**Evidence for semantic selectivity in the online processing of sluiced sentences**

**Background.** In cue-based parsing, items in memory are compared via an associative cue-matching mechanism in parallel (Clark & Gronlund, 1996; McElree, 2000). Such models naturally account for *similarity-based interference*: competitors sharing more cues with the target interfere more with the successful retrieval of the target. Much recent work addresses whether *structurally inaccessible* distractors interfere with the retrieval process, e.g., subject gaps (e.g., Van Dyke & McElree, 2011), reflexives (e.g., Dillon et al., 2015), or NPIs (e.g., Vasishth et al., 2008). We address whether *semantically inappropriate* nouns compete for activation in retrieval. A positive answer would support a *globally unselective* view of retrieval, in which cue-matching computes similarity solely on the basis of surface cues (e.g., number, gender, and even grammatical role). A negative answer, however, would suggest a *grammatically selective* approach, in which grammatical properties of the retrieval site determine which items compete for activation (e.g., Parker 2018).

We investigated the impact of semantic on retrieval by leveraging constraints on sluicing ellipsis, defined as clausal ellipsis of a constituent question, as in *John read some book, but I don't know which one*. Here, a *wh*-phrase remnant (*which one*) corresponds to a correlate (*some book*) in the antecedent clause (Ross, 1967; Merchant, 2001). As correlates must introduce a variable for the *wh*-phrase to bind (Chung et al., 1995; Romero, 1998), quantificational nouns (*each child*) that do not introduce variables are not legal correlates, e.g., ***Each child**$_i$ **laughed, but I don't know which one**$_i$. We explored similarity-based interference effects in which the grammatical features on the remnant *(which one)* match the correlate in the antecedent clause (*a criminal*). Under a **semantically unselective** account, similarity is solely determined by features (number, gender, etc.). In contrast, in a **semantically selective** approach, only grammatically licensed distractors interfere with the target, generating an asymmetry in the online accessibility of the correlate for retrieval.

In two studies, distractors were distinguished from the target by one of two kinds of cue: (i) mismatching grammatical number, but semantically appropriate (*some judges*), or (ii) a semantically inappropriate quantifier of the same number as the target (*each judge*). Sluicing displays a strong *Locality preference*, in which the remnant is preferentially associated with the nearest possible correlate in offline (Frazier & Clifton, 1998; Carlson et al., 2009) and online (Harris, 2015) measures.

**Design. Correlate location** (*Object* / *Subject*) was crossed with **Cue type** (*Number* / *Determiner*), with equally distributed singular (*a criminal*) and plural (*some criminals*) cues. Items were rated as equally acceptable in a separate ratings study on the same population (N = 39).

**Study 1: Eye-tracking (N = 48).** Results confirmed previous Order effects: Subject correlates elicited longer regression path times on the remnant [$B$ = 19.86, $SE$ = 6.90, $t$ = 2.88] and the spillover region [$B$ = 20.03, $SE$ = 8.50, $t$ = 2.35]. However, as predicted by a *selective* approach, Location was interactively modulated by Cue type. Violating the Locality preference incurred a greater penalty for indefinite (but number mismatching) distractors, compared to number matching (but semantically inappropriate) distractors in first fixation durations [$B$ = 3.78, $SE$ = 1.65, $t$ = 2.29] on the remnant, and in regression path times [$B$ = 21.06, $SE$ = 8.58, $t$ = 2.45] on the following spillover region; Fig 1.

**Study 2: Memory probe task (N = 96).** A separate set of participants were presented with the same materials truncated at the remnant (*which one*) in RSVP format; Fig 3. Immediately after the remnant, a probe word corresponding to the subject (JUDGE(S)) or object (CRIMINAL(S)) appeared. Subjects were faster overall to correctly identify object probes, in support of Locality. However, there was also a three-way interaction highly supporting a semantically selective approach. First, there was a greater advantage for Object probes after Object correlates when the Subject correlate was a semantically inappropriate quantifier phrase compared when it was mismatched in number with the remnant. Second, Subject probes elicited an increased penalty when the true correlate was in Object position, suggesting a mismatch effect, only for semantically inappropriate quantifier phrases; Fig 2.

**Conclusion.** In addition to replicating the online preference for Local correlates, the results point to a *selective retrieval system*, which could be modeled by assuming that semantically inappropriate distractors are either (i) ignored as competitors via a grammatical filter (Phillips et al., 2011), or (ii) receive lower levels of gradient activation (Lewis & Vasishth, 2005).

**Materials.**

(1) *Sample quartet of 24 items: All sentences have one and only one appropriate correlate.*

| | **Location of correlate** | |
|---|---|---|
| **Cue type** | *Local / Object correlate = criminal* | *Non-local / Subject correlate = judge* |
| *Number* | a. Some judges / wanted to release / **a criminal** | b. **A judge** / wanted to release / some criminal |
| *Determiner* | c. Each judge / wanted to release / **a criminal** | d. **A judge** / wanted to release / each criminal |

... /but I don't know / which one, / and it caused a major /international scandal.
(remnant) (spillover)

(2) **Comprehension Q:** WHAT DON'T I KNOW? WHICH JUDGE(S) WHICH CRIMINAL(S)

**Figures.**

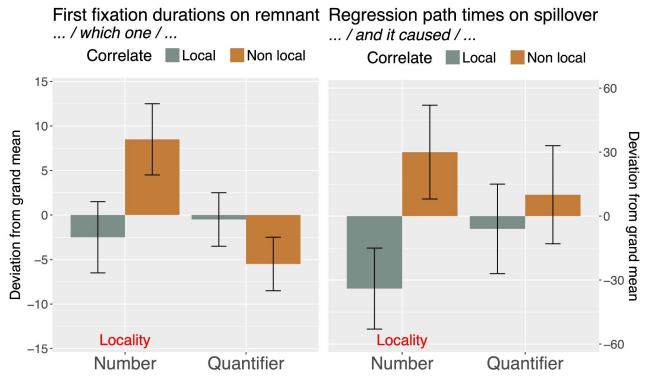


**Fig 1.** Interaction between Determiner and Location of correlate in First fixation times on remnant (Left panel) and in Regression path times on post-remnant phrase (Right panel).

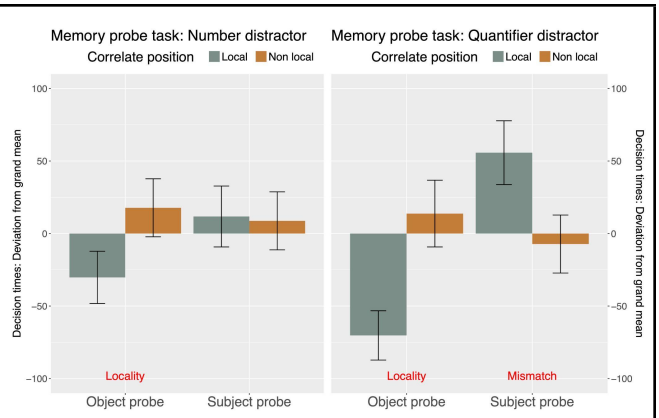


**Fig 2.** Three-way interaction between Correlate position, Probe type, and Distractor type (between-subjects manipulation).

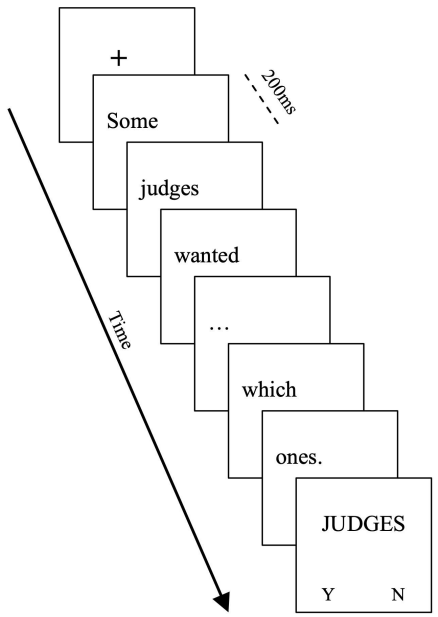


**Fig 3. Probe task in Rapid Serial Visual Presentation** with 200ms between words. Probe words appeared in caps immediately after the remnant.

**Selected references.**

**Carlson** et al. (2009). Information structure expectations in sentence comprehension. *QJEP*, 62, 114–139. • **Clark** & **Gronlund** (1996). Global matching models of recognition memory: how the models match the data? *Psychon. Bull. Rev.* 3, 37–60. • **Frazier** & **Clifton** (1998). Comprehension of sluiced sentences. *LCN*, 13, 499–520. • **Harris** (2015). Structure modulates similarity-based interference in sluicing: An eye tracking study. *Frontiers*, 6:1839. • **Van Dyke** & **McElree** (2011). Cue-dependent interference in comprehension. *JML*, 65, 247–263.