The influence of word order in reflexive processing: Insights from Tagalog

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Background. A standard account of reflexive processing involves cue-based retrieval [1,2]. Upon encountering *himself* in (1), comprehenders launch a retrieval operation that looks for a feature-matching antecedent in working memory.

(1) The bodybuilder who worked with the trainer(s) amazingly injured himself…

Some have used the weaker/smaller interference effects in (2) as evidence for a syntactically guided retrieval operation [3,4,5]. Under this view, comprehenders only deploy or highly weight structural cues (e.g., Principle A [6]) to constrain their search space.

(2) *The bodybuilder who worked with the trainer(s) amazingly injured themselves…

However, the easy access to the antecedent in (2) could also be attributed to the immediate post-verbal position of the reflexive [4,7,8]. This position could give the unlicensed reflexive access to the local subject via recent activation. Upon encountering *injured*, comprehenders could be retrieving the local subject for thematic integration. Because the reflexive is immediately after, the local subject could still be enjoying a high level of activation that either (i) ensures correct retrieval of the feature-mismatching local subject or (ii) makes retrieval unnecessary upon encountering the reflexive. In either case, comprehenders would have easy access to the local subject with no need to rely on syntactically guided retrieval cues.

The present study: Self-paced reading (*N*=70). Because Tagalog reflexives are subject to similar constraints as English [9], we leverage the language's VSO word order to address the extent to which the weaker interference effects in (2) is an artifact of word order. We modified the subject with a relative clause to ensure that the reflexive is given enough temporal distance to allow decay in activation. This configuration allows us to factor out the contribution of recent activation and assess the independent contribution of structural cues. We found facilitatory interference in the ungrammatical and grammatical conditions.

We constructed 24 items by crossing whether the dependency was grammatical or not (GRAM: G, UG) and whether the intervening NP matched or mismatched the number features of the antecedent (MATCH: M, MM). A sample item is provided in Table 1. Average region-by-region raw RTs are plotted in Figure 1. We analyzed their reading times at the critical region using *lme4* [10] in R [11]. We found a main effect of GRAM: ungrammatical sentences took longer to read than grammatical ones (t=2.76, p=.006). We also found a main effect of MATCH: sentences with number-mismatching distractors took longer to read than those with number-matching ones (t=2.39, p=.02). The interaction was not statistically significant (t=.98, p=.32). We also analyzed their responses to the comprehension questions after each item. Grammatical conditions probed their interpretation of the reflexive, while ungrammatical conditions probed their comprehension of the other parts of the sentence. In the grammatical conditions, the participants' accuracy when the antecedent and the distractor matched in number features (M=71%) and their accuracy when they mismatched (M=74%) were not significantly different (z=.03, p=.98).

Discussion. Reflexives in Tagalog are susceptible to cue-based retrieval interference. We found facilitation when the number of the distractor *matched* the number of the reflexive. The direction of this effect cannot be accounted for by a simple model of retrieval like LV05 [1]. However, it could be accounted for by an extended model of retrieval that scales interference effects vis-a-vis the difference in activation between the target and distractor (e.g., an extension of LV05 proposed by [12]). We conjecture that the facilitation could be a reflex of Tagalog's word order. Our items had the following shape: Verb-Target-[$_{RC}$Verb-Distractor…]-Reflexive. The intervener, having been activated for thematic integration with the RC-verb, could have higher levels of activation, which, in turn, could make it more accessible than the target when retrieval is launched at the reflexive. Alternatively, resolving reflexives in Tagalog might be structure-insensitive; instead, it could be about finding antecedents lower in the thematic hierarchy, as suggested by [13]. If true, then the target and the distractor could be accessible since they're both agents, but the recency of the distractor could give it higher levels of activation. We discuss future experiments aimed at teasing these two apart.

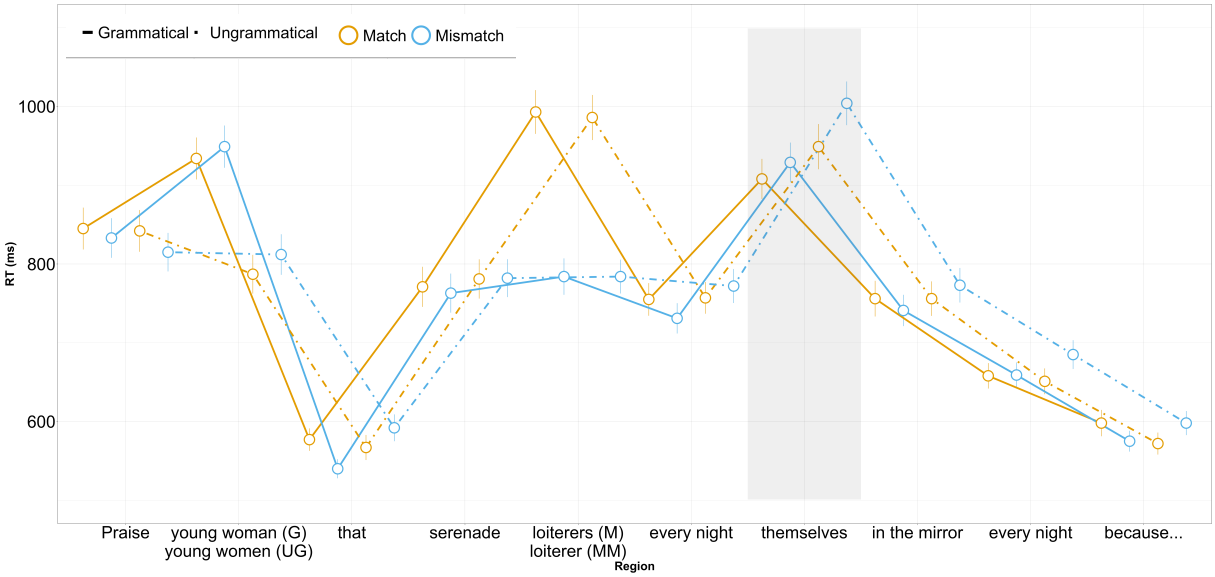
Table 1. Sample experimental item

		Verb	$NP_{[PL/SG]}$		Verb	$NP_{[PL/SG]}$	Adverb	$Reflexive_{[PL]}$…
G	M	Pinupuri	ng mga dalaga	na	hinaharana	ng mga tamabay	gabi-gabi	ang kanilang mga sarili
		praise	young women		serenade	loiterers	every night	themselves
		The young women who the loiterers serenade every night praise themselves…						
G	MM	Pinupuri	ng mga dalaga	na	hinaharana	ng tamabay	gabi-gabi	ang kanilang mga sarili
		praise	young women		serenade	loiterer	every night	themselves
		The young women who the loiterer serenade every night praise themselves…						
UG	M	Pinupuri	ng dalaga	na	hinaharana	ng mga tamabay	gabi-gabi	ang kanilang mga sarili
		praise	young woman		serenade	loiterers	every night	themselves
		*The young woman who the loiterers serenade every night praises themselves…						
UG	MM	Pinupuri	ng dalaga	na	hinaharana	ng tamabay	gabi-gabi	ang kanilang mga sarili
		praise	young woman		serenade	loiterer	every night	themselves
		*The young woman who the loiterer serenades every night praises themselves…						

Comprehension questions

G	Sino ang pinupuri sa salamin? (Who is being praised in the mirror?)
UG	Sino ang taga-harana? (Who is the one serenading?)

Figure 1. Average region-by-region raw RTs



References: **[1]** Lewis & Vasishth (2005). **[2]** Lewis, Vasishth, & Van Dyke (2006). **[3]** Sturt (2003). **[4]** Dillon et al. (2013). **[5]** Cunnings & Sturt (2014). **[6]** Chomsky (1982). **[7]** King et al. (2012). **[8]** Kush & Phillips (2014). **[9]** Richards (2013). **[10]** Bates et al. (2015). **[11]** R Core Team (2020). **[12]** Jaeger, Engelmann, & Vasishth (2015). **[13]** Andrews (1985).