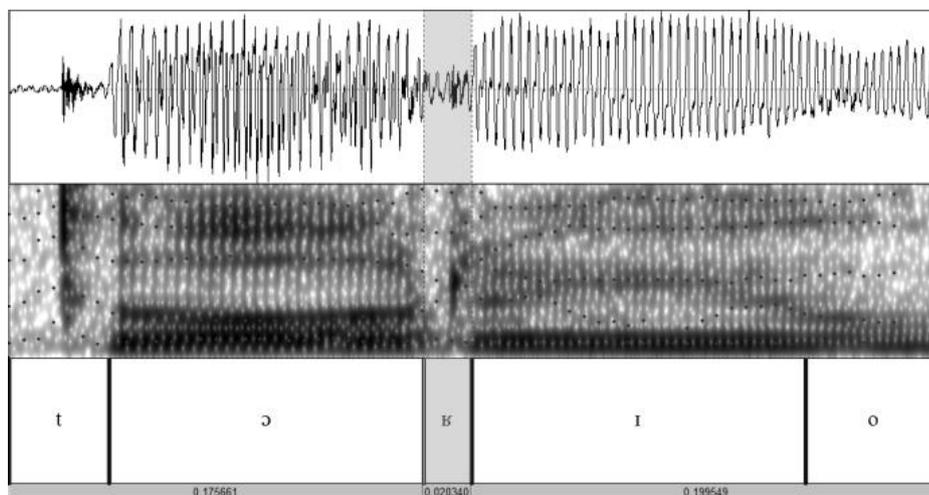


**Figure 5:** Contact between the active and passive articulators for the production of the uvular fricative [ʁ] (FANT, 1970, p. 170).



**Figure 6:** Pronunciation of the word “très” ('very') by a native French speaker.

In the pronunciation of the word “relatório” ('report'), the same intermediate level French student of BP produced the tap [ɾ] in a way similar to the realization of the uvular fricative [ʁ] (disregarding durational values), as can be seen in figure 7. It is possible to see the burst, resulting from the liberation of the contact between the apex of the tongue and the dental or alveolar region, as well as a tendency towards periodicity of the vocal fold vibration. The recording of that word makes it clear that it was not produced by a native speaker.



**Figure 7:** Pronunciation of the two last syllables “tório” of the word “relatório” ('report') by an intermediate level French student of BP.

## Glottal fricative consonant [h]

Another productive strategy in producing the alveolar tap in BP was the realization of a glottal fricative consonant. Since that segment is part of the phonemic chart of BP but not of the French chart, its phonetic realization by the French students also showed their status as foreign speakers. As can be seen in figure 8, the segment is very similar to a vowel. The recording of that word, nevertheless, confirms the perception of a fricative consonant, although not typically characterized.

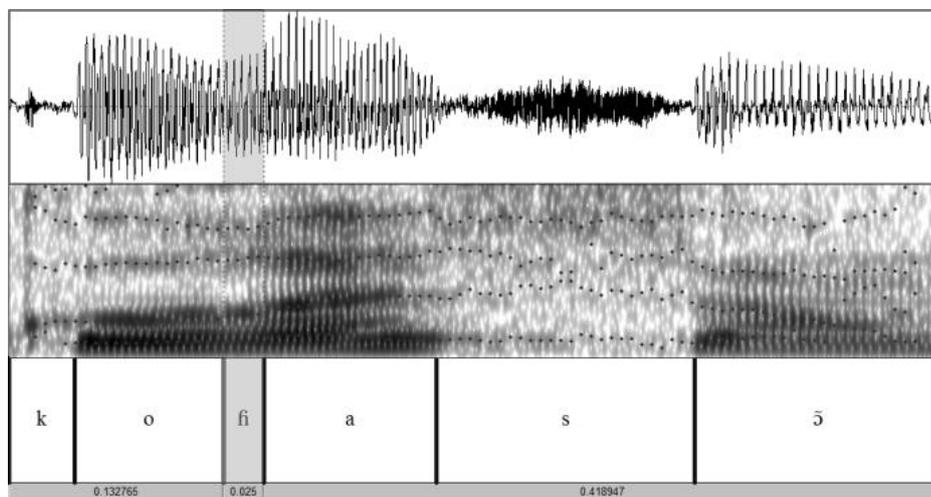


Figure 8: Pronunciation of the word “coração” (‘heart’) by an intermediate level French student of BP.

## Conclusion

A methodology for the teaching of a foreign language can take advantage of the analysis of how a student realizes certain phonemes, especially those which are not part of his/her L1. By being aware of those specificities, it is possible for the teacher to prepare exercises that deal with the necessary articulatory gestures involved in the correct pronunciation of those segments in a gradual and balanced way.

Although the intention of this paper is not to present articulatory exercises useful in L2 teaching, some directions could be suggested. Considering the pronunciation of the alveolar tap in consonantal clusters, it would be possible, for example, to direct the learners’ pronunciation in such a way that they use the vocalic element with a longer duration and, subsequently, diminish it, making it similar to the pronunciation of a native speaker. This same method can be effective, for instance, in treatment of Brazilian people presenting that

irregularity of pronunciation as a speech problem. The same kind of exercise can be useful also to avoid the pronunciation of the alveolar tap as a uvular or glottal fricative consonant. In this way, the acquisition of correct pronunciation of a foreign language can become a more accessible process.

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