


# Elided Clausal Conjunction Is Not the Only Source of Closest-Conjunct Agreement: A Picture-Matching Study

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*Abstract.* A recurring hypothesis about the agreement phenomena generalized as closest-conjunct agreement takes this pattern to result from reduced clausal conjunction, simply displaying the agreement of the verb with the nonconjoined subject of the clause whose content survives ellipsis (Aoun, Benmamoun & Sportiche 1994, 1999; see also Wilder 1997). Closest-conjunct agreement is the dominant agreement pattern in the South Slavic languages Slovenian and Bosnian/Croatian/Serbian. A natural question is whether closest-conjunct agreement in these varieties may indeed be analyzed as entirely derived from conjunction reduction. In this article, we report on two experiments conducted to test this. The results reject the hypothesis as far as these languages are concerned, thereby upholding the relevance of models developed to account for closest-conjunct agreement within theories of agreement.

## 1. Introduction

In a range of typologically and genetically diverse languages, including Hindi, Arabic, and different members of the Slavic family, a conjoined subject may trigger verbal agreement with one of its conjuncts, as in (1) (Munn 1999, Aoun, Benmamoun & Sportiche 1994, 1999, Babyonyshev 1996, Marušič, Nevins & Saksida 2007, Marušič, Nevins & Badecker 2015, Bhatt & Walkow 2013, among others).<sup>1</sup>

- (1) Qaraʔat ʕaliyaa wa ʕumar l-qišša. Standard Arabic  
 read.3.F.SG Alia and Omar the-story  
 ‘Alia and Omar read the story.’ (Aoun, Benmamoun & Sportiche 1994:207)

In some languages, this single-conjunct agreement only occurs with the first conjunct (first-conjunct agreement), in others only with the last (last-conjunct agreement); in

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<sup>1</sup> Single-conjunct agreement of attributive, demonstrative, and other elements internal to nominal expressions is not discussed in this article.

some languages, both options are found, in which case the choice is additionally conditioned by the surface ordering of the subject and verb and can interact with either head-initial or head-final syntax (Bhatt & Walkow 2013, Polinsky 2014).

Slovenian and Bosnian/Croatian/Serbian (B/C/S) are languages in which preverbal subjects trigger both types of single-conjunct agreement, while with postverbal subjects first-conjunct agreement is dominant and last-conjunct agreement is clearly degraded, even if not fully absent (Willer-Gold et al. 2016, Arsenijević & Mitić 2016a,b). Consider (2a), where the preverbal subject licenses first-conjunct agreement (neuter plural), last-conjunct agreement (feminine plural), and a default or resolved gender value (masculine plural), and compare the postverbal subject in (2b): here last-conjunct agreement is strongly degraded, and there is a significantly lower rate of production of the default agreement (Willer-Gold et al. [2016] argue that in fact resolved agreement is not available when the subject follows the verb, i.e., with postverbal subjects).

- (2) a. Ravnala i olovke su pronađena/pronađene/pronađeni. B/C/S<sup>2</sup>  
 ruler.N.PL and pencil.F.PL AUX.PL found.N.PL/F.PL/M.PL  
 b. Pronađena/??pronađene/pronađeni su ravnala i olovke.  
 found.N.PL/F.PL/M.PL AUX.PL ruler.N.PL and pencil.F.PL  
 ‘Rulers and pencils have been found.’

Although previous literature (e.g., Bošković 2009) has occasionally raised doubts about the availability of first-conjunct agreement in sentences like (2a), Willer-Gold et al. (2016) experimentally collect and statistically confirm such patterns. Henceforth, last-conjunct agreement with preverbal subjects and first-conjunct agreement with postverbal subjects will be referred to as closest-conjunct agreement (CCA).

Along with the patterns shown in (2) for conjuncts of different gender, an additional resolution strategy exists when the conjuncts are of the same gender: agreement in the (nonmasculine) gender they share, as in (3). See Arsenijević & Mitić 2016a,b and Willer-Gold et al. 2016 for discussion.<sup>3</sup>

- (3) Majka i ćerka su stajale/%stajali ispod kišobrana.  
 mother.F.SG and daughter.F.SG AUX.PL stood.F.PL/M.PL under umbrella  
 ‘Mother and daughter stood under the umbrella.’

The availability of a broad spectrum of crosslinguistically attested agreement patterns with conjoined subjects makes South Slavic a fruitful ground for more detailed research

<sup>2</sup> All the examples in this article, where not specified otherwise, come from B/C/S and are rendered in the Novi Sad variety. As our research investigated both B/C/S and Slovenian, it is important to make clear that when investigating Slovenian we used near counterparts of the B/C/S examples, not differing in any aspects immediately relevant for the research questions at hand.

<sup>3</sup> Note that as pointed out by Corbett (1983, citing Gudkov 1965), in B/C/S and Slovenian not all coordinations involving nonmasculine conjuncts pattern alike. Concretely, conjoined singular neuter nouns can agree in masculine plural/dual and conjoined feminine nouns of the third declension can agree in masculine plural/dual. As these are all coordinations of singular nouns, they are not directly relevant for our study.

on conjunct agreement, especially single-conjunct agreement. In this article, we restrict our discussion to cases in which both conjuncts are inanimate plurals.

A number of competing analyses have been offered for single-conjunct-agreement phenomena and specifically CCA (e.g., Munn 1999, Aoun, Benmamoun & Sportiche 1994, 1999, Babyonyshev 1996, Sadler 2003, Tantalou & Badecker 2005, Soltan 2007, Marušič, Nevins & Saksida 2007, Bhatt & Walkow 2013, Marušič, Nevins & Badecker 2015). Although CCA in South Slavic has motivated a number of modifications to the theory of agreement (e.g., Bošković 2009, Willer-Gold et al. 2016, Murphy & Puškar 2018), one of the analyses of CCA that keeps coming back involves clausal conjunction followed by a type of ellipsis. This is referred to as conjunction reduction. This idea essentially leaves the existing agreement mechanism intact, with no need for modifications. Aoun, Benmamoun & Sportiche (1994, 1999) argue that an ellipsis-type configuration is the sole source of the single-conjunct agreement in Arabic, but they refrain from attributing a universal status to it. Wilder (1997:66) proposes that backwards and forwards deletion can handle single-conjunct agreement in Russian.

Schein (2017) and Hirsch (2017) argue, based on the semantic denotation of the operator ‘and’, that coordination is always at the level of propositions, which most directly corresponds to the clausal level in syntax. This, however, does not necessarily mean that ‘and’ needs to coordinate full main clauses in the sense of Aoun, Benmamoun & Sportiche 1994 (cf. Schein 2017). Attributing a universally clausal/propositional nature to coordination would thus not directly explain the CCA that we find in South Slavic. Given Schein’s analysis (e.g., for (2a), *Rulers<sub>N</sub> participated, and pencils<sub>F</sub> participated, and they, these events, were events of being found*), some mechanism would be needed that would pass the features from the subject (or the predicate) of one of the partially elided/null coordinated clauses on to the predicate of the overt clause to yield CCA on the verb (feminine, in the case of (2a)). The principal argument of our article is that CCA cannot always result from coordination of full main clauses—although the extra syntactic mechanism that, within clausal-conjunction approaches such as Schein’s, would yield CCA on the overt predicate is not fully worked out (admittedly, CCA vs. default agreement is not the direct concern of such approaches).

According to the outline that conjunction-reduction analyses share, a sentence like (4a) would be derived from a structure that coordinates two clauses and then elides the material from one of them, as in (4b). The surviving verb simply agrees with its local clausal subject, yielding what looks at the surface like single-conjunct agreement. Similar remarks apply for (5).<sup>4</sup>

- (4) a. U supi su se kuvale knedle i rezanca.  
in soup AUX.PL REFL cooked.F.PL dumpling.F.PL and noodles.N.PL  
‘Dumplings and noodles simmered in the soup.’

<sup>4</sup> The lexical items shown in (4) and (5) are not found uniformly across B/C/S; recall that we have selected a single variety, that of Novi Sad, for the purpose of presentation of all examples in the article and the appendices.

- b. U supi su se kuvale knedle i ~~u supi su~~  
 in soup AUX.PL REFL cooked.F.PL dumpling.F.PL and in soup AUX.PL  
~~se kuvale~~ rezanca.  
 REFL cooked.N.PL noodle.N.PL  
 ‘Dumplings simmered in the soup and noodles simmered in the soup.’
- (5) a. Knedle i rezanca su se kuvala u supi.  
 dumpling.F.PL and noodle.N.PL AUX.PL REFL cooked.N.PL in soup  
 ‘Dumplings and noodles simmered in the soup.’
- b. Knedle ~~su~~ se kuvale ~~u supi~~ i rezanca  
 dumpling.F.PL AUX.PL REFL cooked.F.PL in soup and noodle.N.PL  
 su se kuvala u supi.  
 AUX.PL REFL cooked.N.PL in soup  
 ‘Dumplings simmered in the soup and noodles simmered in the soup.’

Under an ellipsis account broadly inspired by Wilder 1997, for instance, one could imagine an underlying biclausal structure with movement of the subjects and the PPs out of the vP followed by a gapping operation yielding ellipsis and the appearance of only a single verb.<sup>5</sup> Although the details may differ in terms of ellipsis mechanisms adopted or indeed via more articulated ways of passing the features of one predicate’s subject to the other, the central intuition in such analyses is that *the same predicate is present in both conjuncts, even when not overtly seen in one of them.*

Let us use the name *the Conjunction-Type Hypothesis* for an analysis in which phrasal conjunction yields default or resolved agreement and single-conjunct agreement is an epiphenomenon of conjunction reduction.

Marušič, Nevins & Saksida (2007) argue against the Conjunction-Type Hypothesis for cases of preverbal CCA in Slovenian, following the reasoning of Munn (1999). They offer examples demonstrating the compatibility of single-conjunct agreement with collective predicates, like ‘graze together’ in (6a), as a crucial argument against

<sup>5</sup> Gary Thoms (p.c.) suggests that the clausal-ellipsis account is not viable in languages where there is no independent process of ellipsis that deletes everything but the subject (nonetheless, it is known that some operations, e.g., Right-Node Raising, can affect constituents that ellipsis cannot). Given that eliding everything but the subject in (i) and (ii) is not grammatical independently in Slovenian and B/C/S respectively (e.g., in subordination environments), the clausal-conjunction analysis would fail this prerequisite test.

- (i) \*Mislim, da so se tukaj pasle krave in vem, Slovenian  
 think.I.SG that AUX REFL here grazed cows and know.I.SG  
 da <so se tukaj pasle> ovce.  
 that sheep  
 ‘\*I think that cows grazed here, and I know that sheep.’
- (ii) \*Čini mi se da su ovdje trčale krave, premda B/C/S  
 seem.3.SG to.me REFL that AUX here ran cows although  
 znam da <su ovdje trčale> koze.  
 know.I.SG that goats  
 ‘\*It seems to me that cows ran here, although I know that goats.’

the conjunction-reduction analysis. Recall that the Conjunction-Type Hypothesis maintains that the same predicate is present in both conjuncts. Marušič, Nevins & Saksida assume that if the underlying structure of the sentences with single-conjunct agreement involved clausal conjunction, a violation should emerge, as in (6b), when their shared predicate is collective.

- (6) a. Krava in teleta so se pasla skupaj. Slovenian  
 COW.F.SG and calves.N.PL AUX.PL REFL graze.N.PL together  
 ‘A cow and her calves were grazing together.’
- b. \*Krava se je pasla skupaj in teleta  
 COW.F.SG REFL AUX.SG grazed.F.SG together and calves.N.PL  
 so se pasla skupaj.  
 AUX.PL REFL grazed.N.PL together

Bošković (2009) applies this same diagnostic to B/C/S, and Citko (2004), focusing on Polish, provides arguments against a clausal-reduction analysis based on number-sensitive items such as distributive *po* phrases. Further arguments against an ellipsis analysis of partial agreement in coordinations may be found in Johannessen 1998, which argues that Czech and German show patterns of CCA in configurations that otherwise disallow clausal coordination, and in Demonte & Pérez-Jiménez 2012, which shows that Spanish prenominal CCA with a single, singular conjunct is followed in the same sentence by postnominal plural resolution on the verb, rendering clausal ellipsis impossible as the source for the prenominal CCA.<sup>6</sup>

In short, it would seem to be clear, both from diagnostics applied within Slavic and from crosslinguistic evidence, that there are numerous cases of CCA that cannot plausibly be derived from ellipsis—at least from ellipsis mechanisms that are independently found within the language outside of the context of CCA. However, speakers’ intuitive judgments about the possibility of CCA in the presence of collective predicates, as in (6), are usually limited to cases where one or both conjuncts are *singular*. As the cases of CCA in South Slavic most robustly attested in the literature involve gender agreement arising when both conjuncts are *plural*, as in (2), simply setting up a diagnostic with a collective predicate and showing that it is incompatible with a singular subject is not sufficient. To analyze the pattern of CCA that arises when both conjuncts are plural, one needs to be able to determine when, in the presence of two conjoined plurals (e.g., ‘sabers and spears’), a collective predicate (e.g., ‘collided’) is interpreted as applying to the conjunction (collisions between sabers and spears; a *mixed-event* reading) as opposed to applying separately to each conjunct (collisions of sabers and collisions of spears; a *split-event* reading). This, however, requires more than a mere acceptability judgment along the lines of (6). Collective-predicate sentences like (6b), with a singular NP within the conjunction, immediately trigger a reaction of unacceptability, even without context provided; sentences with two conjoined plurals, however, “sound acceptable” unless a context is provided. Therefore, a rich context

<sup>6</sup> Further relevant evidence may come from languages that display CCA and that have different coordination heads for phrasal and clausal coordination. Xhosa (Hazel Mitchley, p.c.) may turn out to be such a case.

must be supplied to determine whether speakers allow or rule out the mixed-event or split-event reading in the presence of CCA. This context is better furnished in an experimental picture-matching task of the kind we report on in this article.

We aim to experimentally test whether it is possible to maintain that South Slavic structures like (4a) and (5a), in which the verb agrees with the linearly closest conjunct (CCA), are underlyingly biclausal. We exploit the implication of this analysis that such sentences would be most compatible with a split-event reading, with one event corresponding to the hypothesized first clausal conjunct and the other event to the hypothesized second clausal conjunct. We report on two experiments that test the availability of one-event interpretations for sentences with conjoined subjects according to the pattern of agreement they show. The biclausal analysis of CCA predicts that sentences with CCA will lead speakers to strongly prefer the two-event interpretation over the one-event interpretation. Mixed participation in a single event by the referents of the two conjuncts should correlate with default/resolved agreement. However, considering that a distributive interpretation of the predicate is generally available in South Slavic, no specific prediction for sentences with default or resolved agreement can be made.<sup>7</sup>

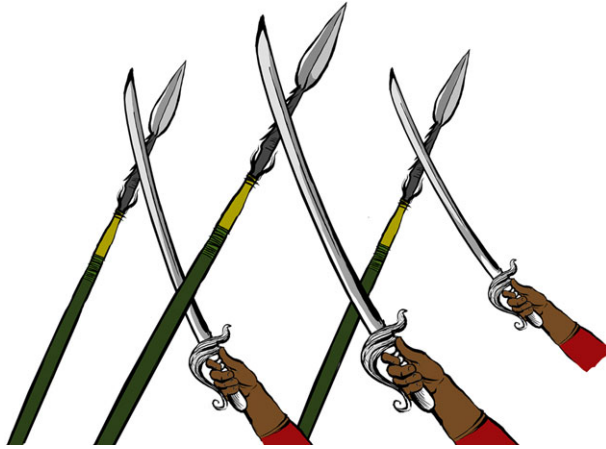
In order to measure the effect of suppressing the two-event interpretation, we introduced a variable *predicate type* with two levels, *collective* and *noncollective*.<sup>8</sup> Collective predicates are supposed to suppress a two-event interpretation (see also Clifton & Frazier 2012), and if Munn's (1999) and Marušič, Nevins & Saksida (2007)'s argument is correct, such predicates will be incompatible with the biclausal underlying parse of the sentences with conjoined subjects. As an illustration, consider the sentences in (7) and the picture in figure 1.

- (7) a. U bici su se sudarali koplja i sablje.  
       in battle AUX.PL REFL collided.M.PL spear.N.PL and saber.F.PL  
       b. U bici su se sudarala koplja i sablje.  
       in battle AUX.PL REFL collided.N.PL spear.N.PL and saber.F.PL  
       ‘Spears and sabers collided in the battle.’  
       c. U bici su se sudarala koplja i u bici su se  
       in battle AUX.PL REFL collided.N.PL spear.N.PL and in battle AUX.PL REFL  
       sudarale sablje.  
       collided.F.PL saber.F.PL  
       ‘Spears collided in the battle and sabers collided in the battle.’

<sup>7</sup> Our claim about the availability of distributive interpretations is an empirical observation about South Slavic languages. A sentence like (i) can receive a distributive interpretation in which each of the girls has fixed a different car. No claim is made about the availability of distributive interpretations more generally or about the existence of a distributive operator (Heim, Lasnik & May 1991) or other means to model this fact.

(i) Ivana, Marija i Anđelka su popravile automobil.  
       Ivana Marija and Anđelka AUX.PL repaired.F.PL car  
       ‘Ivana, Marija, and Anđelka have fixed a car.’

<sup>8</sup> We acknowledge the large body of work on processing collective and distributive interpretations, including work by Patson & Warren (2010), Dotlačil & Brasoveanu (2015), and Dobrovie-Sorin, Ellsiespen & Hemforth (2016). We also acknowledge various experimental studies on the acquisition of distributive and collective interpretations. We submit, however, that these works are not directly relevant to disproving the Conjunction-Type Hypothesis about CCA.



**Figure 1.** A mixed-event picture corresponding to the sentences in (7). In experiment 1, this picture was paired with the sentence in (8), which has a conjoined subject and a collective predicate. (Figure can be viewed in color at [wileyonlinelibrary.com/journal/syntax](http://wileyonlinelibrary.com/journal/syntax).)

On the Conjunction-Type Hypothesis, the sentence with CCA in (7b), putatively deriving from a biclausal underlying structure (e.g., ‘Sabers collided, and spears collided’), is expected to be incompatible with, or at the very least to be disfavored as a match to, the picture in figure 1, which represents a mixed-event reading. The sentence in (7a), on the other hand, is expected to favor the reading presented in this picture. Moreover, the sentence in (7b) is predicted to show the same pattern of incompatibility with the picture as the sentence with an overtly biclausal structure, (7c). By contrast, under the model for CCA developed in Marušič, Nevins & Saksida 2007 and Marušič, Nevins & Badecker 2015, the conjoined subject in (7b) is the subject of a single predicate, and the sentence is thus fully compatible with a mixed-event picture (although biases for distributive readings may also exist).

We tested these predictions in the area of South Slavic in which the relevant oppositions are morphologically visible, namely Slovenian and B/C/S, in four experiments across seven sites where CCA has been previously attested as robust: Nova Gorica (Slovenian), Sarajevo (B/C/S), Zenica (B/C/S), Zadar (B/C/S), Zagreb (B/C/S), Niš (B/C/S), and Novi Sad (B/C/S). We report on two experiments in the following sections.

## 2. Experiment 1: Sentence–Picture–Match Judgment

### 2.1. Aim of the Experiment

As the overall goal of this article is to argue that CCA can indeed result from phrasal conjunction (plus enriched mechanisms of agreement), our aim is to

investigate whether CCA is allowed even in cases where it should be incompatible with a biclausal underlying structure. In experiment 1, we wished to test how CCA and collective predicates affect compatibility with a single-event interpretation, represented by a picture. The experiment was based on two controlled variables: *predicate type* (semantically collective or noncollective) and *subject type* (overtly conjoined or nonconjoined), crossed in a  $2 \times 2$  design to yield four conditions, exemplified by (8)–(11). All the target sentences had postverbal subjects and, in the case of (overtly) conjoined subjects, always exhibited CCA rather than another agreement pattern. Each sentence was paired with a picture, exemplified by figures 1–4, representing the single-event interpretation of that sentence. We illustrate these conditions with sentences from B/C/S, noting that the sentences in Slovenian were their equivalents.

(8) Conjoined subject with a collective predicate

U bici su se sudarala koplja i sablje.  
 in battle AUX.PL REFL collided.N.PL spear.N.PL and saber.F.PL  
 ‘Spears and sabers collided in the battle.’

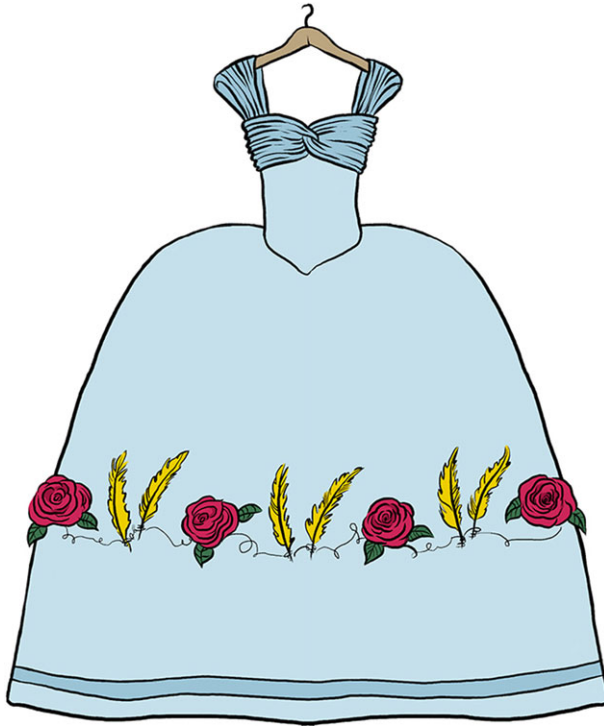
(9) Single-NP subject with a collective predicate

U bici su se sudarala koplja.  
 in battle AUX.PL REFL collided.N.PL spear.N.PL  
 ‘Spears collided in the battle.’



**Figure 2.** The picture paired with the sentence in (9), which has a single-NP subject and a collective predicate. (Figure can be viewed in color at [wileyonlinelibrary.com/journal/syntax](http://wileyonlinelibrary.com/journal/syntax).)

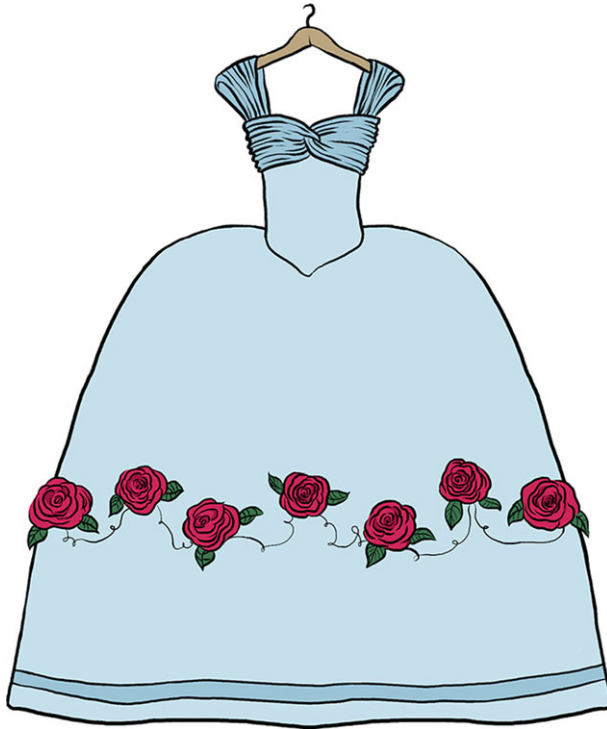




**Figure 3.** The picture paired with the sentence in (10), which has a conjoined subject and a noncollective predicate. (Figure can be viewed in color at [wileyonlinelibrary.com/journal/syntax](http://wileyonlinelibrary.com/journal/syntax).)

- (10) Conjoined subject with a noncollective predicate  
 Na haljinu su zašivene ruže i pera.  
 on dress AUX.PL sewn.F.PL rose.F.PL and feather.N.PL  
 ‘Roses and feathers are sewn onto the dress.’
- (11) Single-NP subject with a noncollective predicate  
 Na haljinu su zašivene ruže.  
 on dress AUX.PL sewn.F.PL rose.F.PL  
 ‘Roses are sewn onto the dress.’

We compared the availability of a mixed-event reading for CCA with a collective predicate and with a noncollective predicate. This comparison is potentially informative as to whether the Conjunction-Type Hypothesis is valid, because positing a biclausal source for CCA predicts mixed-event incompatibility only for collective predicates, not for noncollective predicates. A putative



**Figure 4.** The picture paired with the sentence in (11), which has a single-NP subject and a noncollective predicate. (Figure can be viewed in color at [wileyonlinelibrary.com/journal/syntax](http://wileyonlinelibrary.com/journal/syntax).)

underlying source for (8) akin to ‘Sabers collided and spears collided’ does not match the mixed-event picture in figure 1, but there is no incompatibility per se between a putative underlying source for (10) akin to ‘Roses were sewn on the dress and feathers were sewn on the dress’ and the mixed-event picture in figure 3.

Finally, the Conjunction-Type Hypothesis predicts that sentences with CCA should generally show significantly less compatibility with a mixed-event reading than corresponding sentences with a single-NP subject (such sentences provide a baseline, as there is no underlying biclausal source posited for them). On this hypothesis, therefore, sentences with conjoined subjects and collective predicates, paired with a mixed-event picture, should be rated the lowest compared to both sentences with NP subjects and collective predicates and sentences with conjoined subjects and noncollective predicates. A full exploration of the predictions of the Conjunction-Type Hypothesis, therefore, required a fully crossed  $2 \times 2$  design, with collective versus noncollective predicates and conjoined versus single-NP subjects.

## 2.2. Materials and Methods

### 2.2.1. Participants

In total, 210 first- or second-year undergraduate students (67% female, 33% male; mean age 21.6), 30 at each of seven research institutions, participated in this experiment. They all were native speakers of the local language variety, had attended the local secondary school, and were not pursuing a university degree in the study of the local language. Their participation was voluntary or else they received course credit for their participation. The institutions where the experiment was carried out were the University of Nova Gorica in Slovenia (though some of the Slovenian students were tested at the University of Ljubljana), the University of Zagreb and the University of Zadar in Croatia, the University of Sarajevo and the University of Zenica in Bosnia and Herzegovina, and the University of Novi Sad and the University of Niš in Serbia.

### 2.2.2. Materials and design

The experiment was designed as a version of a standard matching task in which participants are asked to rate the quality of sentence–picture match on a scale from 0% to 100%. A single experimental design and procedure was implemented under equal experimental conditions across all seven research institutions. The language used in the experiment was adapted to each research institution's local neutral variety. Experimental material was first created in the Zagreb variety of Croatian and was later adapted to the other target language varieties, those of Niš, Novi Sad, Sarajevo, Zadar, Zenica, and Nova Gorica. The adaptations were minimal to ensure uniformity across research locations and were mostly lexical, due to variation of specific lexical items.

In the experiments a total of 64 sentential items were presented to the participants. The factors *predicate type* (collective, noncollective) and *subject category* (&P, NP<sub>PL</sub>; i.e., conjoined subjects versus single-NP subjects) were used to yield a simple 2 × 2 design. All items were (overtly) monoclausal. The items all had the same structure, [Adv Aux (Refl) Pred<sub>CCA</sub> &P/NP<sub>PL</sub>], an initial adverb followed by an inflected auxiliary, a reflexive pronoun (if needed for the predicate), a predicate, and finally a subject noun phrase. Eight mixed-gender (feminine–neuter, neuter–feminine) &P items were first created for each of the two levels of *predicate type*. These 16 mixed-gender items were then further manipulated, retaining only the first NP of the conjunction (feminine or neuter), to create the 16 experimental items for the NP condition of *subject category*. All 32 sentences were paired with mixed-event pictures.

Filler items were created using the same 2 × 2 design and the same number of items per condition (eight each for collective–&P, collective–NP, noncollective–&P, and noncollective–NP). Subjects were nouns of all three genders or else conjuncts of two masculine nouns, in order to balance the item-gender ratio in the experiment. Of the 32 fillers, 50% were designed as sentence–picture *mismatches* (cf. grammaticality errors); these 16 items involved mismatch in the number of objects depicting the subject, mismatch in depiction of the NP in the subject position, and mismatch in depiction of the NP in the adverbial phrase. They were included to encourage

participants' use of the full scale of unacceptability. A full list of items and corresponding pictures used in experiment 1 is provided in appendix 1 (see online supplementary material).

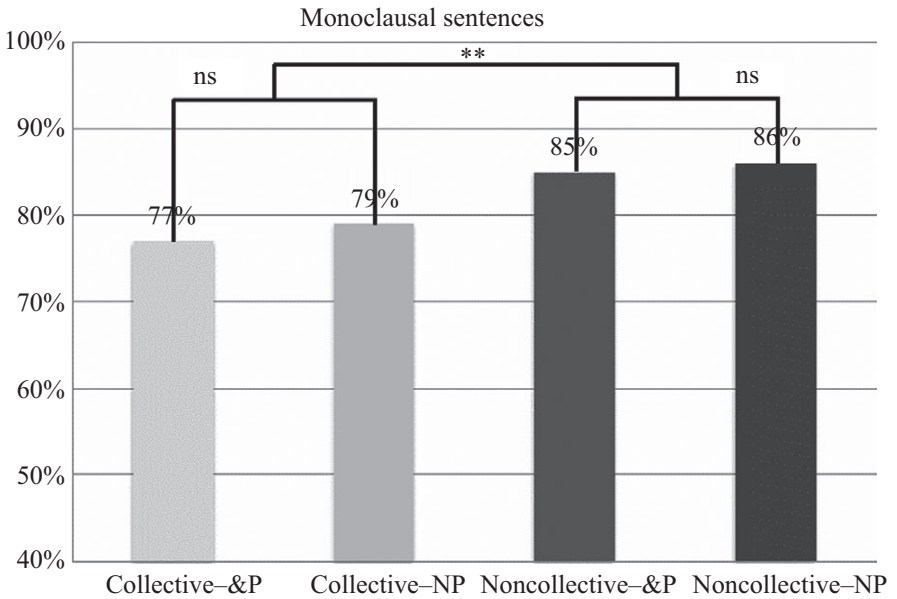
### 2.2.3. Methods

Experiment 1 was conducted in May 2016; it was coded and administered using the online experiment platform IbexFarm.<sup>9</sup> Participants were shown an introduction to the experiment, which included a task description; six practice items; and then the 64 experimental items, each separated by a blank screen. For each practice item or experimental item, participants saw on the screen a sentence–picture pair and a slider representing an acceptability scale. After reading the sentence and examining the picture depicting the event described by it, their task was to evaluate to what degree the picture matched the sentence by positioning the slider on the scale. By positioning the slider on the left side of the scale (in red) they indicated a low degree of match, and by positioning it on the right side of the scale (in green) they indicated a high degree of match. After marking their response they had to press a “continue” button (*nastavi/nadaljuj*) in order to proceed to the next experimental item. The duration of the blank screen between items was 750 ms. Participants typically completed the experiment within 15 minutes. IbexFarm randomized a new list of items for each participant. Acceptability-judgment responses were automatically recorded by IbexFarm and exported afterwards for statistical analysis of the degree of acceptability assigned by participants to the four experimental conditions collective–&P, collective–NP, noncollective–&P, and noncollective–NP.

### 2.3. Results and Discussion

The analysis was conducted using the R package *lme4* with a generalized linear mixed model fit by maximum likelihood (`glmer(glmerControl(optimizer = “Nelder_Mead”))`); response value was the dependent variable and *predicate type* (collective, noncollective) and *subject category* (&P, NP<sub>PL</sub>) were independent variables. The results of experiment 1 are shown in figure 5. There was a statistically significant difference in *predicate type* (estimate 0.9245, standard error 0.3277, *z* value 2.821,  $\Pr(> |z|) .00479$  \*\*; two-way ANOVA Fisher LDS,  $p < .001$ ): sentences with collective predicates were generally judged as less of a match for a mixed-event picture than those with noncollective predicates, across both subject types. However, as we found no statistically significant difference in *subject category* (estimate 0.1278, standard error 0.3230, *z* value 0.396,  $\Pr(> |z|) .69222$ ; two-way ANOVA Fisher LDS,  $p > .1$ ; collective  $p > .05$ , noncollective  $p > .1$ ), no effect of conjunction per se is attested: conditions with a conjoined subject were judged equally acceptable as their counterparts with a single-NP subject. Importantly, no interaction was observed between the two variables.

<sup>9</sup> We are very grateful to Alex Drummond both for building and maintaining the platform and for his direct help in setting up this type of experiment on the platform.



**Figure 5. The rate of acceptance per condition in experiment 1.**

This is clearly not compatible with the predictions of the Conjunction-Type Hypothesis. Sentences in the collective-&P condition (with CCA) were predicted to match mixed-event pictures the worst, yet they were still rated fairly highly as matches. The effect of collectivity overall, observed also with nonconjoined NPs, is likely a matter of processing complexity. These examples were more difficult for participants to interpret, and so they yielded a lower rating—because of processing or verification procedures involved in evaluating collective readings against an otherwise-present distributive bias, not because of a lower degree of matching. The lack of a significant difference between &P and NP and the absence of interaction demonstrate that it cannot be the case that all CCA comes from underlying biclausal structures; if it were, one would expect a much lower degree of matching between &P sentences and mixed-event pictures.

Nonetheless, one might wonder how these same pictures would fare if paired with an overtly biclausal sentence, which led us to experiment 2.

### 3. Experiment 2: Forced Choice of Picture

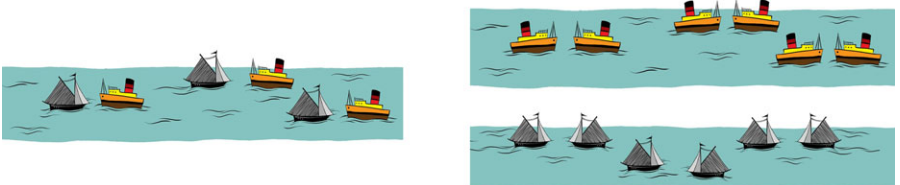
#### 3.1. Aim of the Experiment

The aim of the experiment was similar to that of experiment 1, to test the hypothesis that CCA is the result of a biclausal structure: a conjunction at the

clausal level, reduced by ellipsis to the appearance of a phrasal conjunction (see examples (4) and (5) above). The task, however, was different. In experiment 1, one sentence was paired with one picture and its degree of match was rated by participants. In experiment 2, one sentence—this time it could be biclausal—was coupled with *two* pictures and participants were given a forced choice between the two. Moreover, we designed the experiment in such a way as to increase the chances of detecting any difference between (overt) conjunction types.

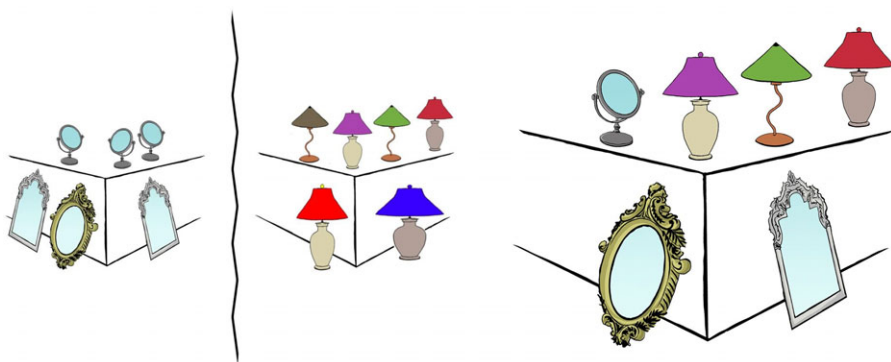
The experiment was designed to force participants to express their preferences between one- and two-event interpretations, represented by pictures like figures 6 and 7, which correspond to the example sentences in (12) and (13), respectively. For each sentence, participants were asked to pick the better-matching picture. Each sentence had either the overtly monoclausal CCA pattern in (12a) and (13a) or the overtly biclausal one in (12b) and (13b) (both conditions were embedded, as in these examples, under a matrix verb). This variable, *clause size* (monoclausal, biclausal), was crossed with the variable *predicate type*: each sentence had either a collective predicate, as in both examples in (12), or a noncollective one, as in (13).

- (12) a. Znamo da su se po nekom kanalu mimoilazile  
 know.1.PL that AUX.PL REFL over some canal passed\_by.F.PL  
 lađe i druga plovila.  
 ship.F.PL and other vessel.N.PL  
 ‘We know that some ships and other vessels passed each other in some canal.’
- b. Znamo da su se po nekom kanalu mimoilazile  
 know.1.PL that AUX.PL REFL over some canal passed\_by.F.PL  
 lađe i da su se po nekom kanalu mimoilazila  
 ship.F.PL and that AUX.PL REFL over some canal passed\_by.N.PL  
 druga plovila.  
 other vessel.N.PL  
 ‘We know that some ships passed each other in some canal and that some other vessels passed each other in some other canal.’



**Figure 6. The pair of pictures standing for the mixed- and split-event interpretations of the sentences in (12), which use a collective predicate. (Figure can be viewed in color at [wileyonlinelibrary.com/journal/syntax](http://wileyonlinelibrary.com/journal/syntax).)**

- (13) a. *Izgleda da su u nekoj trgovini na prodaju stavljena ogledala i lampe.*  
 seems that AUX.PL in some shop on sale put.N.PL mirror.N.PL and lamp.F.PL  
 ‘It seems that mirrors and lamps were put on sale in some shop.’
- b. *Izgleda da su u nekoj trgovini na prodaju stavljena ogledala i da su u nekoj trgovini na prodaju stavljene lampe.*  
 seems that AUX.PL in some shop on sale put.N.PL mirror.N.PL and that AUX.PL in some shop on sale put.F.PL lamp.F.PL  
 ‘It seems that mirrors were put on sale in some shop and that lamps were put on sale in some shop.’



**Figure 7. The pair of pictures standing for the mixed- and split-event interpretations of the sentences in (13), which use a noncollective predicate. (Figure can be viewed in color at [wileyonlinelibrary.com/journal/syntax](http://wileyonlinelibrary.com/journal/syntax).)**

In combination, this illustrates all four conditions in the experiment:

- Monoclausal–collective: sentence (12a) and the two pictures in figure 6
- Biclausal–collective: sentence (12b) and the two pictures in figure 6
- Monoclausal–noncollective: sentence (13a) and the two pictures in figure 7
- Biclausal–noncollective: sentence (13b) and the two pictures in figure 7<sup>10</sup>

Recall that the Conjunction-Type Hypothesis postulates the same underlying biclausal structure for both the surface-monoclausal sentences with CCA and the

<sup>10</sup> An anonymous reviewer points out that the correspondence between the pictures and the sentences is sometimes remote, because some of the predicates used are difficult to visually represent (see appendix 2 for the full list of stimuli used in experiment 2). While this may be true, the experiment design has balanced the difficulty for the relevant contrasts, as the picture–sentence correspondence has the same properties in both the monoclausal and biclausal conditions.

surface-biclausal sentences with simple subjects (the hypothesized source of CCA clauses). Therefore, it predicts that given a biclausal sentence, participants will choose the split-event picture just as often as they will given a surface-monoclausal sentence with CCA. A significant difference between the levels *monoclausal* and *biclausal*—in particular, one where the former but not the latter had a nonmarginal number of selections of the mixed-event interpretation—would falsify the Conjunction-Type Hypothesis.

The purpose of including the variable *predicate type* was to strengthen the within-clause interpretation of the subject in the hypothesized biclausal underlying structure of the CCA clauses. This addresses a possible objection to the outlined design, namely that even two overtly conjoined clauses may refer to the same event, so that participants might still select the one-event picture even while parsing a surface-monoclausal sentence into a biclausal configuration. The design of the experiment is intended to neutralize this problem at two levels. Firstly at the level of pragmatics: even if a biclausal structure may refer to a single event, the fact that there are more economical expressions that can only have this interpretation, namely monoclausal sentences with the default- or resolved-agreement pattern, should provide a clear advantage to the split-event reading. In a forced-choice task, the Conjunction-Type Hypothesis predicts a near 100% selection of the two-event scenario. Secondly, as we still wanted to control for the possibility that the events in the two clauses are interpreted as coreferential, we included *predicate type*, relying on the tendency of certain predicates to have a collective interpretation. Such is the case, for instance, with the B/C/S verb *sresti se* and its English counterpart *to meet*. These verbs, as the examples in (14) illustrate, require a plurality as a participant, which can be realized by a combination of the subject and an indirect object or by a plural subject alone. In the former case, the predicate applies to the referents of the subject and the indirect object and in the latter case to the members of the plurality denoted by the subject.

- (14) a. Dečak se sreo sa devojčicom.  
 boy.M.SG REFL met.M.SG with girl  
 ‘The boy met with the girl.’
- b. Dečaci su se sreli.  
 boy.M.PL AUX.PL REFL met.M.PL  
 ‘The boys met (with each other).’
- c. Dečak i devojčica su se sreli.  
 boy.M.SG and girl.F.SG AUX.PL REFL met.M.PL  
 ‘The boy and the girl met (with each other).’
- d. \*Dečak se sreo.  
 boy.M.SG REFL met.M.SG  
 ‘\*The boy met.’

Now, when two clauses with identical collective predicates are conjoined, it is much harder to establish coreference between the two events than when the conjoined predicates are noncollective: compare (15a) with (15b).



- (15) a. Dečaci su se sreli i devojčice su se srele.  
 boy.M.PL AUX.PL REFL met.M.PL and girls.F.PL AUX.PL REFL met.F.PL  
 ‘The boys met (with each other) and the girls met (with each other).’  
 #‘The boys participated as experiencers and themes in a meeting event,  
 and the girls participated as experiencers and themes in the same  
 meeting event.’
- b. Dečaci su pevali i devojčice su pevale.  
 boy.M.PL AUX.PL sang.M.PL and girl.F.PL AUX.PL sang.F.PL  
 ‘The boys sang and the girls sang (separately).’  
 ‘The boys participated as agents in a singing event, and the girls  
 participated as agents in the same singing event.’

Collective predicates are hence expected to even more strongly block the mixed-event interpretation of any biclausal structure. Thus, (12b) in particular, as an instance of the biclausal–collective condition, should not be able to be linked with a reading in which ships pass by not only other ships but also other vessels, that is, the mixed-event picture in figure 6. Under the biclausal analysis, the same should be true of (12a), as an instance of the monoclausal–collective condition. If, on the other hand, it turns out that monoclausal–collective sentences can be paired with mixed-event conditions even while biclausal sentences cannot, this would strongly suggest that the Conjunction-Type Hypothesis is on the wrong track.

In the collective conditions, we used telic verbs and verbs denoting processes, while in the noncollective conditions, in order to maximally bypass the issue of collectivity, we used stative verbs. We intentionally avoided strongly distributive predicates, that is, predicates that do not allow collective interpretation, because we did not want to additionally favor the split-event level of the dependent variable with monoclausal sentences.

### 3.2. *Materials and Methods*

#### 3.2.1. *Participants*

In total, 90 first- or second-year undergraduate students (72% female, 28% male; mean age = 20), 30 at each of three research institutions, participated in this forced-picture-choice experiment. The three research institutions were the University of Nova Gorica (the Nova Gorica students were tested at the University of Ljubljana), the University of Sarajevo, and the University of Novi Sad. They all were native speakers of the local language variety, had attended the local secondary school, and were not pursuing a university degree in the study of the local language. Their participation was voluntary or they received course credit for their participation.

#### 3.2.2. *Materials and design*

The experiment was designed as a version of a forced-choice task in which a participant is presented with one sentence and two different pictures and their task is

to choose which of the two pictures is a *better* match for the sentence. A single experimental design and procedure was implemented under equal experimental conditions across all three research institutions. Experimental material was initially created in Zagreb Croatian but adapted to the local neutral variety. The adaptations were minimal to ensure uniformity across research locations and were mostly lexical, due to variation in gender of specific lexical items.

A total of 64 experimental sentences were presented to the participants. The factors *predicate type* (collective, noncollective) and *clause size* (monoclausal, biclausal) were used, yielding a  $2 \times 2$  design, with *event picture* (one event, two events) as the dependent variable. First, for each of the two levels of *predicate type*, eight predicates were paired with a mixed-gender (feminine–neuter, neuter–feminine) combination of nominal expressions. Each of these 16 pairings was then manipulated into a monoclausal realization and a biclausal realization along the *clause size* variable, as in (12) or (13), to create a total of 32 items (eight for each of the four conditions). All items in the monoclausal conditions had the same structure, [V Comp Aux (Refl) Adv Pred<sub>CCA</sub> NP<sub>N/F.PL</sub> & NP<sub>F/N.PL</sub>], a matrix predicate followed by the complementizer, an inflected auxiliary clitic, a reflexive clitic (if needed), an adverbial, a predicate, and a final conjoined subject phrase. All items in the biclausal conditions also had the same structure, [V Comp Aux (Refl) Adv Pred<sub>CCA</sub> NP<sub>N/F.PL</sub> & Comp Aux (Refl) Adv Pred<sub>CCA</sub> NP<sub>F/N.PL</sub>], with an overt repetition of the [Comp Aux (Refl) Adv Pred<sub>CCA</sub>] sequence before the second NP. Special attention was paid to the naturalness of the resulting examples, across all four conditions.

All items in the experiment were paired with a one-event picture and a corresponding two-event picture. Half of the stimuli had the two-event picture on the left and the one-event picture on the right, and the other half had the opposite arrangement; the different arrangements were randomly ordered.

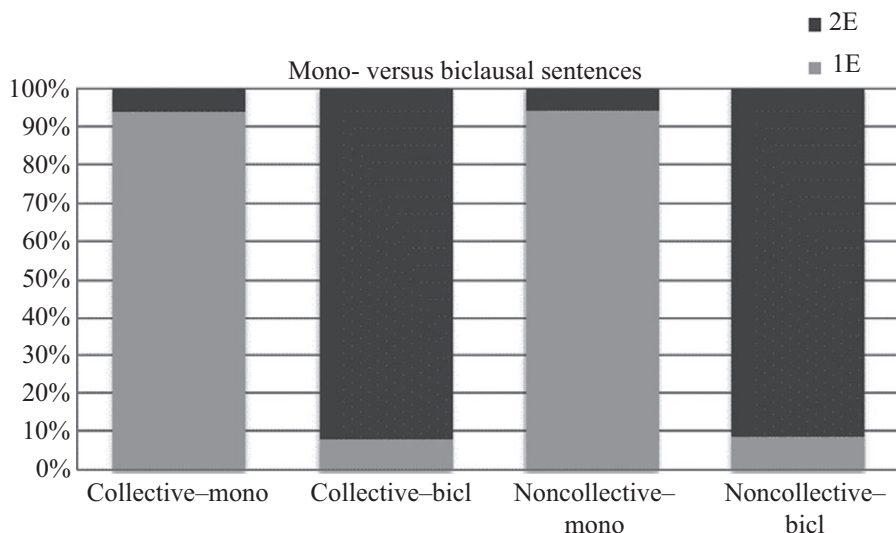
A total of 32 filler items were used in the experiment, involving the same filler material used in experiment 1. New pictures were paired with those from experiment 1 so that there were two pictures for each filler sentence, as required by the forced-choice design of experiment 2. A full list of items and corresponding pictures is provided in appendix 2 (see online supplementary material).

### 3.2.3. *Methods*

Experiment 2, like experiment 1, was coded and administered using IbexFarm. It was conducted in October and November 2017. Participants were shown an introduction that included a task description, then six practice items, then the 64 experimental items. For each item, participants saw a single sentence paired with two pictures. The task was to read the sentence, examine the pictures, and choose the picture that was a better match for the sentence by clicking on it. After clicking on the better-matching picture, participants had to press a “continue” button (in their language) in order to proceed to the next experimental item. For each participant, IbexFarm produced a new random ordering of items. Picture-choice responses were automatically recorded by IbexFarm and afterwards were exported and transcoded (left–right into one event or two events) for statistical analysis of the number of matches per condition.

### 3.3. Results and Discussion

The results of the experiment are shown in figure 8. The monoclausal sentences with CCA yield exactly the inverse pattern of the biclausal sentences. In the biclausal conditions, the participants chose the two-event picture over 90% of the time, and in the surface-monoclausal conditions, they chose it less than 10% of the time. The variable *predicate type* does not appear to have any effect.



**Figure 8. Picture choice per condition in experiment 2.**

A two-factor repeated-measures ANOVA test confirms these observations. The effect of the factor *clause size* is highly significant ( $p < .001$ ;  $F = 1,880.599$ ), while the effect of *predicate type* does not approach significance ( $p = .83238$ ;  $F = 0.04563$ ). No interaction between the two factors is attested either ( $p = .88777$ ;  $F = 0.02028$ ).

The null result for *predicate type* is very likely a consequence of the strong effect of the other variable. The intention was that the level *collective* would strengthen the within-clause interpretation of the predicate, that is, it would generate a closer correspondence between the reading chosen and the underlying structure (one event for the monoclausal underlying structure, two events for the biclausal one). Our participants had a very strong tendency to select the one-event interpretation for the monoclausal conditions and the two-event interpretation for the biclausal conditions. This contrast might have simply been so strong that there was too little room for the strengthening effect of collective predicates to achieve significance.

The results for the surface-biclausal conditions confirm our assumption that clausal conjunction has a strong preference for a two-event reading. The fact that in a small number of cases the one-event reading is still chosen is potentially explained by the possible coreference between the two events in the two clauses, in which case there is

a match with the one-event picture. The fact that for the monoclausal conditions, likewise, there were a number of cases where the two-event interpretation was chosen can potentially be explained by the availability of a biclausal parse, with conjunction reduction—but clearly this is not the only structure that derives CCA, not even a dominant one.

The results reject the Conjunction-Type Hypothesis, since as discussed in section 2, this hypothesis predicts that the levels *biclausal* and *monoclausal* will have identical results, both with a strong preference for the two-event pictures. Exactly the pattern that rejects the hypothesis is attested: the two levels produce opposite extremes, with *biclausal* inducing a preference for two-event interpretations but *monoclausal* inducing a preference for one-event interpretations. The results clearly show that the pictures from experiment 1 do elicit distinct results with surface-biclausal sentences than with surface-monoclausal sentences, and hence the high degree of match between monoclausal CCA sentences and one-event pictures does not persist when the sentences are overtly biclausal.

Our results do not directly address Schein 2017, a theory of conjunction on which coordination always targets the clausal level and may receive a phrasal appearance only through subsequent reduction (see also Hirsch 2017). The reason is that such theories do not necessarily postulate the bisentential structure as a matter of syntax, nor even one with two event representations—which is the hypothesis that we test—and furthermore they do not explicate a mechanism that would determine the agreement pattern, so they make no specific predictions regarding agreement.<sup>11</sup>

### 3.4. *Alternative Accounts for the Observed Asymmetry between Monoclausal and Biclausal Conditions*

An anonymous reviewer points out the possibility that the strong contrast between the two clause-size conditions in experiment 2 (monoclausal with CCA and biclausal) may be simply due to a general tendency of surface-monoclausal expressions to prefer the single-event reading and of surface-biclausal expressions to prefer the two-event

<sup>11</sup> For Schein (2017:173), the difference between CCA and default/resolved agreement is that the latter involves a logical form with a cumulative operator, and he argues (182) for a difference in thematic relations between the conjunct that controls agreement and the one that does not.

Relatedly, an anonymous reviewer claims that previous literature on CCA in Arabic and Slavic has documented differences in interpretation between default/resolved agreement and CCA, although the reviewer acknowledges that these differences have never been subject to experimental verification and are usually left at the level of “Speakers discern some difference or other of meaning between full and partial agreement [i.e., between default/resolved agreement and CCA]” (Schein 2017:191). We are not aware of any such claim about *Slavic* CCA in the literature (cf. Marušić, Nevins & Saksida 2007, Bošković 2009, Marušić & Nevins 2010, Marušić, Nevins & Badecker 2015, Willer-Gold et al. 2016, Arsenijević and Mitić 2016a,b, Murphy & Puškar 2018), nor can we confirm that there is a difference in interpretation between CCA and default/resolved agreement in any of the varieties of South Slavic represented here. In all of the examples tested, both in Slovenian and B/C/S, both conjuncts seem to be equally “agentive” regardless of the agreement used. Thus, in examples like those in (12), both ships and vessels participate in the passing by comparably, so that neither of the two is more actively passing by while the other participant is less perspectively anchored or is demoted to comitative status. We note, however, that our experiment was designed to test mixed-event versus split-event readings and not the types of differences in perspectival anchoring outlined in Schein 2017:188.

interpretation, a tendency attested for English by Clifton & Frazier (2012). While we agree that the observed difference may be partly due to the preference detected by Clifton & Frazier, we offer a few pertinent observations here. Our experiments tested the hypothesized underlying biclausal structure of CCA. According to the Conjunction-Type Hypothesis, all sentences in experiment 2 are (underlyingly) biclausal. Taking the underlying structure as the one determining interpretation, the Conjunction-Type Hypothesis predicts that the CCA condition should pattern like the biclausal condition. Clifton & Frazier do not distinguish between the two potential types of surface-monoclausal phrasal conjunctions: those triggering default or resolved agreement, which are underlyingly monoclausal, and those triggering CCA, which, according to the Conjunction-Type Hypothesis, are underlyingly biclausal (cf. Schein 2017 for the claim that these two types are underlyingly the same and both biclausal in some sense). As Clifton & Frazier only test the first type, their results, as important as they may be for the study of processing distributive predicates, are not directly relevant to the question of whether *agreement* necessarily diagnoses or presupposes a biclausal structure.

It may be that the two experiments, ours and Clifton & Frazier's, are not wholly comparable. One highly relevant difference is that Clifton & Frazier only used strongly distributive predicates and predicates ambiguous between distributive and nondistributive readings. No strongly collective predicates were used, unlike in our experiment, where one of the variables was precisely that of strongly collective versus ambiguous predicates. Strongly collective predicates strengthen the tendency for a monoclausal interpretation of the sentence, which clashes with the hypothesized biclausal underlying structure of sentences with the CCA pattern. Moreover, Clifton & Frazier's conclusions are based on reaction-time results, not levels of acceptability. In their experiment, the difference between the *acceptance* rates of the mono- and biclausal conditions was subtle: there was an acceptance rate of 80.7% for the bisentential realization of potentially collective predicates, while for the monoclausal expression it was 93.8%. Hence, if the surface realization is the source of the asymmetry in experiment 2, it is not expected that the CCA surface-monoclausal condition should yield the exact inverse quantitative pattern of the surface-biclausal condition (over 90% selection of one-event pictures versus less than 10%). One would expect a higher rate of two-event readings for the surface-monoclausal CCA condition than the rate of one-event readings in the surface-biclausal condition.<sup>12</sup>

#### 4. Conclusion

A hypothesis that keeps coming back about the agreement phenomena generalized as CCA is that this pattern results from reduced clausal conjunction and simply reflects

<sup>12</sup> We conducted an additional experiment (experiment 3) that we do not report on due to its null results. The experiment was identical to experiment 2 except that the variable *clause size* was replaced with *agreement pattern*, so that instead of biclausal examples, monoclausal examples with the default agreement pattern were used; the contrast was thus between CCA and default agreement. No significant effect was attested for *agreement pattern* ( $p = .19, 3.852606$ ), with a 90% rate of choice of the one-event reading for the default-agreement level versus 87% for CCA.

the agreement of the verb with the nonconjoined subject of the clause whose content survives ellipsis (Aoun, Benmamoun & Sportiche 1994, 1999), the same predicate being underlyingly present in both clauses. CCA is the dominant agreement pattern in South Slavic languages where gender marking is visible in plural forms (a prerequisite for clear identification of CCA, due to the plural number yielded by conjunction). In this article, we reported on two experiments conducted on these languages with the aim of testing whether the underlying-biclausal hypothesis applies universally to CCA patterns and, more particularly, whether it applies to Slovenian and B/C/S, which have been used to motivate complex agreement mechanisms to yield CCA (Willer-Gold et al. 2016, Murphy & Puškar 2018). The results of our experiments reject the conjunction-reduction hypothesis as the only source of CCA as far as these languages are concerned.

We close by noting that the experiments reported here used cases of CCA involving postverbal subjects, where ellipsis of the second verb (as originally posited for Arabic) is a potentially plausible hypothesis to begin with; even so, these cases proved inconsistent with a necessarily biclausal underlying structure. The preverbal-subject cases of CCA by now amply documented for South Slavic in the literature are even less likely to come from an underlyingly elliptical source.

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