

0. Introduction

Reading is a very fast and automatic activity. In order to be possible to do all this so fast, some of the processes (phonological decoding, word recognition, syntactic parsing, semantic processing) that take place during reading must be automatized, freeing attention to the most complex ones (Laberge e Samuels 1985; *apud* [1]). However, there are some situations where automaticity is disrupted, for instance, during the reading of ambiguous sentences or when reading a text with a less familiar topic. In these situations readers' behavior changes, showing not only readers' difficulties but also what strategies are they using to solve the problems. These changes may be analyzed by measuring reading speed (in general) while reading aloud or registering readers eye movements during silent reading. This last methodology allows us not only to detect that the reader has had difficulties while reading a text or fragment, but where did that happen and what did the reader do as well.

1. Current Study

The goal of the present study was to examine whether the familiarity of a text topic and the presence of some syntactic violations interfere in the reading processing costs, and, to observe the strategies that readers use to deal with these problems during silent reading.

Hypotheses

- Texts with syntactic violations and with a less familiar topic increase processing costs and therefore take readers to adopt different strategies, changing their reading behavior.
- The most difficult text to process will be the one with unfamiliar topic and with syntactic violations.

2. Experiment

Methods

- The eye movements of 20 Portuguese University students (native speakers) were registered with the ASL 504 system at a 60 Hz rate

Stimuli and procedures

- Two text presented in PowerPoint, divided in three slides (two paragraphs each slide)
≠ topic

T1 – concerning a well known topic

T2 – concerning a specific knowledge domain

- = length (number of words and number of paragraphs)
- = syntactic structure of each sentence (the first sentence had the same structure on every text; and the same goes for the second one and so on)
- Two versions of each text were created: one with four different kind of violations and another without any problem
- 10 subjects read the original version of T1 and the agrammatical version of T2 (*T2); 10 subjects read T1 with syntactic violations (*T1) and T2 in the original version

We used three different measures ([2], [3]):

TRT – Total Reading Time: sum of all fixations made on the text;

NFix – Number of Fixations: number of fixations made on a text;

MFix – Mean Fixation duration: mean duration of fixations made on a text

3. Results

		T1	*T1	T2	*T2
TRT	X	47,871	46,654	51,222	54,882
	σ	6,727	10,293	10,308	9,168
FixN	X	167,5	164,3	169,3	186,5
	σ	12,817	19,534	16,33	16,761
MFix	X	0,286	0,282	0,302	0,293
	σ	0,033	0,036	0,048	0,029

Table 1. – Values for Total Reading Time (TRT), Fixation Number (FixN) and Mean Fixation duration (MFix) during the reading of all texts.

		T2	*T2
T1	*T1	t(18)= 0,313; p=0,758	t(18)= -1,888; p=0,075
	T2	t(18)= -0,861; p=0,409	t(18)= 0,906; p=0,412

Table 2. – T test values for Total Reading Time.

		T2	*T2
T1	*T1	t(18)= 0,433; p=0,670	t(18)= -2,727; p<0,05
	T2	t(18)= -0,274; p=0,787	t(18)= 2,324; p<0,05

Table 3. – T test values for Mean Number of Fixations.

		T2	*T2
T1	*T1	t(18)= 0,252; p=0,804	t(18)= 0,398; p=0,458
	T2	t(18)= -0,888; p=0,386	t(18)= -0,520; p=0,609

Table 4. – T test values for Mean Fixation Duration.

- Significant differences on TRT only when contrasting *T1 with *T2
- Significant differences on NFix when contrasting *T1 with *T2 and T2 with *T2
- No significant differences on MFix

Our results show that readers tend to decrease their reading speed (as in [1]) and increase the Number of Fixations when dealing with the more problematic text *T2 (both when comparing it with *T1 or with T2). Although with an increase in the Number of Fixations, significantly higher in the reading of *T2 (in both situations: *T2x*T1; *T2xT2), and in the Total Reading Time (just in one contrast situation: *T2x*T1) this is not followed by an increase in the Mean Fixation Duration.

4. Conclusions

With the results presented above, we may infer that:

- 1. increase in processing costs** affect the number of fixations. When experiencing difficulties, readers tend to focus more on the lower level information. Therefore, reading becomes a clearly bottom-up process.
- 2. readers experience reading difficulties** only when syntactic degradation and topic familiarity are associated. Thus, our second hypothesis is confirmed.
- 3. syntactic degradation** does not increase reading costs itself, but only when associated with topic unfamiliarity; confirming our first hypothesis.

Reading strategies depend both on topic familiarity and on syntactic degradation, if associated. When the reading automaticity is disrupted, readers tend to adopt strategies, like changing reading speed and increasing the number of fixations, to solve the problems.

5. References

- [1] Costa, M.ª A., (1991). *Leitura: Compreensão e Processamento Sintático*. Faculdade de Letras da Universidade de Lisboa. Tese de Mestrado.
- [2] Hyönä, J., Lorch, R.F., Jr., & Rinck, M., (2003). Eye movement measures to study global text processing. In J. Hyönä, R. Radach & H. Deubel (Eds.), *The mind's eye: Cognitive and applied aspects of eye movement research* (pp. 313-334). Amsterdam: Elsevier Science.
- [3] Rayner, K., Liversedge, S. P., (2004). Visual and Linguistic Processing During Eye Fixations in Reading. In J.M. Henderson & F. Ferreira (Eds.), *The interface of language, vision, and action*. (59–104). New York: Psychology Press.