

Similarity-based interference and morphological retrieval in Portuguese sluiced sentences

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Background. In a cue-based retrieval system, all potential antecedents for a retrieval cue are accessed and matched through a rapid, associative cue-matching procedure [4]. When the retrieval cue overlaps with more than one item in memory, however, retrieval accuracy is inhibited (similarity-based interference, SBI). Although there is evidence that semantic, morphological and structural information can modulate SBI effects in well-documented cases of retrieval (i.e. subject-verb dependencies), research on this topic has been largely confined to analyzing a limited number of cues and types of grammatical dependencies. In particular, the role of competing morphological cues in retrieval has received far less attention in the literature.

Current Study. We address this gap by examining the role of number and gender morphology in Brazilian Portuguese (BP) sluiced sentences. Sluicing is a form of clausal ellipsis following a *wh*-expression (i.e. *Mary loved someone_i, but I don't know who_i*) in which the *wh*-remnant (*who*) is paired with a correlate (*someone*) in the matrix clause. Sluices show a strong preference to associate the *wh*-remnant with the most structurally local correlate, known as the *Locality Bias* [1]. Harris (2015) uses the finding that violations of the Locality Bias in sluiced sentences increases SBI effects to draw a parallel between remnant-correlate pairings and retrieval mechanisms. The rich morphology of BP allows us to expand upon previous findings by: (i) addressing the extent to which gender and number features modulate SBI effects, as both cues are overtly expressed on *wh*-remnants, and (ii) replicating the Locality Bias on interference using a non-English language. We hypothesized that (i) any morphological feature that is overtly shared between competing correlates and a retrieval cue will contribute to SBI effects, which (ii) will increase when the target correlate violates the Locality Bias [2,3].

Self-paced reading experiments. In two experiments, we used a 2x2 design crossing *Locality* (Local, Non-Local) and *Distractor Cue* (Match, Mismatch). Participants read 24 sluices, provided an acceptability rating (1-7), and selected which whether the Local or non-Local noun was the correlate to the remnant. In all items, the target correlate was an indefinite animate noun and the distractor was a definite animate noun (Tables 1-2). In **Experiment 1** (N=32), the *wh*-remnant was overtly marked for gender (*quais deles/delas* – which ones of them_{M/F}). In spillover and final regions, we observed a processing penalty for distractors with the same morphological gender as the target (p 's<0.05), as well as an interaction between Locality and gender cue match (p 's<0.05), indicating a penalty for non-Local targets that matched in gender with the distractor. In **Experiment 2** (N=12) the *wh*-remnant was only overtly marked for number (*qual/quais* – which_{SG/PL}). In the spillover region, there was a penalty for violating the Locality Bias (p <0.01). The final region showed a penalty for number cue match (p <0.05) and the expected penalty for non-local targets that matched in number with the distractor (p <0.05). In both experiments, offline comprehension question accuracy decreased when the Locality Bias was violated (p 's<0.01) and distractor cues matched with the target (p 's<0.01), but there were no interactions.

Conclusions. Our results show that both gender and number are reliable retrieval cues in BP and support the claim that structural biases modulate similarity-based interference effects in ellipsis structures, thus supporting our initial hypotheses. However, gender cues were associated with earlier effects of SBI than number cues, suggesting that these features do not have equal status in retrieval. Our findings align with previous studies showing that the amount of information contained in a retrieval cue affects the strength of retroactive SBI effects, as well as the time-course in which these effects appear, whereby SBI effects are seen earlier for highly informative retrieval cues [2,3]. The time-course differences found in the present study may indicate that gender is more informative in BP than number, speeding retrieval of the correlate. Overall, our findings suggest that the retrieval mechanism is sensitive to fine-grained linguistic information and that not all cues are equally relevant at the point of retrieval.

Materials from Self-Paced Reading Experiments

“/” indicates analysis region – critical, spillover and final regions in bold

Table 1: Sample item from Experiment 1 (from 24 quartets) - “/” indicates analysis region

Na empresa nova/... At the new company/...	
Object Correlate – Gender Match	Subject Correlate – Gender Match
...as empreendedoras/ demitiram/ algumas funcionárias... the entrepreneurs F. PL./ fired/ some employees F. PL.	...algumas empreendedoras/ demitiram/ as funcionárias... some entrepreneurs F. PL./ fired/ the employees F. PL.
2. Object Correlate – Gender Mismatch	Subject Correlate – Gender Mismatch
...os empreendedores/ demitiram/ algumas funcionárias... the entrepreneurs M. PL./ fired/ some employees F. PL.	...algumas empreendedoras/ demitiram/ os funcionários... some entrepreneurs F. PL./ fired/ the employees M. PL.
...mas eu não posso dizer/ quais delas / pois tenho medo/ de ser demitido também.	...but I can't say / which PL. ones of them F. PL. / as I am afraid. / of getting fired as well.

Table 2: Sample item from Experiment 2 (from 24 quartets) - “/” indicates analysis region

Na empresa nova/... At the new company/...	
Object Correlate – Number Match	Subject Correlate – Number Match
...os empreendedores/ demitiram/ algumas funcionárias... the entrepreneurs M. PL./ fired/ some employees F. PL.	...algumas empreendedoras/ demitiram/ os funcionários... some entrepreneurs F. PL./ fired/ the employees M. PL.
2. Object Correlate – Number Mismatch	Subject Correlate – Number Mismatch
...o empreendedor/ demitiu/ algumas funcionárias... the entrepreneur M.SG./ fired/ some employees F. PL.	...algumas empreendedoras/ demitiram/ o funcionário... some entrepreneurs F. PL./ fired/ the employee M. SG.
...mas eu não posso dizer/ quais, / pois tenho medo/ de ser demitido também.	...but I can't say / which PL.,/ as I am afraid. / of getting fired as well.

Figure 1: Interaction in Final Region - Experiment 1

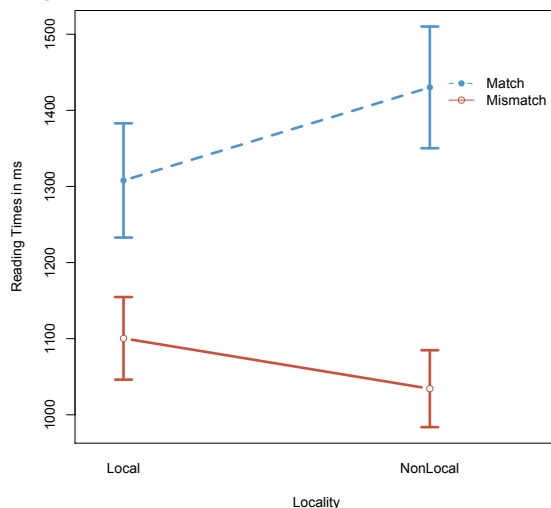
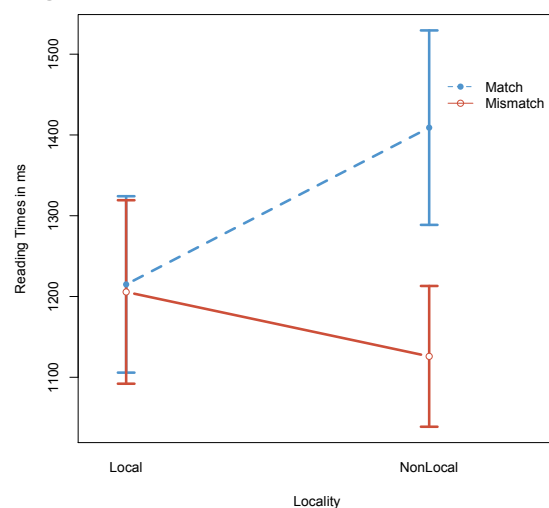


Figure 2: Interaction in Final Region - Experiment 2



2. Condensed References

- [1] Frazier, L., and Clifton, C. Jr. (1998). Comprehension of sluiced sentences. *Lang. Cogn. Process.* 13, 499–520; [2] Harris, J. A. (2015). Structure modulates similarity-based interference in sluicing: An eye tracking study. *Frontiers in psychology*, 6; [3] Harris, Jesse A. (2019). Alternatives on demand and locality: Resolving discourse-linked *wh*-phrases in sluiced structures. In: Clifton, C., Fodor, J.D., & Carlson, K. *Grammatical Approaches to Language Processing - Essays in Honor of Lyn Frazier*. Springer Studies in Theoretical Linguistics.; [4] Van Dyke, J. A., & Lewis, R. L. (2003). Distinguishing effects of structure and decay on attachment and repair: A cue-based parsing account of recovery from misanalyzed ambiguities. *Journal of Memory and Language*, 49(3), 285-316