

# Comparative-descriptive acoustic analysis of nasal vowels in the dialects of Pelotas (RS) and São Paulo (SP): Duration Measurements

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## Introduction

- This research work is inserted in a tradition of studies regarding Nasal Vowels in Brazilian Portuguese and collaborates to a better understanding of the phenomenon and of the diatopic variability in the production of the segments.
- Question: Is there a difference between the duration of the nasal vowels produced by SP speakers and RS speakers?
- The aim of this research project was to elaborate a descriptive exploratory acoustic analysis of the nasal vowels of two distinct dialects of Brazilian Portuguese (PB): the southern dialect and the dialect of São Paulo.
- The work intended to develop an acoustic description that accounted for the main similarities and differences in the production of the nasal vowel segments in the different dialects, focusing on the aspect of duration.

## Methods and Materials

- Phonetic Experiment
- Recording speakers from both dialects in a controlled experiment
- Segmentation of the occurrences using Praat
- Duration measurements
- Duration of Nasal Murmur
- Duration of the Entire Segment – Vowel + Nasal Murmur
- Analysis of the proportional relation between Nasal Murmur and the Entire Segment in both dialects

## Recordings

- 3 speakers from SP and 3 speakers from RS
- Recordings: acoustical isolated booth, an AKG microphone and a Boss recorder
- 60 dissyllabic words

## Database

- Nasal Vowels [ã], [ê], [ĩ], [ô] and [ũ] in a stressed syllable and in syllable coda [(C)VN.C]
- 60 dissyllabic words
- Linguistic Context to the right: plosives (unvoiced and voiced) and fricatives (unvoiced and voiced)
- Creation of pseudowords
- Words inserted in the sentence: “Eu digo \_\_\_\_\_ para você” (“I say \_\_\_\_\_ to you”)
- 3 Repetitions
- 1080 occurrences

## Measurements

- Duration of the Complete Segment (milliseconds)
- Duration of the Murmur (milliseconds) – Starting from the end of the F2 path

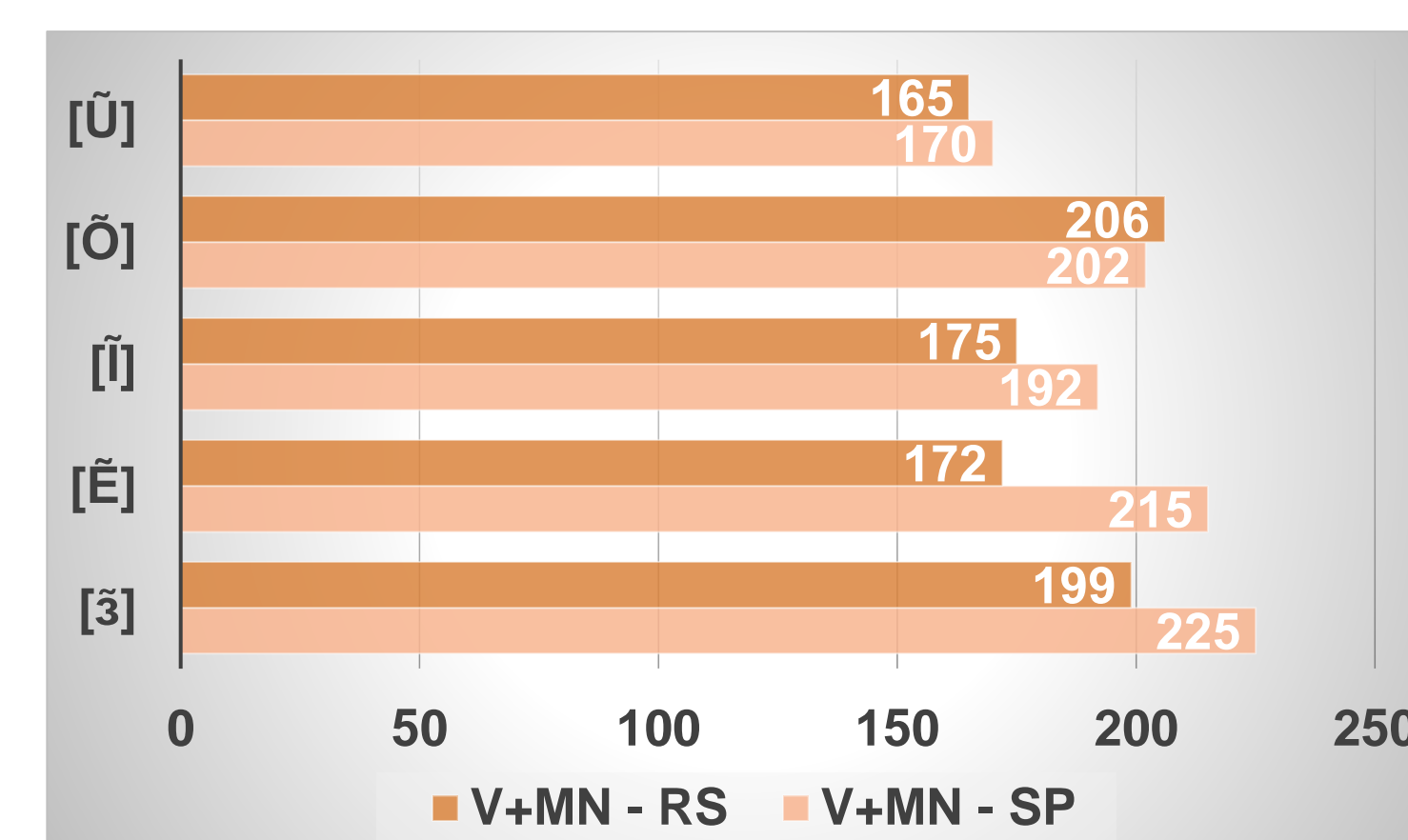
## Results and Conclusions

- Vowels [ĩ], [ô] and [ũ] maintain a similar pattern in the durations of both the Entire Segment (V+MN) and the Murmur (DM)
- Vowel [ê] seems to be the most prominent one, showing a difference in the duration of the Murmur (DM), which is bigger in the RS dialect according to the averages and proportions gathered
- Vowel [ã] and vowel [ê] showed a longer duration than expected in the SP dialect
- Vowel [ê] presents itself in a diphthongized form [êj] in the SP dialect, while the RS dialect shows no diphthongs in the vowel [ê]
- Similarities in terms of overt occurrence of nasal murmur before plosive context, and a reduced frequency of it before fricative context in both dialects

Duration of V+MN (Entire Segment) for every vowel in both dialects – Averages in milliseconds (Table 1 & Graph 1)

Vowel	Duration V+MN -SP	Duration V+MN -RS
[ã]	225	199
[ê]	215	172
[ĩ]	192	175
[ô]	202	206
[ũ]	170	165

Table 1 – Averages of DV+MN in milliseconds for every vowel in both dialects

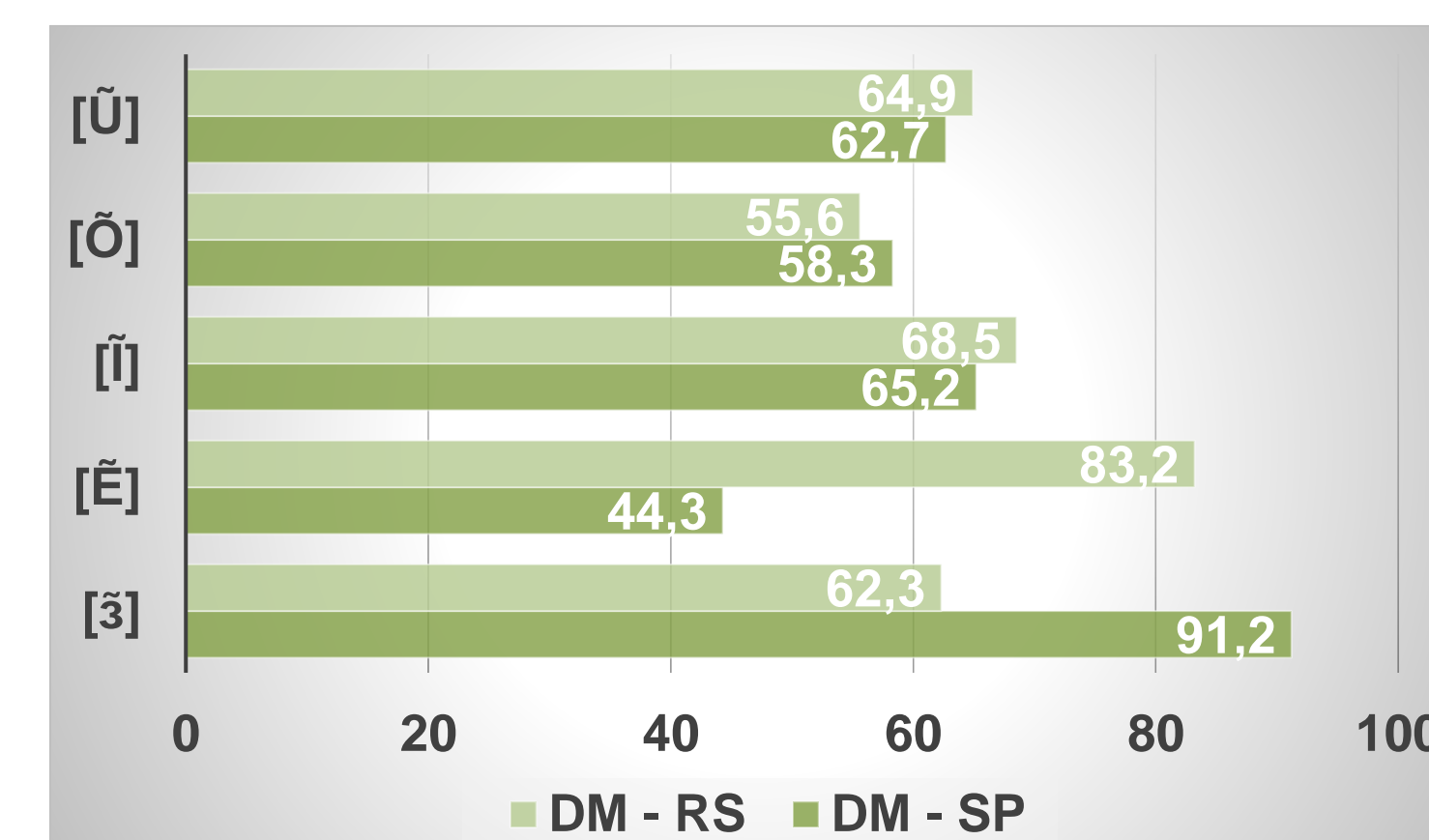


Graph 1 – Comparative graph of the averages of DV+MN in milliseconds for every vowel in both dialects

Duration of MN (Murmur) for every vowel in both dialects – Averages in milliseconds (Table 2 & Graph 2)

Vowel	Duration of the Murmur – SP	Duration of the Murmur – RS
[ã]	91,2	62,3
[ê]	44,3	83,2
[ĩ]	65,2	68,5
[ô]	58,3	55,6
[ũ]	62,7	64,9

Table 2 – Averages of DMN in milliseconds for every vowel in both dialects



Graph 2 – Comparative graph of the averages of DMN in milliseconds for every vowel in both dialects

Proportion of Murmur per Vowel and Dialect (Table 3)

VOWEL	DM/V+MN SP	DM/V+MN RS
[ã]	40,53%	31,30%
[ê]	20,60%	48,37%
[ĩ]	33,95%	39,14%
[ô]	28,86%	26,99%
[ũ]	36,88%	39,33%

Table 3 – Percentage of DMN in DV+MN per vowel and dialect

## Vowel [ê]

- Diphthongized [êj] in the SP dialect
- Longer DV+MN in SP dialect
- Longer DM in RS dialect
- Proportional difference (20,60% in the SP dialect and 48,37% in the RS dialect)

Visual Inspection: Diphthongized and Non-diphthongized [ê] (Images 1 & 2)

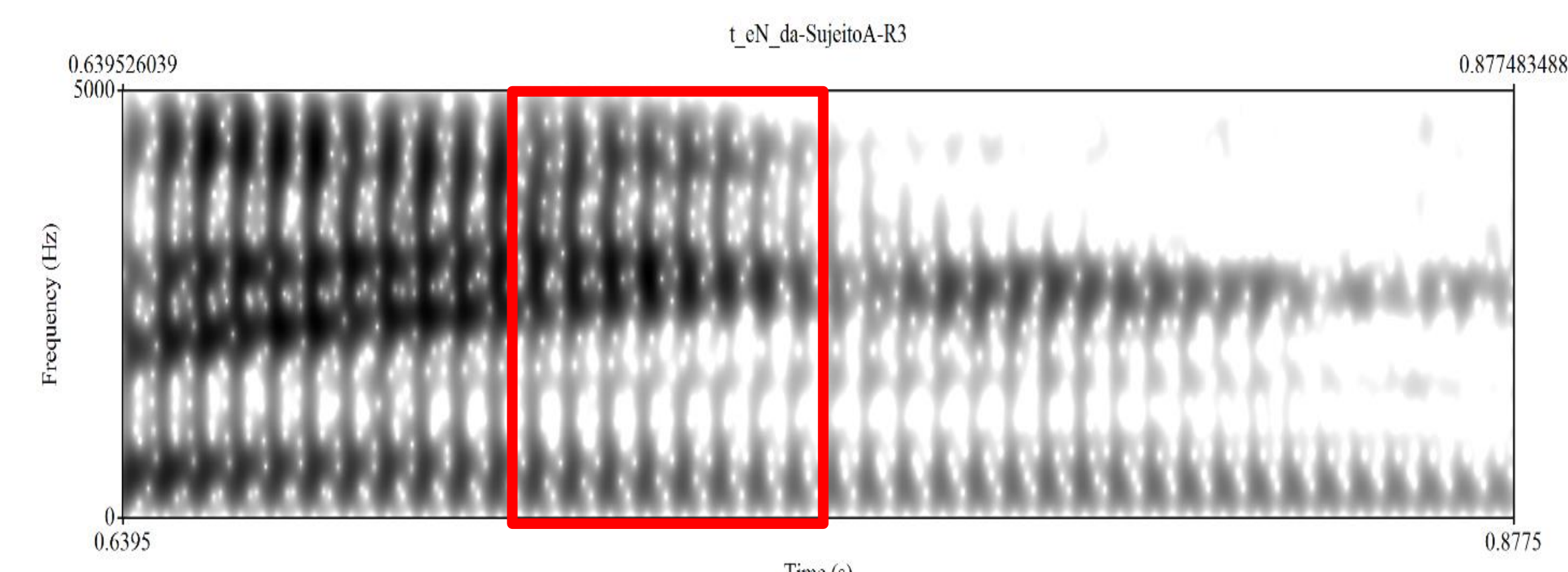


Image 1 – Tenda – Subject A – 3rd Repetition – SP Dialect (Diphthongized segment)

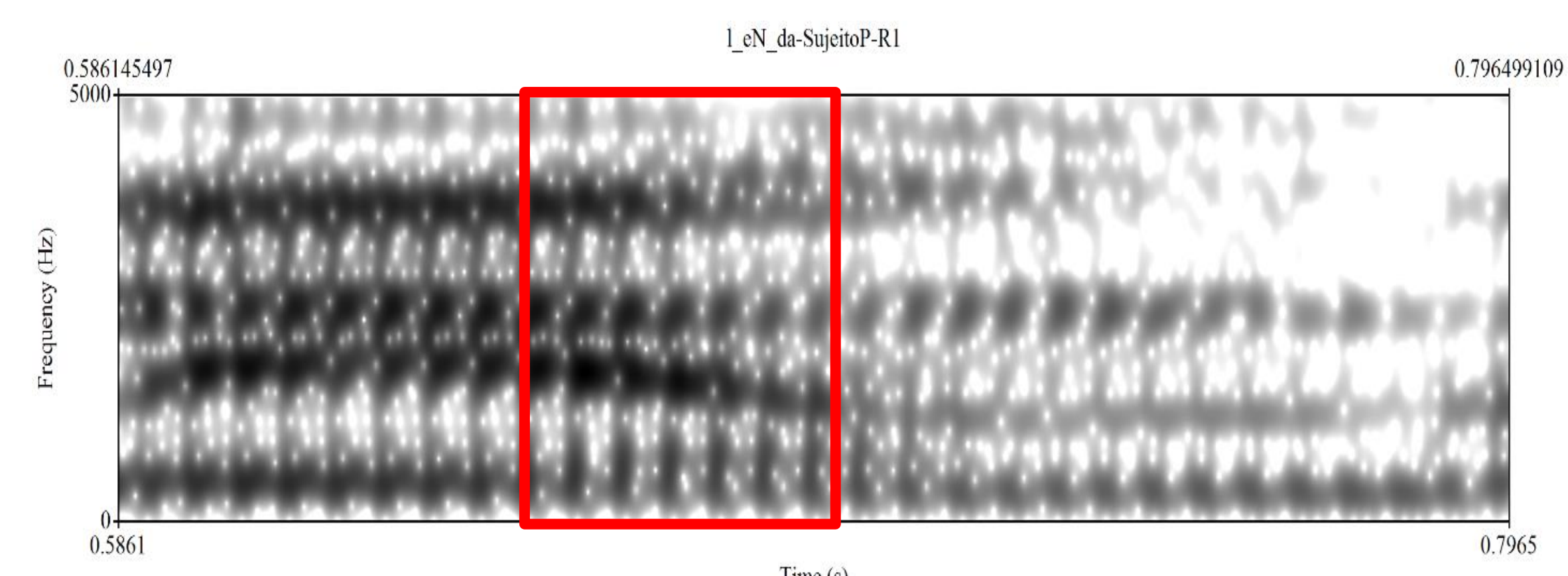
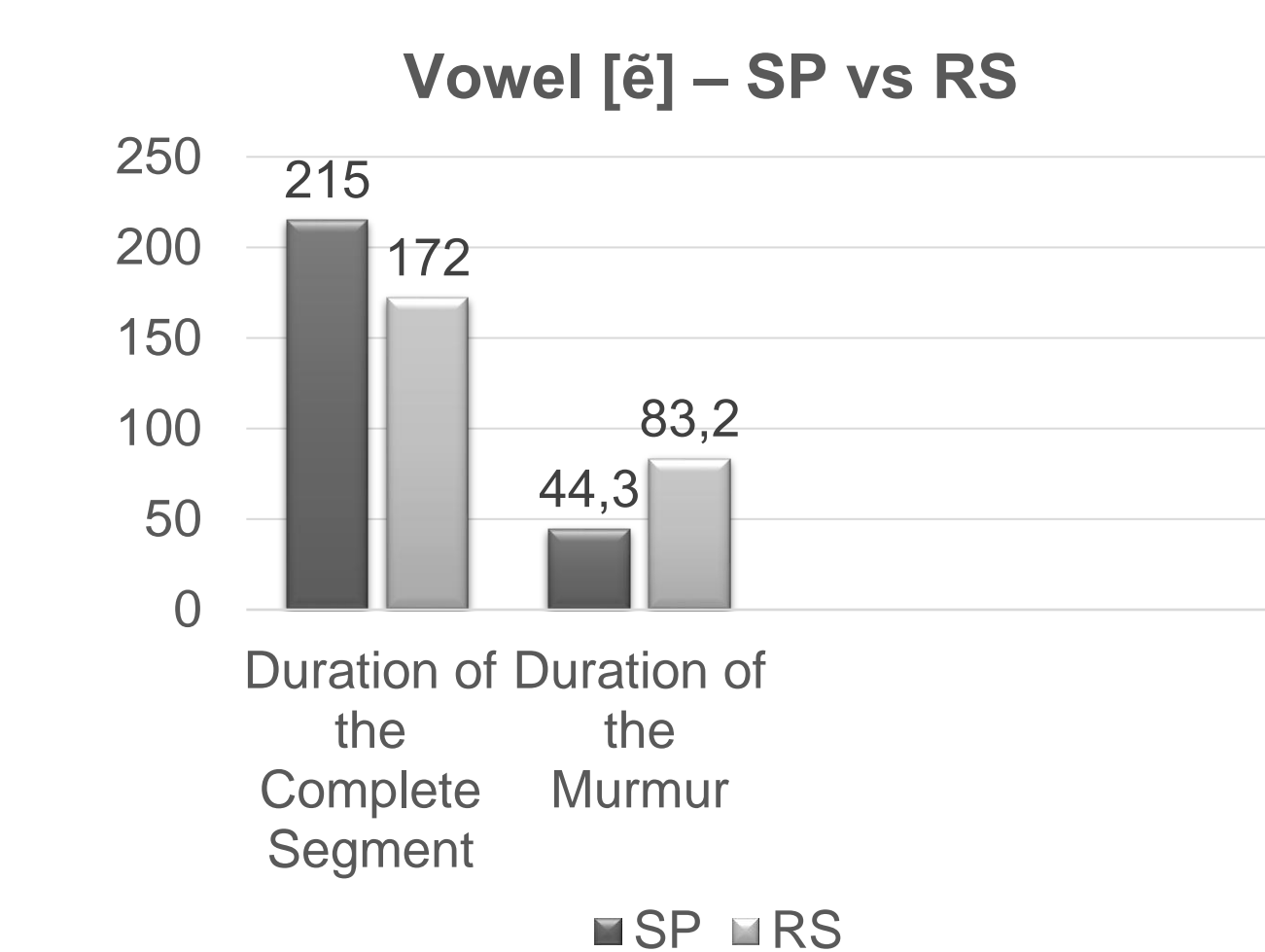


Image 2 – Tenda – Subject P – 1st Repetition – RS Dialect

Proportional Differences: SP vs RS – Vowel [ê]

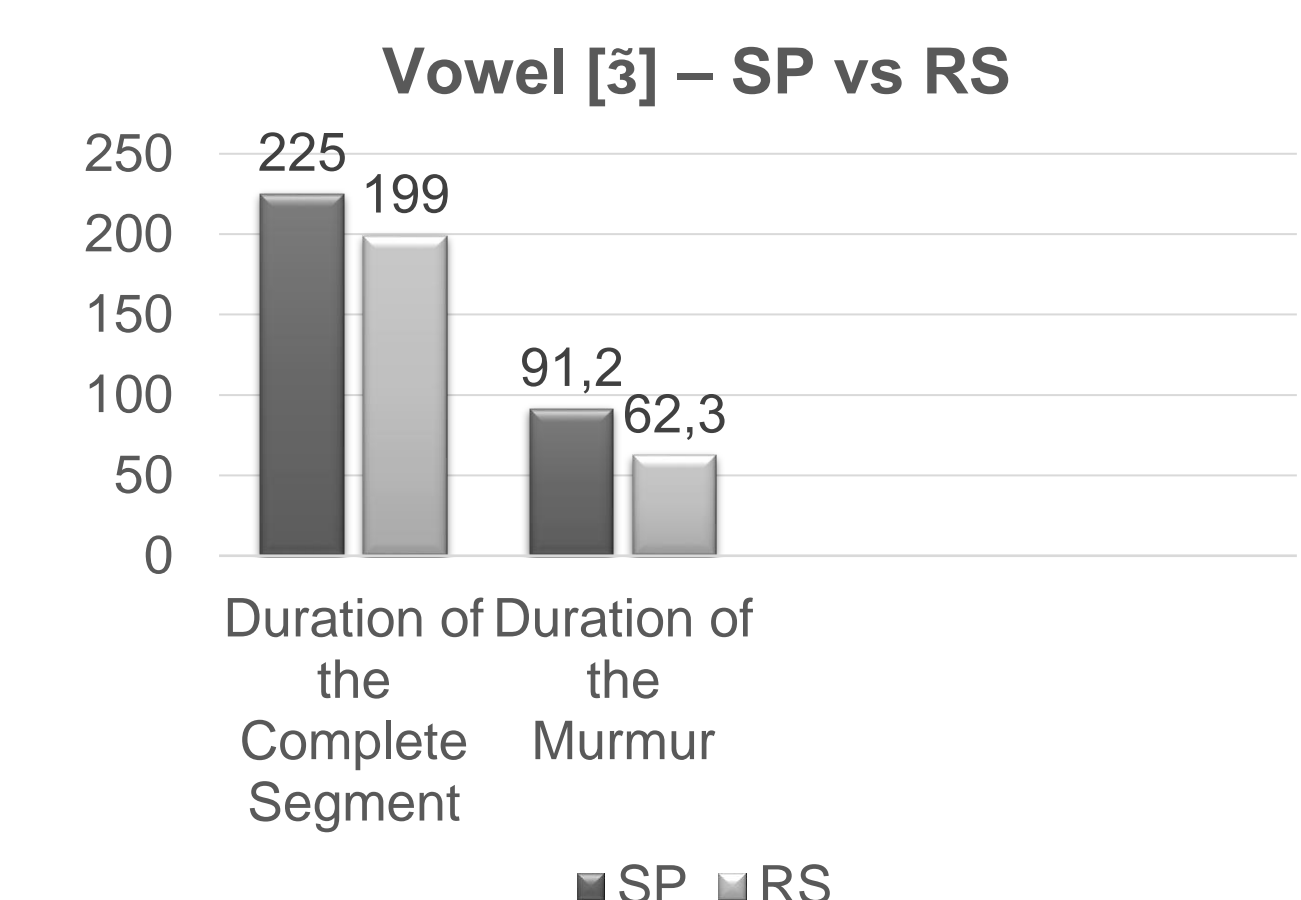


Graph 3 – Comparative graph of the averages of DMN in milliseconds for vowel [ê] in both dialects.

## Vowel [ã]

- Longer DV+MN than expected
- Longer DM in SP dialect
- Longer DV+MN in SP dialect
- Proportional similarities

Proportional Similarities: SP vs RS – Vowel [ã]



Graph 3 – Comparative graph of the averages of DMN in milliseconds for vowel [ã] in both dialects.

## Discussion and Further Steps

- There seems to be a difference, at least in the aspect of duration, between the nasal vowels of both dialects, especially when it comes to the vowel [ê]. Other aspects of nasal vowel production can be analyzed in further studies, such as:
  - Differences and similarities in Formantic Patterns
  - FFT measures
  - Cepstral Analysis

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