



Willer-Gold, Jana. 2023. Locus and timing of gender resolution: Probes, goals and predictions. *Glossa: a journal of general linguistics* 8(1). pp. 1–45. DOI: <https://doi.org/10.16995/glossa.8939>



Open Library of Humanities

## Locus and timing of gender resolution: Probes, goals and predictions

Jana Willer-Gold, University College London, UK, [j.willer-gold@ucl.ac.uk](mailto:j.willer-gold@ucl.ac.uk)

---

Two lines of theoretical research have dominated the question of the locus of gender resolution in the context of Slavic conjunct agreement. *Goal Resolution* accounts comprise of the assumption made by mainstream research that resolved value (masculine plural) on ConjP goal is readily available to be copied onto probe (Bošković 2009; Franks and Willer-Gold 2014; Marušić et al. 2015; Murphy and Puškar 2018). The *Probe Resolution* account instead argues that gender resolution takes place on probe once gender values have been copied from the two conjuncts, as proposed by Citko (2018). The current study aims to experimentally test the validity of these two theoretical accounts of gender resolution. In this objective, we first discuss the results of an elicited production study on conjunct agreement in South Slavic (Willer-Gold et al. 2018), which found production times for nine gender combinations to strongly correlate with uniformity of agreement exponents. This finding indicates that simultaneous activation of multiple conjunct agreement strategies is resolved by competition at the level of morphological exponents on probe, offering support for the *Probe Resolution* account. We then report a novel study comprised of three self-paced reading experiments in Croatian (n: 99) designed to validate the resolved masculine gender on ConjP goal with (in)congruent gender conjuncts. Results of this study suggest <masc> is an early predictor of the gender on the upcoming verbal target but its violation is detected late in the presence of an alternative agreement strategy in the experimental paradigm, and as expected when this alternative is eliminated from the experimental paradigm favouring *Goal Resolution* theories. Conflicting data from comprehension (self-paced reading) and production (elicited production) studies supporting *Goal* and *Probe* approaches are finally considered in the context of the production-comprehension asymmetry often observed in gender attraction studies.

---

*Glossa: a journal of general linguistics* is a peer-reviewed open access journal published by the Open Library of Humanities. © 2023 The Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC-BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited. See <http://creativecommons.org/licenses/by/4.0/>.

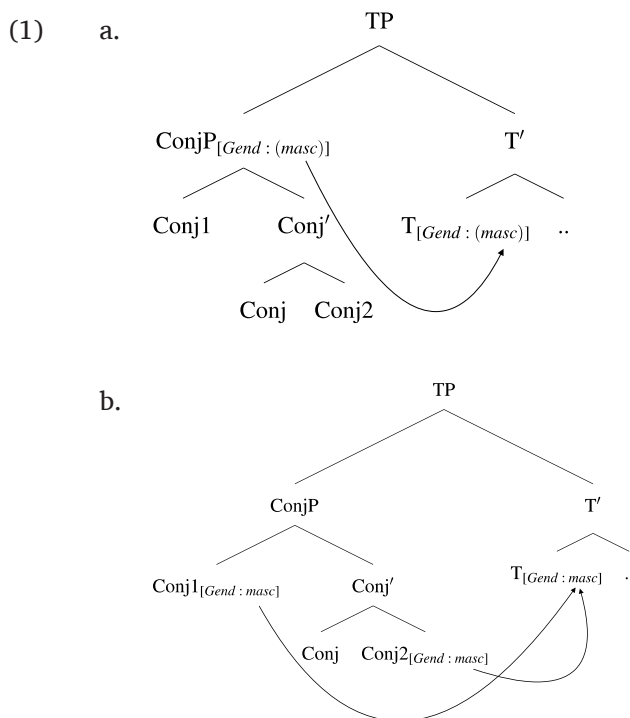
 OPEN ACCESS



## 1 Introduction

Agreement is canonically defined as a syntactic operation of feature valuation where a feature on the probe is valued by an active feature on the dependent goal, henceforth *single feature* goals. Languages are, however, rich in complex dependents with more than one goal and hence more than one feature targeted by the probe (e.g., PCC), henceforth *multiple feature* goals; as well as agreement dependents where there are no features on a single goal available to value the feature on the probe (e.g., quirky, impersonal, clausal subjects), henceforth *no feature* goals.

Theoretical approaches to agreement identify coordination, a complex structure resulting from the coordination of two or more noun phrases, as a primary case of the three types of dependent – *single feature* goal, *multiple feature* goals, and *no feature* goal, as illustrated in (1), respectively. In (1a), the probe targets and is valued by the active gender feature on the maximal projection ConjP; and, in (1b), the probe simultaneously targets and is valued by the two active features on the two nominal conjuncts Conj1 and Conj2 (here illustrated by the verbal probe). In the representations in (1), in the absence of value for the gender feature(s) on the goal(s) the probe unsuccessfully targets its goal(s), the ConjP in (1a) and the two conjuncts Conj1 and Conj2 in, (1b).



As no clear criteria constrains this theoretically induced variation in the domain of ConjP agreement, the objective of this paper is to show that this variation in agreement dependents is not uniquely of interest to syntactic theory but can be substantially informed by experimental

investigations that rely on agreement to probe syntactic processes. In order to formulate an experimentally testable hypothesis contrasting directly in *single feature* and *no feature* goals this paper considers conjunct agreement in gender feature in Croatian, a South Slavic language, with a primary interest in Resolution.

Resolution results from subject-verb agreement where a verbal probe targets a goal that is the conjunction phrase. The theoretical interest in Resolution is driven by a variety of topics such as identification of language components computing Resolution (syntactic, post-syntactic, discourse-semantic), timing of Resolution relative to other agreement operations (ordered or parallel), restrictions on Resolution with post-verbal ConjPs (upward or downward agree) and, relevant for current discussion, the mechanisms contributing to the active status of the ConjP goal (*resolution rules* and *default value insertion rule*) (Nevins 2018, Nevins and Weisser 2019).

The long-established research into Resolution in Slavic languages assumes that the phrase internal application of *resolution rules* and *default value insertion rule* provides a value for the unvalued gender feature on the maximal projection ConjP, (1a); signalling that ConjP is a single goal active for agreement with the probe, henceforth *Goal Resolution* accounts (Franks and Willer-Gold 2014; Marušić et al. 2015; Murphy and Puškar 2018; cf., Bošković 2009). In contrast to this mainstream approach, Citko (2018) has recently proposed that Resolution instead applies on the probe after the probe has agreed with the two NP conjuncts and copied features from these multiple goals, (1b), hereafter *Probe Resolution* account.

Consequently, Citko's theoretical remark opens a specific research agenda of key interest for this paper, into Slavic conjunct agreement pertaining to the *locus* of Resolution characterised as the domain of its operation – the Goal (*Goal Resolution* accounts) or the Probe (*Probe Resolution* accounts).

To provide experimental grounding for the two contrasting accounts on the *locus* of Resolution, we consider two sets of experimentally collected measures – production times and reading times, on conjunct agreement and Resolution, in particular, in South Slavic. First are revisited production times from an elicited production study on conjunct agreement in South Slavic suggesting that the competition of multiple parallel agreement strategies mediated by the uniformity of morphological exponents is resolved at a *later* point of the derivation (Willer-Gold et al. 2018). This production data seemingly favours the *Probe Resolution* account. Second are reported reading times from a newly designed self-paced reading study on Resolution in Croatian developed here to validate the hypothesis that *early* representation of gender feature value on the ConjP goal predicts gender value of the upcoming verbal target at its first encounter. Confirmation of this hypothesis in absence of any formal cues would provide support for the *Goal Resolution* accounts.

In what follows, Section 2 introduces conjunct agreement strategies – single-conjunct agreement and ConjP agreement, in Croatian, and (South)Slavic more generally, to identify a

single property pertinent to Resolution that can serve to formulate experimentally verifiable and theoretically informative experimental hypothesis about its *locus* (see the self-paced reading study in Section 4). Section 3 provides an overview of theoretical accounts on conjunct agreement in (South) Slavic with a special focus on Resolution to refine the identified property and distribute the accounts as *Goal Resolution* and *Probe Resolution*. Section 4 revisits the elicited production study and presents the novel self-paced reading comprehension study to further the discussion of the findings for the *locus* of Resolution and gender agreement, in general. Section 5 discusses the impact of experimentally sourced data in the context of production-comprehension asymmetry observed in gender attraction studies and considers future avenues of research into the *locus* of resolution and the valuation, i.e., activation, of features on the maximal projections.

## 2 Conjunct agreement in Croatian

### 2.1 Subject-verb agreement

Croatian as other Slavic languages is known for its omnipresent and transparent inflectional morphology. In subject-verb agreement, the inflectional morpheme on the agreeing verb encodes the paradigmatic values for gender (masculine, feminine and neuter) and number (singular, dual/paucal, and plural) features, see **Table 1**. This property to transparently encode gender values in singular and plural has proven to be advantageous for theoretical and experimental research providing a controlled but adequately diverse testing ground for direct and precise probing of agreement, and for current purposes, Resolution. In examples (2) and (3), the inflectional morpheme on the agreeing verb, in this case the past-participle, *kupil-e* and *opkoljen-a*, is congruent with the declension class morpheme, *-e* and *-a*, on the subject noun, *djevojke* and *sela*, respectively.

	NP (declension)		Past-participle (agreement)	
	singular	plural	singular	plural
masculine	-∅	-i	-∅, -o	-i
feminine	-a, -∅	-e, -i	-a	-e
neuter	-o, -e	-a	-o	-a

**Table 1:** Croatian inflectional morphology.

- (2) Croatian  
 Djevojk-e su kupil-e auto.  
 girl.fem.pl aux.pl bought.fem.pl car  
 ‘The girls bought a car.’

- (3) Croatian  
 Sel-a su bil-a opkoljen-a požarom.  
 village.neut.pl aux.pl be.neut.pl surrounded.neut.pl by fire  
 ‘The villages were surrounded by fire.’

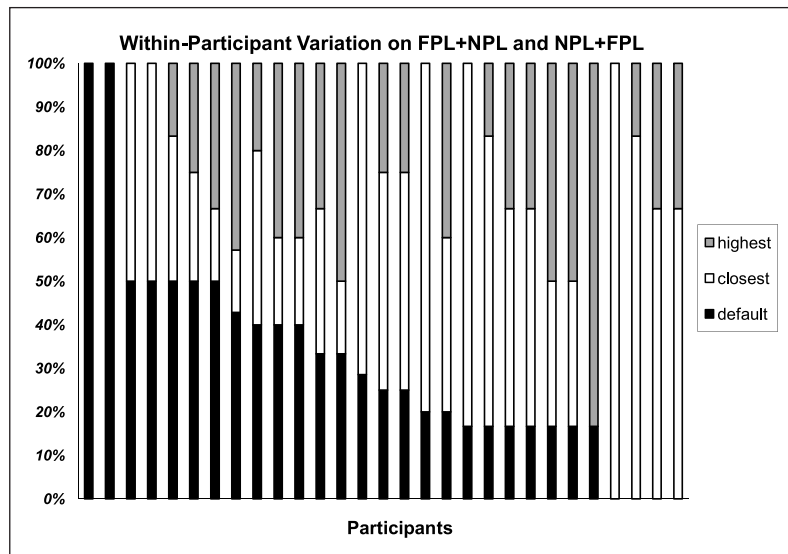
The second property pertinent to subject-verb agreement is the presence of agreement alternatives (Corbett 1983). As illustrated by a member of a small class of hybrid nouns, the morphological inflection on the agreeing verb alternates referencing the discourse-semantic (masculine – natural gender) and morphological (feminine – grammatical gender) property of the subject noun *kukavica*, (4).

- (4) Croatian  
 Kukavic-a je pobjega-o/pobjegl-a.  
 girl.fem.sg aux.sg ran.masc.sg./ran.fem.sg  
 Intended: ‘A coward (male) ran away.’

Inflectional alternations are also found with structurally complex subjects, quantified noun phrases and conjunction phrase. In the case of coordinated subject, the inflectional alternatives on the agreeing verb are indicative of multiple (parallel) agreement procedures targeting ConjP or one of its NP conjuncts, (1a) and (1b), respectively. These conjunct agreement alternatives are closely considered in the next section.

## 2.2 Conjunct agreement

Investigations into conjunct agreement in South Slavic languages have documented and experimentally attested two main agreement procedures: single-conjunct agreement and ConjP agreement, with the former often featuring as an additional (competing) strategy to the more widely attested ConjP agreement (cf., Marušič, Saksida, and Nevins 2006 for corpus data on Slovenian, Barić et al. 1997 for Croatian). The empirical evidence for the two conjunct agreement strategies based on corpus frequency as first documented by Corbett (1983) was recently substantiated by production data from an elicited production study on Slovenian (Marušič et al. 2015) and replicated in an elicited production study on a larger group of South Slavic languages, Slovenian and BCS (Willer-Gold et al. 2016; 2018) (see section 4.1); with the corpus and experimental data confirming the robust status of single-conjunct and ConjP agreement alternations. The elicited production study on Slovenian additionally highlighted the inter- and intra-speaker variation in conjunct agreement procedures (coded as *highest*, *closest*, and *default*) and production rates of those procedures, see **Figure 1**. As illustrated in **Figure 1**, while some speakers actively produce a single agreement alternative (e.g., *default*), others produce multiple agreement alternatives (e.g., *highest* and *closest*) at varying rates suggesting activation of parallel grammars.



**Figure 1:** Elicited production study: Conjunct agreement. Inter- and intra-individual variation (Slovenian, Marušič et al. 2015).

### 2.2.1 Single conjunct agreement

Single conjunct, or asymmetrical, agreement is an instance of agreement where only one of the conjuncts – closest or distal, serves as an active goal for the agreeing probe.<sup>1</sup> Marušič and colleagues (2015) elicited production study on native Slovenian speakers showed a strong preference for agreement with the closest conjunct when the ConjP subject is placed pre- and post-verbally. Willer-Gold and colleagues (2016; 2018) replicated this finding in a larger elicited production study on native speakers of South Slavic languages, Slovenian and BCS. The stable preference for agreement with a single-closest conjunct is exemplified by gender incongruent conjuncts (feminine and neuter), in (5). The relevant observation comes from the high production rate for the inflectional morpheme (neuter) on the agreeing verb congruent in gender with the closest conjunct when the ConjP subject is placed pre- (53%) and post-verbally (93%), in (5a) and (5b), respectively. The authors argue that closest conjunct agreement has a distributive property with the subject-verb dependency established in syntax (via Agree-Link) and feature copying in post-syntactic component after linearisation (via Agree-Copy) with no novel contribution to the semantics of the subject-verb dependency. The argument for the distributive account of closest-conjunct agreement is supported by the follow up studies showing that closest-conjunct agreement is sensitive to plurality and semantic notions typically associated with sentential subject (animacy, agentivity, and collective interpretation) as well as syncretism

<sup>1</sup> The asymmetry alluded here refers to agreement goal(s); with no intent to contribute to the discussion on structural (a)symmetry of ConjP.

(Arsenijević and Mitić 2016a; 2016b; Mitić and Arsenijević 2019 for elicited production studies; Arsenijević et al. 2020 for ellipsis; Peti-Stantić et al. 2015 for pseudo-words). The relevance of these findings resides in the consequence of the distributive approach, namely, that irrespective of surface illusion of single-conjunct agreement, closest-conjunct agreement is calculated based on a syntactically established dependency between the ConjP subject and the agreeing verb (see Marušič et al. 2015 for discussion of examples (5)–(7)).

(5) Elicited production of conjunct agreement (BCS and Slovenian, Willer-Gold et al. 2016)

- a. Olovk-e i rumenil-a su stigl-e/-a/-i.  
 eye-pencil.fem.pl and blushe.neut.pl aux.pl arrived.fem.pl/neut.pl/masc.pl  
 na skladište.  
 to warehouse  
 (F:11%, N:53%, M: 36%)
- b. Na skladište su stigl-e/-a/-i rumenil-a i  
 to warehouse aux.pl arrive.fem.pl/neut.pl/masc.pl blushe.neut.pl and  
 olovk-e.  
 eye-pencil.fem.pl  
 (F:2%, N:93%, M:5%)  
 ‘The eye-pencils and the blushes arrived at the warehouse.’

In contrast to closest-conjunct, the production rate of distal-conjunct agreement is low with pre-verbal conjoined subjects (feminine) in (4a), and even further reduced with post-verbal ones (feminine), in (4b) (cf., data in Bošković 2009). This word order asymmetry in single-conjunct agreement captured by the two production studies on South Slavic varieties, is in line with the cross-linguistic observations pointing to the ungrammatical status of post-verbal distal-conjunct agreement (e.g., Aoun et al. 1994 for Arabic; Citko 2004; 2018 for Polish).

Consequently, for the purposes of the self-paced reading experimental study presented in Section 4.2, the closest-conjunct agreement is considered as the (sole) strong alternative (competitor) to ConjP agreement, discussed in the next sections.

### 2.2.2 Resolution

Resolution is an instance of agreement of the verb with the conjunction phrase subject. It stands in contrast with the single-conjunct agreement in that it is inclusive and symmetrical as the gender values on both conjuncts are (not) simultaneous active goals for agreement. Two procedures present themselves as valid contenders for resolution – *resolution rules* and the *default value insertion* rule. These two mechanisms of resolution can co-exist in a single language (and in a single speaker’s grammar, see **Figure 1**) as illustrated in (6) with the two gender congruent conjuncts (feminine and feminine, neuter and neuter). The shared gender (feminine in (6a)

and neuter in (6b)) inflectional morphology on the agreeing verbs indicates application of the *resolution rules*; while the alternative (masculine in (6a) and (6b)) inflectional morphology on the agreeing verbs indicates application of the *default value insertion* rule. In Croatian, as in other Slavic languages, masculine is a *default* gender in plural (with the probe already valued for the plural number feature).<sup>2</sup>

(6) Elicited production of conjunct agreement (BCS and Slovenian, Willer-Gold et al. 2016)

a. Zahval-e i čestitk-e su  
 acknowledgment.fem.pl and congratulation.fem.pl aux.pl  
 izašle-e/\*-a/-i. u novinama.  
 came out.fem.pl/neut.pl/masc.pl in newspapers  
 (F:85%, N:0%, M: 15%)

‘The acknowledgments and the congratulations came out in the newspapers.’

b. Jedr-a i vesl-a su popravlj-an-a/\*-e/-i u garaži.  
 sail.neut.pl and paddle.neut.pl aux.pl fix.neut.pl/fem.pl/masc.pl in garage  
 (F:0%, N:88%, M:12%)

‘The sails and the paddles were fixed in the garage.’

### 2.2.2.1 Resolution rules

*Resolution rules* (RES rules) are defined by equal contribution of feature values from the two conjuncts towards the valuation of the gender feature. RES rules operate on the goal (*Goal Resolution accounts*) or on the probe (*Probe Resolution accounts*) to compute a single (resolved) feature value. For the RES rules operating on the goal, it is the Conj-head that operates with feature unification or feature intersection rules to percolate a single feature value for ConjP (Dalrymple and Kaplan 2000; Wechsler 2008; Corbett 1983; 1991; see Franks and Willer-Gold 2014 for feature percolation; Despić 2016; Murphy and Puškar 2018; cf., Adamson and Anagnostopoulou submitted for Italian). In contrast, for the RES rules to operate on the verbal probe, the probe first has to simultaneously target and copy the gender feature values from the two conjuncts (Citko 2018). A consequence of RES rules postulated to operate in the two domains, the gender feature on the probe is predicted to be valued either, in one fell swoop, by targeting the *resolved* valued ConjP (*Goal Resolution accounts*), (1a); or, subsequent to copying of the gender feature values from the two conjuncts and application of the RES rules (*Probe Resolution account*), (1b).

In instances of congruent features on the two conjuncts, RES rules effortlessly compute the single value: conjuncts congruent in their gender feature resolve to agreement in shared

---

<sup>2</sup> Independent of its analytical value, *default value insertion* as described here remains agnostic to the choice of the ‘masculine’ gender – referring to all-male or mixed gender groups for the inserted gender feature value (for discussion see Marušič et al. 2015).



gender (e.g., distributive reading), as seen in example (6). In instances where the feature values of the two conjuncts are incongruent, as shown in example (5), various RES rules have been proposed to avoid feature conflict – including rules favouring the gender value most prominent in the discourse (e.g., masculine in South Slavic, masculine personal (viril) in Polish, Citko 2018, or animate/human in Bantu, Corbett 2006; see Lyskawa 2021 for grammar-external resolution); and, morphological rules such as impoverishment rules deleting all but the *least* marked feature (e.g., neuter, underspecified or absent in gender value, Willer-Gold et al. 2016, Franks and Willer-Gold 2014; or masculine, the least marked gender on the Markedness hierarchy, Murphy and Puškar 2018). Notably, then in their empirical coverage, RES rules often overlap with *default value insertion* rule, i.e., masculine gender (cf., Murphy and Puškar 2018).

And, finally, the conflict in feature values can, alternatively, block the application of RES rules with feature percolation resulting in no value for the maximal projection ConjP (Franks and Willer-Gold 2014). An issue resolved by the Default Value Insertion Rule.

### 2.2.2.2 Default value insertion rule

In contrast to RES rules, the *default value insertion* rule (DVI rule) is indicative of the inability to access gender features on the two conjuncts used to calculate a single value for the ConjP goal, either directly or via the ConjP (*Goal Resolution accounts*), (1a). The DVI rule can operate simultaneously (parallel grammars) or after the (unsuccessful) application of the RES rules (rescue strategy), (6) (cf., Murphy and Puškar 2018).

The DVI rule operating on the goal is triggered by top-down or bottom-up processes. The top-down process is in operation when agreement probe stops probing at the ConjP absent in gender value; and, does not ‘peek’ inside the ConjP to recover the gender value of (either of) the two conjuncts (No-Peeking grammar Marušič et al. 2015). The alternative bottom-up process motivates default gender value insertion on the ConjP when the Conj-head is unable to compute and percolate a single feature value to ConjP either due to feature conflict or an inherent inability of the Conj-head to compute the gender feature value (Franks and Willer-Gold 2015; Marušič et al. 2015). In both scenarios, the failure to value the gender feature, and, hence, the ConjP as an active goal is rescued by insertion of a *default value* – masculine gender.

For the presented accounts, *default value insertion* points to a prevention of a syntactic failure of a probe to agree in gender feature with its goal, rescued by a process of masculine value insertion on the ConjP facilitating successful feature valuation on the probe, (1a). Alternatively, the DVI rule has been argued to be indicative of a syntactic failure rescued by a late morpho-phonological process operating on the probe, (1b), (Nevins and Weisser 2019; cf., Coon and Keine 2001 for Feature Gluttony).

Finally, a crucial contrast exists between *Goal* and *Probe Resolution accounts*, as for the latter with the probe not targeting ConjP, (1b), operation of the DVI rule does not need to be postulated.<sup>3</sup>

### 2.2.2.3 Resolution of neuter singular conjuncts

Notably, not all Resolution is as effortless as implied for congruent gender combinations. One of the agreement patterns in Croatian that is well-described but hard to theoretically capture pertains to the coordination of two neuter singular conjuncts (Corbett 1991; Franks and Willer-Gold 2014; Willer-Gold et al. 2016; Despić 2016; cf., Marušič et al. 2015 for dual in Slovenian). The coordination of two singular masculine or feminine conjuncts predictively resolves to masculine and feminine (plural) via RES rules or, alternatively, to masculine (plural) via the DVI rule as indicated by the morphological inflection of the agreeing verb, in (7a) and (7b), respectively.

(7) Croatian

- a. Ormar i stol su izgoril-i u požaru.  
wardrobe.masc.sg and table.masc.sg aux.pl burn.masc.pl in fire  
'The wardrobe and the table were burnt in the fire.'
- b. Kuć-a i štal-a su izgoril-e/-i u požaru.<sup>4</sup>  
house.fem.sg and barn.fem.sg aux.pl burn.fem.pl/masc.pl in fire  
'The house and the barn were burnt in the fire.'

However, as exemplified in (8a), the coordination of two neuter singular conjuncts yields masculine plural on the agreeing verb, and as indicated alternative neuter plural is ungrammatical (see section 4.2.2). This is in contrast to the otherwise grammatical neuter plural morphological inflection on the agreeing verb with the subject that is a simple neuter plural noun or a

---

<sup>3</sup> In reference to absence of DVI rule postulated for the Probe accounts, the authors thank the anonymous reviewer for pointing out a logical possibility for DVI rule to operate on the probe under equal conditions to those on the goal. Namely, the failure of resolution to compute the gender value on the probe could initiate the DVI repair operation to intervene and prevent further failure of the derivation. As this option has not been considered by the Probe accounts, I leave this point for future investigations.

<sup>4</sup> Corbett (1983) notes animacy effects with default masculine when the two conjoined feminine nouns are animate, (i). In (ii), feminine plural agreement on the participle refer to a group that consists exclusively of female referents.

(i) Njegova žena i njegova tetka su jučer došle/?\*i.  
his wife.fem.sg and his aunt.fem.sg are yesterday arrived.pl.masc  
'His wife and his aunt arrived yesterday.'

(ii) Njegova snaga i njegova pažnja su posvećeni  
his strength.fem.sg and his attention.fem.sg are dedicated.pl.masc  
toj borbi.  
that fight  
'His strength and his attention are dedicated to that fight.'

coordination of two neuter plural conjuncts, in (8b); indicating that the unavailability of neuter plural agreement with the neuter singular conjuncts stems from the neuter *singular* itself rather than the operability of Resolution.

(8) Croatian

- a. Stabl-o i gnjezd-o su izgoril-i/\*-a u požaru.  
 tree.neut.sg and nest.neut.sg aux.pl burn.masc.pl/neut.pl in fire  
 ‘The tree and the nest were burnt in the fire.’
- b. Stabl-a (i gnjezd-a) su izgoril-i/-a u požaru.  
 tree.neut.pl and nest.neut.pl aux.pl burn.masc.pl/neut.pl in fire  
 ‘The trees (and the nests) were burnt in the fire.’

To account for this contrast, Franks and Willer-Gold (2014) suggest that masculine gender in (8a) is determined at the early stages of the derivation when the neuter noun first merges with the Conj-head. Due to the absence of the interpretative value for the gender feature on the noun, the gender feature value is blocked from percolation and the default masculine is inserted. Arsenijević (2017; 2021) elaborates on the interpretative component underlying this process by relating gender to classifier systems, allowing him to posit individuation vs mass distinction. Neuter, corresponding to the absence of the relevant individuation classifier feature, fails to form a properly individuated plural meaning (distributive interpretation), leading to the insertion of masculine plural (collective interpretation).

### 2.3 The identifying property of the *locus* of Resolution

This section has provided a description of conjunct agreement procedures proposed to account for the complex patterns of agreement alternations in Croatian, and South Slavic languages, more generally. Focusing on Resolution, RES rules have been proposed to *resolve* the (conflicting) features from *multiple feature* goals and the DVI rule to *prevent* the failure of agreement in *no feature* goal. Crucially, while RES rules have been postulated to operate on the goal and on the probe, under the *Probe Resolution account*, there is no requirement for the DVI rule to operate on the probe (as nothing blocks targeting and copying the feature values from the two conjuncts onto the probe). In order to formulate an experimentally testable hypothesis informative for the theoretical discussion on the *locus* of Resolution (see the novel self-paced reading study in Section 4.2), the *locus* of Resolution can be more precisely defined – on Goal: *early* Resolution operates ConjP internally predicting that the maximal projection ConjP is valued for gender feature (e.g., *resolved/default* masculine gender) and as such is an active target for copying of the gender value and valuation of the matching gender feature on the probe, (1a);<sup>5</sup> in contrast, on Probe: *late*

---

<sup>5</sup> Agreement is predicted to interact with discourse-semantics and potentially correlate with the collective reading of resolution rules (e.g., Corbett 2006) (Franks and Willer-Gold 2014; Marušić et al. 2015).

Resolution, and valuation, operates on the probe after copying of the gender value from the two conjuncts, predicting that no valued gender feature (e.g., (*resolved/default*) masculine gender), or even gender feature itself, is present on the maximal projection ConjP for copying and valuation of the gender feature of the probe, (1b).

The next section details the underlying assumptions of the theoretical accounts that derive the posited identifying property of the *locus* of Resolution, and, consequently, motivate the distribution of the presented accounts into *Goal* and *Probe Resolution* accounts.

### 3 Theoretical approaches to Resolution

#### 3.1 Resolution from Goal to Probe

The complex pattern of conjunct agreement alternations in (South) Slavic has motivated a surge of theoretical accounts questioning the structure of the conjunction phrase (Franks and Willer-Gold 2014), the order of merge and agree operations (Murphy and Puškar 2018), the operational component of agree-copy (Marušič et al. 2015), as well as agreement with single vs multiple goals and single vs split-probes (e.g., Bošković 2009; Citko 2018).

The primary concern of the current paper is the remark put forward in the theoretical literature by Citko (2018) that questions the standard assumptions about the *locus* of operation of Resolution and with it the valuation by the *resolved/default* masculine gender feature on the ConjP. The long line of theoretical research on conjunct agreement in (South) Slavic considers conjunction phrase as the primary domain for the internal application of Resolution in order to supply its maximal projection with the gender value targeted for copy and valuation by the probe. However, as pointed out by Citko, there is no a priori reason why there should be a bias for Resolution to operate ConjP internally, i.e., on the goal.

Citko questions the mechanics of feature percolation by pointing out the absence of morphological cues of Resolution on the Conj-head (or the ConjP), i.e., no inflectional marking of Resolution on the Conj-head (or ConjP), suggesting that neither the Conj-head (nor subsequently the ConjP) have agreement feature(s).<sup>6</sup> This leaves the two conjuncts as the sole source of gender feature and hence, the (inherently) active goals for the agreeing probe. The proposed account makes a crucial prediction, namely that the operating domain of Resolution is not the goal, but the probe – after the features from the two conjuncts have been copied over. Contrasted with the standard approaches, Citko’s analysis of ConjP agreement presents a theoretically interesting and experimentally testable contrast for the *locus* of Resolution – on goal or on probe – a contrast

---

<sup>6</sup> cf., (i) where the genitive case assigning preposition, *od*, blocks Resolution.

(i) \*Olovk-e                    od papir-a                    su            prodan-i.  
pen.masc.pl.nom of paper.masc.sg.gen aux.sg sold.masc.pl  
‘Paper pens were sold.’

that will be directly experimentally tested by the novel self-paced reading study presented in Section 4.2.

In the remainder of this section, the theoretical accounts of conjunct agreement with special reference to Resolution are considered in detail; on the one hand, to demonstrate the diversity of the theoretical landscape, and on the other, to distribute the presented accounts according to the identity property of Resolution into *Goal* or *Probe Resolution* accounts.

### 3.2.1 Goal Resolution accounts

The first two theoretical accounts of Resolution considered under *Goal resolution* approaches, postulate that the ConjP is valued for a full set of phi-features – the gender feature included. Accordingly, under these accounts, in subject-verb agreement, the ConjP acts as a single active goal for the agreeing probe.

Franks and Willer-Gold (2014) account of resolution argue that gender feature on ConjP is computed ConjP internally and feed by percolation to ConjP; RES rules proceed via unification – in the case of congruent features, and, via the DVI rule – in the case of feature conflict or in absence in the feature value on a conjunct (e.g., neuter singular conjuncts in example (8)). The account further proposes a structure where the conjuncts are ConjPs, namely, the NP is merged with its own ConjP projecting Conj-head – [ConjP2 [ConjP1 Conj1 NP1] [Conj'2 Conj2 NP2]]. Consequently, as resolution applies in parallel to structure building, the maximal projection is inevitably valued for gender feature. The valued gender feature on ConjP (or a single conjunct NP) contributes to the maximal projection targeted as a single goal by a single (non-split) probe. The example in (9) supports the single goal-single probe approach, demonstrating that agreement with two *singular* conjuncts with incongruent gender features is restricted to masculine gender agreement on the verbal probe (cf., Consistency Principle, Marušič et al. 2015). The contrast in grammaticality with the neuter and feminine plural agreement on the verb indicates that a probe *cannot* independently target gender feature of a (single) conjunct, and number feature on the ConjP (for detailed discussion on the precise derivation of the masculine value in (9) see Franks and Willer-Gold 2014).

- (9) Croatian (Franks and Willer-Gold 2014)
- a. Sel-o                    i    rijek-a        su    zagađen-i/\*-e/\*-a.  
     village.neut.sg and river.fem.sg aux.pl polluted.masc.pl/fem.pl/neut.pl
- b. Zagađen-i/\*-e/\*-a                    su    sel-o            i    rijek-a.  
     polluted.masc.pl/fem.pl/neut.pl aux.pl village.neut.sg and river.fem.sg  
     ‘The village and the river are polluted.’

Murphy and Puškar’s (2018) rule ordering account of conjunct agreement equally argues for the gender value(s) on the ConjP to be internally sourced. Resolved agreement is derived by

the c-selecting Conj-head consecutively merging with its two conjuncts; followed by the Conj-head probing each conjunct to copy its gender feature. The two accumulated gender features project up to the maximal projection ConjP from which they are visible to a higher phi-agreeing probe. To account for resolution of two incongruent gender features copied on the probe, the account introduces a further assumption – a Conj-head prespecified for the default masculine gender. Once this head is (optionally) selected from the lexicon, the ConjP inherits three gender values later copied onto the probe. Notably, to derive a single gender value for the agreeing verb, resolution operates post-syntactically by deleting all but the least marked value of the probe’s gender features resulting in masculine agreement (for detailed discussion on the precise mechanics of constraint-driven impoverishment rules deriving masculine value see Murphy and Puškar 2018). Consequently, Murphy and Puškar’s distributed account of resolution posits that although the (default) masculine value can be already present on the goal, its resolved status is attributed after *copy* on the probe.

In contrast to the two presented accounts, the final account of resolution considered in this section argues that the Conj-head *cannot* compute its own gender value; and, as a consequence, ConjP *cannot* be inherently specified for gender feature. According to Marušič and colleagues (2015), in *No-Peeking* grammar, a probe first targets the ConjP goal to agree with its number feature and *copy* its *plural* value; and, only consequently targets the ConjP goal to agree with its gender feature. As no value for gender feature is found on ConjP by the probe, in order for the probe to successfully agree in gender with ConjP, the default masculine gender value is inserted on the ConjP ([–singular → +masc]), and copied onto the probe.

In sum, the three presented accounts of Resolution in South Slavic argue for a *resolved/default* masculine value to be present on the ConjP prior to *copy*, and, consequently, gender feature valuation on the probe. Note, though, with Murphy and Puškar’s (2018) account distributing the status of *masculine* across the goal and the probe, respectively; Franks and Willer-Gold (2014) and Marušič and colleagues (2015) accounts present a clear example of *Goal resolution* approaches. This distinction will be relevant for the precise formulation of the experimental hypothesis for the novel experimental study presented in Section 4.2.

### 3.2.2 Probe Resolution approach

The two accounts considered for *Probe resolution* approaches assume that the Conj-head *cannot* compute the value for the gender feature (only for the number feature), and, hence, no gender feature (value) is present on the ConjP. Crucially, the sole bearers of the (grammatical) gender feature, and, hence, the (inherently) active goals for the probing verb within the conjunction phrase, are the two nouns.

Citko’s (2018) account of resolved agreement argues for a gender probe to agree with the two conjuncts. This instance of Multiple Agree simultaneously copies the gender features of

the two conjoined nouns onto the probe. The feature resolution of the two (conflicting) values operates on the probe in line with the language specific gender feature RES rules. Notably, with the two conjoined nouns being (inherently) active goals, no requirement is in place for operation of the DVI rules. Citko's account then represents a clear example of the *Probe resolution* approach.

In his tentative account of resolution, Bošković (2009) assumes that a single (split-)probe can target two independent goals. Assuming that no value for gender feature is present on ConjP, the probe is forced to agree with two local goals – the ConjP to value its number feature and the higher conjunct to value its gender feature. This configuration, inevitably, leads to a lethal ambiguity as the (subject) ConjP is blocked from being successfully pied-piped to SpecTP. To resolve this conflict and avoid agreement failure, Bošković tentatively suggests that the valued gender on the probe is deleted and replaced by a (default) masculine value.

### 3.3 The locus of Resolution from the theoretical perspective

Contending Resolution, and in particular the DVI rule, is an omnipresent alternative yielding a *masculine* value for an unvalued gender feature on the maximal projection ConjP (see section 2.2.2), the criteria singled out as a valid contender for identifying the *locus* of Resolution can be further reduced to the following contrast between the two *Resolution* accounts: *Goal Resolution* accounts – the presence of the resolved *masculine* gender value prior to; or, *Probe Resolution* account – (only) after *copying* of the feature(s) from the goal(s) onto the probe. More to the point, the contrast can be stated in the following terms: the presence or absence of the resolved *masculine* gender value on the ConjP, *single feature* goal (*Goal Resolution Accounts*), (1a), or *no feature* goal (*Probe Resolution Account*), (1b), respectively. As summarised in **Table 2** below, the presented accounts of Resolution in South Slavic can then be distributed according to this refined *locus* of Resolution criteria under *Goal* and *Probe Resolution* approaches in reference to a single criteria – the presence of the *resolved* masculine value, i.e., active gender feature, on ConjP goal (see the last line of **Table 2**). Further reduction or precision of the criteria to ‘the masculine gender value’ (in contrast to ‘the *resolved* masculine gender value’), refereeing to the first instance of inclusion of the masculine value in the derivation, unambiguously distributes Murphy and Puškar's 2018 and Bošković's 2009 accounts into *Goal* and *Probe Resolution* accounts, respectively.

In conclusion, the relevance of formulating the research question in simple terms by focusing on a single aspect of the theoretically detailed landscape of Resolution in South Slavic is to empower an experimentally testable and theoretically informative hypothesis. The advantage the *locus* of Resolution criteria indicated by the presence of the *resolved* masculine gender on ConjP prior to or after *copy* has for the experimental study, and in particular, the experimental design, will become evident in the next section.

The <i>locus</i> of Resolution	Goal (Resolution approaches)		Probe (Resolution approach)	
	RES rules	DVI rule	RES rules	DVI rule
Franks and Willer-Gold 2014	✓	✓		
Murphy and Puškar 2018		✓	✓	
Marušič et al. 2015	✓	✓		
Citko 2018			✓	
Bošković 2019				✓
<b>Resolved masculine gender on ConjP</b>	✓	✓	X	X

**Table 2:** The *locus* of Resolution criteria. Theoretical hypothesis space for the experimental study.

## 4 The *locus* of gender Resolution: Experimental studies

The objective of this section is to experimentally explore the question of the *locus* of gender Resolution and to put forward experimental evidence for the *Goal Resolution* accounts and/or the *Probe Resolution* account informative for the theoretical discussion. Therefore, section 4.1 revisits one of the promising but overlooked experimental pieces of production time data on gender conjunct agreement that resulted from the elicited production study on South Slavic varieties (Willer-Gold et al. 2018), to introduce existing empirical evidence of Resolution, particularly focusing on the masculine plural inflectional morpheme on the agreeing verbal target. Section 4.2 further contributes with novel reaction time data from a specially designed self-paced reading study that capitalises on the identified single criteria for the *locus* of Resolution (see section 2.3 and 3.3) to directly contrast predictions from the *Goal* and *Probe Resolution* accounts.

### 4.1 Production: Elicited production study

In a large scale elicited production study, Willer-Gold and colleagues (2016/2018) collected conjunct agreement data on native speakers of South Slavic languages, Slovenian and BCS ( $n = 180$ ). The study focused on subject-verb agreement, with the conjunction of two *plural* conjuncts placed pre- and post-verbally. To freely elicit the variety of conjunct agreement strategies (see section 2.2), the speakers were first presented with a model sentence followed by a prompt. Their task was to complete the prompt using the model sentence as a template. The model sentence comprised of a simple NP subject in masculine singular agreeing with a past participle verb followed by an adverb (preverbal order: subject-verb-adverb; postverbal order: adverb-verb-subject). The prompt was a conjunction phrase. The combination of three gender features on NP1 and NP2 (and plural number) were used to form nine combinations with the conjuncts congruent



(MM, FF, NN) or incongruent (MF, MN, FM, NM, FN, NF) in gender value, (6) and (7). The inflectional morpheme produced on the agreeing past participle was transcribed for the gender feature in order to calculate the production rate of the single- and ConjP-agreement strategies for each of the nine ConjP combinations. An additional measure of production time was collected for each condition. The results of these two measures with the special focus on the (resolved) *masculine* value of the gender feature – production rate and production time, are presented in Section 4.1.1 and 4.1.2, respectively. As discussed in what follows, of particular interest to the *Goal-Probe Resolution* theoretical alternatives is the second production time measure.

#### 4.1.1 Production rate

The elicited production rates indicate that the *masculine* was produced on the agreeing verbal target in all nine conditions in preverbal order, see **Table 3**. These production rates varied across conditions due to interaction of two factors: (i) the additive contribution of two dominant agreement strategies, ConjP-agreement and single-closest conjunct agreement; and, (ii) the gender value of non-masculine conjunct(s), neuter and feminine.<sup>7</sup> The production rate of masculine plural in the masculine congruent condition (the combination of the two masculine conjuncts, MM), was 100%, with ConjP-agreement and single-(closest) conjunct agreement contributing the same value, masculine, to this result. In non-masculine congruent conditions, the combination of two neuter or feminine conjuncts, masculine plural was produced at the lower rate compared to the shared gender, (NN = M:12%, FF = M:15%), (6), with the unique contribution of ConjP-agreement to the production of the masculine on the agreeing past participle. The production rate of masculine plural in the masculine incongruent conditions varied relative to the order and gender values of the two conjuncts. This interaction is observed, for example, in the combination of neuter and masculine conjuncts with a higher rate of masculine produced in the condition where masculine was the second (closest) conjunct (NM = M:92%, MN = M:55%); with additive contribution of ConjP-agreement and closest-conjunct agreement. In the non-masculine incongruent conditions, the combination of neuter and feminine conjuncts, where ConjP and single (closest-)conjunct agreement are argued to transparently compete. In these conditions, the production rate of masculine strongly competes with that of the closest conjunct particularly when the closest conjunct is neuter, with a lower production rates observed for masculine with the closest neuter conjunct (FN = M:38% or NF = M:52%), (5), (see section 2.2.2.1 and Willer-Gold et al. 2016 for neuter derived by resolution rules additionally contributing to this low % of masculine plural). In contrast, when the ConjP subject was placed post-verbally, there was a significant reduction in production rates of *masculine* (M = 2–5%) in conditions other than MM, MN, and MF (compared to single(closest-)conjunct agreement M/F/M = 90–95%), suggesting

---

<sup>7</sup> In the elicited production study, across conditions, neuter gender feature contributed higher agreement rate compared to feminine feature (Willer Gold et al. 2016).

unavailability of ConjP-agreement with postverbal subjects (cf., Smith 2017). In sum, the elicited production data direct the research domain of Resolution to pre-verbal contexts.

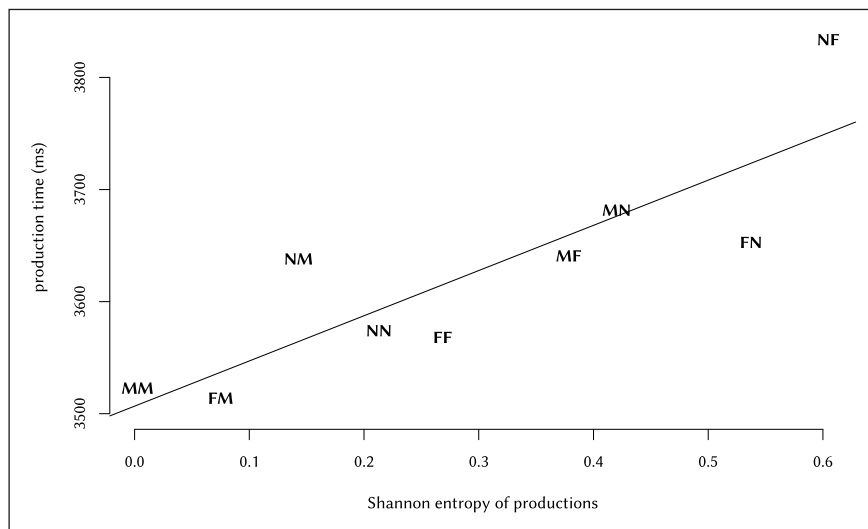
<b>Experiment 1: Preverbal Conjunct Agreement</b>			
<b>SV</b>	<b>M</b>	<b>F</b>	<b>N</b>
<b>MM</b>	100%	0%	0%
<b>FF</b>	15%	85%	0%
<b>NN</b>	12%	0%	88%
<b>MF</b>	75%	25%	0%
<b>MN</b>	55%	0%	45%
<b>FM</b>	97%	3%	0%
<b>NM</b>	92%	0%	8%
<b>FN</b>	36%	11%	53%
<b>NF</b>	46%	36%	18%
<b>Experiment 2: Postverbal Conjunct Agreement</b>			
<b>VS</b>	<b>M</b>	<b>F</b>	<b>N</b>
<b>MM</b>	100%	0%	0%
<b>FF</b>	3%	97%	0%
<b>NN</b>	2%	0%	98%
<b>MF</b>	100%	0%	0%
<b>MN</b>	98%	0%	2%
<b>FM</b>	10%	90%	0%
<b>NM</b>	5%	0%	95%
<b>FN</b>	5%	91%	4%
<b>NF</b>	5%	2%	93%

**Table 3:** Elicited production study: Conjunct agreement. Production rates in % (BCS and Slovenian, Willer-Gold et al. 2016).

#### 4.1.2 Production time

The production time was the second measure collected in the elicited production study reported in Willer-Gold and colleagues (2018). Note that this measure was only calculated for the agreement with the preverbal subjects. The production time is a temporal measure, quantifying the time it takes the speaker to produce the prompted response. In this study, the production time was a measure of a time window recorded from the onset of a stimulus presentation to the end of the prompted sentence production when the participant pressed the button to continue to the next model sentence.

The results presented in **Figure 2** show that the shortest production times were recorded for the masculine congruent condition (MM) and the longest for the non-masculine incongruent conditions (FN and NF). As argued by the authors, these production times are predicted by the uniformity of productions as summarised in **Table 4** listing the individual exponents per condition (nine gender combinations) and per agreement strategy (Resolution, closest-conjunct agreement and distant conjunct agreement). In masculine congruent condition, ConjP agreement and single-conjunct agreement yield uniform feature values (masculine, masculine, masculine) matched in uniformity with their (syncretic) morphological exponents (-i, -i, -i).<sup>8</sup> In stark contrast, in the non-masculine incongruent conditions, each agreement strategy yields a different gender value (masculine, neuter/feminine, neuter/feminine) mapped onto non-uniform morphological exponents (-i; -a, -e; -e, -a). The masculine incongruent conditions (NM and FM), where the two dominate strategies, ConjP-agreement and single closest-conjunct agreement, yield uniform feature values (masculine, masculine) mapped onto syncretic morphological exponents (-i, -i) result in comparatively faster reading times to the previous two conditions, (see also MN and MF); with comparable reading times measured for the non-masculine congruent conditions, matched in the degree of uniformity (NN and FF, (neuter/feminine, neuter/feminine) (-a, -e; -a, -e)). To summarise the findings, the results indicate the production times for the nine gender combinations in preverbal order strongly correlate with the uniformity of gender value transparently mapped onto the morphological exponent produced on the agreeing verb, with the equal degree of uniformity of productions computed via dominate strategies resulting in faster production time.



**Figure 2:** Elicited production study: Conjunct agreement. Production times in ms (BCS and Slovenian, Willer-Gold et al. 2018).

<sup>8</sup> (-i, -i, -i, ) correspond to (Resolution, closest-conjunct agreement, distant-conjunct agreement).

	Resolution	Closest-conjunct agreement	Distant-conjunct agreement
MM	-i	-i	-i
FN, NF	-i	-a, -e	-e, -a
NM, FM	-i	-i	-a, -e
MN, MF	-i	-a, -e	-i
NN, FF	-i, -a, -e	-a, -e	-a, -e

**Table 4:** Elicited production study: Conjunct agreement exponents (BCS and Slovenian, adapted based on Willer-Gold et al. 2016; 2018).

Contending uniformity of productions is estimated at the late stage of sentence production and is a measure of the processing cost of uniformity of the productions for the agreeing verb, it is valid to question if this production data should be considered as empirical evidence for the *Probe* or *Goal Resolution* accounts. Notably, in contrast to *Goal Resolution*, *Probe Resolution* account predicts *late* valuation of the gender feature on the verbal probe (only) after copying and Resolution of the (conflicting) gender feature values from the two nominal conjuncts.

However, a few words of caution are in order. Firstly, the presented times are a gross measure capturing production at the sentence level rather than the agreeing verb.

Secondly, it is important to dissociate the conflict in feature values indicated by low uniformity resulting from (multiple) alternative agreement procedures operating in parallel and yielding conflicting gender values for a single (or multiple) probe(s) (e.g., -i; -a,-e; -e,-a); from the conflict resulting from incongruent gender values on the two conjuncts (e.g., neuter and feminine) which once resolved contribute a single value for the probe. Arguably, with the latter subsumed under the former, only the former has an impact on the production times (see section 2.3 and 2.4) (note though that the same mechanism could be recruited to resolve the two conflicts, e.g., impoverishment rules).<sup>9,10</sup> Crucially, then, if uniformity is an estimation of conflict resolution over (multiple/in parallel) valued probe(s) – the (resolved) masculine value included, the production times provide at best only indirect evidence for the *locus* of Resolution to be on the Probe.

And, thirdly, with the production times capturing production at the sentence level, the observed effect could reflect speakers taking longer to read the second conjunct when conflicting

<sup>9</sup> Note that certain accounts of conjunct agreement would predict that the conflict arises after linearisation (Marušič et al. 2016).

<sup>10</sup> In both instances, the uniformity effect is predicted to be enforced by the transparent mapping of gender feature values to morphological inflection (see Table 1).

in gender value with the first conjunct. In this case, longer production times could be an indication not of the variance of morphological exponents on the verb but rather of cumulative effects from reading the coordinated subject. This potential of competition being resolved at the earlier stage of sentential processing is explored in the novel self-paced reading study presented in the next section. Confirmation of Resolution taking place at an earlier stage would offer experimental evidence in support of the *Goal Resolution* accounts.

## 4.2 Comprehension: Self-paced reading study

Resolution has standardly been assumed to operate ConjP internally, with the resolved masculine gender value readily available on the maximal projection ConjP – the goal, to be copied by the agreeing verbal probe (Franks and Willer-Gold 2014; Murphy and Puškar 2018; Marušič et al. 2015). However, as pointed out by Citko (2018), there is no a priori reason why there should be a bias for these mechanisms to operate in the subject domain leading her to posit that resolution operates on the probe. As argued in the previous sections, this leads to a direct contrast in predictions of the two theoretical approaches with respect to the *locus* of Resolution – on the Goal or on the Probe. Moreover, Citko’s argument is particularly valid as there is no morphological inflection on the ConjP subject indicative of Resolution. The uniquely transparent indicator of this process is morphological inflection on the (upcoming) agreeing verb. Therefore, with the morphological confirmation of resolution present at the agreeing verb, a methodological question arises of how to experimentally verify the predicted presence of the *resolved* masculine gender already in the subject domain, with the confirmation supporting *Goal Resolution* accounts.

To experimentally explore the possibility of Resolution operating at an early stage of incremental sentence processing when/after reading the ConjP subject, in the absence of a formal cue to be used as an unambiguous indicator of this process, the self-paced reading study described below harnesses insights from the psycholinguistic literature on prediction.

### 4.2.1 Predicting (grammatical) gender

Prediction refers to a cognitive process by which present contextual and linguistic information can be used to access new input in advance during rapidly evolving discourse (Kutas and Hillyard 1984; Kamide 2008). Psycholinguistic studies of word-level prediction have consistently shown that grammatical gender feature is a valid predictor of an upcoming target noun (see Sekerina 2012; Akhutina et al. 1999 for Russian; see Badecker and Kuminiak 2007 for Slovak; see Wicha, Moreno, and Kutas 2003; 2004 for Spanish; see van Berkum et al. 2005 for Dutch; Fuchs 2022 for heritage speakers). The early detection of a violation of this prediction is signalled by a significant increase in processing cost replicated across languages and methods suggesting that (grammatical) gender prediction arises routinely and effortlessly.

In their study of anticipating words in discourse, Van Berkum and colleagues (2005) have shown that discourse information not only allows readers to predict the semantic features of the upcoming target noun but to instantaneously activate predictions about its grammatical gender. This study used context to constrain the prediction about the upcoming target noun down to a single lexical item (*the bookcase*) and, crucially, its gender feature (common), seen in example (10). To validate the prediction, the experimental design manipulated the gender feature on the adjective preceding the target noun with prediction-consistent (neuter) and prediction-inconsistent (common) inflectional agreement. The strength of the gender prediction was reflected in the strength of the disruption in sentence processing by the *unexpected* gender value on the agreeing adjective (neuter). The small but reliable disruption to the evolving sentential interpretation was quickly picked up by the readers at the adjective, i.e., before the target noun was presented. This result was taken as evidence for the presence of grammatical gender prediction available to the speakers before they read the adjective. In their ERP experiment, this disruption was signalled by positive deflection in the ERP waveform and in the self-paced reading experiment by slowdown in reading times.

- (10) Self-paced reading and ERP study: nominal paradigm (Dutch, Van Berkum et al. 2005)  
*De inbreker had geen enkele moeite de geheime familiekluis te vinden. ....*  
 [The burglar had no trouble locating the secret family safe.]
- a. Deze bevond zich natuurlijk achter een groot maar onopvallend schilderij.  
 [Of course, it was situated behind a big-neuter but unobtrusive painting-neut.]  
 (consistent)
  - b. Deze bevond zich natuurlijk achter een grote maar onopvallende boekenkast.  
 [Of course, it was situated behind a big-common but unobtrusive bookcase-com.]  
 (inconsistent)

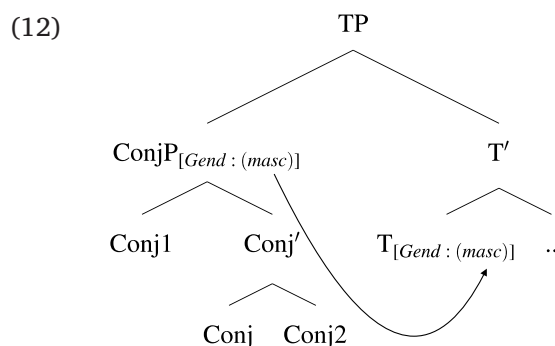
In the eye-tracking study on spoken word-recognition, Sekerina (2012) has shown that the grammatical gender inflectionally marked on the adjective acts as a predictor of the upcoming target noun. In this study, speakers were presented with a scene containing four pictures of concrete objects (mis)matched in colour and/or gender (masculine and feminine) with the target noun featured in the auditorily presented sentence, in (11). The study investigated the eye-movements to the target object focusing on two critical regions lined up with the auditory presentation of the adjective, the verb, and the noun. To investigate the earliness of this anticipatory effect, the experimental design manipulated the distance between the colour adjective and the noun, with the noun immediately following the adjective as in (11a) and being split from the adjective by an intervening verb as in (11b). The study captured an early effect of gender with the fixations to the target object observed ahead of the auditory presentation of the target. Additionally, at the critical verb region in the split-constituent condition, the listeners looked significantly more to the target object in the scene that contained the colour competitor mismatched compared to

the one matched in gender. This was taken as evidence that the prediction is retained across an intervening verb.

- (11) Eye-tracking study on spoken word-recognition: Nominal paradigm (Russian, Sekerina 2012)
- a. Krasnuju mašinku položite v Poziciju 6 (constituent condition)  
 red.fem.acc car.fem.acc put in Position 6
- b. KRASnuju položite mašinku v Poziciju 6 (split-constituent condition)  
 RED.fem.acc put car.fem.acc in Position 6

#### 4.2.2 Predicting resolved masculine gender

The current study builds on the research into (grammatical) gender prediction by extending the classic gender prediction paradigms to subject-verb agreement and in particular to the conjunction phrase in subject position. The study is concerned with the conjunction of two (inanimate) plural nouns with congruent and incongruent (grammatical) gender in the pre-verbal subject position and agreement in gender formally marked on the (upcoming) past-participle verb.<sup>11</sup> The study sets out to experimentally validate the assumption posited by the *Goal Resolution* approaches – the presence of valued *resolved* gender feature on  $\text{ConjP}_{[\text{Gend:masc}]}$ , (1a) repeated below as (12).



<sup>11</sup> The subject(/attractor)-verb agreement paradigm has been extensively used in (gender) attraction agreement studies. For example, Tucker and colleagues (2021) use a subject-verb agreement paradigm and embed the attractor in the subject relative clause. However, the focus of these studies was not on the predictive strength of grammatical gender but rather on the mechanisms accountable for agreement illusions (Wagers et al. 2009, among others).

(i) Self-paced reading study : Verbal paradigm (Arabic, Tucker et al. 2021)

ʔal-mutarʔim-u ʔallaii saa ad-a ʔal-raʔiis-a ʔahjaanan ja-takallamu xamsata  
 translator.nom comp.masc.sg helped.3.masc.sg president.acc often 3.sg.masc.speaks five  
 luYaata-in bi-fasaa hatin.  
 languages.acc with fluency

‘ The translator who helped the president-fem often speaks five languages with fluency.’

In order to achieve this, we start by positing a simple linking assumption that the representation of gender feature value on maximal projection ConjP in subject position activates a *single* masculine gender, henceforth < masc >, used by the parser to predict the value of the gender feature of the upcoming agreeing verbal target, masculine, (13); this assumption does not hold for the *Probe Resolution* approach. It follows that when reading the two nouns conjoined by a formal cue of coordination, the conjunction *i*, the parser incrementally access the grammatical genders of the two nouns and, at that point, can either (i) derive a single representation of gender to predict the gender on the upcoming target verb, (14a); or, (ii) withhold derivation of such a representation until reading the verbal target, (14b).

(13) ConjP<sub>[Gend:masc]</sub> ..... V<sub>[Gend:masc]</sub> < masc > prediction  
 < masc > ..... < masc >

(14) a. [NP1&NP2]<sub>[Gend:masc]</sub> ..... V<sub>[Gend:masc]</sub> *Goal Resolution* approaches  
 < masc > ..... < masc >

b. [NP1&NP2] ..... V<sub>[Gend:masc]</sub> *Probe Resolution* approach  
 <gend&gend> ..... < masc >

To validate activation of < masc > by the representation of gender on ConjP, ConjP<sub>[Gend: masc]</sub>, the postulated activation of < masc > should hold under two conditions.

Firstly, with < masc > activated by the [Gend: masc] on ConjP goal, in line with the *Goal Resolution* approaches, resolved masculine prediction is hypothesised to be activated early (even) ahead of reading the verbal target, rather than at the verbal target. This latter parse is predicted by *Probe Resolution* account with the resolved masculine prediction activated by the representation of the valued (grammatical) gender on the probe. From these two conditions, it follows that any disruption caused by encountering a < masc > -inconsistent gender (e.g., neuter) on the verbal target should be quickly picked up; and, its effects should be measured *early* – at the first encounter of the verbal target, (15a).

Secondly, in line with the observations that *resolved* masculine is an omnipresent agreement alternative, and, hence, present under any combination of (grammatical) genders on the conjoined nouns, < masc > should hold in the absence of formal cues of masculine gender (masculine nouns) in the subject domain, (15c) and (15d).

In line with the *early* < masc > hypothesis, at the first encounter of masculine agreeing verb consistent with the < masc > prediction, no increase in reading times is expected for any gender combination of conjuncts in (15), but crucially, not even for conjunction of two non-masculine



nouns, (15c) and (15d).<sup>12</sup> If confirmed, this prediction would support the assumption that [Gend: masc] can be represented on ConjP in the total absence of formal cues of masculine gender in the subject domain. Furthermore, in contrast, an increase in reading time is predicted at the first encounter of agreeing verb that is *inconsistent* with < masc > (e.g., neuter). Confirmation of these two predictions for the paradigm in (15) would support the representational status of [Gend: masc] on Goal and, hence, provide experimental evidence in support of the *Goal Resolution* approaches.

- (15) Croatian
- |    |  |     |                 |        |                                |
|----|--|-----|-----------------|--------|--------------------------------|
| a. | Mobiteli   | i   | tableti         | su     |                                |
|    | cell phones.masc.sg                                      | and | tablets.masc.sg | aux.pl |                                |
|    | uključen-i/*-a.  |     |                 |        | MM...M/N                       |
|    | plugged in.masc.pl/neut.pl                               |     |                 |        |                                |
|    | ‘The cell phones and the tablets were plugged in.’       |     |                 |        |                                |
| b. | Zglobovi   | i   | stopala         | su     | stavljen-i/*-a u gips.         |
|    | joints.masc.sg   | and | feet.neut.sg    | aux.pl | put.masc.pl/neut.pl in plaster |
|    | ‘The joints and the feet were briefly put (in plaster).’ |     |                 |        |                                |
| c. | Sablje   | i   | koplja          | su     | pričvršćen-i/*-a.              |
|    | sabers.fem.sg  | and | spears.neut.sg  | aux.pl | attached.masc.pl/neut.pl       |
|    | ‘The sabers and the spears were attached (to the wall).’ |     |                 |        |                                |
| d. | Skladišta  | i   | dvorišta        | su     | očišćen-i/*-a.                 |
|    | warehouses.neut.sg                                       | and | yards.neut.sg   | aux.pl | cleaned.masc.pl/neut.pl        |
|    | ‘The wardrobe and the mirror were cleaned.’              |     |                 |        |                                |

In the paradigm presented in (15), < masc >-*inconsistent* neuter gender on the verbal target performs two functions. Firstly, it provides an ungrammatical contrast to, postulated, grammatical masculine agreement on the verbal target, in (15a). Secondly, it introduces a comparatively strong grammatical alternative – single-closest conjunct agreement strategy (preferred agreement alternatives in South Slavic, see section 4.1.1); which is inevitably expected to be processed in parallel (or even compete) with ConjP-agreement (see section 2, **Figure 1**), in (15b)–(15d). Presumably, with the closest-conjunct agreement parse, the grammatical gender of the second noun, supported by the formal cue on the neuter gender noun, receives an

---

<sup>12</sup> It is worth noting that with the nine possible gender combinations of conjoined nouns, not all are equally informative candidates to answer the research question at hand. In particular, when two inanimate nouns are conjoined, neuter gender has been observed to interact more strongly with the resolution mechanisms (and number feature) than the feminine gender (for gender markedness effects in two and three gender languages see Villata and Franck 2019 for French; and Slioussar and Malko 2016 for Russian). Therefore, in accordance with the research question, nine conditions can be collapsed to feature a subset of informative conditions.

additional boost in activation, <neut>, predicting the presence of neuter gender on upcoming agreeing verbal target, (15b)–(15d).<sup>13</sup> It follows that due to the parallel activation of the two parses – ConjP (<masc>) and closest-conjunct agreement (<neut>), no difference in reading time should be measured at the verbal target when the verb is morphologically inflected for masculine compared to neuter for the gender combinations with second conjunct neuter noun, (15b)–(15d); to the exclusion of conjunction of two masculine nouns as the (ConjP and) closest-conjunct agreement strategy only predicts masculine gender on the agreeing verbal target, (15a).

Notably, in testing for the representation of ConjP<sub>[Gend: masc]</sub>, the issue of multiple parses due to availability of multiple agreement strategies in the language presents a challenge to any attempt to constrain the paradigm to a standard 2\*2 factorial design with a *single* (un)grammatical agreement strategy. One strategy to achieve this aim would be to block or suppress the parse of closest-conjunct agreement by priming ConjP-agreement; potentially a challenge in itself with the high level of intra- and inter-individual variation in speakers of South Slavic languages. Second strategy would be to *exclude* the alternative closest-conjunct agreement parse from the paradigm. This could be achieved in two ways. First, by reducing the paradigm in (15) to a smaller set of gender combinations excluding feminine/masculine and neuter combinations, (15b) and (15c); and, hence, *freeing* feminine gender to induce the ungrammatical contrast on the verbal target for the remaining two gender combinations, (15a) and (15d). This paradigm would allow for direct contrast between <masc> congruent (grammatical) – masculine verbal target and <masc> incongruent (ungrammatical) – feminine verbal target, with the latter causing disruption in processing measured by the increase in reading times. However, although the alternative agreement would not be directly encoded in the paradigm, the paradigm does not exclude activation of additional <neut> prediction in (15d).<sup>14</sup> And, second, to attempt to fully exclude the possibility of activating additional <neut> prediction. This latter option is being pursued below.

To control for the alternative single-closest-conjunct agreement parse, we posit a second paradigm in (16) which capitalises on the predictions of Consistency Principle which states that single-conjunct agreement strategy is *only* available for conjuncts matched in *plural* number with the probe (Marušič et al. 2015). Paradigm in (16) iterates gender combinations from paradigm in (15), with the conjoined nouns being in singular number in order to block closest-conjunct

---

<sup>13</sup> Note that assuming <neut> prediction could be activated by the *resolution rules* (e.g., impoverishment rule) on the probe, as noted in section 2.2.2.1, this assumption would only affect conditions with conflicting gender conjuncts, (15b) and (15c), predicting additional facilitation in processing neuter agreement on the verbal.

<sup>14</sup> Considered paradigm, reduces the set of testable gender combinations, and, importantly, disallows for the direct comparison in terms of reading time signatures of Resolution with another grammatical (and preferred) agreement alternative.

agreement parse in (16b)–(16d). Consistency Principle, consequently, predicts a disruption measured by the increase in reading times at the encounter of target verb morphologically inflected for neuter gender and plural number – not only for the masculine congruent combination of the two nouns, (16a), but, equally, for the combinations of the singular nouns where the second noun is in neuter gender, and in particular where both nouns are in neuter gender, (16b)–(16d) (see section 2.2.2.3). In contrast, assuming that the activation of <masc> is triggered by ConjP subject, and as such is uniformly available for any given combination of gender and number conjoint nouns, verbal target morphologically inflected for *masculine plural* is expected to be processed without any additional cost, (16).<sup>15</sup> The reading time signatures for the singular conjuncts conditions, (16), are, hence, predicted to parallel those for the combination of plural masculine conjoined nouns, (15a).

(16) Croatian

- a. Ormar                    i    prozor                    su    počišćen-i/\*a.  
wardrobe.masc.sg and window.masc.sg aux.pl clean.masc.pl/neut.pl  
‘The wardrobe and the window were cleaned.’
- b. Ormar                    i    ogledal-o                su    počišćen-i/\*-a.  
wardrobe.masc.sg and mirror.neut.sg aux.pl clean.masc.pl/neut.pl  
‘The wardrobe and the mirror were cleaned.’
- c. Olovk-a                i    ravnal-o                su    pospremljen-i/\*-a.  
pencil.fem.sg. and ruler.neut.sg aux.pl put away.masc.pl/neut.pl  
‘The pencil and ruler have disappeared.’
- d. Stabl-o                i    gnjezd-o                su    izgoril-i/\*-a                u požaru.  
tree.neut.sg and nest.neut.sg aux.pl burn.masc.pl/neut.pl in fire  
‘The tree and the nest were burnt in the fire.’

The two number-congruent conjuncts (mis)matched in number feature with the target verb are directly compared in (17). Moreover, if the representation of ConjP<sub>[Gend: masc]</sub> is uniformly available, no difference in reading times is predicted for the singular and plural number congruent conjuncts at the *masculine plural* verbal target. Alternatively, assuming that the mismatch in formal cues on the conjuncts and the verb induces processing cost, the two singular conjuncts mismatched in number feature with the *masculine plural* verb should induce longer reading times at the verbal target compared to two conjuncts matched in number values, (17) (see also (16) and (15), respectively).

---

<sup>15</sup> In the case of singular conjuncts, the increase in reading times for the non-masculine verbal target, neuter, in particular in combinations where the second conjunct is a neuter noun, would provide support for the theoretical approaches to conjunct agreement that argue against the split-probe where the number-probe targets ConjP for number valuation and gender-probe is independently valued by a single-(closest) conjunct.

## (17) Croatian

- a. Ormar-i/-Ø            i    prozor-i/-Ø            su    počišćen-i.  
wardrobe.masc.pl/sg and window.masc. pl/sg aux.pl clean.masc.pl  
'The wardrobe and the window were cleaned.'
- b. Ormar-i/-Ø            i    ogledal-o/-a            su    počišćen-i.  
wardrobe.masc.pl/sg and mirror.neut.pl/sg aux.pl clean.masc.pl  
'The wardrobe and the mirror were cleaned.'
- c. Olovk-e/-a            i    ravnal-a/-o            su    pospremljen-i.  
pencil.fem.pl/sg and ruler.neut.pl/sg aux.pl put away.masc.pl  
'The pencil and the ruler have disappeared.'
- d. Stabl-a/-o            i    gnjezd-a/-o            su    izgoril-i            u požaru.  
tree.neut.pl/sg and the nest.neut.pl/sg aux.pl burn.masc.pl in fire  
'The tree and nest were burnt in the fire.'

Finally, the elicited production study on conjunct agreement in South Slavic indicated that the production rate of masculine agreement with the gender combinations featuring in the paradigm in (15) and (16) incrementally decreases from (a) to (d) (masculine in MM:100% > MN:55% > FN:36% > NN:12%); and, that the two sub-sets of (in)congruent (NN, MM/MN, FN) gender combinations cluster together in their production times, (a) and (d) and (b) and (c) (Willer-Gold et al. 2016; 2018). Assuming processing symmetry in production and comprehension of agreement dependencies (cf., Villata and Franck 2019; Slioussar and Malko 2016), we could expect to observe variation in facilitation at the masculine agreement target (in terms of timing or size of the effect, see discussion in section 4.2.4), relative to the gender combination of the conjuncts with, for example, NN combination either eliciting longer or shorter reading times at the verb, respectively, compared to the other three conditions.

To conclude the discussion on the (grammatical) *resolved* masculine gender prediction, the activation of < masc > at the *early* stage of sentence processing, in the ConjP subject domain, is predicted by the *Goal Resolution* accounts. To test that the (early) effect of gender persists at the (linear) distance, the auxiliary, *su*, and the adverb, *uredno*, intervened between the ConjP and the agreeing verbal target, (18).

- (18) Ormar/-i            i    prozor/-i            su    uredno    bil-i  
wardrobe.masc.sg/pl and window.masc.sg/pl aux.pl properly be. masc.pl  
počišćen-i.  
clean.masc.pl  
'The wardrobe and the window were properly cleaned.'

Conversely, the *Probe Resolution* account predicts that the verb as a *locus* of *Resolution* is the *locus* of < masc >. Therefore, the violation of < masc > is expected to be observed not at the verb but

at the next agreeing target (if not before). To accommodate this expectation, the study capitalises on the double past-participle in the verb domain: the be-participle and the lexical-participle. This solution allows to track the timing of Resolution, with *Goal Resolution* accounts predicting the ungrammaticality effect to be observed on the be-participle, *bila*, and the *Probe Resolution* account for it to be measured only later on the lexical-participle, *počišćena*, (18).

In sum, the paradigms in (15)–(17) verify the postulated representation of  $\text{ConjP}_{[\text{Gend: masc}]}$  activating  $\langle \text{masc} \rangle$ -prediction after reading the two nouns in the subject conjunction phrase. Paradigm in (15) included an agreement alternative to *Resolution* with disruption in processing expected with  $\langle \text{masc} \rangle$  inconsistent agreement on the target verb (neuter) *only* for conjunction of two masculine nouns, as well as no disruption in processing of  $\langle \text{masc} \rangle$  consistent agreement on the target verb with conjunction of non-masculine nouns. Paradigm in (16) established a clear bidirectional grammaticality contrast with disruption in processing expected *only* for  $\langle \text{masc} \rangle$  inconsistent agreement on the target verb (neuter). Finally, paradigm in (17) contrasts singular and plural congruent conjuncts and predicts to observe no increase in processing of the  $\langle \text{masc} \rangle$  consistent verbal target with the singular congruent conjuncts. In the experimental study detailed in the following sections, these three paradigms were split across three self-paced reading experiments as summarised in **Table 5**.

EXP	conjunction phrase					verb
	number	gender				participle
	SG/PL	MM	NN	MN	FN	be-/lexical- participle
EXP 1	PL	✓	✓	✓	✓	M.PL
		X	✓	✓	✓	N.PL
EXP2	SG	✓	✓	✓	✓	M.PL
		X	X	X	X	N.PL
EXP3	SG	✓	✓	✓	✓	M.PL
	PL	✓	✓	✓	✓	M.PL

**Table 5:** Complete set of conditions for Experiments 1–3 and predictions of grammaticality.

#### 4.2.3 Methods

The study used the self-paced reading task to verify the predictions of the *Goal Resolution* approaches by testing the early representation of the resolved masculine gender on the maximal projection  $\text{ConjP}$  that activates  $\langle \text{masc} \rangle$  in the subject position predicting the value of the gender feature at the (upcoming) agreeing verbal targets – be-participle and lexical-participle. The self-paced reading study is the first of its kind that uses the classic prediction paradigms

to discern the representation and the processing of the resolved masculine gender at the ConjP maximal projection and the impact it has for the two theoretical approaches: *Goal Resolution* approaches and the *Probe Resolution* approach.

#### 4.2.3.1 Participants (Experiment 1–3)

The self-paced reading data from 99 native speakers of Croatian were collected at University of Zadar and University of Zagreb, Croatia (Exp1:28, Exp2:36, Exp3:35). Participants were university students (age = 22.6; female = 81, male = 18). Participants provided informed consent and received course credit for their participation.

#### 4.2.3.2 Design and materials (1–3)

The same set of materials was used for Experiments 1, 2, and 3 as exemplified in **Table 6**. The experimental sentences consisted of [adverb-conjunction phrase-auxiliary-adverb-be participle-lexical participle-adverb]. In Experiments 1 and 2, the experimental sentences consisted of 48 sentence sets arranged in a  $4 \times 2$  design with subject *conjunction phrase* (MM/NN/MN/FN) and *verb* (M/N) as factors. In experiment 1, the two conjuncts were plural. In Experiment 2, the two conjuncts were singular. In Experiment 3, the experimental sentences consisted of 48 sentence sets arranged in  $4 \times 2$  design with *gender* (MM/NN/MN/FN) and *number* (SG/PL) as factors of the subject conjunction phrase. In Experiments 1 and 2, the *verb* was in masculine plural (M.PL) and neuter plural (N.PL). In Experiment 3, the *verb* was in masculine singular (M.SG) and masculine plural (M.PL). In Experiments 1, 2, and 3, the *verb* was composed of a be-participle and a lexical-participle, which were l-participles in plural and matched in gender, corresponding to the relevant condition. The conjoined nouns were inanimate and concrete with unambiguous grammatical gender to avoid semantic agreement and maximise projection of the resolved masculine gender. A manner adverb intervened between the auxiliary and the be-participle to increase the distance between the ConjP subject and the agreeing participles to verify the retention of the representation of the masculine gender. The 48 sentences were intermixed with 60 filler sentences. The filler sentences were all grammatical, varied in complexity, and contained a non-conjoined subject.

In accordance with the research question, the regions of interest in the study were two (consecutive) past-participles inflectionally marked for gender (and number) feature.

#### 4.2.3.3 Procedures

A moving-window self-paced reading paradigm was used to present the materials on the computer screen. IbxFarm online experimental platform was used for material presentation (Drummond 2011). Participants were instructed to read at a natural pace and answer comprehension questions.

	R1	R2	R3	R4	R5	R6	R7	R8
	<b>Adv</b>	<b>NP1</b>	<b>and</b>	<b>NP2</b>	<b>aux</b>	<b>adv</b>	<b>be-ptcp</b>	<b>lexical-ptcp</b>
EXP1	In spite of a heavy storm	the airplane M.PL	and	the ferry M.PL	were	properly	being M/N.PL	driving M/N.PL
EXP2	In spite of a heavy storm	the airplane M.SG	and	the ferry M.SG	were	properly	being M/N.PL	driving M/N.PL
EXP3	In spite of a heavy storm	the airplane M.SG/PL	and	the ferry M.SG/PL	were	properly	being M.PL	driving M.PL
sen- tence	Usprkos snažnom nevremenu	avioni	i	trajekti	su	uredno	bili	vozili
								po rasporedu.

**Table 6:** Complete item set for one sentence for Experiments 1–3.

Each session began with the presentation of six practice items followed by the experimental items. In each trial, participants were first presented with a masked sentence before proceeding to reveal masked words one-by-one by pressing the space bar. A subset of filler items was followed by yes/no comprehension questions to ensure that participants were attentive. The question referred to the statement expressed by the filler sentence and was not a measure of interest for the analysis. The order of experimental items and fillers was randomised by participant. A session lasted approximately 15 minutes.

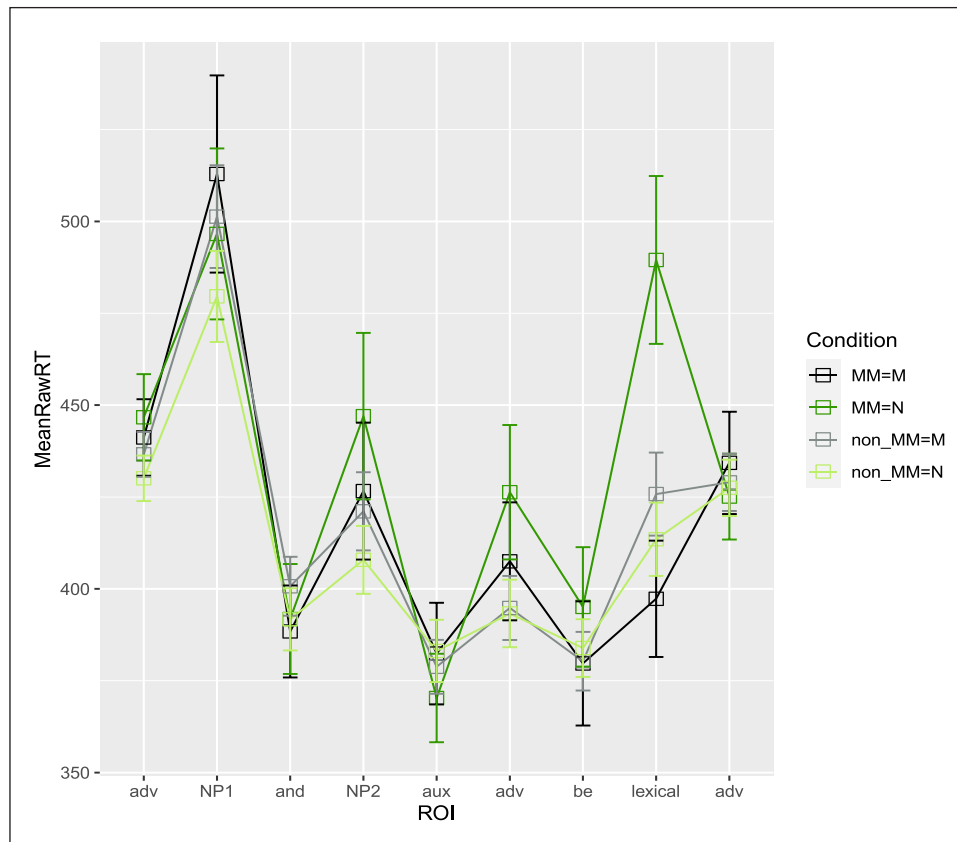
#### 4.2.3.4 Analysis

Reading times data was processed as follows. Reading times shorter than 120ms and longer than 2500ms were removed (Exp1 = 1.6%, EXP2 = 1.1%, EXP3 = 0.9%). The analysis focused on two critical regions of interest: the be- participle and the lexical-participle as indicated in **Table 6**. Reading times were analysed with the mixed-effects linear regression LME4 package in R (R Core Team 2021; Bates et al. 2015). The dependent variable of the lmer models were the raw reading times (raw RT) in milliseconds for the two critical regions of the be- and lexical-participles. The independent variables were the two factors (*conjunction phrase* and *verb*) and their interactions. Random effects for all models assumed correlated varying intercepts and slopes for items and participants for all conditions and their interactions. Model formula *raw RT* ~ *conjunction phrase* \* *verb* + (1 | part) + (1 | item) was used, with effect coding for *conjunction phrase/gender* (-1,-0.5,0.5,1), *conjunction phrase/number* (EXP3) and *verb/gender* (EXP1-2) (-0.5,0.5). The models were computed to address two research questions. First, the predictive strength of the <masculine> prediction across the full sets of gender combinations; and, second, the grammaticality of the neuter plural on the agreeing participles.

#### 4.2.3.5 Results

Experiment 1 results are plotted in **Figure 3**. For the critical region of the be-participle, no difference in reading times can be observed between M-vs N-*verb* conditions. The expected slowdown in reading times for the ungrammatical MM = N condition is not visible in the plotted data in **Figure 3**, a result confirmed by the statistical analysis finding no significant effect in this region of the be-participle. This result is expected for NN/MN/FN-*conjunction phrase* conditions but not for the MM-*conjunction phrase* as N-*verb* neither result from ConjP- nor closest-conjunct agreement (see **Table 5**). The expected slowdown in reading times for the MM = N condition is observed (only) at the second encounter of the agreeing verb, at the critical region lexical-participle as reflected in the interaction of *conjunction phrase\*verb* for the MM condition (ROI: lexical-ptcp  $t = -3.361$ ,  $p = 0$ ). This delay in increase in reading time in the ungrammatical condition will be discussed in detail in the next section. No significant effect of a *conjunction phrase\*verb* interaction was found for the remaining three conditions. The results of the analysis for Experiment 1 are summarised in **Table 7**.



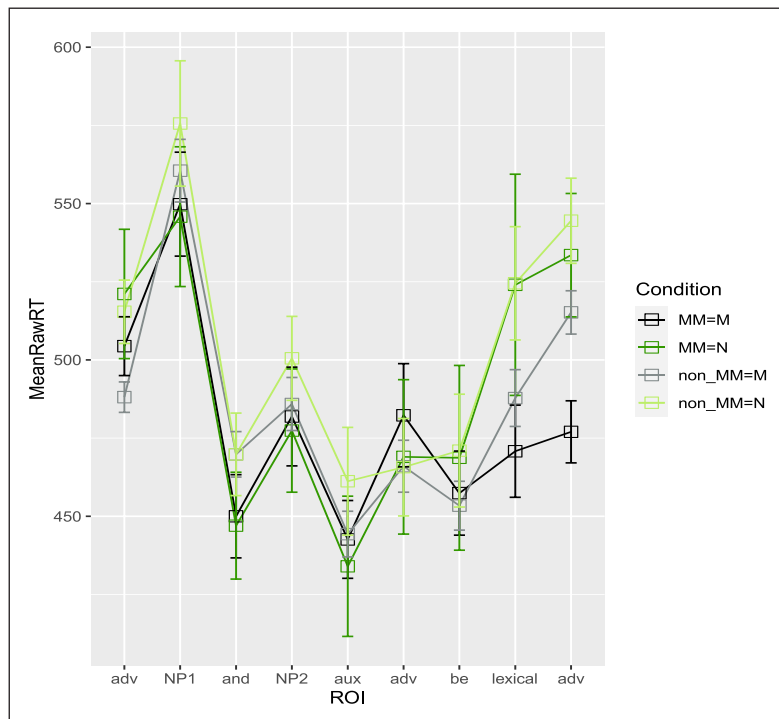


**Figure 3:** Self-paced reading study: Experiment 1. Raw mean reading times for all regions of interest (ROI) contrasting merged MM and non-MM conditions calculated across participants and items.

Conditions	ROI	Factor	Estimate	Std. Error	df	t value	p
MM vs FN	be						
		<i>conjunction phrase</i>	8.125	22.878	44.075	0.355	0.724
		<i>verb</i>	8.819	10.670	1300.155	0.827	0.409
		<i>conjunction phrase*verb</i>	4.688	21.345	1300.124	0.220	0.826
MM vs FN	lexical						
		<i>conjunction phrase</i>	-24.419	30.982	43.016	-0.788	0.4349
		<i>verb</i>	11.463	10.621	1272.716	1.079	0.2806
		<i>conjunction phrase*verb</i>	-70.616	21.013	1272.782	-3.361	0

**Table 7:** Self-paced reading study. Experiment 1. Summary of statistical analysis results.

Experiment 2 results are plotted in **Figure 4**. As expected, a clear slowdown is observed in reading times for ungrammatical N-*verb* conditions at the two critical regions, the be-participle and the lexical-participle. The statistical analysis confirms this main effect of grammaticality as indicated by the effect of *verb* (ROI: be-ptcp  $t = -2.317, p = 0.01$ ; ROI: lexical-ptcp  $t = 2.792, p = 0.01$ ), and no *conjunction phrase* nor *conjunction phrase\*verb* interaction. These results align with the predictions summarised in **Table 5**. The results of the analysis for Experiment 2 are summarised in **Table 8**.

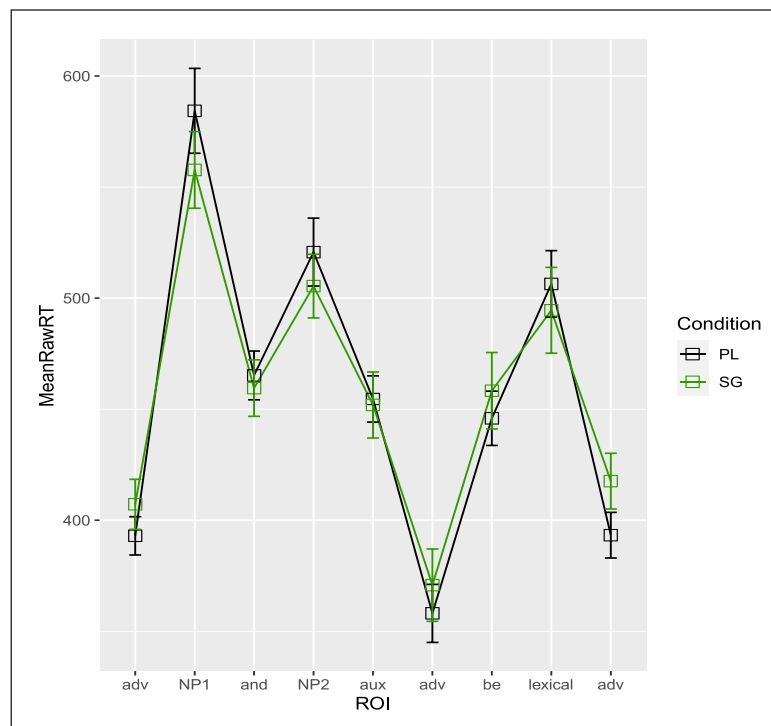


**Figure 4:** Self-paced reading study: Experiment 2. Mean raw reading times for *verb* at verb regions contrasting merged gender conditions calculated across participants and items.

Conditions	ROI	Factor	Estimate	Std. Error	df	t value	p
MM vs FN	be						
		<i>conjunction phrase</i>	11.591	23.944	34.975	0.484	0.6313
		<i>verb</i>	-104.662	45.176	34.599	-2.317	0.01
MM vs FN	lexical						
		<i>conjunction phrase</i>	16.681	40.538	36.253	-0.411	0.6831
		<i>verb</i>	-179.859	64.421	43.524	-2.792	0.01
		<i>conjunction phrase*verb</i>	7.046	81.077	36.253	0.087	0.9312

**Table 8:** Self-paced reading study. Experiment 2. Summary of statistical analysis results.

Experiment 3 results plotted in **Figure 5** show no significant slowdown between the two grammatical conditions, an expected result. No effect of *gender* or *number* nor their interaction was confirmed by statistical analysis. These results suggest that the prediction of *masculine plural* on the agreeing participle is independent of number (and gender) values of the two conjuncts congruent in number feature. The results of the analysis for Experiment 3 are summarised in **Table 9**.



**Figure 5:** Self-paced reading study: Experiment 3. Mean raw reading times for *number* at verb regions calculated for merged *gender* four conditions across participants and items.

Conditions	ROI	Factor	Estimate	Std. Error	df	t value	p
MM vs FN	be						
		<i>conjunction phrase</i>	3.050	14.644	57.782	0.208	0.836
		<i>verb</i>	2.900	5.453	2646.324	0.532	0.595
		<i>conjunction phrase*verb</i>	-7.301	10.795	2653.519	-0.676	0.499
MM vs FN	lexical						
		<i>conjunction phrase</i>	4.987	14.258	59.205	0.350	0.728
		<i>verb</i>	-8.257	8.010	2651.878	-1.031	0.303
		<i>conjunction phrase*verb</i>	-3.185	10.197	2647.973	-0.312	0.755

**Table 9:** Self-paced reading study. Experiment 3. Summary of statistical analysis results.

#### 4.2.4 General discussion

In the self-paced reading experimental study, two results stand out: (1) the early, robust and sustained detection of the prediction-inconsistent agreement (N-*verb*) observed at the first encounter of the verbal target (the be-participle) (Experiment 2); this result stands in contrast to (2) the late but robust detection of the prediction-inconsistent agreement (N-*verb*) observed at the second encounter of the verbal target (the lexical-participle) for masculine congruent condition (Experiment 1). Therefore, the first result is considered as baseline against which to interpret the second result.

This first result confirms that the parser is responsive to prediction violations with the significantly longer reading time measured for the prediction-*inconsistent* than prediction-*consistent* verbal target. This contrast in reading time signatures maps directly onto the ungrammatical and grammatical status of the eight experimental conditions, respectively; validating the methodology used in this study and the manipulation controlled for by the design. More to the point, this first result is predicted by *Goal Resolution* accounts arguing that the gender feature on the maximal projection ConjP is valued by the resolved masculine gender (irrespective of the gender combination of the two (singular) conjoined nouns); and, as such ConjP presents an active goal for copying of the feature values to the agreeing probe. In comparison, in Experiment 1, in the masculine *incongruent* conditions, no difference in reading times was observed for <masc>-consistent and -inconsistent agreement on the verbal target. The absence of disruption points to the grammatical status of the two alternative agreement strategies – the ConjP agreement-Resolution (<masc>) and the single-closest conjunct agreement (<neut>), suggesting the two strategies are (equally) available to the parser (with no indication of competition between the two strategies) (see also Experiment 3 results Section 4.2.3.).<sup>16</sup>

The second result is of special interest as it indicates the peculiar behaviour of the MM plural condition – the delay in capturing the disruption induced by <masc> prediction *inconsistent* agreement on the verbal target. Namely, in the masculine congruent condition, the violation expected to be observed at the first encounter of the verbal target, the be-participle, is delayed till the second encounter, the lexical-participle. This inconsistency of the result across the two participles is not *directly* predicted by the *Goal Resolution* accounts (see discussion in section 4.2.4.1); but falls in line with the predictions of the *Probe Resolution* account arguing that Resolution operates on the verbal probe after the probe has copied the gender features from the two conjuncts. In accordance with the *Probe Resolution* account, occurrence of the violation is expected to be observed at the second encounter of the verbal target with the <masc>-prediction activated later, when reading the second past-participle. However, this pattern of

---

<sup>16</sup> Note that a more detail analysis of the reaction times comparing non-masculine congruent conditions could be more informative to discern the nature of the processing of the two strategies – in parallel or in competition, however this is beyond the scope of this paper.

delayed effect of < masc > (whether disruptive or facilitatory) does not generalised to other conditions where the activation of < masc >-prediction is expected to be activated in the same manner, i.e., no such delay is observed for the ungrammatical conditions, in Experiment 2; and, more to the point, no delay is observed for the masculine incongruent conditions (FN and NN) crossed with *M-verb*, in Experiment 1. Finally, the (cumulative) facilitation of reading *M-verb* at the second encounter is predicted by both accounts.

Crucially, neither *Goal* nor *Probe Resolution* accounts can offer a comprehensive and straightforward explanation as to why this late effect is uniquely observed in the ungrammatical condition in the Experiment 1 experimental paradigm. The next section presents three findings from the experimental studies on agreement that, when consolidated, offer a formulation of a processing proposal that captures the late gender effects under the *Goal Resolution* approaches.

#### 4.2.4.1 Late effect of gender for *Goal Resolution* approaches

The late effect of gender indicated by the delay in detecting the unexpected gender agreement, has previously been reported for the self-paced reading studies. Van Berkum and colleagues' (2005) gender prediction study reported a three-word delay after the critical region. The authors speculated that a stronger (double) disconfirmation might be required in reading paradigms for the participants to pick up the gender inconsistency (compared to the ERP). Tucker and colleagues' (2021) agreement attraction study consistently found gender effects in the verb + 1 region, and hence after the verb region where the grammaticality effects were expected to first occur. Furthermore, their study compared the timing and strength of the gender and the number effects and found that the gender effects were larger and occurred later relative to the number effects. Finally, in a similar way, Lago and colleagues' (2015) study, notably for number agreement, found a time delay in attraction effects relative to grammatical agreement with reading time signatures suggesting that the readers first detected the ungrammaticality which triggered *reanalysis*, captured as attraction effect.<sup>17,18</sup>

These observations then seem to suggest that the observed delay is not due to the ungrammaticality itself not being present on the (verbal) target, but to the processes that allow us to measure the perception of the disruption; and, so, we note on three findings from the

---

<sup>17</sup> Note also that in Experiment 1-3 no spill-over effects were found in post-verbal region.

<sup>18</sup> Lago and colleagues propose that the observed time delay of attraction effects favours a two-stage predict-retrieve model with retrieval activated upon violation detection – a processing model that could be further explored to test the predictions of the *Probe Resolution Accounts*. An alternative to the current experimental paradigm designed to further verify the predictions of the *Probe Resolution Accounts* could apply manipulate the distance between the two participles, placing the be-participle after the auxiliary and before the (intervening) adverb; and, the gender on the be- and lexical- participle that would resulting in four conditions (MM/NN = MM, MM/NN = NN, MM/NN = MN, MM/NN = NM).

experimental studies on agreement that, considered together, offer a formulation of a proposal that can capture the late gender effects under the *Goal Resolution* approaches.

Firstly, Schlueter and colleagues' (2019) study on number attraction using acceptability judgment found evidence suggesting that the illusionary licensing of the incongruent number agreement on the verbal target by the attractor is due to a low-level feature-checking process with no impact on the structural or semantic interpretation of the sentential subject. This model allows for the formulation of a component of the proposal that distinguishes processing of the be-participle and the lexical-participle in the self-paced reading study. With the be-participle contributing to the temporal rather than semantic dimension of the event, the absence of the gender effect on the be-participle is expected if only the low-level checking of the resolved masculine prediction-incongruent gender is being performed at this stage. Note though that in contrast to the attraction study paradigm, no formal cue supporting the prediction *inconsistent* neuter gender, i.e., neither conjunct contained a neuter noun, appeared in the relevant MM-N-*verb* condition, suggesting that additional factors should be considered.

Secondly, Chow and Chen's (2020) audio-picture matching study of classifier-noun agreement showed that the detection of a prediction-inconsistent value in the audio input can be used to promptly revise the existing prediction when the target matching this prediction-inconsistent value is also available in the picture scene of that trial. This finding opens the possibility that the accommodation of the inconsistent/ungrammatical agreement on the verbal target should proceed only when the same verbal target is grammatical for another condition featured in the same experimental paradigm. This finding allows us to postulate the second component of the proposal that contextualises the impact of the second alternative single-closest conjunct agreement parse in the experiment paradigm of the Experiment 1 (compared to Experiment 2 and 3).

Thirdly, similarly to the presented study, Palmović and Willer-Gold's (2016) ERP study on conjunct agreement found that the set of agreement alternatives included in the experimental paradigm modulates cognitive mechanisms involved in processing of single-(distant)-conjunct agreement. The memory related component was activated only when Resolved agreement was excluded from the experimental paradigm; inclusion of the resolved agreement in the experimental paradigm activated the language specific component. This finding points to the significance of the paradigm internal ecological validity when studying a phenomena rich in alternations.<sup>19</sup> The choice of the agreement alternative(s) within a single experimental paradigm has an effect on processing of the (un)grammatical condition.

---

<sup>19</sup> The term 'ecological validity' standardly refers to the performance of the experimental conditions in the natural world settings. Here the concept is borrowed to refer to a set of agreement alternatives that are naturally determined by a particular paradigm, i.e., paradigm internal natural setting.

With these findings in mind, we hypothesise that despite the lack of a morphologically overt formal cue in the ungrammatical MM\*N-*verb* condition, an alternative grammatical closest-conjunct agreement <neut> prediction is active in the paradigm triggered by the three non-masculine congruent conditions (NN\*N-*verb*, MN\*N-*verb*, and FN\*N-*verb*). The co-existence of the two agreement alternatives in the experimental paradigm is sufficient to licence the low-level processing of the ungrammatical neuter agreement on the be-participle. And, with the be-participle not contributing to the event semantics of the sentence, the parser (due to lack of (immediate) perception of the inconsistency) (rapidly) accommodates this verbal target. The late effect of gender violation in this study is accordingly suggested to be driven by the ecological validity of the experimental paradigm which included an (equally) available agreement alternative of the single-closest-conjunct agreement to the (omnipresent) Resolved agreement. An experimental paradigm excluding this grammatical alternative is predicted to yield a different result – to obviate the late effect of gender. Notably, this was the case in Experiment 2.

To summarise, the discussion leads to the conclusion that <masc> prediction activated by the representation of the *resolved* masculine gender value on the maximal projection ConjP in the subject domain in Experiment 1 is *weakened* by the presence of an (equally) available alternative <neut> prediction. In contrast, in Experiment 2, <masc> being the only prediction triggering a strong violation at the first encounter of the verbal target. The late detection of the gender violation thus seems to correlate with the presence of the prediction-*inconsistent* but otherwise grammatical verbal target in the experimental paradigm. This conclusion is supported by the absent difference in reading times for the four gender combinations at the be-participle in Experiment 1 and the be- and the lexical-participle in Experiment 2. The discussion as constructed in this section favours the processing of <masc> as predicted by the *Goal Resolution* accounts.

## 5 Conclusion

The grammaticality effect and the late gender effect observed in Experiment 2 and Experiment 1, respectively, favour the *Goal Resolution* approaches to ConjP agreement arguing for the resolved masculine gender value to be represented on ConjP. In processing terms, the representation of the resolved gender on ConjP predicts the gender value of the upcoming verbal target. In a non-alternating experimental paradigm where the alternative single-closest-conjunct agreement is excluded (Experiment 2), the prediction-*inconsistent* agreement on the verbal target is shown to be quickly picked up by the parser, confirming the early activation of the <masc> prediction. In the alternating agreement experimental paradigm (Experiment 1), the prediction-*inconsistent* agreement on the first encounter of the verbal target is open to (quick) accommodation of another <neut> prediction available for other gender combinations of conjuncts via the alternative gender agreement strategy (closest-conjunct agreement).

The asymmetry suggested by the two experimental studies in conjunct agreement, comprehension (self-paced reading) and production (elicited production), favouring *Goal* and *Probe* approaches, respectively, finds its grounding in performance. The grammatical resolved gender feature on ConjP is quick to activate prediction in comprehension and slow to constrain gender alternatives to a single exponent in production. In the domain of conjunct agreement, it is the number of alternatives that seem to drive this asymmetry in addition to the markedness of a specific gender feature value (cf., asymmetry in comprehension and production of gender in agreement attraction studies Villata and Franck 2019 for French; Slioussar and Malko 2016 for Russian).

This tentative conclusion about the <masculine>-prediction raised by ConjP agreement should be subjected to replication and further experimental verification by other time sensitive methods (e.g., ERP and eye-tracking); experimental paradigms that include ungrammatical or erroneous baseline; other languages with agreement alternation (e.g., Arabic, Bantu); as well as other agreement features (e.g., person, number), other instances of alternative agreement (e.g., hybrids, QNP) or other instances of agreement (e.g., concord – maximise principle). Finally, as the issues discussed here out-scope the question of the *locus* of Resolution in ConjP agreement, future investigations should inform the theoretical debate on the status of nominal projection (NP/DP); as well as the psycholinguistic debate on representational vs. retrieval models and the investigations on predictions in the absence of formal cues.

---



## Abbreviations

fem, F = feminine, neut, N = neutral, masc, M = masculine, com = common, sg = singular, pl = plural, aux = auxiliary, nom = nominative, acc = accusative, gen = genitive, ptcp = participle

## Supplementary files

The Supplementary file includes experimental materials (stimuli sentences glossed and translated).

DOI: <https://doi.org/10.16995/glossa.8939.s1>

## Ethics and consent

Ethical approval for the experiments was obtained from UCL Ethics Committee prior to data collection. Informed consent was obtained on-line from the participants.

## Acknowledgements

I thank Andrew Nevins, Bojana Ristić, Lanko Marušič, Anita Peti-Stantić and Boban Arsenijević and EMSS project members for helpful comments and suggestions. I am very thankful to the two anonymous reviewers for engaging with the manuscript and providing valuable comments and suggestions as well as the editors (in particular Zheng Shen) of this special issue. Thanks to the participants of the Workshop on Agreement in Multivaluation Constructions.

## Funding information

This work was supported by Leverhulme Trust grants RPG-2018-300 (awarded to Andrew Nevins).

## Competing interests

The authors have no competing interests to declare.

---

## References

- Adamson, Luke & Anagnostopoulou, Elena. Submitted. Interpretability and gender features in coordination: Evidence from Greek. *Linguistic Inquiry*.
- Akhutina, Tatiana & Kurgansky, Andrei & Polinsky, Maria & Bates, Elizabeth. 1999. Processing of grammatical gender in a three-gender system: Experimental evidence from Russian. *Journal of Psycholinguistic Research* 28. 695–713.
- Aoun, Joseph & Benmamoun, Elabbas & Sportiche, Dominique. 1994. Agreement, word order, and conjunction in some varieties of Arabic. *Linguistic Inquiry* 25. 195–220.

- Arsenijević, Boban. 2017. Gender, like classifiers, specifies the type of partition: Evidence from Serbo-Croatian. *Proceedings from the Annual Meeting of the Chicago Linguistic Society* 52(1). 21–37.
- Arsenijević, Boban. 2021. No gender in ‘gender agreement’: on declension classes and gender in Serbo-Croatian. *Balcania et Slavia* 1. 11–46. DOI: <https://doi.org/10.30687/BES/0/2021/01/001>
- Arsenijević, Boban & Mitić, Ivana. 2016a. Effect of animacy and agentivity on the processing of agreement in Serbo-Croatian. In Halupka-Rešetar, Sabina & Martínez-Ferreiro, Silvia (eds.), *Studies in Languages and Mind, Selected papers from third Novi Sad Workshop on Psycholinguistics, Neurolinguistic and Clinical Linguistic Research*, 41–77. Novi Sad: Faculty of Philosophy.
- Arsenijević, Boban & Mitić, Ivana. 2016b. On the independence of gender with respect to number in agreement with coordinated subjects: an experimental study. *Journal of Slavic Linguistics* 24. 41–69. DOI: <https://doi.org/10.1353/jsl.2016.0006>
- Arsenijević, Boban & Willer-Gold, Jana & Aljović, Nadira & Čordalija, Nermina & Vukosav, Marijana Kresić & Leko, Nedžad & Malenica, Frane & Marušić, Franc Lanko & Milićev, Tanja & Milićević, Nataša & Mišmaš, Petra & Mitić, Ivana & Peti-Stantić, Anita & Stanković, Branimir & Tušek, Jelena & Nevins, Andrew. 2020. Elided clausal conjunction is not the only source of closest-conjunct agreement: A picture-matching study. *Syntax* 23(1). 78–104. DOI: <https://doi.org/10.1111/synt.12171>
- Badecker, William & Kuminiak, Frantisek. 2007. Morphology, agreement and working memory retrieval in sentence production: evidence from gender and case in Slovak. *Journal of Memory and Language* 56. 65–85. DOI: <https://doi.org/10.1016/j.jml.2006.08.004>
- Barić, Eugenija & Lončarić, Mijo & Malić, Dragica & Pavešić, Slavko & Peti, Mirko & Zečević, Vesna & Znika, Marija. 1997. *Hrvatska gramatika*. Školska knjiga, Zagreb.
- Bates, Douglas & Maechler, Martin & Bolker, Ben & Walker, Steven. 2015. Fitting Linear Mixed Effects Models Using lme4. *Journal of Statistical Software* 67. 1–48. DOI: <https://doi.org/10.18637/jss.v067.i01>
- Bošković, Željko. 2009. Unifying first and last conjunct agreement. *Natural Language & Linguistic Theory* 27(3). 455–496. DOI: <https://doi.org/10.1007/s11049-009-9072-6>
- Chow, Wing Yee & Chen, Di. 2020. Predicting (in)correctly: listeners rapidly use unexpected information to revise their predictions. *Language, Cognition and Neuroscience* 35(9). 1149–1161. DOI: <https://doi.org/10.1080/23273798.2020.1733627>
- Citko, Barbara. 2004. Agreement asymmetries in coordinate structures. In Arnaudova, Olga (ed.), *Formal approaches to Slavic linguistics: The Ottawa meeting 2003*, 91–108. Ann Arbor, MI: Michigan Slavic Publications.
- Citko, Barbara. 2018. Complementizer agreement with coordinated subjects in Polish. *Glossa: a journal of general linguistics* 3(1). 124. DOI: <https://doi.org/10.5334/gjgl.588>
- Coon, Jessica & Keine, Stefan. 2021. Feature gluttony. *Linguistic Inquiry* 52(4). 655–710. DOI: [https://doi.org/10.1162/ling\\_a\\_00386](https://doi.org/10.1162/ling_a_00386)
- Corbett, Greville G. 1983. *Hierarchies, Targets and Controllers: Agreement Patterns in Slavic*. Croom Helm, London.

- Corbett, Greville G. 1991. *Gender*. Cambridge, UK: Cambridge University Press.
- Corbett, Greville G. 2006. *Agreement*. Cambridge, UK: Cambridge University Press.
- Dalrymple, Mary & Kaplan, Ronald M. 2000. Feature Indeterminacy and Feature Resolution. *Language* 76(4). 759–98. DOI: <https://doi.org/10.2307/417199>
- Despić, Miloje. 2016. Coordinating gender: What can coordinate structure agreement tell us about gender? *Studies in Polish Linguistics* 11(1). 1–25.
- Drummond, Alex. 2011. *IbexFarm* (Version 0.2.7).
- Franks, Steven & Willer-Gold, Jana. 2014. Agreement strategies with conjoined subjects in Croatian. Jaworski, Sylwester & Witkoś, Jacek (eds.), *New insights into Slavic linguistics*, 91–115. Frankfurt am Main: Peter Lang.
- Fuchs, Zuzanna. 2022. Eyetracking evidence for heritage speakers' access to abstract syntactic agreement features in real-time processing. In Bayram, Faith & Kubota, Maki & Soares, Sergio (eds.), *The Next Phase in Heritage Language Studies: Methodological Considerations and Advancements*. *Frontiers of Psychology*, 13. DOI: <https://doi.org/10.3389/fpsyg.2022.960376>
- Kamide, Yuki. 2008. Anticipatory Processes in Sentence Processing. *Linguistics and Language Compass* 2(4). 647–670. DOI: <https://doi.org/10.1111/j.1749-818X.2008.00072.x>
- Kutas, Marta & Hillyard, Steven A. 1984. Brain potentials reflect word expectancy and semantic association during reading. *Nature* 307. 161–163. DOI: <https://doi.org/10.1038/307161a0>
- Lago, Sol & Shalom, Diego & Sigman, Mariano & Lau, Ellen F. & Phillips, Colin. 2015. Agreement attraction in Spanish comprehension. *Journal of Memory and Language* 82. 133–149. DOI: <https://doi.org/10.1016/j.jml.2015.02.002>
- Lyskawa, Paulina. 2021. *Coordination without grammar-feature internal resolution*. University of Maryland dissertation.
- Marušič, Franc & Nevins, Andrew & Badecker, Bill. 2015. The grammars of conjunction agreement in Slovenian. *Syntax* 18(1). 39–77. DOI: <https://doi.org/10.1111/synt.12025>
- Mitić, Ivana & Arsenijević, Boban. 2019. Plural Conjuncts and Syncretism Facilitate Gender Agreement in Serbo-Croatian: Experimental Evidence. In Mancini, Simona & Caffarra, Sandy & Nevins, Andrew (eds.), *Featural Relations in the Brain: Theoretical and Experimental Perspectives on Grammatical Agreement*. *Frontiers in Psychology* 10. DOI: <https://doi.org/10.3389/fpsyg.2019.00942>
- Murphy, Andrew & Puškar, Zorica. 2018. Closest conjunct agreement is an illusion: Evidence from gender agreement in Serbo-Croatian. *Natural Language and Linguistic Theory* 36. 1207–1261. DOI: <https://doi.org/10.1007/s11049-017-9396-6>
- Nevins, Andrew & Weisser, Philipp. 2019. Closest Conjunct Agreement. *Annual Review of Linguistics* 5. 219–241. DOI: <https://doi.org/10.1146/annurev-linguistics-011718-012708>
- Palmović, Marijan & Willer-Gold, Jana. 2016. Croatian Mixed Gender Conjuncts Agreement: an ERP Study. Special Issue: Agreement in Slavic. *Journal of Slavic Linguistics* 24(1). 137–160. DOI: <https://doi.org/10.1353/jsl.2016.0000>

- Peti-Stantić, Anita & Willer-Gold, Jana & Tušek, Jelena. 2015. Excluding Semantics in Coordination Agreement Strategies: A non-words production study in Croatian. *Agreement Across Borders Conference*. University of Zadar, Croatia.
- R Core Team. 2021. *R: A language and environment for statistical computing*. R Foundation for Statistical Computing, Vienna, Austria. <https://www.R-project.org>.
- Schlueter, Zoe & Parker, Dan & Lau, Ellen. 2019. Error-Driven Retrieval in Agreement Attraction Rarely Leads to Misinterpretation. *Frontiers in Psychology* 10. 1002. DOI: <https://doi.org/10.3389/fpsyg.2019.01002>
- Sekerina, Irina. 2012. The effect of grammatical gender in Russian spokenword recognition. In Makarova, Veronika (ed.), *Russian language studies in North America. New perspectives in theoretical and applied linguistics*, 107–132. New York: Anthem Press. DOI: <https://doi.org/10.7135/UPO9780857286505.006>
- Slioussar, Natalia & Malko, Anton. 2016. Gender agreement attraction in Russian: production and comprehension evidence. *Frontiers in Psychology* 7. 1651. DOI: <https://doi.org/10.3389/fpsyg.2016.01651>
- Smith, Peter. 2017. The syntax of semantic agreement in English. *Journal of Linguistics* 53(4). 823–863. DOI: <https://doi.org/10.1017/S0022226716000360>
- Tucker, Matthew A. & Idrissi, Ali & Almeida, Diogo. 2021. Attraction Effects for Verbal Gender and Number Are Similar but Not Identical: Self-Paced Reading Evidence From Modern Standard Arabic. In Mancini, Simona & Caffarra, Sandy & Nevins, Andrew (eds.), *Featural Relations in the Brain: Theoretical and Experimental Perspectives on Grammatical Agreement*. *Frontiers in Psychology* 11. DOI: <https://doi.org/10.3389/fpsyg.2020.586464>
- Van Berkum, Jos J. A. & Brown, Colin M. & Zwitserlood, Pienie & Kooijman, Valesca & Hagoort, Peter. 2005. Anticipating upcoming words in discourse: evidence from ERPs and reading times. *Journal of Experimental Psychology, Learning, Memory, and Cognition* 31(3). 443–467. DOI: <https://doi.org/10.1037/0278-7393.31.3.443>
- Villata, Sandra & Franck, Julie. 2019. Similarity-based interference in agreement comprehension and production: Evidence from object agreement. *Journal of Experimental Psychology: Learning, Memory, and Cognition* 46(1). 170–188. DOI: <https://doi.org/10.1037/xlm0000718>
- Wagers, Matt W. & Lau, Ellen F. & Phillips, Collin. 2009. Agreement attraction in comprehension: representations and processes. *Journal of Memory and Language* 61. 206–237. DOI: <https://doi.org/10.1016/j.jml.2009.04.002>
- Wechsler, Stephen. 2008. ‘Elsewhere’ in gender resolution. In Hanson, Kristin & Inkelas, Sharon (eds.), *The Nature of the Word: Studies in Honor of Paul Kiparsky*, 567–586. Cambridge, MA: MIT Press. DOI: <https://doi.org/10.7551/mitpress/9780262083799.003.0024>
- Wicha, Nicole Y. & Moreno, Eva K. & Kutas, Marta. 2003. Expecting gender: An event related brain potential study on the role of grammatical gender in comprehending a line drawing within a written sentence in Spanish. *Cortex* 39(3). 483–508. DOI: [https://doi.org/10.1016/S0010-9452\(08\)70260-0](https://doi.org/10.1016/S0010-9452(08)70260-0)
- Wicha, Nicole Y. & Moreno, Eva K. & Kutas, Marta. 2004. Anticipating words and their gender: an event related brain potential study of semantic integration, gender expectancy, and gender

agreement in Spanish sentence reading. *Journal of Cognitive Neuroscience* 16(7). 1272–1288. DOI: <https://doi.org/10.1162/0898929041920487>

Willer Gold, Jana & Arsenijević, Boban & Batinić, Mia & Becker, Michael & Čordalija, Nermina & Kresić, Marijana & Leko, Nedžad & Marušić, Franc Lanko & Milićev, Tanja & Milićević, Nataša & Mitić, Ivana & Peti-Stantić, Anita & Stanković, Branimir & Šuligoj, Tina & Tušek, Jelena & Nevins, Andrew. 2018. When linearity prevails over hierarchy in syntax. *Proceedings of the National Academy of Sciences* 115(3). 495–500. DOI: <https://doi.org/10.1073/pnas.1712729115>

Willer-Gold, Jana & Arsenijević, Boban & Batinić, Mia & Čordalija, Nermina & Kresić, Marijana & Leko, Nedžad & Marušić, Franc Lanko & Milićev, Tanja & Milićević, Nataša & Mitić, Ivana & Nevins, Andrew & Peti-Stantić, Anita & Stanković, Branimir & Suligoj, Tina & Tušek, Jelena. 2016. Conjunct agreement and gender in South Slavic: From theory to experiments to theory. *Journal of Slavic Linguistic* 24(1). 187–224. DOI: <https://doi.org/10.1353/jsl.2016.0003>

