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

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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 violation of Binding Principle C (Chomsky, 1981).

(2) $He_{ij}$ likes $John_i$.

• Condition C also applies across clauses and limits the distribution of coreferring R-expressions (3).

(3) $He_{ij}$ 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) *Oni je juče ugrizao Jovana. (Despić 2013: 251, ex.27)
  he is yesterday bitten John
  ‘He bit John yesterday.’

(6) *Njegov papagaj je juče ugrizao Jovana. (Despić 2013: 253, ex. 31)
  his parrot is yesterday bitten John
  ‘His parrot bit John 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<sub>i</sub> roommates met John<sub>i</sub> at the restaurant.
= no violation of principle C (no c-command) ➞ active search for antecedent

(8) *He<sub>i</sub> met John<sub>i</sub> at the restaurant.
= violation of principle C (c-command) ➞ 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 ps < .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.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Mean rating (Standard error)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principle C</td>
<td>1.7 (.09)</td>
</tr>
<tr>
<td>No-constraint</td>
<td>3.4 (.13)</td>
</tr>
<tr>
<td>Forward anaphora*</td>
<td>4.3 (.08)</td>
</tr>
</tbody>
</table>

* 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).

<table>
<thead>
<tr>
<th></th>
<th>No constraint/ match:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>No constraint/ match:</td>
<td>His$_i$ managers chatted amiably with some fans while the talented, young <strong>quarterback$_j$</strong> signed autographs for the kids, but Carol wished the children’s charity event would end soon so she could go home.</td>
</tr>
<tr>
<td>C2</td>
<td>No constraint/ mismatch:</td>
<td>Her$_i$ managers chatted amiably with some fans while the talented, young <strong>quarterback</strong> signed autographs for the kids, but Carol$_i$ wished the children’s charity event would end soon so she could go home.</td>
</tr>
<tr>
<td>C3</td>
<td>Principle C/ match:</td>
<td>He$_i$ chatted amiably with some fans while the talented, young <strong>quarterback</strong> signed autographs for the kids, but Steve$_i$ wished the children’s charity event would end soon so he could go home.</td>
</tr>
<tr>
<td>C4</td>
<td>Principle C/ mismatch:</td>
<td>She$_i$ chatted amiably with some fans while the talented, young <strong>quarterback</strong> signed autographs for the kids, but Carol$_i$ wished the children’s charity event would end soon so she could go home.</td>
</tr>
</tbody>
</table>
Background and previous research (Kazanina et al. 2007)

Self-paced reading task

- If coreference is not possible (principle C) → no difference in reading times expected between gender match and mismatch (no search for an appropriate antecedent)
- If coreference is possible (no constraint) → 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$_i$ 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)

- 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.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Constraint</th>
<th>Congruency</th>
<th>Mean rt (ms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>No constraint</td>
<td>Gender match</td>
<td>364.6</td>
</tr>
<tr>
<td>C2</td>
<td>No constraint</td>
<td>Gender mismatch</td>
<td>402.5</td>
</tr>
<tr>
<td>C3</td>
<td>Principle C</td>
<td>Gender match</td>
<td>369.6</td>
</tr>
<tr>
<td>C4</td>
<td>Principle C</td>
<td>Gender mismatch</td>
<td>376.4</td>
</tr>
</tbody>
</table>

- 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); 2\textsuperscript{nd} sentence subject as another possible antecedent
- Procedure: intro sentence, test item, question
- Answer: co-referential (1\textsuperscript{st} name), non-coreferential (2\textsuperscript{nd} name or somebody else)

| C1 | No c-command/ gender match | Njegov\textsubscript{i} advokat je čitao slučaj dok je Dejan, 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\textsubscript{i} advokat je čitao slučaj dok je Dejan čekao u kancelariji. Elena, 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\textsubscript{i} je čitao slučaj dok je Dejan čekao u kancelariji. Filip, 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\textsubscript{j} je čitala slučaj dok je Dejan čekao u kancelariji. Elena, 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.

<table>
<thead>
<tr>
<th></th>
<th>C1 (no c-command/gender match)</th>
<th>C3 (c-command/gender match)</th>
</tr>
</thead>
<tbody>
<tr>
<td>coref</td>
<td>58.57%</td>
<td>0.95%</td>
</tr>
<tr>
<td>non-coref</td>
<td>41.34%</td>
<td>99.05%</td>
</tr>
</tbody>
</table>

Table 1. Choice of (non)coreference in % for C1 and C3 (gender match conditions)
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: Choice ~ poly(TrialOrder, 2) + Ccommand + Gender + (1 | Participants) + (0 + poly(TrialOrder, 2) | Participants) + (1 | 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 2\textsuperscript{nd} subject/ 1\textsuperscript{st} antecedent/name
- Due to a 1-word difference in the structure of the first subject:

<table>
<thead>
<tr>
<th></th>
<th>C1 &amp; C2: region 8</th>
<th>C3 &amp; C4: region 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>No c-command/ gender match</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Njegov, advokat je čitao slučaj dok je Dejan, 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.'</td>
<td>8</td>
</tr>
<tr>
<td>C2</td>
<td>No c-command/ gender mismatch</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Njen, advokat je čitao slučaj dok je Dejan čekao u kancelariji. Elena 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.'</td>
<td>8</td>
</tr>
<tr>
<td>C3</td>
<td>C-command/ gender match</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Oni je čitao slučaj dok je Dejan čekao u kancelariji. Filip 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.'</td>
<td>7</td>
</tr>
<tr>
<td>C4</td>
<td>C-command/ gender mismatch</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ona, je čitala slučaj dok je Dejan čekao u kancelariji. Elena 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.'</td>
<td>7</td>
</tr>
</tbody>
</table>
Online experiment
Results

<table>
<thead>
<tr>
<th>Condition</th>
<th>C-command</th>
<th>Gender</th>
<th>Mean rts (ms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>Possessive</td>
<td>Match</td>
<td>515</td>
</tr>
<tr>
<td>C2</td>
<td>Possessive</td>
<td>Mismatch</td>
<td>558</td>
</tr>
<tr>
<td>C3</td>
<td>Pronoun</td>
<td>Match</td>
<td>494</td>
</tr>
<tr>
<td>C4</td>
<td>Pronoun</td>
<td>Mismatch</td>
<td>511</td>
</tr>
</tbody>
</table>

Table 3. 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: \( m1a = \text{lmer}(\logRT \text{ Ccommand} \times \text{Gender} + (1 \mid \text{subject}) + (1 \mid \text{sentence}), \text{control} = \text{lmerControl (optimizer="bobyqa")}, \text{N1data, REML=FALSE}) \)

| 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)
Discussion & Conclusions

• 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 $D^\circ$ (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) \[
\text{\textsc{QP} [Q Mnogo [NP Kusturicin}}{{}_{i}\text{NP prijatelja]]]] je kritikovalo njega.}
\]

\[
\text{Many Kusturica'\textsc{\textsc{s}}}{{}_{\text{GEN}}} \text{friends}_{{}\text{GEN}} \text{ is criticized him.}
\]

\]['Many of Kusturica’\textsc{’s} friends criticized him.’ (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.

\[(11) \text{Jovanovi}^i\text{p papagaj }\text{ga}_i^j \text{ je ugrizao }\text{njega}_i^j.\]

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!
References


