THEORETICAL BACKGROUND

STRUCTURE-BASED RETRIEVAL

In the very first stage of binding a reflexive, the parser relies on structural information (Binding Principle A) alone. Evidence: Nicol & Swaney (1989); Sturt (2003); Xiang, Dillon, & Phillips (2009); Dillon (2011).

RESEARCH QUESTION

Is animacy used as a non-structural retrieval cue in addition to the structural c-command cue when searching memory for the antecedent of the Mandarin reflexive zi? If so, is it used already in a very early stage of processing?

THEORETICAL BACKGROUND

MULTIPLE-FEATURE BASED RETRIEVAL

In the retrieval of a reflexive’s antecedent, non-structural cues are used in addition to structural ones already in the very first stage of binding. Evidence: Badecker & Straub (2003); Cunnings & Felser (2011); Patil, Vasishth, & Lewis (2011); King, Andrews, & Wagers (2012).

EXPERIMENT I

2x2 factorial design:
Animacy of a structurally accessible (i.e., c-commanding) antecedent
Animacy of a structurally inaccessible (i.e., not c-commanding) antecedent

First-fixation duration at ziji

EXPERIMENT II (Oberauer & Kliegl, 2006). Under this view, the results of Experiment II cannot be explained by a purely structure-based retrieval account.

Multiple-choice comprehension questions testing the retrieval of the reflexive’s antecedent.

• More first-pass regressions from the reflexive when the words held in memory were animate (Coef=0.36, SE=0.13, t=2.79, p=0.01).

• Long reading times in late measures when the memory load was animate (RPD: Coef=0.11, SE=0.04, t=2.79; RBR: Coef=0.05, SE=0.02, t=2.11; TTF: Coef=0.10, SE=0.03, t=3.31).

• More re-readings of the reflexive when memory load was animate (Coef=0.31, SE=0.12, t=2.65, p=0.01).

• No interference effect in comprehension questions.

• The inhibitory interference due to animacy of the memory load is compatible with multiple feature-based retrieval in which animacy is used as a retrieval cue: competition between the antecedent and the animate words held in memory leads to processing difficulty.

• Encoding interference provides an alternative explanation for the slowdown observed at the reflexive when animate nouns are held in memory (Oberauer & Kliegl, 2006): When the antecedent shares its animacy feature with the three words held in memory, this might lead to a poorer encoding of the antecedent causing a slower retrieval of the latter when the dependency with the reflexive is being built.

• Question-response accuracies: as in Experiment I, the interference effect observed in online measures does not show up in offline question response accuracies, which indicates a higher weight of the c-command cue.

• Encoding interference due to feature overlap provides an alternative explanation to the effect observed in Experiment II (Oberauer & Kliegl, 2006). Under this view, the results of Experiment II are compatible with a structure-based retrieval mechanism. However, the results of Experiment I cannot be attributed to encoding interference.

PREDICTIONS

Structure-based retrieval
No effect of the inaccessible antecedent at the reflexive.

Multiple-feature based retrieval
Interference effect due to animacy of the inaccessible antecedent at the reflexively present already in early measures.

Linear Mixed Effects Models revealed inhibitory interference in early and late eyetracking measures:

i. Main effect of inaccessible antecedent: slowdown due to animacy of the inaccessible antecedent already in early measures (FFD: Coef=0.02, SE=0.01, t=2.22; PRRT: Coef=0.03, SE=0.01, t=2.79).

ii. Interaction between animacy of accessible and inaccessible antecedent (FFD: Coef=0.02, SE=0.01, t=2.3; PRRT: Coef=0.03, t=2.8, SE=0.01).

iii. Pairwise comparisons showed that the main effect was driven by the conditions with an inanimate antecedent (FFD: Coef=0.05, SE=0.01, t=3.2; PRRT: Coef=0.06, SE=0.02, t=3.4).

iv. This pattern remained statistically significant also in late measures (RRRT, PRRT).

v. No interference effect in comprehension questions.

Multiple-feature based retrieval
Slowdown at the reflexive when animate nouns are held in memory.

Linear Mixed Effects Models revealed inhibitory interference in early and late eyetracking measures:

i. More first-pass regressions from the reflexive when the words held in memory were animate (Coef=0.36, SE=0.13, t=2.79, p=0.01).

ii. Longer reading times in late measures when the memory load was animate (RPD: Coef=0.11, SE=0.04, t=2.79; RBR: Coef=0.05, SE=0.02, t=2.11; TTF: Coef=0.10, SE=0.03, t=3.31).

iii. More re-readings of the reflexive when memory load was animate (Coef=0.31, SE=0.12, t=2.65, p=0.01).

iv. No interference effect in comprehension questions.

DISCUSSION

• The early inhibitory interference effect cannot be explained by a purely structure-based retrieval account.

• The results are compatible with a parallel multiple-feature based retrieval mechanism that uses animacy and c-command simultaneously to identify candidate antecedents:

  • Inanimate accessible antecedent: no fully feature-matching target is available and the presence of an animate inaccessible antecedent leads to competition between the two NPs.

  • Animate accessible antecedent: the fully feature-matching animate access antecedent gets enough activation to not suffer interference from the only partially feature-matching inaccessible antecedent.

  • Question-response accuracies: the animacy feature of the inaccessible antecedent does not lead to an increased proportion of mis-readings of the latter. This could be explained by a higher weight of the c-command cue: With the passage of time, the c-command cue finally overpowers the animacy cue.

GENERAL DISCUSSION

• In the binding of the Mandarin reflexive zi, a non-structural cue – the animacy feature of the antecedent required by the reflexive – is used at a very early stage.

• Competition between alternative candidates leads to a slowdown in online measures.

• The structural c-command cue appears to be weighted higher than the animacy cue.

• Question response accuracies show that the online interference effect does not lead to misretrievals of the non c-commanding candidate.

• The fact that we can observe interference effects despite the presence of a fully cue-matching antecedent in Experiment II but not in Experiment I indicates that the conscious effort subjects spent on not forgetting the memory load words while reading leads to a high activation of those words and hence produces interference.

REFERENCES

Badecker & Straub (2003); Cunnings & Felser (2011); Patil, Vasishth, & Lewis (2011); King, Andrews, & Wagers (2012).