Processing of control structures in German in the light of cue-based retrieval

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Introduction

In cue-based retrieval (Lewis & Vasishth, 2005), difficulties in dependency resolution are explained by effects of interference and decay.
We tested for interference and decay effects in control structures.

Experiment 1: object vs. subject control

In experiment 1, we varied the control type. In the example below, the covert subject PRO has to be identified with the subject of *promise* (subject control) or with the object of *allow* (object control) as indicated by the subscripts. We expected increased processing costs for subject control due to decay.

Peter$_i$ promises / allows Lisa$_j$ PRO$_{i/j}$ to catch the chicken.

▷ Peter *erlaubt / verspricht* nun Lisa, PRO das Huhn zu jagen und zu fangen.

Experiment 2: gender match vs. mismatch

In experiment 2, we varied the gender of the two main clause nouns of subject control structures. We expected increased processing costs when the nouns matched in gender.

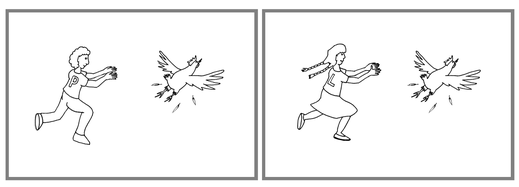
Peter promises Tom / Lisa that he will catch the chicken.

▷ Peter verspricht nun *Lisa / Thomas*, dass er das Huhn jagt und fängt.

Methods & Design

participants: 48 German-speaking adults
(18 male, age: 19–83 years, M=49 years)
methods: self-paced listening, visual world eye-tracking
task: sentence-picture matching, n=50 items

Who interacts with the animal?



A B

outcome measures & statistical analyses:

- listening times, % looks to the target
- reaction time (RT) for picture selection
- Bayesian (generalized) linear models, random intercepts & slopes for subjects and items

Statistical analysis

Experiment 1

	effect (ms)	95% CrI (ms)
noun	40	[-35, 118]
verb	58	[-9, 126]
RT_{SPL}	134	[-54, 311]
RT_{ET}	97	[-118, 319]

ET: non-overlapping 95% CrI 550ms-1300ms

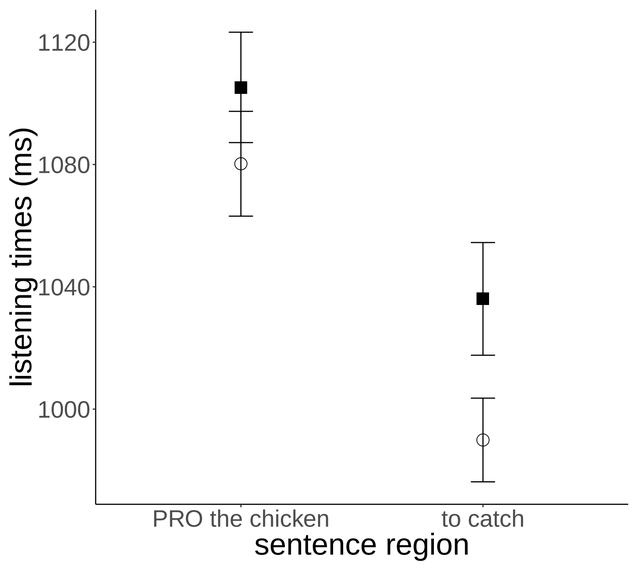
Experiment 2

	effect (ms)	95% CrI (ms)
pronoun	1	[-56, 56]
noun	-31	[-91, 27]
verb	14	[-44, 74]
RT_{SPL}	246	[114, 389]
RT_{ET}	187	[42, 327]

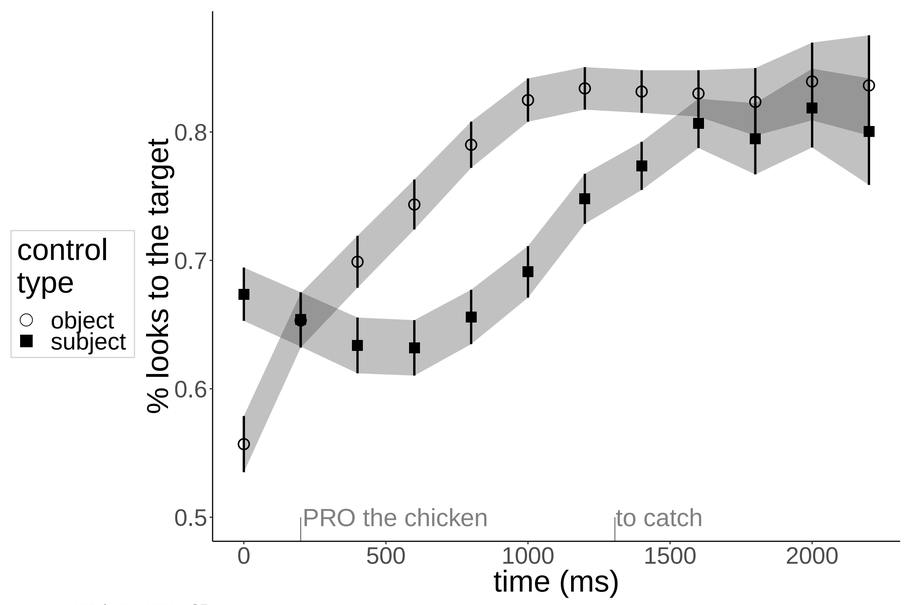
ET: no non-overlapping 95% CrI

Experiment 1

SPL results



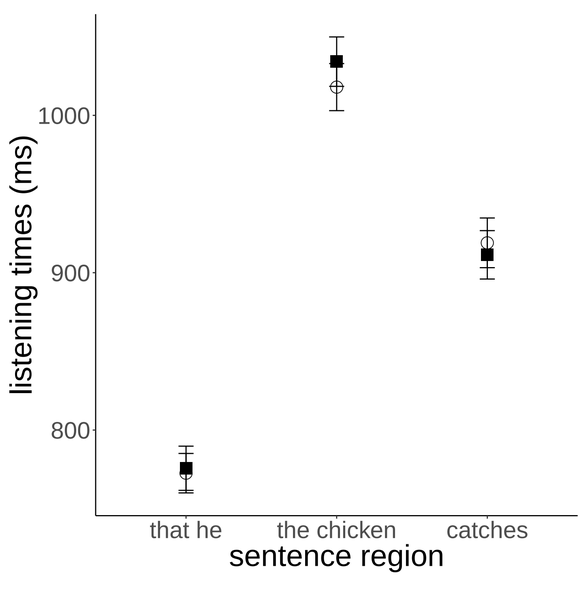
visual world ET results



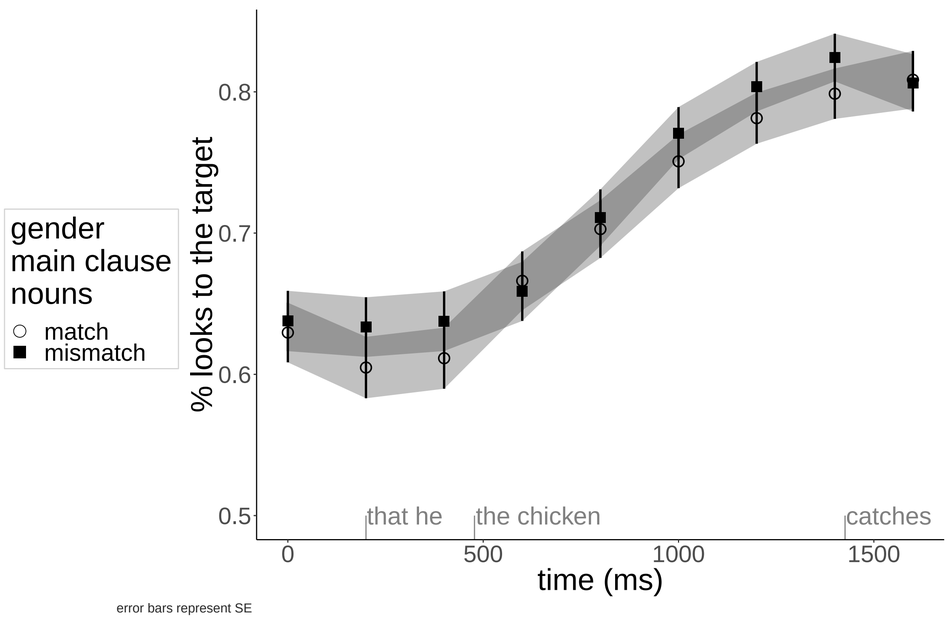
error bars represent SE

Experiment 2

SPL results



visual world ET results



error bars represent SE

Discussion

Experiment 1

- We found a locality effect, i.e., a slower pronoun resolution for sentences with a target in the subject position.
- The direction of the effect is in line with the cue-based retrieval model.
- The effect can be explained by the greater decay of the target in subject control.

Experiment 2

- We found no effects of gender on pronoun resolution during self-paced listening and eye-tracking.
- We found higher reaction times in the picture selection task in the gender match condition.
- This suggests a late interference effect during discourse integration of the referents.

Conclusion

The locality effect of experiment 1 can be explained by decay. The absence of gender effects in experiment 2 speaks against early interference. The absence of the effect cannot be explained by the dominance of the c-command feature as it was proposed for the resolution of reflexive pronouns.

References

▷ Lewis, R. L., & Vasishth, S. (2005). An activation-based model of sentence processing as skilled memory retrieval. *Cognitive Science, 29*, 375–419.

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