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Rhythmic characteristics of prose and verse in varieties of Portuguese

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Whether varieties of Portuguese differ in their rhythmic classification is not entirely clear. European Portuguese is generally considered to employ stress-based rhythm whereas the rhythmic classification of Brazilian Portuguese is disputed. Acoustically-based measures of rhythm have usually been calculated from samples of spoken prose passages. However, the apparent rhythmic characteristics of language varieties may depend upon the different types of language materials employed. Therefore, we selected spoken prose and traditional verse to clarify whether different types of spoken materials influence rhythm. Five native speakers of European Portuguese and five native speakers of Brazilian Portuguese recorded a sonnet consisting of 154 syllables and a short prose passage consisting of 270 syllables. From these recordings, acoustically based rhythm metrics were calculated. Neither prose nor poetry clearly distinguished between the two varieties of Portuguese. In both varieties of Portuguese, measures of consonantal duration variability increased from spoken prose to spoken poetry.

1 Introduction

The two varieties of Portuguese organize their speech patterns following different sets of principles. While in Brazilian Portuguese the relevant factor is the alternation of strong vs. weak syllables, in European Portuguese it is the position of the accent, at the beginning of the intonation phrases and prosodic word [6]. Because they appear to differ, their rhythmic characteristics have received considerable investigation.

There is not much dispute about European Portuguese (EP): it is considered to be a stress-timed language largely because it has vowel reduction in unstressed syllables [3]. The rhythmic characterization of Brazilian Portuguese (BP) is much less clear. Barbosa and colleagues [1, 2] claim that Brazilian Portuguese shows characteristics of both syllable- and stress-timed rhythm. From acoustic measurements, Frota and Vigário suggest that Brazilian Portuguese has characteristics of syllable and mora rhythm. [6]. Major [12] has suggested that there is a tendency toward stress rhythm in spoken Brazilian Portuguese, but not in read text, and Stockmal, et al. [15] have concluded that considerable speaker variability characterized the rhythmic structures of both language varieties so that rhythmic differences between them did not appear to be categorical.

Listener judgments also seem inconclusive. In asking listeners to respond to language samples with most segmental information eliminated, Dufter and Reich [5] found that listeners had difficulty classifying low-pass filtered samples of EP with other Romance languages. Frota, et al [8] found that listeners were not able to distinguish between the two varieties of Portuguese nor could they discriminate Portuguese from stress-timed Dutch in the absence of intonation.

Llisterri has suggested that for any model that considers phonetic variability of two language varieties, style comparisons within a particular language variety and across language varieties are essential [11]. The majority of studies investigating rhythmic structure have employed prose passages or highly controlled sentences for acoustic measurements or for listener judgments. To what degree rhythmic differences are consistent or vary depending on talker style or speech materials is still an open question.

2 Objectives

The goal of our study is to clarify the rhythmic properties of two varieties of Portuguese using two different types of language materials, materials which would presumably elicit different reading styles. Because talker interpretation of a reading task may affect the obtained rhythmic characteristics, we selected a task which may naturally emphasize prosody, namely reading metrically structured poetry, and compared it with another reading task of a less constrained rhetorical nature, reading a narrative passage from a newspaper article.

Lehiste has suggested that 'the suprasegmental system of a language is crystallized in the metric structure of its traditional poetry' [9]. If this is indeed a correct observation, then we would expect measures of the metric structure of European and Brazilian Portuguese to differ less in read poetry than in read prose if the languages employ the same basic rhythm; alternatively, if the languages represent different rhythmic categories, we would expect measures of rhythm to show greater differences for read poetry than for read prose.

3 Method

3.1 Talkers

Five talkers represented each variety of the language. For European Portuguese, four talkers were from Lisboa, one from Braga in northern Portugal. Four of the five Brazilian Portuguese talkers were from southern Brazil (Rio de Janeiro; Castelo, Espirito Santo; Sao Paolo; Belo Horizonte, Minas Gerais). One talker was from Manaus, Amazonas. All of the talkers were university students.

3.2 Materials

The talkers read two different passages. The first was a short prose passage from a newspaper. This passage was two paragraphs long consisting of 135 words or 270 syllables.

The second passage was a poem, *As Maõs***,** by Manuel Alegre (b. 1936). The poem is a sonnet of 14 lines divided into two quatrains and two tersest. Each line consists of 11 syllables in which stress falls on syllables 2, 6, and 10. According to a native speaker consultant, there is a discrepancy on the last line of the first tersest, in which the

stressed syllables are 1, 6, and 10, and in the last line of the second tersest in which the stressed syllables are 4 and 10. The poem consists of 112 words or 154 syllables.

3.3 Procedure

The European Portuguese talkers were recorded in Spain; the Brazilian Portuguese talkers were recorded in Ohio. All talkers read the same newspaper passage and poem at a self-selected comfortable rate.

Consonantal and vocalic interval durations in these passages were measured according to the criteria suggested by Ramus, Nespor & Mehler [13] and Ling, Grabe & Nolan [10]. Measurements were made using Praat or CLS.

4 Results

The rhythm metric suggested by Ramus, et al. [13] attempts to classify languages by employing two dimensions, the percent of vocalic intervals (%V) and the variability (standard deviation) of consonantal intervals (ΔC). High values on the dimension 'percent vocalic interval' are thought to be characteristic of syllable based rhythm, low values with stress based rhythm. High values on the 'consonantal variability' dimension are associated with stress based rhythm, low values with syllable-based rhythm.

Figure 1 shows the Ramus et al. values for the two varieties of Portuguese in both tasks. The standard deviation of consonant intervals (ΔC) does not differ between the language varieties but is significantly greater ($p<.05$) for the poem than for the prose passage. The proportion of vocalic interval is slightly greater for BP than for EP, especially in the prose passage.

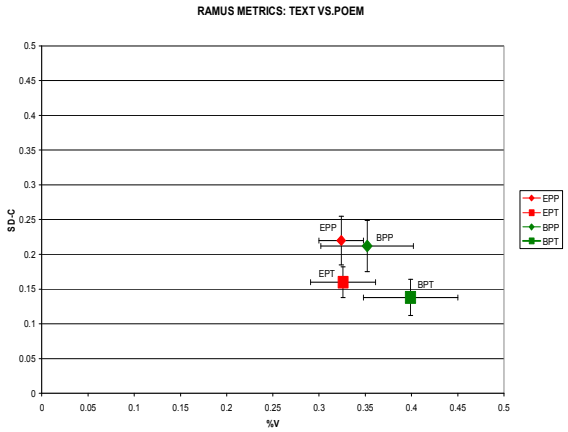

Fig. 1 Ramus metrics, means and standard deviations. Consonant interval variability in the read poem is greater than in the prose passage. Proportion of vocalic interval is higher in BP than in EP.

The metric proposed by Ling, Grabe and colleagues [10] also employs two dimensions, representing variability for successive consonantal (PVI-C) and vocalic intervals (PVI-V). High values for variability on the vocalic interval dimension are thought to be indicative of languages which employ stress rhythm.

Fig. 2 displays the values of the Ling, Grabe et al. metric for the two reading tasks of the two varieties of Portuguese. BP shows more variability than EP on the dimension PVI-V while EP shows more variability than BP on the dimension PVI-C. In both varieties of the language, the poem shows higher variability than the prose passage on both dimensions. These differences are statistically significant ($p < .05$).

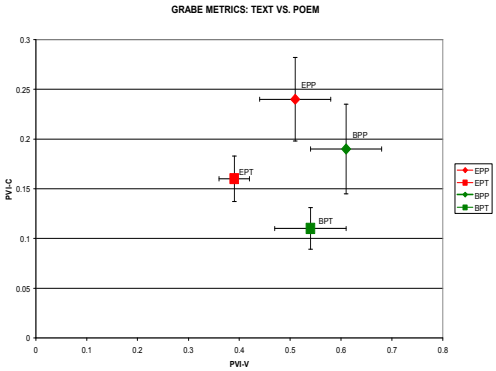

Fig. 2: Ling, Grabe et al. metrics, means and standard deviations. In both varieties of Portuguese, the poem shows more variability than the prose passage on both dimensions, PVI-V and PVI-C.

The values representing individual talkers as well as the averages for the two varieties of Portuguese in the two tasks are given below. Table 1 gives values for the prose; table 2 gives values for the poem. The tables give the values for the Ramus et al. dimensions ΔC, ΔV, and %V as well as for the Ling, Grabe et al. dimensions PVI-V and PVI-C. The table also includes total duration and rate in syllables per second.

Tlkr	ΔV	ΔC	%V	PVIv	PVIc	Rate	T.Dur.
EP 1	.038	.17	.37	.35	.17	4.58	58.9
EP 2	.052	.17	.29	.38	.19	4.02	67.1
EP 3	.036	.17	.31	.37	.17	4.88	55.3
EP 4	.037	.13	.34	.40	.14	4.55	59.4
EP 5	.035	.14	.32	.43	.14	4.66	57.9
Mean	**.040**	**.16**	**.33**	**.39**	**.16**	**4.54**	**58.7**
BP 1	.045	.12	.46	.48	.09	4.99	54.1
BP 2	.032	.13	.34	.46	.12	5.50	50.7
BP 3	.049	.10	.43	.60	.08	5.68	47.5
BP 4	.046	.16	.35	.59	.13	4.6	60
BP 5	.049	.17	.42	.55	.13	4.55	59.4
Mean	**.044**	**.14**	**.40**	**.53**	**.11**	**5.06**	**54.3**

Table 1 Acoustic measurements from two varieties of Portuguese for the prose passage.

Tlkr	ΔV	ΔC	%V	PVIv	PVIc	Rate	T. Dur.
EP1	.06	.24	.35	.44	.25	3.67	40.9
EP2 .	07	.20	.33	.64	.23	3.34	46.1
EP3	.05	.25	.30	.50	.29	3.39	45.4
EP4	.04	.17	.34	.49	.18	4.14	37.2
EP5	.04	.24	.30	.47	.27	4.01	38.4
Mean	**.05**	**.22**	**.32**	**.51**	**.24**	**3.71**	**41.6**
BP1	.06	.16	.42	.54	.14	3.84	40.0
BP2	.05	.26	.29	.53	.26	3.35	46.0
BP3	.05	.2	.34	.67	.17	4.3	35.7
BP4	.06	.21	.33	.68	.21	3.43	44.9
BP5	.05	.23	.38	.61	.18	3.67	41.9
Mean	**.05**	**.21**	**.35**	**.61**	**.19**	**3.72**	**41.7**

Table 2 Acoustic measurements from two varieties of Portuguese for the poem.

5 Discussion

Our goal was to investigate whether different types of language materials, in our study prose vs. poetry, would clarify the rhythmic structure of two varieties of the same language. Results showed that the language materials elicited different speech styles; however they did not clearly indicate whether the two language varieties belonged to different rhythmic categories.

We found that talkers of both varieties of the language approached the tasks in the same way. They read the prose passage more rapidly, close to 5 syllables per second than they read the poem, less than 4 syllables per second.

A slow speech rate is characteristic of clear speech which in turn implies less reduction of consonants and clearer articulation of stressed and unstressed vowels. Consequently, a slow speech rate is associated with higher variability in vowel duration through preservation of short unstressed vowels, and in consonant interval durations through less consonant reduction. As a result, both varieties of Portuguese exhibited higher values on all measures of variability (ΔC, PVI-V, PVI-C) for the poem than for the prose passage.

Smiljanic et al. [14] report similar findings, that the slower speech rate, the more variation in the duration of consonantal intervals.

We also found that the rates of the read poem in both varieties exhibit almost the exact same average values (3.71 for EP vs. 3.72 for BP).

Not only the rate, but also the measures of the metric structure of both languages seem to be more consistent in read poetry that in read prose. From Lehiste's observation [9] we may infer that talkers approach the task of reading a poem the same way, whether they speak EP or BP. That is, the reading task naturally elicited a specific style of the language.

Although the rhythm metrics showed some differences between the two language varieties, neither task elicited a clear, distinct difference between them. Since talkers from both varieties approached the two reading tasks in the same way, the mechanism of slow, clear speech were probably responsible for the acoustical measurements of both language varieties in read verse.

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