Cue Confusion and Distractor Prominence Can Explain Inconsistent Interference Effects

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Current assumptions about cue-based memory retrieval mechanisms in sentence processing (e.g., Lewis & Vasisht, 2009) ([V09]) explain only a subset of interference effects from structurally inaccessible distractors observed in dependency resolution. We present (1) a literature review that compares observed patterns of effects from distractor and subject-verb dependencies and (2) a cue-based retrieval model extended with Distractor Priming and Cue Confusion that offers a principled explanation of hitherto unexplained effects. For comparability with other dependency types, we relate the cross-validated number agreement studies.

Principle 1: Distractor Priming

The strength of similarity-based interference (Inhibition) caused by a distractor depends on its activation level in relation to the target distractor presentation. This predicts:

- Winner effects in target-match vs. in target-mismatch ("paradigm symmetry" effect).
- Effects generally increase with higher distractor-based activation.
- Facilitation in target-match for very high distractor activation.

Principle 2: Cue Confusion

A retrieval cue can be associated with multiple features. In different degrees. The associative strength between a cue and a feature is learned by experience. If two features occur frequently in target items for a certain type of dependency, the parser has to treat them separately. E.g., the correct target for reciprocals (e.g., John gives Mary a book) is scored as feature attraction between cue and feature for ‘give’ and ‘am’, where English reflexives (John or Mary) are not scored in their number and gender requirement.

This leads to a novel association (traffic jam vs. Metropolitan): between cues and features for ‘give’ and ‘am’ in reciprocals, which are based on independent target-mismatch conditions and, therefore, predict inhibitory effects.

Simulation Parameters

Retrieval latency was in both models adjusted for experimental method. Distractor base level: In both models adjusted for distractor position: 0.5, 1.5, 6, 12. (V09: a, b, c, d).

Cue Confusion modeled in extended model was adjusted for feature co-occurrence (reciprocals and Mandarin reflexives).

Selected studies marked with *(Number agreement was not included in simulations.)

Conclusions

The relabeling of conditions in number agreement reveals consistent feature interference effects in target-match, contrary to the predictions of cue-based retrieval (standard or extended). This suggests that number attraction experiments demonstrate a different kind of dependency than other subject-verb dependencies and anaphoric dependencies:

Distractor base-level activation in the extended model is correlated with distractor position (0, 1.5, 6, 12). Consequently, Distractor Priming can explain the absence of differences in interference costs for prominent distractor positions, and cases of facilitatory interference in target-mismatch conditions (Cunnings & Fesler 2013; Sturt, 2003).

Cue Confusion predicts inhibitory interference in target-mismatch conditions for reciprocals (Kush & Phillips, 2014) and Mandarin reflexives (Jager et al., in prep.):

A high cue confusion level could potentially explain inhibitory interference in target-mismatch conditions for low-span readers (Cunnings & Fesler, 2013).

Limitations: With increased distractor prominence, the extended model overestimates the magnitude of facilitatory target-mismatch effects.

Try out the simulations yourself at https://jangelmann.shinyapps.io/ACTRInterference.