

Searching for the semantic locality effect

Jan Winkowski, Rick Nouwen, Jakub Dotlačil (UIL OTS Utrecht University)

j.l.winkowski@uu.nl

Many studies support theories of memory retrieval which interpret the retrieval as an immediate cue-based content-addressable process [1–4]. The staple of these theories is a prediction that retrieval is prone to interference. Almost all of these studies focus on syntactic dependencies (with few exceptions e.g. [5]). We present two studies in which we observed locality effects i.e. slowdown caused by increased dependency distance, which we think is caused by semantic interference. In our studies we used presupposition, a phenomenon from the semantic-pragmatic interface in which speakers signal with linguistic means that some information can be taken for granted. For example in (1) **too** presupposes that there is another individual earlier in the discourse who was also running. The focus of our studies was a so-called additive “too”.

1. **Lucas ran** to the barn. He was yelling. Peter was running **too**, trying to take care of the chickens.

We conducted two self-paced reading experiments which were meant to test whether the readers will slow down when distance will grow. Each of the experiments was preceded by an acceptability judgement study which was meant to test if the items did not differ much in acceptability between the conditions. All the experiments were conducted in English.

If retrieval of semantic dependents is similar to the retrieval of syntactic dependents, to retrieve the antecedent the parser uses some relevant cues. In case of “too” such cues could be e.g. +PREDICATE or +VP. In the first experiment we hypothesised that the retrieval of the antecedent of “too” will be sensitive to predicates appearing between the site of the trigger and the antecedent.

Study 1 The first experiment crossed 4 levels of distance (0,4,8,12 words) with 2 levels of trigger (“nil” or “too”). An example of the item is shown in the supplementary material. We created 32 items which were combined with 32 fillers. 40 participants took part. A hierarchical Bayesian model with log-normal likelihood was fit to the reading times measured at critical and post-critical regions. Since we were interested in comparing the slowdown with distance between the trigger conditions, we were primarily interested in the interaction effect. The effect estimate on the post-critical region was 0.012 log-ms (89% CrI: (0, 0.025)).

Study 2 In the second study we tried to test whether a notion of event could also be used to influence the speed of retrieval. We hypothesised that the more events between the trigger and the antecedent the longer it should take the participants to retrieve the antecedent and consequently the longer reading times on or after the trigger. Events were operationalized as simple sentences in the past tense. We constructed 24 items which crossed 2 levels of event number condition (“long” or “short”) with 2 levels of trigger (“nil” and “too”) condition (see (1) for an example of an item from a “too, short” condition). The target items were combined with equal number of filler items. 60 participants were recruited in two batches. After 20 out of 48 items the participants were asked to answer comprehension questions. A similar Bayesian model as before was fit to the data. The effect estimate on the critical region was 0.01 log-ms (89% CrI: (-0.004, 0.024)).

As a way of checking if the second experiment replicated the first one, we fit our Bayesian model to the pooled data. Data was combined by annotating each target sentence from each experiment by the number of words between the antecedent and the trigger. This gave us two predictors (trigger and distance) which then were used to model the interaction effect on the data pooled from both experiments. The effect on the pooled data was: 0.01 log-ms (89% CrI: (0.002, 0.022))

The results suggest that the retrieval of a semantic dependent of “too” is guided by the cue-based retrieval and that it is subject to interference. These studies opens up semantics and pragmatics to the cue-based retrieval approaches as a novel empirical ground.

Supplementary Material

Study 1, example of an item.

NIL condition

- 0 The cook is a swimmer and the waiter dances often, I have been told recently.
- 4 The cook is a swimmer and the waiter, who is a boxer, dances often, I have been told recently.
- 8 The cook is a swimmer and the waiter, who is a great boxer from southern Amsterdam, dances often, I have been told recently.
- 12 The cook is a swimmer and the waiter, who is a great lightweight boxer from east parts of southern Amsterdam, dances often, I have been told recently.

TOO condition

- 0 The cook is a dancer and the waiter dances too, I have been told recently.
- 4 The cook is a dancer and the waiter, who is a boxer, dances too, I have been told recently.
- 8 The cook is a dancer and the waiter, who is a great boxer from southern Amsterdam, dances too, I have been told recently.
- 12 The cook is a dancer and the waiter, who is a great lightweight boxer from east parts of southern Amsterdam, dances too, I have been told recently.

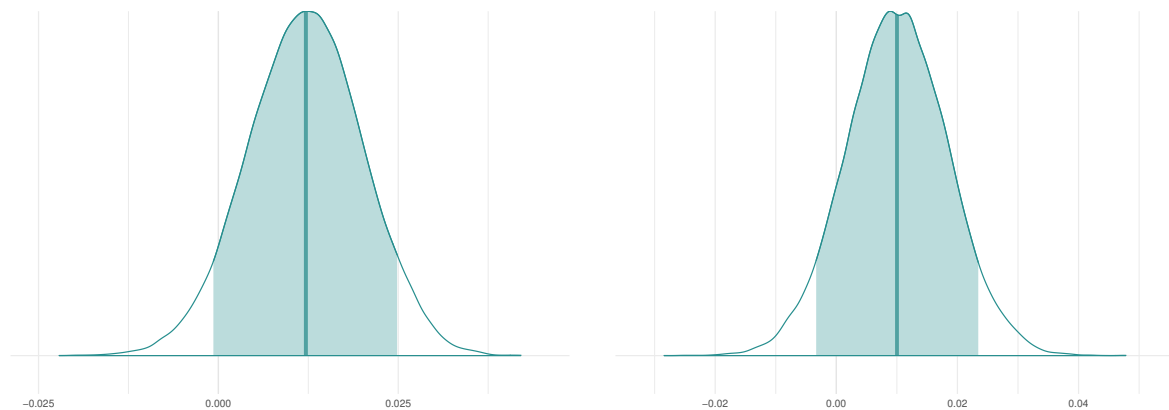
Study 2, example of an item (S – short, L – long)

NIL condition

- S Lucas dashed from the house. He was yelling. Peter was running around, trying to take care of the chickens.
- L Lucas dashed from the house. He shut the door. He sealed the lock. He was yelling. Peter was running around, trying to take care of the chickens.

TOO condition

- S Lucas ran to the barn. He was yelling. Peter was running too, trying to take care of the chickens.
- L Lucas ran to the barn. He shut the door. He sealed the lock. He was yelling. Peter was running too, trying to take care of the chickens.



Posterior distribution of the interaction parameter. The shaded region is 89% HPDI, the darker line is the median. Study 1 on the left, study 2 on the right.

References

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