1 Introduction
How do people read sentences word by word and understand their meanings? Let us first assume that it is possible to distinguish two components:

- a database that contains knowledge about a language (e.g., its grammar, social conventions, etc), and
- an algorithm that uses the database in order to process sentences.

Clearly, the database is different for different languages: grammars and social conventions vary. But, is it possible that a single algorithm is used to process all languages in the world? In other words, is it possible that all parametric variation can be restricted to the database?

(1) **UPH** (Universal Processor Hypothesis): All human languages are processed by the same algorithm.

For example, because of working memory constraints, it is often assumed that the algorithm shows locality preferences in all languages (see Gibson, 1998, and references therein).

(2) **Locality**: Whenever a modifier can be associated with two different sites, there's a general preference for the linearly closest one.

The preference is observed in various constructions across different languages. (Examples from Miyamoto, 1999.)

(3) a. The policeman saw the man who was looking at the woman with binoculars.
    b. Policajt viděl muže který koukal na ženu s dalekohledem. (Czech)

(4) a. The daughter of the professor in Sudan likes apples.
    b. Die Tochter des Professors in Sudan mag Äpfel. (German)

(5) a. I ate the ice-cream that I bought yesterday.
    b. Kinou katta aisu-kurimu-o tabeta. (Japanese)

2 Relative clause attachment
Although Locality is believed to be a universal characteristic of the human processing algorithm, it is not obeyed in the attachment of relative clauses (RCs), therefore challenging the validity of the UPH.

(6) a. Someone shot the servant of the actress [RC who was on the balcony].
    b. Alguien disparó contra el criado de la actriz [RC que estaba en el balcón]. (Spanish)

Despite the fact that a preference for associating the RC to actress in (6a) (i.e., the actress was on the balcony) has been found in English, a non-local preference (the attachment of the RC to criado in (6b)) was found in Spanish (Cuetos & Mitchell, 1988). Low attachment has also been observed in several other languages tested thus far (Dutch, French, German, Japanese, inter alia; see http://cl.aist-nara.ac.jp/.etm/rc for a more complete list and references).
3 Brazilian Portuguese (BP)
BP has the potential of providing invaluable evidence on RC attachment.

3.1 Word order
Rigid word order has been claimed to be the responsible for the low attachment preference in English (Gibson et al., 1996). Here, we define languages with rigid word order as languages that do not allow an adverb to intervene between a transitive verb and a direct object (see Pollock, 1989, for differences between English and French). Word order flexibility as attested by adverb intervention may correlate with RC attachment preferences because adjacency (or Locality) between constituents is less informative in languages with flexible word order. Or perhaps in flexible word-order languages, readers are more used to dependencies that are not local.

(7) **Hypothesis**: in languages with rigid word order (i.e., languages that do not allow an adverb to intervene between a transitive verb and its direct object), readers prefer to attach an RC to the most local noun in constructions such as (6).

The hypothesis above correctly predicts the local attachment preference in English as opposed to the non-local preference in Dutch, French, German and Spanish. BP is an ideal language to further test the hypothesis.

3.2 Word order in BP
Linear word order in BP with respect to adverb placement is a controversial issue. There is no theoretical consensus as to (a) whether BP can be considered a Verb-raising language; or (b) the extent to which adverb placement alone is a reliable measure to determine the way Verb-movement takes place. One possible account is the one according to which BP – at least, some of its dialects – is similar to English in that grammaticality is degraded when an adverb intervenes between a verb and its object (Rohrbacher, 1994, 1995, and references therein). We support this observation with the following judgements, which seem to hold in the BP spoken in São Paulo.

(8) a. *? João abraça **freqüentemente** a Maria.
b. João abraça a Maria **freqüentemente**.
c. João **freqüentemente** abraça a Maria.

(9) a. *?João perde **sempre** a carteira.
b. João **sempre** perde a carteira.

It seems that both (8a) and (9a) need emphasis on *a Maria and *sempre respectively in order to sound natural in BP. Despite the possible regional differences regarding grammaticality judgements, sentences such as (10) below, in which the article *a ("the") has been removed, and emphasis is more difficult, seem to be considered completely unacceptable.

(10) * João abraça **freqüentemente** Maria.

The markedness of adverbs between verb and object in BP has been related to the loss of second person agreement (Rohrbacher, 1994, 1995). If so, regions in Brazil where the second person pronoun inflection is still in use should present grammars with more flexible word order and, hence a stronger preference to attach the RC to the non-local noun. We can thus build a table correlating the three phenomena as follows.

<table>
<thead>
<tr>
<th></th>
<th>second person agr (*tu)</th>
<th>intervening adverb</th>
<th>RC attachment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Porto Alegre</td>
<td>yes</td>
<td>yes?</td>
<td>non-local</td>
</tr>
<tr>
<td>Sao Paulo</td>
<td>no</td>
<td>no</td>
<td>local</td>
</tr>
</tbody>
</table>
4 Previous results in BP

Previous results in RC attachment in BP have been contradictory.

4.1 Local attachment result

Miyamoto (1999) reported a local attachment preference for BP using a self-paced reading task with sentences disambiguated by number agreement like the following.

(11) a. Non-local
   Uma aluna criticou os professores do curso [RC que foram escolhidos pelos estudantes].
   b. Local
   Uma aluna criticou o professor dos cursos [RC que foram escolhidos pelos estudantes].

Reading times were slower at the RC if it had to attach to the non-local noun as in (10a). However, the study had a number of problems. First, the sentences were considerably different from the original sentences used in the English/Spanish study (Cuetos & Mitchell, 1988). Second, the BP speakers were residents in the United States, therefore it is conceivable that knowledge of English interfered with attachment preferences (but see Gibson, Pearlmutter & Torrens, 1999, for a non-local attachment result with Spanish speakers living in the United States). Third, most problematic is that recent results suggest that number agreement can sometimes affect the results of RC attachment experiments (Carreiras, Betancort & Meseguer, 2001). Moreover, an off-line questionnaire using ambiguous items like the following did not reveal any statistically reliable preference.

(12) Ambiguous
   Uma aluna criticou o professor do curso que foi escolhido pelos estudantes.

4.2 Non-local attachment results

Off-line results conducted in Rio de Janeiro (Maia & Maia, 2001) using a subset of items translated from Cuetos & Mitchell (1988), and in Porto Alegre with a new set of items (Finger & Zimmer, 2002) suggest that RC attachment preference is in fact non-local in BP.

The present study attempts to address this controversy by conducting an experiment in two different regions of the country, namely São Paulo (SP for short) and Porto Alegre (PA).

5 Experiment

5.1 Participants

Undergraduates in engineering or computer science based in PA (61 participants) and SP (14 participants so far).

5.2 Materials

5.2.1 Questionnaire 1

24 items based on materials from Cuetos & Mitchell (1988) (30 participants in PA; 14 in SP). Test items and 56 filler items were presented in pseudo-random order.

(13) Alguém atirou no empregado da atriz que estava na sacada.
   Quem estava na sacada? [ ] o empregado [ ] a atriz

5.2.2 Questionnaire 2

16 items based on materials from Carreiras & Clifton (1993). Test items and 62 filler items (including 6 items from Cuetos & Mitchell, 1988) were presented in pseudo-random order.

(14) O policial prendeu a irmã da criada que está grávida.
   Quem está grávida? [ ] a irmã [ ] a criada

In both questionnaires, half of items had the order of the alternatives inverted, for example:

Quem está grávida? [ ] a criada [ ] a irmã
5.3 Results
Mean and standard error for the non-local attachment preference for each city (PA or SP) and each questionnaire (1 or 2).

<table>
<thead>
<tr>
<th>Questionnaire</th>
<th>Mean % (Standard error)</th>
<th>Subject</th>
<th>Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>PA 1</td>
<td>71 (2.7)</td>
<td>25/3</td>
<td>22/2</td>
</tr>
<tr>
<td>PA 2</td>
<td>74 (2.6)</td>
<td>29/1</td>
<td>19/3</td>
</tr>
<tr>
<td>SP 1</td>
<td>62 (5.0)</td>
<td>10/3</td>
<td>19/3</td>
</tr>
</tbody>
</table>

6 Conclusion
Similar populations in both cities judged the non-local attachment interpretation more natural. Thus, word order flexibility does not seem to be a good predictor of RC attachment. However, there is a tendency for the population in SP to have a weaker preference for the non-local attachment. More data have to be collected in SP and a more detailed comparison should be conducted. A weaker version of (7) may still hold. Further results are necessary in order to explore other regional differences and alternative explanations.

References