

SPEECH RATE OF OLDER PEOPLE

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ABSTRACT: *This research consists primarily of the attempt to better understand the phenomena related to the temporal organization in oral reading of adults and older people in Brazilian Portuguese. In order to do so, readings were collected from one of the excerpts of the corpus EUROMI for Brazilian Portuguese, with 20 female informants. For the analysis of temporal organization, we studied the following parameters: elocution and articulation time, number of pauses and their time, number of syllables, elocution and articulation rates. We were able to note that there is a statistically significant difference between the two groups observed for all the analyzed parameters (except the one with number of syllables). Therefore, we conclude that the temporal organization is an important aspect of prosody, which may give relevant information in a comparative study.*

KEYWORDS: *speech rate, pauses, older*

RESUMO: *Esta pesquisa consiste, essencialmente, na tentativa de melhor compreender os fenômenos ligados à organização temporal na leitura de adultos e idosos no português brasileiro. Para tanto, foram coletadas leituras de uma passagem traduzida do EUROMI para o português brasileiro de 20 informantes do sexo feminino. Para análise da organização temporal, estudamos os seguintes parâmetros: tempo de elocução e de articulação, número e tempo das pausas, número de sílabas, taxas de elocução e articulação. Foi possível observar que há diferença estatisticamente significativa entre os dois grupos estudados para todos os parâmetros analisados (com exceção do número de sílabas). Dessa forma, podemos concluir que a organização temporal é um aspecto importante da prosódia, podendo transmitir informações relevantes em um estudo comparativo.*

PALAVRAS-CHAVE: *velocidade de fala, pausas, idoso*

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INTRODUCTION

A great interest on prosody studies has been noted due to the recognition of its primordial role in human communication.

Nowadays there is a consensus among researchers that prosody comprises aspects related to melody, intensity and discourse temporal organization. In this study, some aspects of temporal organization in oral reading were examined, particularly speech rate and pause.

Speech is a linear process which is developed throughout time. It consists of a temporal events chain which occurs at different levels. Thus, temporal organization influences syntactic and semantic information produced by the speaker and perceived by the listener, which makes it one of the main elements of speech (Duez, 2005).

Duration is related to the time spent in the execution of a certain articulatory production, independently of its length. Through this parameter it is thus possible to measure the duration of any speech production event.

Studies on speech temporal organization has raised great interest since pioneering works by Maclav & Osgood (1959), Goldman-Eisler (1968) and Crystal (1969). Special attention is given to Grosjean (1976) and Duez (2005) for French, and to Abaurre (1981), Reis (1995), Cagliari (1999) and Barbosa (2002) for Portuguese.

Our hypothesis is that there is some difference in the temporal organization when we compare older people and adults, for it is known that the former have speech features which are typical of their age.

Aiming to better understand the phenomenon of temporal organization in two groups of distinct ages, we raise the following hypotheses: (a) the parameters articulation time and elocution time are longer for the older group; (b) the elocution and articulation rates are longer for the adults⁵, and; (c) the place of pauses is based on the text punctuation, and the period is the place which tends to show more pauses, the place of pauses follows the syntactic structure of the text, and its duration is closely related to the syntactic hierarchy.

METHODOLOGY

Initially, speech samples were collected from 20 female individuals, who were divided into two groups: G1 and G2. Group G1 consists of 10 women between the ages 20 and 27, and group G2 consists of 10 women between the ages 50 and 70. All participants

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Hypotheses (a) and (b) together converge to the same thought: the older group shows lower speech rate than the adults.

are either college students or have already graduated, and they were born and brought up in the state of Minas Gerais, southeastern region of Brazil.

In order to elaborate the corpus, an excerpt from the EUROM1⁶ database was selected, from the English project, and it was later translated to Brazilian Portuguese. Each informant was oriented to do a pre-reading and then they were recorded while reading aloud. The recording was conducted in an acoustic cabin located at the Phonetics Lab (LabFon) of Faculdade de Letras in Universidade Federal de Minas Gerais. The recorder used was the Digital Audio Tape (DAT), Sony, model TCD-D8 and a head microphone Leson HD-74, unidirectional, placed laterally at a distance of 5cm from the informant's mouth. The utterances were recorded and then transferred to the computer. The analysis was carried out with the software Praat version 4.4.27.

In the study of speech rate the following aspects were considered: elocution time, which is the time of emission from the beginning to the end of the elocution; articulation time, which is the elocution time, excluding the time referent to the pauses; elocution rate, which is obtained by dividing the number of syllables of the text by the elocution time; and the articulation rate, which is calculated by dividing the number of syllables of the text by the articulation time (Grosjean & Deschamps, 1972).

Pause marking was conducted using a spectrogram and an oscillogram, also considering auditive perception, and the unit used was seconds. Silent pauses, which are moments of silence marked by the absence of acoustic sign, were also measured.

In this study, moments of silence were considered pauses. Knowing that plosive consonants show a moment of silence which precedes the explosion bar, the silence length was measured when such consonants were found in intervocalic contexts. From these values the average was taken for each informant, and it was discounted on the pauses preceding plosive consonants. The syllabic division was done through auditive perception (phonetic division).

The statistic calculus used for analysis of this study was conducted with the software Microsoft Excel. At first the data of the absolute values was organized, and the average and the standard deviation of G1 and G2 were taken from them, for each analyzed parameter. Because we have a few samples and the variables do not seem to be normally distributed, it was applied the non-parametric test of Mann Witney for the comparison between the groups, with the significance rate of 0.05.

The results found from these analyses were presented in tables, charts and were described textually, aiming for a better comprehension of these results.

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The EUROM1 database contains more than twelve hours of data for each of the eleven European languages covered: Danish, Dutch, English, French, German, Greek, Italian, Norwegian, Portuguese, Spanish and Swedish. The material is of high acoustic quality, and was selected specifically for use in the assessment of speech technology devices.

RESULTS AND DISCUSSION

Results and discussions will be presented in two parts: the first one refers to the analysis of groups G1 and G2 separately, and the second one is a comparison between G1 and G2.

Group G1 and G2

For group G1 it was possible to note that the values of elocution and articulation time and rate, number of pauses and number of syllables were low, as shown in the table below:

Table 1 - Values related to the temporal organization of the adults group

Infor- mantes	TE (s)	TA(s)	NP	TP (s)	NS	te (sil/s)	ta (sil/s)
1	10,53	9,38	3	1,15	70	6,64	7,46
2	12,43	10,53	4	1,90	72	5,79	6,83
3	12,18	10,26	5	1,91	70	5,74	6,82
4	10,55	9,16	4	1,39	69	6,53	7,53
5	9,73	8,29	4	1,43	69	7,08	8,31
6	13,26	10,82	4	2,44	69	5,20	6,37
7	11,98	10,61	3	1,37	70	5,84	6,59
8	12,59	11,52	3	1,07	70	5,55	6,07
9	12,47	10,10	4	2,37	70	5,60	6,92
10	11,82	9,82	4	1,99	70	5,92	7,12
Média	11,75	10,05	3,8	1,70	69,9	5,99	7,00
dp	1,11	0,92	0,63	0,48	0,87	0,57	0,64

ET: elocution time; AT: articulation time; NP: number of pauses; PT: pause time; NS: number of syllables; ER: elocu- tion rate; AR: articulation rate; sd: standard deviation

In order to verify the speech rate, we consider the elocution and articulation rates, since the elocution and articulation time depends on the text size which was read by the informants.

Valente (2003) found, when carrying out a study on children oral reading, elocution rate of 5.52 syl/s and articulation rate of 6.42 syl/s. With such results, we can note that both

children’s and adults’ readings show very similar speech rates, and do not show significant differences.

In a study about reading conducted with children on the second grade of elementary school, it was possible to note that the elocution rate was 3.6 syl/s and the articulation rate was 4.8 syl/s (Celeste, 2006).

The articulation rate of the older group is similar to the children group during the reading, at 4.8 syl/s for children, according to the study of Celeste (2006), and 4.7 syl/s for the older group. Elocution rates of the older group is also similar to the children group, which does not occur with the adults group in this study. Table 2 shows the results found for the older group.

Table 2 - Values related to the temporal organization of the older group

Infor- mantes	TE (s)	TA(s)	NP	TP (s)	NS	te (sil/s)	ta (sil/s)
1	18,20	14,65	5	3,55	69	3,79	4,70
2	14,29	12,52	5	1,76	69	4,82	5,50
3	19,34	16,08	6	3,26	69	3,56	4,29
4	19,89	17,14	5	2,75	70	3,51	4,08
5	15,39	13,56	5	1,83	70	4,54	5,16
6	15,73	14,09	6	1,64	70	4,44	4,96
7	15,29	12,93	5	2,36	70	4,57	5,41
8	20,09	17,53	6	2,56	70	3,48	3,99
9	20,91	17,56	5	3,34	70	3,34	3,98
10	16,31	14,21	4	2,1	71	4,35	4,99
Média	17,54	15,03	5,2	2,51	69,8	4,04	4,71
dp	2,40	1,90	0,63	0,69	0,63	0,55	0,58

ET: elocution time; AT: articulation time; NP: number of pauses; PT: pause time; NS: number of syllables; ER: elocution rate; AR: articulation rate; sd: standard deviation

COMPARISON BETWEEN G1 AND G2

Concerning elocution time (ET), we have seen that there is an increase from G1 to G2. If we compare two people, each from a distinct group, we expect the person from the second group to have 5.765 more points for ET. Moreover, we can state with 95% certainty

that the difference between the groups will always be higher than 3.417 and never higher than 7.913. The second group will always have ET higher than the first one.

By comparing the articulation time (AT) of G1 and G2, we note that the difference between the groups is statistically significant ($p = 0.0002$). Like for ET, we see an increase of AT from the first to the second analyzed group.

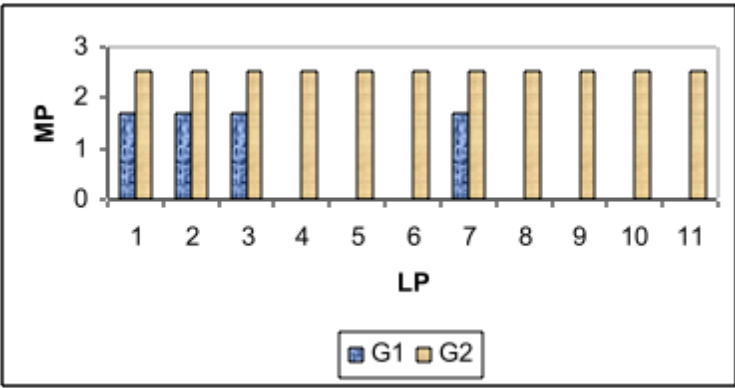
Elocution (ER) and articulation rates (AR) also happened to be statistically different for the two analyzed groups, both with $p = 0.0002$. We note here a decrease of ER and AR from the first to the second group.

The difference between the groups was statistically significant for the number of pauses as well, with $p = 0.0008$, and group G2 happened to have more pauses than group G1. This occurrence was not noted for the number of syllables ($p = 1$).

Still concerning the pauses, it is important to observe the place of occurrence. Despite the existence of variation concerning the place, all informants from group G2 showed pauses between clauses and within them. Group G1, on the other hand, three informants did not show any pause between clauses.

As we compare the places of pauses between G1 and G2, we note that in group G1 pauses were located in the same places whenever they occurred, and the average number of pauses was 3.8, with the standard deviation 0.6. In group G2, bigger variation was found in the place of pauses, yet the number of pauses itself had an average 5.2 with a standard deviation 0.6. Such description is clearer as we see the graphic below.

Graphic 1 - Possibilities for place of pauses in G1 and G2



MP: average values of pauses in seconds. LP: place of pauses, whose boundaries are the following: Minha irmã tem medo do escuro. (1) Ela nunca sai à noite sozinha. (2) Ela tem que ter sempre alguém com ela. (3) Meu pai fala (4) que ela deve levar (5) o cachorro (6) quando sair. (7) Pelo menos (8) ela estaria (9) protegida (10) se algo (11) a ameaçasse.

Through the graphic above it is possible to note that the number of possible boundaries for the pauses in G2 is considerably higher than in G1.

CONCLUSION

Temporal organization is an important aspect of prosody and works as a discourse organizer, which makes it possible to identify speech styles and speakers' groups, regarding the different sociolinguistic variables.

Through the results obtained we see that the speech rate of younger informants is higher and the place of pauses is more consistent. We also note that the difference between the groups is statistically significant for the parameters related to the discourse temporal organization, except for the number of syllables in the same read text. At the development of temporal organization in oral reading, children probably start at lower rates, which increase as they get more experienced on speech and reading production. This rate tends to stabilize in adulthood, and starts a process in which it becomes lower in the old age. This research made it possible, thus, to confirm some of our hypotheses (a and b) e disregard the other one (c), as well as to raise new questions for the study of speech temporal organization.

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