

Possessive pronouns do not c-command out of the noun phrase in Serbian

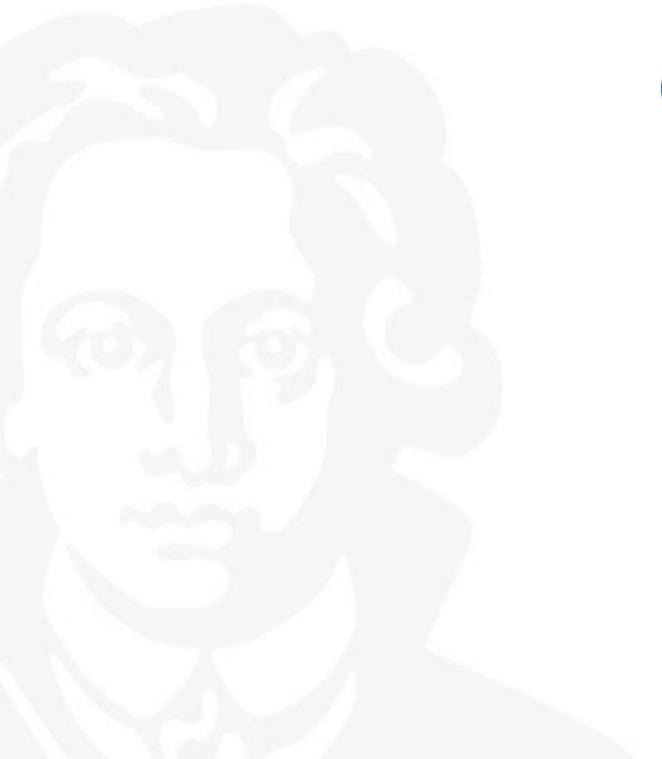
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RTG Nominal Modification

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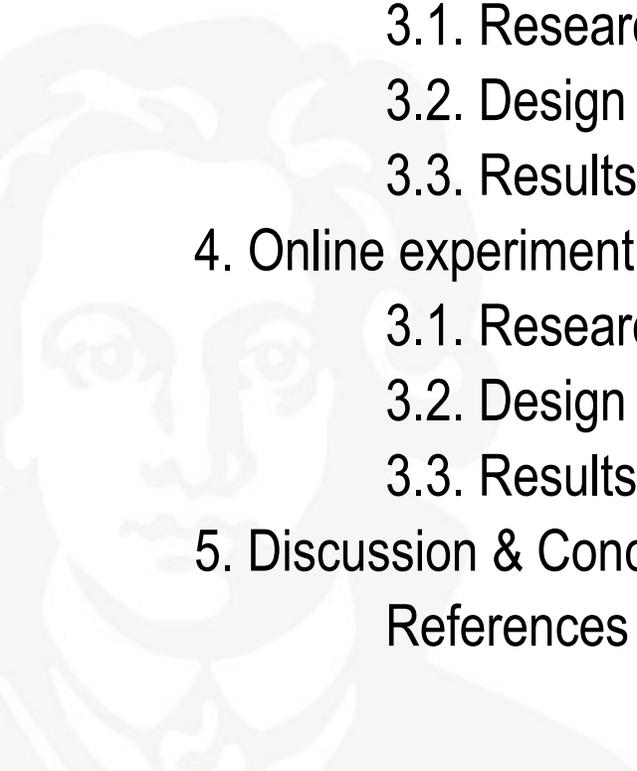
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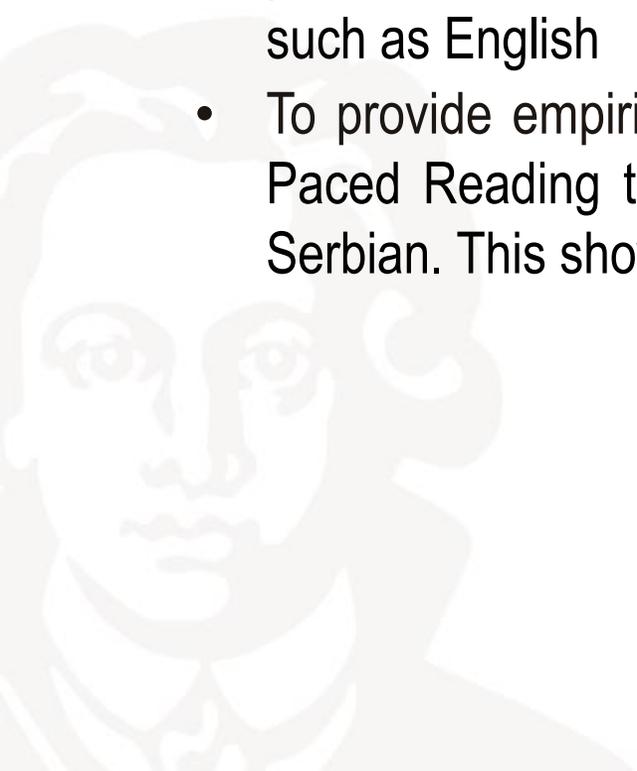
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Aims of this talk

- To discuss potential cross-linguistic differences concerning binding principle C in constructions with possessive modifiers between articleless languages such as Serbian and languages with articles such as English
- To provide empirical evidence - based on the results of a Forced Choice Judgment and a Self-Paced Reading task - that possessive modifiers do not c-command out of the noun phrase in Serbian. This shows that Serbian does not differ in this respect from English.



Background and previous research

- Backward anaphora (cataphora) is less common than forward anaphora, but it is still productive and acceptable in English as in (1).
(1) When *he_i* was alone, *John_i* invited Mary for a drink.
- When a pronoun c-commands an R-expression, as in (2), the noun phrases *he* and *John* cannot be coreferential \Rightarrow violation of Binding Principle C (Chomsky, 1981).
(2) *He_{*i/j}* likes *John_i*.
- Condition C also applies across clauses and limits the distribution of coreferring R-expressions (3).
(3) *He_{*i/j}* drank beer while *John_i* watched a soccer game.
- In the absence of a potential binding configuration, a coreferential reading is freely available in (4). In (4), the possessive pronoun *his* does not c-command the R-expression *John*.
(4) *His_i* brother drank beer while *John_i* watched a soccer game.

Background and previous research

What about Serbian?

- According to Despić (2013: 245), Serbian patterns with English concerning sentences with pronouns (5) but not with respect to examples with possessive pronouns modifying a subject (6).

(5) **On_i je juče ugrizao Jovana_i.* (Despić 2013: 251, ex.27)

he is yesterday bitten John

'He_i bit John_i yesterday.'

(6) **Njegov_i papagaj je juče ugrizao Jovana_i.* (Despić 2013: 253, ex. 31)

his parrot is yesterday bitten John

'His_i parrot bit John_i yesterday.'

- Assumption: the possessive in (6) cannot bind the R-expression in Serbian, because it is in an adjoined position. In an articleless language like Serbian no DP prevents that possessives c-command out of the noun phrase. (NP/DP-Parameter)

Background and previous research

- How to empirically test the effects of binding principle C?
- There is a number of psycholinguistic studies investigating the effects of syntactic constraints in the processing of backwards anaphora (cataphora) in English, German and Russian (Kazanina et al, 2007; Kazanina and Phillips, 2010; Drummer and Felser, 2018).

Central assumptions:

- **When encountering a cataphoric pronoun, a search for a suitable referent is triggered.**
- This search is constrained by binding principle C: participants actively search for an antecedent following a cataphoric pronoun only when there is no c-command relation (no violation of principle C) (Kazanina et al, 2007).

Background and previous research

- When there is a violation of Principle C, (i.e. when c-command is involved), speakers rate the construction lower (*Offline*) or do not consider the interpretation of readings that violate this constraint, which is shown in shorter RTs (*Online*). (Kazanina et al, 2007)

(7) *His_i* roommates met *John_i* at the restaurant.

= no violation of principle C (no c-command) \Rightarrow active search for antecedent

(8) **He_i* met *John_i* at the restaurant.

= violation of principle C (c-command) \Rightarrow no consideration of reading violating the constraint

Offline test: higher ratings in (7) vs. lower ratings in (8)

Online experiment: longer reaction times (RT) in (7) vs. shorter RT in (8)

Background and previous research (Kazanina et al. 2007)

- Kazanina et al. (2007) conducted a number of **offline** and **online (self-paced reading task)** experiments in English.

Offline acceptability rating task

Method: In each sentence a pronoun and a noun phrase were highlighted in bold and participants were instructed 'to determine how plausible it is that the pronoun in bold and the noun in bold refer to the same person' **on a scale from 1 (impossible) to 5 (absolutely natural)**.

Participants: 60 native speakers of English

Stimuli: 24 test items (no constraint vs. principle C + forward anaphora) + 36 filler items

Principle C:

He_i chatted amiably with some fans while the talented, young **quarterback** signed autographs for the kids, but **Steve_i** wished the children's charity event would end soon so he could go home.

No constraint:

His_i managers chatted amiably with some fans while the talented, young **quarterback_i** signed autographs for the kids, but Carol wished the children's charity event would end soon so she could go home.

Background and previous research (Kazanina et al. 2007)

- The Principle C condition received a mean rating score of 1.7 - significantly lower than the rating score in the other conditions (2-tailed paired t-test, all p s < .01). (Kazanina et al. 2007:403)
- The results showed that judgments of coreference are substantially degraded (only) when a pronoun c-commands its antecedent, as predicted by the Principle C constraint.

Condition	Mean rating (Standard error)
Principle C	1.7 (.09)
No-constraint	3.4 (.13)
Forward anaphora*	4.3 (.08)

* The coreference rating score in the no-constraint condition was significantly lower than in the forward anaphora condition, but this is expected given that forwards anaphora is the preferred way of expressing coreference in these contexts.

Background and previous research (Kazanina et al. 2007)

Self-paced reading task

- Including **gender match/mismatch condition** allows them to test for (potential) coreference indirectly: difference in RT expected only in no constraint conditions (C1 vs. C2).

C1	No constraint/ match:	His_i managers chatted amiably with some fans while the talented, young quarterback_i signed autographs for the kids, but Carol wished the children's charity event would end soon so she could go home.
C2	No constraint/ mismatch:	Her_i managers chatted amiably with some fans while the talented, young quarterback signed autographs for the kids, but Carol_i wished the children's charity event would end soon so she could go home.
C3	Principle C/ match:	He_i chatted amiably with some fans while the talented, young quarterback signed autographs for the kids, but Steve_i wished the children's charity event would end soon so he could go home.
C4	Principle C/ mismatch:	She_i chatted amiably with some fans while the talented, young quarterback signed autographs for the kids, but Carol_i wished the children's charity event would end soon so she could go home.

Background and previous research (Kazanina et al. 2007)

Self-paced reading task

- If coreference is not possible (principle C) \Rightarrow no difference in reading times expected between gender match and mismatch (no search for an appropriate antecedent)
- If coreference is possible (no constraint) \Rightarrow it is expected that gender mismatch slows down the reading time

- Slow down in reading time in C2 only (**no constraint/gender mismatch**):

C1: **His_i** managers chatted amiably with some fans while the talented, young quarterback_i signed autographs for the kids, but Carol wished the children's charity event would end soon so she could go home.

C2: **Her_i** managers chatted amiably with some fans while the talented, young quarterback signed autographs for the kids, but **Carol_i** wished the children's charity event would end soon so she could go home.

RT ↗

Background and previous research (Kazanina et al. 2007)

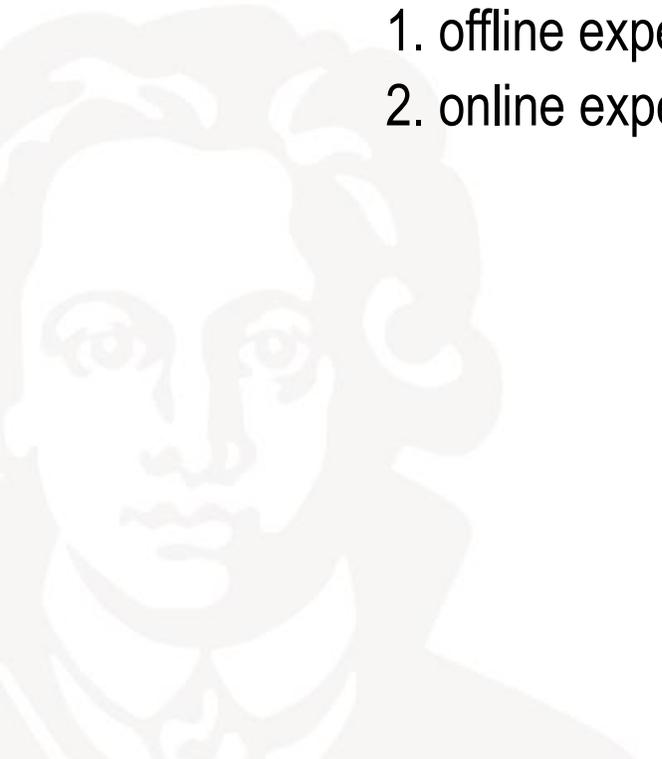
- At the critical noun ('quarterback') there was a main effect of congruency and a significant constraint congruency interaction. Separate pairwise comparisons of the Principle C and no-constraint conditions revealed a strong effect of congruency in the no constraint pair in the predicted direction. No corresponding effect was observed in the Principle C pair.

Condition	Constraint	Congruency	Mean rt (ms)
C1	No constraint	Gender match	364.6
C2	No constraint	Gender mismatch	402.5
C3	Principle C	Gender match	369.6
C4	Principle C	Gender mismatch	376.4

- Kazanina et al.'s (2007) study show that syntactic constraints immediately restrict active search processes: speakers are sensitive to Condition C.**

⇒ What about the corresponding structures in Serbian?

- In order to test whether Serbian indeed disallows coreference with both a possessive pronoun and a personal pronoun in subject position, we conducted 2 experiments, following the design of Kazanina et al. (2007), with some adjustments:
 1. offline experiment: Forced Choice Judgment Task
 2. online experiment: Self-paced reading Task



Offline experiment

Research questions:

- Do Serbian native speakers differ from English speakers and reject coreference both with possessive modifiers and pronouns?
- Or do Serbian speakers distinguish between pronouns and possessives as in English?

Hypothesis I: Serbian differs from English

- Serbian speakers **do not choose a coreferential interpretation with pronouns and possessives** (no sensitivity to principle C)

Hypothesis II: Serbian does not differ from English

- Serbian speakers choose a **coreferential interpretation with the possessive (no-c-command condition) but not with pronouns (c-command condition)**

Offline experiment

Participants:

35 Serbian native speakers

mean age: 28, 54

gender: 26 female, 9 male

region: Novi Sad, Serbia

non-linguists

Method:

- Forced Choice Judgment Task in the online software IBEX farm, using PennController (Zehr, J., & Schwarz, F., 2018)

Offline experiment

Design and Procedure

- **Independent variables:**
 1. C-command, 2 levels:
 - I. No c-command (possessive)
 - II. C-command (pronoun)
 2. Gender, 2 levels:
 - I. Gender match
 - II. Gender mismatch
- **4 conditions**
- **Dependent variable:** Choice
- **Latin Square Design** – the presentation sequence was randomized per each participant
48 items per participant: 24 test items + 24 filler items (forward anaphora)

Offline experiment

Design and Procedure

- Male-female gender equally distributed across items
- 2 sentences (2 clauses +1 clause); 2nd sentence subject as another possible antecedent
- Procedure: intro sentence, test item, question
- Answer: co-referential (**1st name**), non-coreferential (**2nd name or somebody else**)

C1	No c-command/ gender match	Njegov_i advokat je čitao slučaj dok je Dejan_i čekao u kancelariji. Filip je bio optimističan u vezi sa parnicom. 'His lawyer was reading the case while Dejan was waiting in the office. Filip was optimistic about the litigation.'
C2	No c-command/ gender mismatch	Njen_i advokat je čitao slučaj dok je Dejan čekao u kancelariji. Elena_i je bila optimistična u vezi sa parnicom. 'Her lawyer was reading the case while Dejan was waiting in the office. Elena was optimistic about the litigation.'
C3	C-command/ gender match	On_i je čitao slučaj dok je Dejan čekao u kancelariji. Filip_i je bio optimističan u vezi sa parnicom. 'He was reading the case while Dejan was waiting in the office. Filip was optimistic about the litigation.'
C4	C-command/ gender mismatch	Ona_i je čitala slučaj dok je Dejan čekao u kancelariji. Elena_i je bila optimistična u vezi sa parnicom. 'She was reading the case while Dejan was waiting in the office. Elena was optimistic about the litigation.'

Offline experiment

Results

- The results from the offline experiment corroborate that participants chose coreferential interpretation in sentences with possessives suggesting that there is no violation of principle C in such constructions in Serbian.

	C1 (no c-command/ gender match)	C3 (c-command/ gender match)
coref	58.57%	0.95%
non-coref	41.34%	99.05%

Table1. Choice of (non)coreference in % for C1 and C3 (gender match conditions)

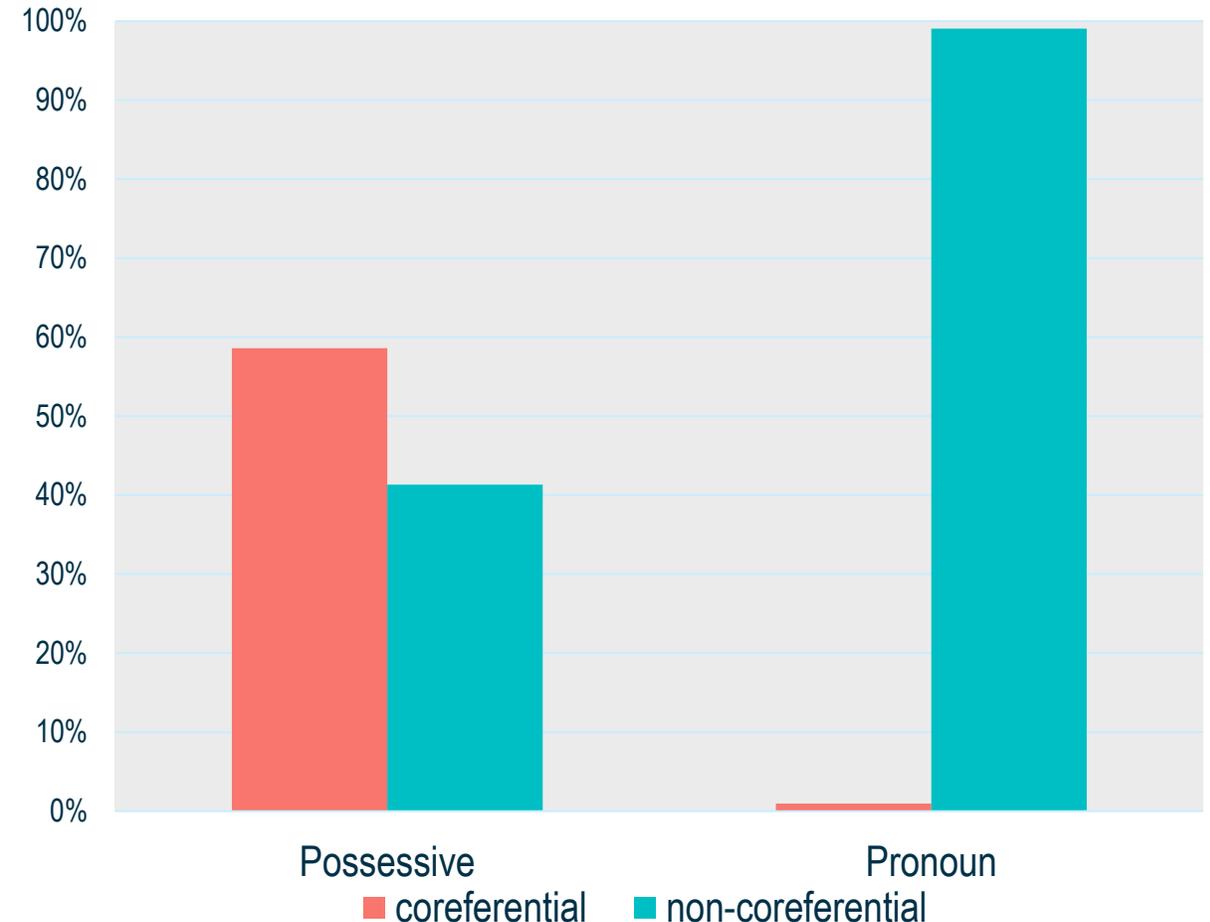


Figure 1. Acceptance of (non)coreference in C1 and C3

Offline experiment

Results

- For the statistical analysis, the results of the test items were introduced in a Generalized Linear Mixed-Effects Regression (GLMER) with choice (coreference/non-coreference) as the dependent variable and conditions (C-command and Gender) as the independent variables. Participants and stimuli were included as random factors. There is a statistically significant effect of both conditions, C-command and Gender ($p < .001$).
- Formula: $\text{Choice} \sim \text{poly}(\text{TrialOrder}, 2) + \text{Ccommand} + \text{Gender} + (1 | \text{Participants}) + (0 + \text{poly}(\text{TrialOrder}, 2) | \text{Participants}) + (1 | \text{Item})$

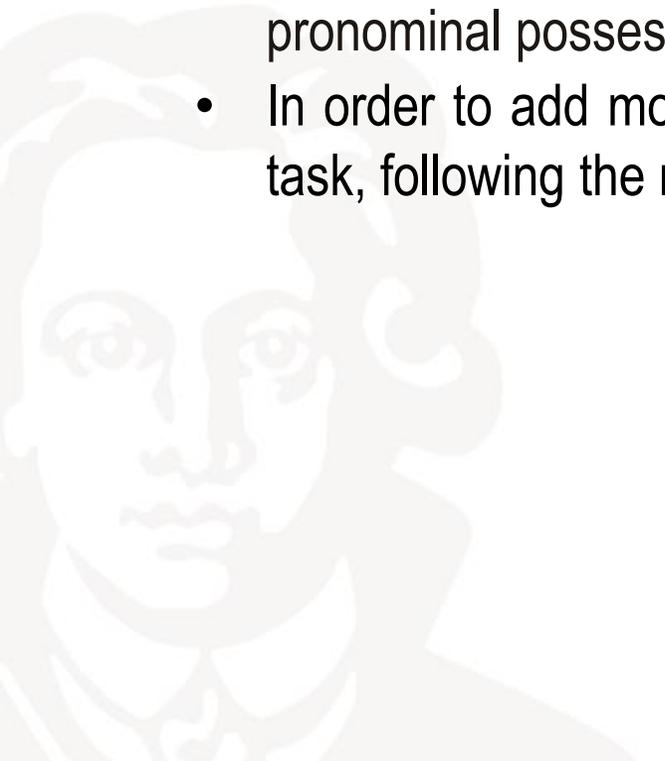
	Estimate	Std. Error	z value	Pr (> z)
Intercept)	-0.291	0.301	-0.96	0.33
C-command	4.75	0.599	7.93	2.2e-15***
Gender	4.325	0.546	7.92	2.3e-15***

Table 2. GLMER (fixed effects results)

- The results indicate that coreferential reading is possible only in C1 (no c-command/ gender match) with a possessive form.

Interim Summary

- The results from the offline experiment indicate that Serbian judgments are not different from English.
- If coreference is available in English because no c-command applies, the same holds for pronominal possessives in Serbian.
- In order to add more experimental evidence from processing we developed a self-paced reading task, following the methodology of Kazanina et al. (2007).



Online experiment

Research question:

- Given the results from the Offline study, can the contrast between pronouns and possessives be confirmed in an online study?

Hypothesis I: Serbian differs from English

- Serbian speakers **do not show a difference in Reading times between *gender mismatch* and *gender match* in the no-c-command condition (possessives) and also not in the c-command condition (pronouns).** (c-command with pronouns and with possessives)

Hypothesis II: Serbian does not differ from English

- Serbian speakers show a **difference in Reading times between *gender mismatch* and *gender match* in the no-c-command condition (possessives) but not in the c-command condition (pronouns).** (c-command with pronouns but not with possessives)

Online experiment

Participants:

46 Serbian native speakers

mean age: 22.60

gender: 31 female, 15 male

region: Novi Sad, Serbia

non-linguists

Method:

- Self-paced reading task (the moving window technique) in the online software IBEX farm, using PennController (Zehr, J., & Schwarz, F., 2018)

Online experiment

Design and Procedure

- The same design as in the offline experiment.

- **Independent variables:**

1. C-command, 2 levels:

- I. No c-command (possessive)

- II. C-command (pronoun)

2. Gender, 2 levels:

- I. Gender match

- II. Gender mismatch

4 conditions

- **Dependent variable:** rt (ms)
 - **Latin Square Design** – the presentation sequence was randomized per each participant
- 48 Items per participant: 24 test items + 24 filler items
- Test items/filler items followed by **yes/no comprehension questions**

Online experiment: Design and Procedure

- Same stimuli as in the offline experiment (N=24)
- Based on previous studies, **the region of interest** was the 2nd subject/ 1st antecedent/name
- Due to a 1- word difference in the structure of the first subject:

C1 & C2: region 8

C3 & C4: region 7

8

C1	No c-command/ gender match	Njegovi _i advokat je čitao slučaj dok je Dejan _i čekao u kancelariji. Filip je bio optimističan u vezi sa parnicom. 'His lawyer was reading the case while Dejan was waiting in the office. Filip was optimistic about the litigation.'	8
C2	No c-command/ gender mismatch	Njen _i advokat je čitao slučaj dok je Dejan čekao u kancelariji. Elena _i je bila optimistična u vezi sa parnicom. 'Her lawyer was reading the case while Dejan was waiting in the office. Elena was optimistic about the litigation.'	8
C3	C-command/ gender match	On _i je čitao slučaj dok je Dejan čekao u kancelariji. Filip _i je bio optimističan u vezi sa parnicom. 'He was reading the case while Dejan was waiting in the office. Filip was optimistic about the litigation.'	7
C4	C-command/ gender mismatch	Ona _i je čitala slučaj dok je Dejan čekao u kancelariji. Elena _i je bila optimistična u vezi sa parnicom. 'She was reading the case while Dejan was waiting in the office. Elena was optimistic about the litigation.'	7

Online experiment Results

Condition	C-command	Gender	Mean rts (ms)
C1	Possessive	Match	515
C2	Possessive	Mismatch	558
C3	Pronoun	Match	494
C4	Pronoun	Mismatch	511

Table3. Average rts on critical word per condition

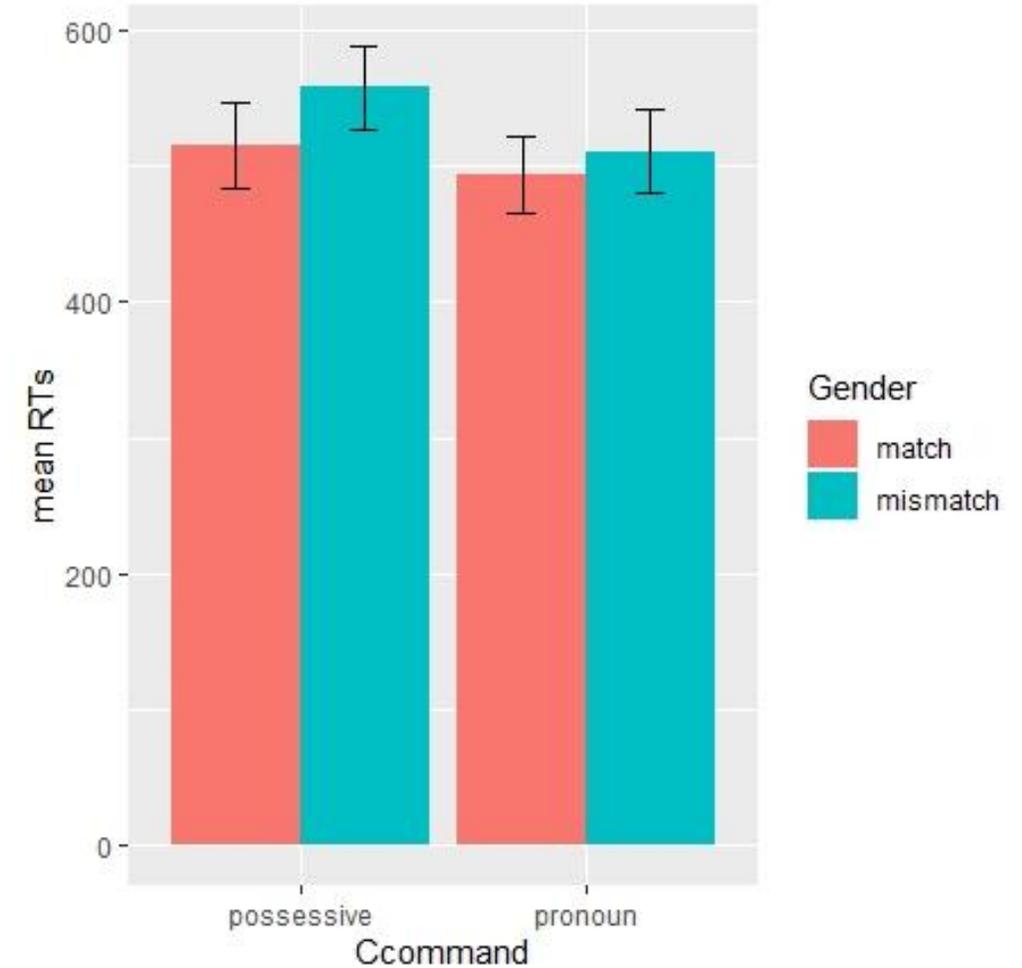


Figure 2. Average rts on critical word per condition

Online experiment

Results

- Analyses were carried out using R (Core Team et al, 2013). For the statistical analysis, the results of the test items were introduced in a Linear Mixed-Effects Regression (LMER) with (log-transformed) reaction time as the dependent variable and conditions (C-command and Gender) as the independent variables.
- Participants and stimuli were included as random factors, in the final LMER model.
- Formula: `m1a = lmer(logRT Ccommand * Gender +(1 | subject)+(1 | sentence), control = lmerControl (optimizer="bobyqa"), N1data, REML=FALSE)`

Fixed effects:	Estimate	Std. Error	df	t value	Pr(> t)
(Intercept)	6.1578	0.0423	49.8758	145.52	< 2e-16 ***
C command1	-0.0739	0.0198	993.9008	-3.73	0.00021 ***
Gender1	0.0593	0.0198	991.9443	2.99	0.00286 **
C command1:Gender1	-0.1014	0.0397	993.5791	-2.56	0.01074 *

Table 4. LMER (fixed effects results)

- There is a statistically significant effect of both conditions, C-command ($p < .0$) and Gender ($p < .001$), as well as the interaction ($p < .01$).
- Pairwise comparison: possessive mismatch > pronoun mismatch ($p < .0001$) - C2 vs C4
possessive gender match < possessive gender mismatch ($p < .001$) - C1 vs C2
But not pronoun gender match – pronoun gender mismatch ($p = .99$) – C3 vs C4

Discussion

The results reveal a statistically significant difference in reading times **only in the no-c-command condition** (possessives): **gender mismatch plays a role with possessives only, not with pronouns**

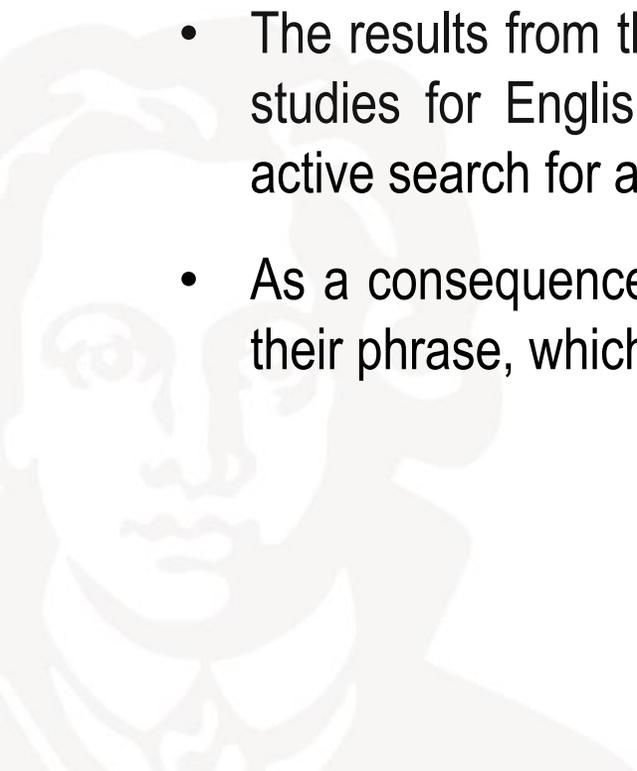
Hypothesis I: **Serbian differs from English** - rejected

Serbian speakers **do not show a difference in Reading times between *gender mismatch* and *gender match* in the no-c-command condition (possessives) and also not in the c-command condition (pronouns).** (c-command with pronouns and with possessives)

Hypothesis II: **Serbian does not differ from English** - confirmed

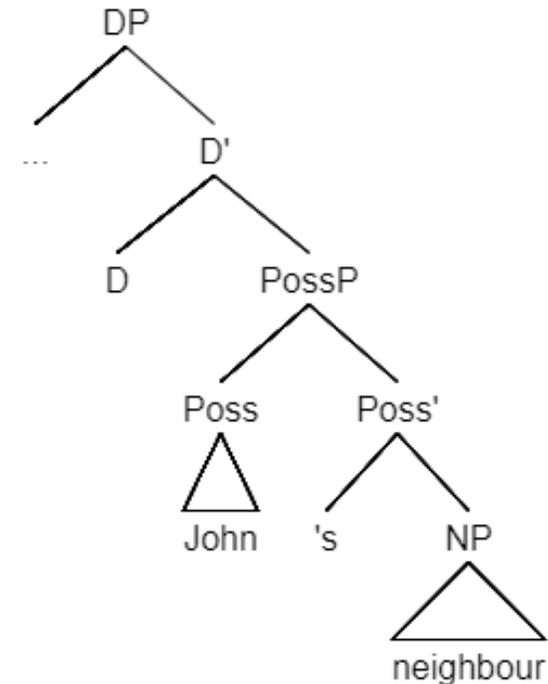
Serbian speakers show a **difference in Reading times between *gender mismatch* and *gender match* in the no-c-command condition (possessives) but not in the c-command condition (pronouns).** (c-command with pronouns but not with possessives)

- The effect of gender mismatch with possessives in Serbian indicates that **there is a difference between the structures with c-command (pronouns) and without c-command (possessives) as in English.**
- The results from the experiment indicate that the hypothesis was correct and in line with previous studies for English (Kazanina et al. 2007), i.e. encountering a cataphoric pronoun triggers an active search for a suitable antecedent.
- As a consequence, this suggests that Serbian pronominal possessives do not c-command out of their phrase, which patterns with the behavior of possessives in DP languages.



Discussion & Conclusions

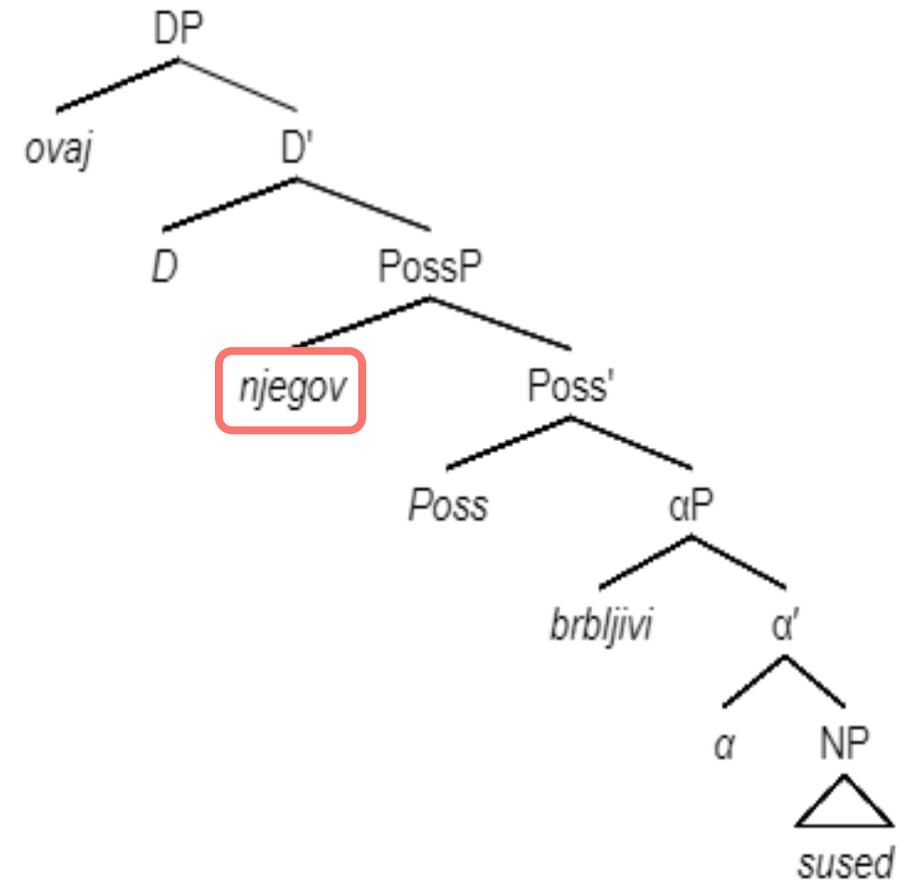
- Based on the results of both offline and online experiments, Serbian possessives pattern with English ones. **Does this imply a parallel analysis of the construction in English and Serbian?**
- In English, PossP is below a DP with an empty D° (cf. Kayne 1994 for English). The (empty) DP blocks c-command of the possessive out of the noun phrase with no violation of Principle C.



Discussion & Conclusions

- The results of our experiments suggest that **something blocks c-command of possessives out of the noun phrase in Serbian, too.**
- This speaks in favour of Bašić's (2004:25) DP-analysis. Based on the evidence from deverbal nominals and LBE, the author argues for a similar structure of the Serbian and English noun phrase.

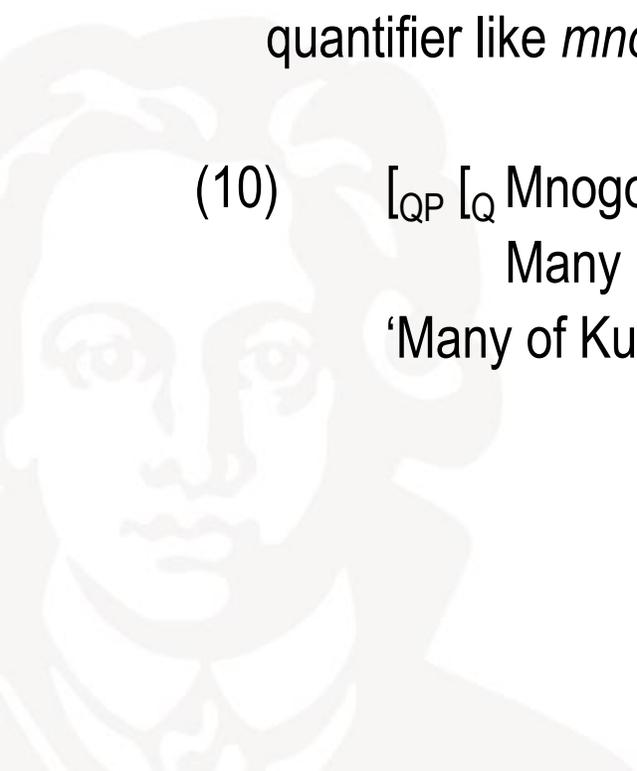
(9) Ovaj **njegov** brbljivi sused
 this his talkative neighbour
 'this talkative neighbour of his'



Discussion & Conclusions

- Alternatively, it could be assumed that the functional projection above PossP is not a DP proper, but some other kind of functional category, which can be empty or host elements like quantifiers (or demonstratives) as the QP proposed by Despić (2011: 71) for noun phrases including a quantifier like *mnogo* ‘many’ (10).

(10) [QP [Q *Mnogo* [NP *Kusturicinih_i* [NP *prijatelja*]]]] je kritikovalo njega_i.
 Many *Kusturica_i*’s_{GEN} friends_{GEN} is criticized him_i
 ‘Many of *Kusturica_i*’s friends criticized him_i.’ (Despić’s 2011: 71, ex. 82)



Discussion & Conclusions

- The assumption of an additional functional layer above PossP is also confirmed by experimental evidence on condition B-effects in Serbian.
- Srdanović & Rinke (in press) show that prenominal possessive modifiers modifying a noun phrase in subject position can be interpreted as coreferential with a clitic or a strong pronoun in object position in Serbian.

(11) **Jovanov_i** papagaj **ga_i** je ugrizao **njega_i**.
 John's parrot him.cl is bit him.str
 'John's parrot bit him.'

- Also in these constructions, the modifier occupies a position below DP/FP from where it does not c-command out of the noun phrase, leading to free *covaluation* in these contexts (cf. Reinhart, 2006).

Thank you for your attention!



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