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Agreement with disjoined subjects in German

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This paper presents results from an empirical study on number and person agreement with disjoined subjects in Standard German. We show that disjunctive agreement resolves to plural if one or both of the disjuncts are plural. The main empirical finding of the paper is that if both disjuncts are singular, verbal agreement is either singular or plural, irrespective of the relative order of subject and verb. We account for this observation in an Optimality Theoretic approach by assuming that the verb has to agree with each disjunct as well as with the disjunction itself, which bears a special kind of plural feature. The number feature of the verb has to match the number feature of both the disjunction and the disjuncts. This can lead to potential conflicts which as we show is the source of agreement optionality in case of singular disjunctions. Further, we discuss the effects of mismatching person in disjunctions, the effects of syncretic verb forms, as well as word order effects. Importantly, we observe that closest conjunct agreement is not consistently available in German. Finally, we present a brief excursus to agreement with disjoined subjects in other languages and discuss how data from Somali, Slovenian, and Hebrew fit into our analysis.

1 Introduction

This paper presents results from experiments on agreement with disjunctive coordination[1] in Standard German. The starting point of this research is the observation that verbal agreement strategies of a predicate with a disjoined subject may differ from those of agreement with a conjoined subject (see Foppolo & Staub 2020 for similar results in English and Italian). This is surprising given that both, conjunctions and disjunctions, are coordinations with identical syntactic properties and restrictions. Our experimental results show that verbal agreement with a SG-SG disjoined subject exhibits variability in that it resolves to either plural or singular, see (1b). This differs from conjunctive coordination, which generally resolves to plural (1a).

(1) a. [*Das Regal   und der Tisch*   ] **werden/*wird** morgen   geliefert.
         the shelf.SG and the table.SG   will.be.PL/SG   tomorrow delivered
         'The shelf and the table will be delivered tomorrow.'

     b. [*Das Regal   oder der Tisch*   ] **werden/wird** morgen   geliefert.
         the shelf.SG or   the table.SG   will.be.PL/SG   tomorrow delivered
         'The shelf or the table will be delivered tomorrow.'

We argue that disjunctive coordinations exhibit an ambivalent behaviour with respect to plurality. On the one hand, disjoined subjects fail typical tests for plurality such as the availability of cumulative and distributive interpretations or the possibility to combine with collective predicates. This clearly sets disjoined subjects apart from conjoined subjects, which pass these tests and therefore behave like regular plurals. On the other hand, we argue that conjunctions and disjunctions share the property that they evoke sets of alternatives, which give rise to a certain kind of plural meaning. Thus, disjunctions are partly like conjunctions and partly not. Ultimately, it is this ambivalent behaviour of disjunctions that will be shown to be responsible for number agreement variation with SG-SG disjoined subjects.

With conjunctions, the verb only agrees with the conjoining element, but with disjunctions, the verb has to agree with both, the disjoining element and all the disjuncts. Concerning number agreement, we assume that coordinating elements ("and"/"or") have a plural feature, which results from the set of alternatives evoked by the coordinated structure. This feature, formalized as [$\#_{alt}$:PL], is present on any coordinating element and – by feature projection – on the coordination itself.

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[1] We use the following terminology: The term *coordination* refers to any syntactic structure where two XPs are paratactically combined by a coordinating element. If this element is the *conjoining element* "and", we refer to the structure as *conjunctive coordination* or simply *conjunction*; if the element is the *disjoining element* "or", we talk about *disjunctive coordination* or simply *disjunction*. The coordinated XPs are referred to as *conjuncts* versus *disjuncts*. Coordinated XPs may be *conjoined* or *disjoined*.

Conjunctions differ from disjunctions with respect to the distribution of the normal – what we henceforth call individual – number feature, written below as [$\#_{ind}$:SG/PL]. This feature is present on the conjunction "and", where it always has the value PL. Hence, there is never a conflict between the values of the two number features on the conjoining element, because both are plural. In disjunctions, however, the individual number is only present on the disjuncts with immediate effects on agreement: The verb has to agree with each disjunct as well as with the disjunction itself and thus conflicting values are possible. We suggest that this is the reason for the optionality of agreement with disjoined SG-SG subjects. We implement our theoretical assumptions in an Optimality Theoretic account, which we find to be a suitable framework to capture variability in syntax.[2]

The first part of the paper presents the results of an offline rating study, which can be summarized in four empirical observations: First, number agreement in German disjunction resolves to plural unless both disjuncts are singular. Then, singular agreement is possible as well. This effect can be found in both SV and VS order. Second, if the two conjuncts differ in person, plural agreement is clearly preferred, which suggests an interaction between person and number agreement. Third, closest conjunct agreement (CCA) improves ratings of sentences, but does not render singular agreement grammatical in disjunctions with one plural and one singular disjunct. Fourth, there are syncretism effects in disjunctions with mismatching person: If the verb form is syncretic for both persons, the sentences are judged in the grammatical range of the rating scale in contrast to sentences with non-syncretic verb forms.

The second part develops a theory on number resolution that is able to capture the empirical observations and implement the findings in an Optimality Theoretic approach. Concretely, we assume that the optionality in SG-SG disjunctions is due to a tie between the constraints that constrain the singular and plural verb forms. Essentially a constraint tie is a formalization of having parallel grammars (see Anttila 1997; Müller 2003). We show further that this idea cannot only derive the German pattern but also looks promising with respect to agreement data from other languages, in particular Hebrew, Slovenian, and Somali.

The paper is structured as follows: Section 2 introduces some basic assumptions on agreement with coordinations and provides a brief overview of the experimental literature on agreement with disjoined subjects. Section 3 summarizes the experimental studies on agreement with disjoined subjects in German. Section 4 discusses semantic properties of disjunctions. Section 5 presents our theory on number resolution in disjunctions, the implementation of the theory in Optimality Theory, as well as a brief typological excursus. Section 6 summarizes.

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[2] Note that optionality is difficult to derive in any deterministic framework. We tentatively hypothesize that the idea worked out here for OT can be formalized in different frameworks as well. The only necessary device is the existence of parallel grammars in one language/one speaker, which differ in how feature conflicts are resolved (cf. Anttila 1997; Marušič et al. 2015 among others). See Müller (2003) on the challenges involved with handling optionality in OT.

2 Basic assumptions and previous studies

In this section, we introduce some basic assumptions on coordination and agreement and discuss previous empirical studies on agreement with disjoined subjects.

2.1 Agreement with coordinated subjects

Starting with the structure of coordination, we assume that both conjunctions and disjunctions coordinate expressions of any category (Ross 1967). Whether Conjunction Reduction applies, is an independent, and cross-linguistically varying question, which we will not discuss in detail (but see Section 4, page 15). Following standard approaches to coordination, we assume coordination phrases ('BoolP', see Munn 1993) with the first conjunct/disjunct appearing in the specifier, and the second in the complement position of the coordinating head. In German, ϕ-feature agreement between the verb and the subject involves person and number, the values being 1, 2, 3 for person, and SG and PL for number. Standard German agreement is illustrated in (2), where both, the subjects (in italics) and the verb (in bold) are third person plural.

(2)   [$_{BoolP}$ [$_{DP}$ *Die Friseure*] [$_{Bool'}$ *und / oder* [$_{DP}$ *die Fitnessstudios*]] **mussten** erneut
        the hairdressers   and / or   the fitness.centres   must.3PL.PST again
        schließen.
        close
        'The hairdressers and/or the fitness centres had to close again.'

In verbal agreement with a conjoined subject, there exists cross-linguistic variation with respect to the target of agreement (see e.g. Obrst 1993; Aoun et al. 1994; Munn 1999; Aoun et al. 1999; Citko 2004; van Koppen 2006; 2007; Bošković 2009; Demonte & Pérez-Jiménez 2012; É. Kiss 2012; Marušič et al. 2015, Mitchley 2015; Palmovi & Willer-Gold 2016; Willer-Gold et al. 2016; Citko 2018; Murphy & Puškar 2018; Nevins & Weisser 2019; Arsenijević et al. 2019; Al Khalaf 2022). The two strategies that are relevant for our experiments are: agreement with the coordinated subject ('resolved agreement') and agreement with the closest conjunct (CCA). Starting with resolved agreement, the verb resolves the conflict of having to choose between two conjuncts, hence two agreement targets, and agrees with the entire coordination. The coordination computes its ϕ-features from those of its conjuncts according to strategies to be defined below. This is shown in (3) where a 1SG and a 2SG subject resolve into PL agreement on the verb. (The first and third person plural are syncretic in German. Syncretisms are marked by "~" throughout the paper.)

(3)   [*Ich und du*] **werden** geimpft.
          I   and you   get.1~3PL vaccinated
        'I and you are getting vaccinated.'

The verb may also agree with the closest conjunct. In SV-order in (4), the second conjunct is closest and the verb agrees in person with the 2PL subject, see (4). Note however that 2SG agreement is not possible.

(4) [*Er und du*] **?werdet/*wirst** geimpft.
    he and you   get.2PL/2SG   vaccinated
    'He and you are getting vaccinated.'

German is a verb second language, meaning that the verb in a main clause always appears in second position. The preverbal position may be occupied by the subject, yielding SV order, see (3) and (4), or by some other constituent, in which case the subject follows the verb (VS order), see (5), where the temporal adverbial *morgen* ('tomorrow') precedes the verb.

(5) Morgen   **werden**   [*ich und du*] geimpft.
    tomorrow get.1~3PL   I   and you   vaccinated
    'Tomorrow I and you will get vaccinated.'

Word order may influence agreement strategies, especially CCA. With SV order, the verb agrees with the second conjunct of the subject; with VS order, it agrees with the first conjunct of the subject.

An interesting question to ask is how agreement resolution works in natural language. A standard approach to resolve ϕ-feature agreement is to list language and construction-specific rules (see e.g. Bhatt & Walkow 2013; Marušič et al. 2015). Marušič et al. (2015: 57) analyze number agreement with coordinated subjects in Slovenian and assume that the number features of the conjuncts are inherited to the conjunction head, where an algorithmic process computes the value on the conjunction. A problem of this approach is that inherent agreement features are not attributed to the conjunction itself. However, especially for number agreement, there seems to be a clear cross-linguistic pattern, which is determined by the semantics of the conjunction. Thus, number resolution is not arbitrary. Instead agreement reflects the sum operation of the conjunction (see also Harbour 2020). In particular, a conjunction consisting only of plurals does not trigger singular agreement.

2.2 Previous studies on agreement with disjunctions

Despite a lot of experimental work on agreement with conjoined subjects, the literature on experiments concerning agreement with disjoined subjects is scarce. In this section, we report on three experimental studies on this topic, Foppolo & Staub (2020) on disjunctive agreement in English and Italian, Marušič & Shen (2021) who tested gender agreement with disjoined subjects in Slovenian, and finally Weiss (2015) on how person agreement with disjoined subjects in German is resolved with respect to word order.

2.2.1 Foppolo & Staub (2020)

Foppolo & Staub (2020) summarizes a series of psycholinguistic experiments about number agreement with coordinated singular subjects in English and Italian. The authors carried out several eye-tracking-during-reading studies and rating studies investigating variability in number agreement in English and Italian. An example of the test sentences used in the experiments is given in (6) (Foppolo & Staub 2020: 4)

(6)   [*The lawyer and/or the accountant*] **is coming/are coming/will come** to the meeting.

The results for English disjunction from both experiments show that disjoined subjects consisting of two singular nouns allow for either singular or plural agreement on the verb with a slight preference for singular agreement. This shows that during online-processing the grammar is "largely insensitive to number agreement with a subject that is a disjunction of singulars." (Foppolo & Staub 2020: 14). The availability of resolved plural agreement is surprising since it counters the tendency of the verb to agree with the closest conjunct in English disjunctions (Haskell & MacDonald 2005). The results suggest that agreement with disjoined subjects may follow two strategies, CCA and resolved agreement. Such variability is not attested to the same extent in single subject agreement (Keung & Staub 2018) where agreement violations have only been attested in specific syntactic configurations (*agreement attraction,* cf. Bock & Miller 1991) or with semantic agreement (Smith 2017).

The experimental results are compared with results from Italian, a pro-drop language with a rich morphological agreement system that could influence the agreement options. Both a completion task and a rating study show that plural and singular agreement are equally possible with disjoined singular subjects in Italian as well, with no preference for either of them. Foppolo & Staub (2020) discerned a difference between the two languages in that ratings show a lot more variability in Italian than in English. Both plural and singular agreement could receive the lowest rating with some speakers as well as the highest rating with others.

Foppolo & Staub (2020) do not provide an analysis of their results. They speculate that the observed variation of verbal agreement with disjoined singular subjects results from a failure to value the number feature on the verb in such constructions. Why feature valuation fails with disjunctions remains unclear. The authors refer to the few contexts that license natural occurrences of sentences with disjoined subjects. Thus, the input for grammar to establish agreement rules is sparse (Clifton & Frazier 2016). Another aspect that could have an impact on agreement variability is pattern import from related constructions, as argued in Haskell et al. (2010). Crucially, conjunction could not serve as a template here given the different agreement strategies. None of the mentioned proposals takes the semantics of *or* into account. In Section 4, we discuss semantic properties of the disjunction, which will also provide the key to a better understanding of agreement variability in SG-SG disjunctions.

2.2.2 Marušič & Shen (2021)

Marušič & Shen (2021) tested gender agreement on participles with disjoined subjects in Slovenian. In a guided elicitation experiment, participants saw a sentence with a simple subject (7a) and had to replace the simple subject with a disjoined (*either X or Y*) noun phrase shown to them (7b), which varied in gender combinations (see Marušič & Shen 2021: 522).

(7)   a.   [*Oreh*] bo **posajen** za hišo.
           walnut AUX planted.M.SG behind house
           'Walnut will be planted behind the house.'

      b.   [*ali grmi ali pa večje rože*]
           or shrub.M.PL or PA bigger flowers.F.PL
           'either shrubs or large flowers'

The authors observe two main strategies for gender agreement with disjoined subjects, CCA and resolved agreement. First, CCA proves to be a stable option of disjunction agreement, confirming previous studies on other languages. Comparing the results with CCA in conjoined subjects (Marušič et al. 2015; Willer-Gold et al. 2016), CCA is even more prominently involved in disjunctions. Second, resolved (masculine) agreement is a further attested strategy in Slovenian disjunctions (and conjunctions). It appears as a statistically relevant alternative to CCA in mixed disjunctions where no masculine is involved ([F *or* N]).[3]

CCA and resolved agreement strategies may be combined, which results in a higher ratio of resolved agreement with disjoined subjects with a second masculine disjunct ([N/F *or* M] = 94%), in comparison to second non-masculine disjuncts ([M *or* F] = 46%; [M *or* N] = 39%; and [F *or* N] = 17%).

To summarize, CCA and resolved agreement occur as agreement strategies with disjoined subjects just as they do with conjoined subjects in Slovenian.

2.2.3 Weiss (2015)

Weiss (2015) is the only experimental study on agreement with disjoined subjects in German that we are aware of. The author tested how person and number agreement with disjoined subjects in German is resolved, depending on the relative word order of verb and coordinated subject. Weiss (2015) carried out a rating study for verbal agreement with disjunctions of the 2SG pronoun *du* ('you') and the 3SG pronoun *er* ('he'). The items appeared with two word orders: VS and SV; the verb either had 2SG or 3SG agreement. The subjects appeared in '2 or 3' or '3 or 2' order, as illustrated in the polar questions in (8) (Weiss 2015: 36/38).

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[3] [N *or* F] had to be excluded due to a coding error.

(8)   a.   **Fällst/fällt**   [*du oder er*] den Baum, der in der Einfahrt steht?
            log.2SG/3SG   you or   he   the tree   that in the driveway stands
            'Do you or he log the tree that is in the driveway?'

    b.   [*Er oder du*] **fällst/fällt**   den Baum, der in der Einfahrt steht.
            he or   you   log.2SG/3SG the tree   that in the driveway stands
            'He or you log the tree that is in the driveway?'

Contradicting earlier results by Johannessen (1996; 1998), who explicitly exclude CCA for German, Weiss (2015) shows that German has CCA with pre- and postverbal disjoined subjects. With VS-order, agreement with the first disjunct is clearly preferred; with SV-order, agreement with the second disjunct receives the highest scores.

The scope of the study is restricted to the investigation of CCA in German and does therefore not include the option of resolved 3PL agreement. Plural agreement only appears as a factor given the frequent homophony between 3SG and 2PL agreement in German. A potential effect of this homophony is excluded since no systematic preference for 2PL could be observed. However, this observation does not carry over to 3PL agreement, which is the preferred option for mixed person disjuncts in German according to our findings. The results of Weiss (2015) are therefore potentially misleading since the absolute frequency of CCA in German remains unclear, see also Smith et al. (2018).

In our experiments, we expand Weiss' approach by including additional agreement options. We also extend our data to number agreement. Our results show that CCA is highly marked in comparison to resolved agreement.

3 Experiments

In this section, we outline the design and results of an offline acceptability judgment study on agreement with disjoined subjects in German. We start with a general overview of the method, which is the same for all experiments. Afterwards, we describe in more detail the individual experiments and their results.

In a nutshell, we find that if the disjuncts mismatch in person or number, the preferred agreement is resolved agreement with third person plural. If both disjuncts are third person singular, there is optionality between singular and plural agreement.

3.1 Method

3.1.1 Procedure

We conducted a large offline acceptability judgment study in two questionnaires (Q1, Q2). Participants were asked to judge German sentences with disjoined subjects using the Likert scale 1–4. We used this scale as participants in a pilot study did not feel comfortable with a larger scale.

All questionnaires were hosted on L-Rex (Starschenko & Wierzba 2023, https://www.l-rex.de/). The test items in all questionnaires were presented in a Latin-Square-Design. All the fillers were shown to every participant.

3.1.2 Participants

Participants were recruited via e-mail and received a link to the online questionnaires, which were filled out by first semester students of linguistics or German studies as well as random acquaintances. All participants had little to no background in linguistics and were naive to the purpose of the study. As a motivation, participants could win gift certificates for online shops.

Overall, 67 participants completed Q1 (∅age: 37.2) and 69 participants finished Q2 (∅age: 27.5). These numbers do not include non-native speakers and inattentive speakers, by which we mean people who repeatedly rated clearly ungrammatical fillers as grammatical or vice versa. The answers of the excluded speakers were not included in the statistical analysis.

3.2 Experiment 1 on the influence of number

3.2.1 Materials

Questionnaire Q1 for Experiment 1 tests how number agreement is affected by the number feature on the disjuncts. Person agreement does not play a role in this questionnaire, meaning that the disjuncts and the verb are always marked for third person.

The verb is either marked for singular or plural agreement and the disjuncts can also be singular or plural. This yields four combinations for the number features on the disjuncts: PLVPL, SGVSG, PLVSG, SGVPL. (9) illustrates how the test items are constructed. Additionally, the word order can vary with either the subject preceding the verb as in (9a) or the subject following the verb as in (9b).

(9)   a. [*Das Regal   oder die Tische*] **wird/werden** morgen   geliefert.
             the shelf.SG or   the table.PL   will.be.SG/PL tomorrow delivered
             'The shelf or the tables will be delivered tomorrow.'

        b. Morgen   **wird/werden** [*die Regale oder der Tisch*] geliefert.
             tomorrow will.be.SG/PL   the shelf.PL or   the table.SG   delivered

Thus, Experiment 1 has a 2 × 4 × 2 factorial design. Altogether, Q1 contains 32 test items like the one in (9) and 48 fillers. All the test items are main sentences with an auxiliary like *werden* ('become') or *haben* ('have'), the copula *sein* ('be'), or a modal like *können* ('can'), *sollen* ('should'), *müssen* ('must') in V2 position and the infinite lexical verb at the end of the sentence.

The filler items are constructed identically to the test items, the only difference being that the subject is not a disjunction. In the fillers, the subject can be a simple DP, a DP modified by a relative clause or a conjunction of DPs.

3.2.2 Results

Doing an ordinal logistic regression, we found that the interaction of the factor agreement and the factor numbers of disjuncts was significant. The best fit model (AIC = 4244.7) was one that included both factors and the interaction of the factors. The model including an interaction between the two factors was significantly better than both the null model (AIC = 5793.0, p < 0.001) and better than reduced models including only one factor (agreement (AIC = 5063.5, p < 0.001) or number of disjuncts (AIC = 5687.8, p < 0.001)) or two factors, but no interaction (AIC = 4918.5, p < 0.001).[4]

Descriptively, we found that when the disjunction contains at least one plural, plural agreement is preferred; singular agreement is unacceptable. When the disjunction consists of two singulars, both singular and plural agreement is acceptable. The results are depicted in **Figures 1** and **2**.[5]

We interpret this in a way that the number of the disjuncts interacts with the number of the agreement markers. This by itself is expected by any theory, but disjunctions seem to be special: First, they allow optionality, something that is not normally found with agreement in German, and second, the optionality is limited to SG-SG disjunctions. We develop an analysis of this in Section 5 and specifically derive this pattern in Section 5.2.

3.2.3 Effects of CCA

While plural is the preferred agreement for mixed number disjunctions, we further wanted to investigate whether CCA is considered better than non-CCA. For this we analyzed a subset of the data consisting of the sentences with singular agreement and mixed number disjunctions. We excluded plural agreement data, as the larger study showed an overall higher rating for plural agreement in mixed number disjunctions. Further, SG-SG disjunctions were excluded as they do not clearly represent cases of CCA (contra the view of Foppolo & Staub 2020). CCA is given in VS word order with SG agreement followed by a SG-PL disjunction or in SV order with a PL-SG disjunction followed by SG agreement. Non-CCA is the reversed case.

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[4] The AIC is an abbreviation for the *Akaike information criterion* (Akaike 1973; 1974). It is an estimator about the relative quality of statistical models. The model with the lowest AIC is the best fit model. The absolute number in each case does not matter. As standardly used, the *p*-value gives information about the significance of the result, that is how probable it is that the results are accidental. *p*-values lower than 0.05 mean that a result is statistically significant. We employed the `clm()`-function in R (version 4.2.2, package `ordinal`) to fit cumulative link models (CLMs) to the data. CLMs are suitable for analyzing ordered categorical response variables. This function implements the maximum likelihood estimation method to estimate model parameters. Comparisons between models were done via a likelihood-ratio test with the `anova()`-function. All materials, including the items and fillers, and the R-codes are uploaded under https://osf.io/5xjfc/?view_only=ea2a29e7b6fb4630a15ab4e12df7c4aa.

[5] The figures show the mean ratings of different conditions. Additionally, the error bars show the standard deviation. They are to be understood in a way that the top of the bar is the middle point of the standard deviation. This means that a mean rating of 2.0 with the error bar ranging from 2.0 to 2.5 in the figure indicates a standard deviation of 1.0.
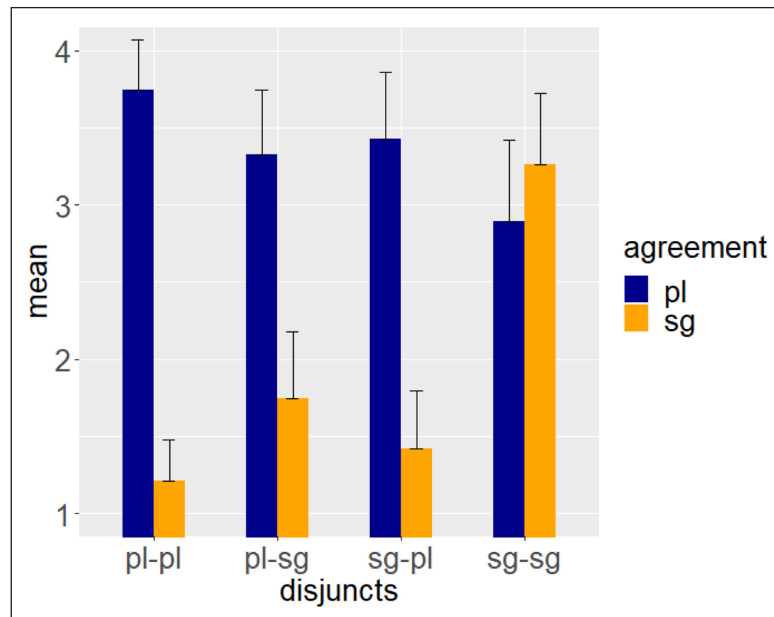
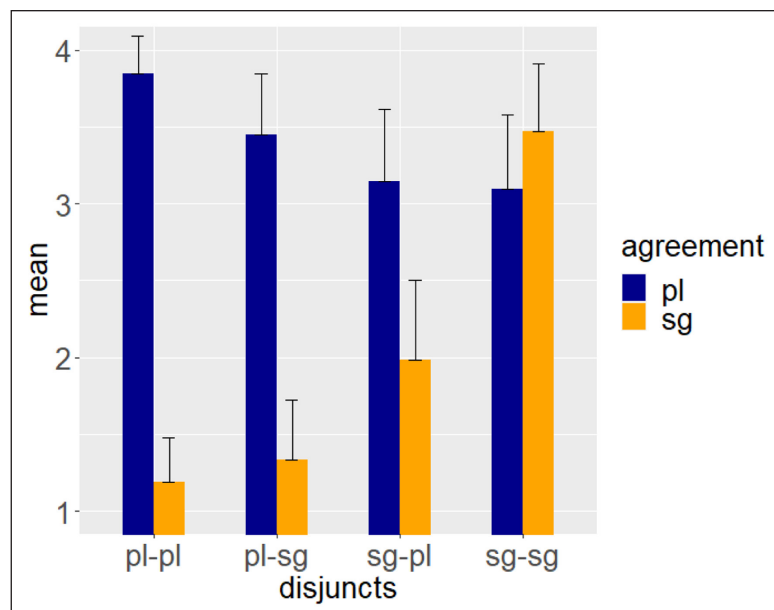**Figure 1:** Ratings under SV word order in Experiment 1.

Figure 2: Ratings under VS word order in Experiment 1.

An ordinal logistic regression analysis revealed that the factor CCA was significant (AIC = 1108.7) compared to the null model (AIC = 1161.7, p < 0.001). However, word order was not a significant factor: The model including word order additionally to CCA (AIC = 1110.6) did not fit better than the model only containing the factor CCA (AIC = 1108.7, p > 0.1). Also, the model

including the two factors plus an interaction (AIC = 1107.2, p > 0.05) was not significantly better than the simple CCA-model. We can conclude that the data with CCA produced significantly higher ratings than the data without CCA (that is with furthest conjunct agreement). This is also shown in **Figure 3**. However, we could not find an interaction between the factors CCA and word order. That means, CCA is not significantly better under VS order than under SV order.
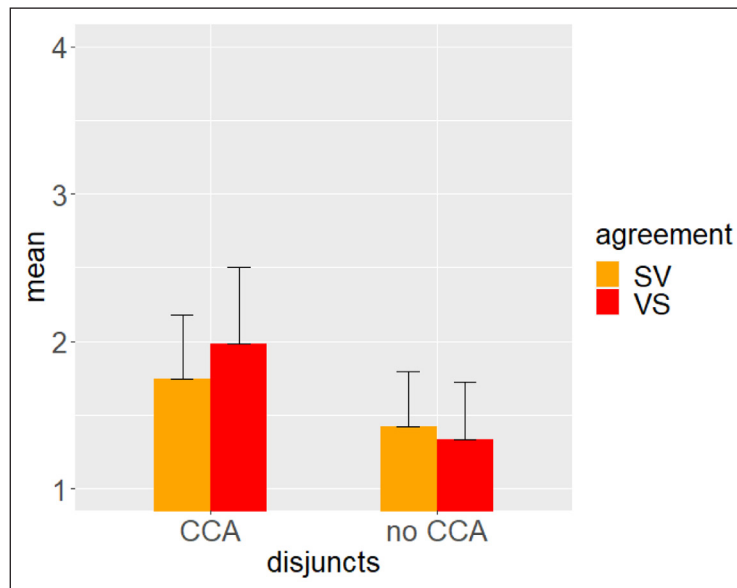

Figure 3: Ratings of CCA in the two word orders.

Even though significant, we can see in the mean ratings that CCA only achieve a mean rating of at most 2 on a scale from 1–4, which is below the middle point of 2.5. If we interpret the middle point of the scale as the threshold to grammaticality, we see that CCA helps rating (probably for processing reasons, see Section 5.2.3), however, it does not result in grammaticality.[6] As such, we do not provide a theoretical analysis of CCA in Section 5.

3.2.4 Idiolectal differences

Before proceeding to the experiment about the influence of person, one question remains to be answered: Is it possible that the optionality between plural and singular agreement is an illusion and that in fact speakers vary as to what agreement they prefer? The answer to this question is no.

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[6] In experiment 2 about the influence of person on agreement, we see that CCA in VS order is the only case where the mean ratings are in the grammatical range. This surely is interesting, but the overall picture still is that CCA is not strictly correlated with grammaticality. We thus attribute it to processing factors rather than being an actual part of German syntax. This, however, does not mean that we believe that CCA is never a part of actual grammar, see Section 5.2.3 and Marušič et al. (2015); Marušič & Shen (2021) for more discussion.

Looking at the mean ratings of singular and plural agreement with SG-SG disjunctions for each participant, we see that the large majority of participants in our experiment do not rate singular and plural agreement largely different. **Figure 4** shows the differences in mean ratings between singular and plural agreement with SG-SG disjunctions for each participant: Negative numbers show that singular agreement is worse than plural; positive numbers show that plural agreement is worse than singular. As shown in **Figure 4**, most participants only had a small difference between singular and plural agreement: Out of 67 participants, 35 had a difference of maximally 0.5 points on the scale of 1 to 4 between singular and plural agreement and 50 participants had maximally 1 point between singular and plural agreement.
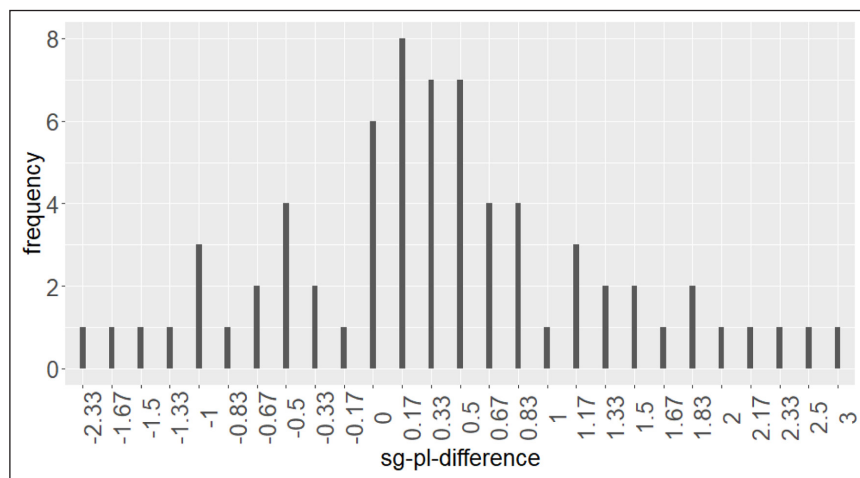

Figure 4: Difference in mean ratings between singular and plural agreement with SG-SG-disjunctions for each participant: Negative numbers show that singular agreement is worse than plural; positive numbers show that plural agreement is worse than singular. The y-axis shows the frequencies of each rating difference.

We conclude from this that for at least about half of the speakers singular and plural agreement are equal in case of SG-SG-disjunctions. Our interpretation of this is that singular and plural agreement are not due to different idiolects of speakers, but that there exists optionality for speakers (even though some speakers seem to allow only one of the options).

3.3 Experiment 2 on the influence of person

3.3.1 Materials

Questionnaire Q2 contains material to test the effects of the person feature of disjuncts on agreement. In this questionnaire, the sentences are constructed in the same way as in Q1, only this time, the subject is a disjunction of a first or second person pronoun and a full DP (which is 3rd person). We refrain from using only pronouns because disjunctions like *er oder du* ('he or you'), even though grammatically fine, feel somewhat unnatural and forced to us as native

German speakers. To control for number agreement, the disjuncts are always singular of the following forms: 1/2SGV3SG, 3SGV2/1SG. The verb can be marked for first or second person singular agreement (depending on which pronoun is used), it can be third singular or it can appear with a third plural agreement marker.[7] Again, the word order varies between SV and VS. (10) shows examples of test items in Q2 (equivalent examples for second person are omitted).

(10)   a.   [*Ich oder mein Mann*] **werde/wird/werden** morgen vorbeikommen.
            I   or   my   husband   will.1SG/3SG/1~3PL tomorrow come.over
            'I or my husband will come over tomorrow.'

    b.   [*Mein Steuerberater oder ich*] **kann/kann/können** dir bei dem Formular helfen.
            my   accountant   or   I   can.1SG/3SG/1~3PL you with the form help
            'My accountant and I can help you with the form.'

    c.   Gestern **habe/hat/haben** [*ich oder mein Kollege*] einen Fehler gemacht.
            yesterday have.1SG/3SG/1~3PL I or my colleague a mistake made
            'Yesterday, I or my colleague made a mistake.'

Experiment 2 has a 2 × 2 × 3 factorial design. Q2 contains 24 test items and 48 fillers. Half of the test items use the 1SG pronoun *ich* as the pronominal disjunct, the other half use the 2SG *du*. Furthermore, half of the items contain the modal verbs *können* ('can') and *sollen* ('should'), which are syncretic for 1SG and 3SG; the other half use *werden* ('will') and *haben* ('have'), which are non-syncretic. The difference between the 1SG and 2SG pronoun is not a factor for the statistical analysis.

As for the fillers in Q2, the subjects could again be simple DPs or pronouns or a conjunction of a pronoun and a DP.

3.3.2 Results

We analyzed the data with an ordinal logistic regression and found that the factor agreement is significant overall. A model containing this factor proves significantly better (AIC = 4462.7) than the null model (AIC = 4793.1, $p < 0.001$).[8] Concretely, plural agreement leads

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[7] In principle, we could have included a 2PL agreement option for 3-2/2-3 disjunctions (for this option, see Fuß 2018). This, however, would have caused an imbalance in the design for 1-3/3-1 disjunctions because the 1PL verb agreement form is syncretic in all instances with the 3PL agreement form. Thus, we decided to only include one plural form. Noticeably, this decision did not affect the observation that mismatching person in SG-SG disjunctions lead to plural agreement in contrast to matching 3rd person.

[8] Further, we found the factor person on disjuncts alone as well as the following interactions of factors to be significant, meaning that the models with these interactions are better than the models without (in all cases $p < 0.01$): agreement with person on disjuncts, agreement with word order, and an interaction of all three factors. As for the factor person on disjuncts, we can see that, overall, disjunctions of the order *NP or pro* are rated worse than *pro or NP*. We speculate that this is due to prosodic reasons that heavier elements should not precede lighter elements. As the main focus of this paper is agreement, we leave this issue to further research. For the various interaction effects with agreement, we think that these effects are related to CCA, see Section 3.3.3.

to higher ratings as opposed to both first/second and third person singular agreement, see also **Figures 5** and **6**.

Thus, the generalization on mismatching disjunctions needs to be refined in the following way: If the disjuncts are both singular, but do not match in person, 3PL agreement is the preferred option.
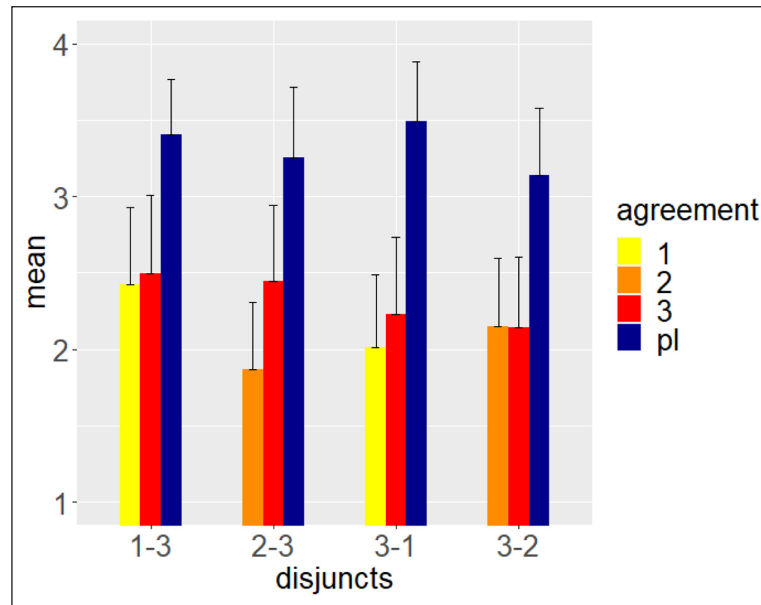

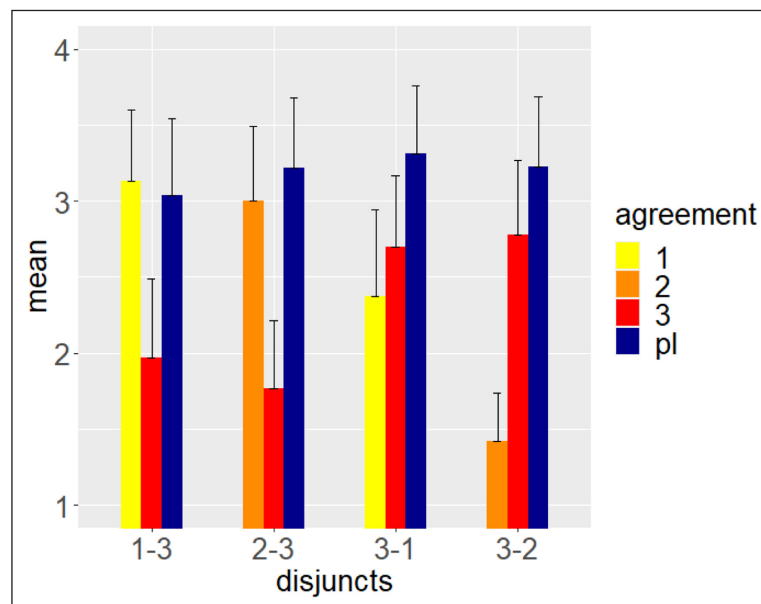**Figure 5:** Ratings under SV word order in Experiment 2.

Figure 6: Ratings under VS word order in Experiment 2.

We interpret the data in a way that person has an influence on agreement. Concretely, mismatches of person seem to be handled like mismatches in number: They result in (third person) plural agreement. This idea is formalized in Section 5.2.1.

3.3.3 Effects of CCA

Descriptively, the data highly suggest an effect of word order. This is why we ran a further statistical analysis on a subset of data, excluding the data with plural agreement analagous to experiment 1 in Section 3.2.3. This gave the following results based on an ordinal logistic regression analysis: The model including the interaction of both factors of CCA and word order (AIC = 3008.8) is a significantly better fit than just CCA (AIC = 3074.8, $p < 0.001$), which in turn is significantly better than the null model (AIC = 3159.4, $p < 0.001$). Also a model including an interaction of both factors fits significantly better than a model with both factors but without the interaction (AIC = 3069.3, $p < 0.001$). Concretely, CCA is linked to higher ratings. Further CCA in VS order leads to higher ratings than CCA under SV order, see **Figure 7**. See the end of Section 3.2.3 and particularly footnote 6 for a discussion of these results.
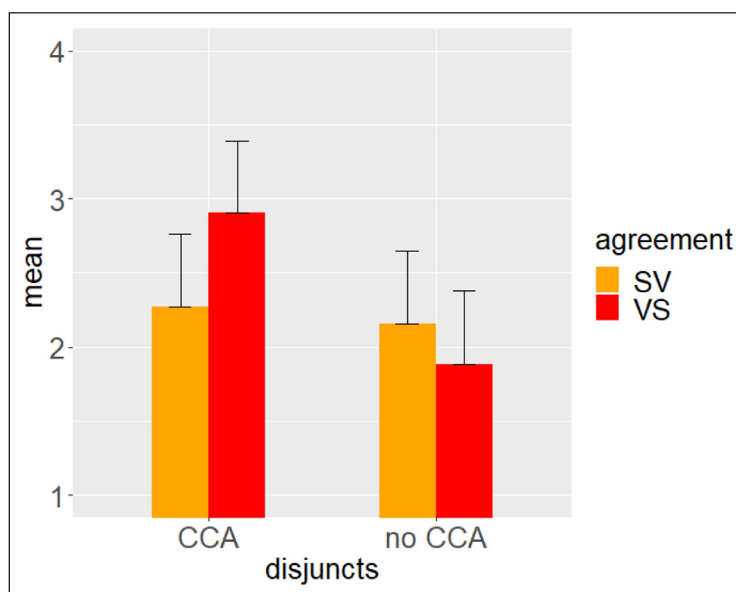
Figure 7: Ratings of CCA in the two word orders.

3.3.4 Effects of syncretisms

Lastly, we can take a closer look at the effect of syncretism. Since syncretisms can only appear in the combinations of first and third person, we ran a separate test on a subset of the data where we excluded 2/3-combinations and plural agreement. So we compared the singular syncretic forms of examples like (10b) with the singular non-syncretic forms in (10c).

The results of an ordinal logistic regression test showed that both the factor syncretism and the factor word order are significant. The model with both factors makes better predictions (AIC = 1170.0) than the reduced models (syncretism: AIC = 1207.1, p < 0.001; word order: AIC = 1183.5, p < 0.001) and the null model (AIC = 1218.6, p < 0.001). However, adding an interaction of syncretism and word order does not create a better-fitted model (AIC = 1171.4, p > 0.4) This means we have two main effects: syncretism and word order. As for word order this is most likely connected to the subset of items we analyzed: They only bear singular agreement, which works better under VS order than under SV order, see Section 3.3.3. More importantly, this test confirms that syncretism is a significant factor: Syncretisms lead to higher ratings both in SV and in VS order, see **Figure 8**.
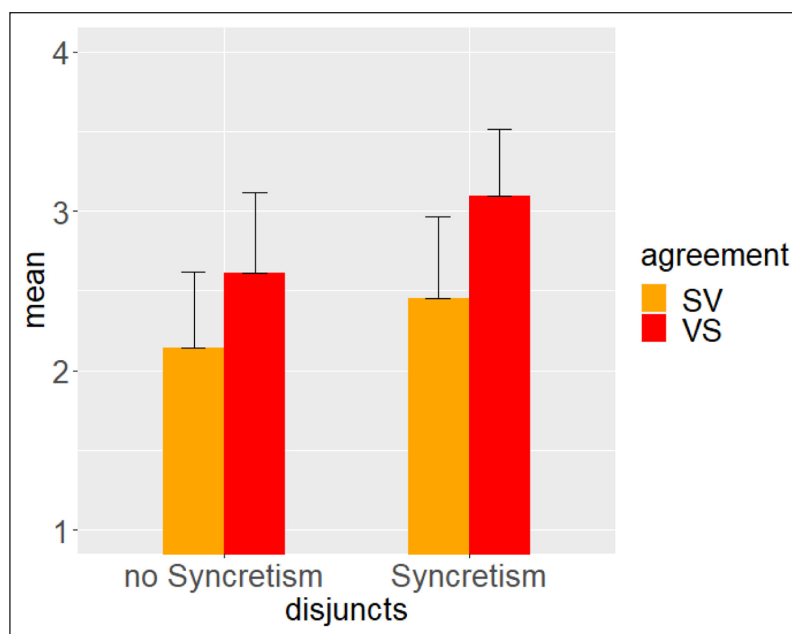
Figure 8: Ratings of syncretisms in the two word orders.

Thus, syncretisms, like CCA, have an ameliorating effect on the ratings. But data with syncretism cross or are at the line to grammaticality on our interpretation of the scale, as can be seen in **Figure 8**. We therefore assume that the syncretism effect should be analyzed as being part of the grammar. Essentially, we assume that, in syncretisms, the person feature is impoverished, which means that there is no longer a person mismatch between the disjuncts. This in turn leads to singular agreement being an option, see also Section 5.2.2.

3.4 Interim summary

To sum up the results of the study, we find the generalizations in (11).

(11) *Generalizations*
    a. If the disjuncts in a disjunction mismatch in number or person, the preferred agreement form is 3PL.
    b. If the disjuncts of a disjunction are both 3SG, the agreement form can be 3SG or 3PL.
    c. Closest conjunct agreement is only possible in some instances. Importantly it is not consistently grammatical under either word order.
    d. Syncretic verb forms alleviate the deviance of mismatching person.

Based on these four generalizations, Section 5 provides an analysis that derives the generalizations in (11). Before this, Section 4 introduces some aspects on the semantics of disjunctions that serve as a baseline for the theoretical assumptions in Section 5.

4 Semantic properties of disjunctions

In this section, we show that disjoined subjects behave differently from conjoined subjects with respect to plural interpretation. Whereas conjoined subjects denote pluralities (Schmitt 2013; 2019), disjoined subjects do not. Evidence comes from the different behavior of conjunction and disjunction with collective predicates, cumulative and distributive interpretations and anaphoric dependencies, each of which will be addressed in the following subsections.

4.1 Collective predicates

Collective predicates require a subject that refers to a plurality (Link 1993). This requirement can be met by a plural noun and also by a conjoined subject, as shown in (12).

(12) *Die Kinder*_{PL} / [*Clara und Chloe*] **trafen** sich   auf dem Spielplatz.
    the children / Clara and Chloe met themselves on the   playground
    'The children_{PL} / [Clara and Chloe]_{PL} met on the playground.'

In contrast, collective predicates cannot select disjoined subjects, irrespective of subject-verb agreement. This is illustrated for German in (13). In (13a), the adjective ähnlich ('similar') forces the collective interpretation of the predicate, which requires a plural subject. The predicates *treffen* ('to meet') and *bilden* ('to form') both need a plural subject. In none of the examples can the requirement be met by a disjoined subject.

(13) a. *Im   Urlaub **werde/werden** [*ich oder mein Mann*] ein <u>ähnliches</u> Buch lesen.
       in.the holidays will.1SG/1PL   I or my husband a   similar   book read
       'In the holidays, I or my husband will read a similar book.'

    b. *Morgen **werde/werden** [*ich oder mein Mann*] uns   in der Stadt <u>treffen</u>.
       tomorrow will.1SG/1PL   I or my husband ourselves in the city   meet
       'Tomorrow, I or my husband will meet in the city.'

c. *Bei dem Wettkampf **bilde/bilden** [*ich oder mein Mann*] ein Team.
at the competition form.1SG/1PL I or my husband a team
'At the competition, I or my husband will form a team.'

All of the predicates in (13) perfectly combine with conjoined subjects under plural agreement (cf. (12)). The unavailability of collective predicates with disjunctive structures shows that disjoined subjects do not denote plural entities but behave like singular nouns.

The different behavior of conjunction and disjunction observed in (13) could be assumed to follow from different syntactic structures. It could be argued that disjunctions are always underlyingly sentential, with the derivation involving Conjunction Reduction. Under this analysis, the sentences in (13a) to (13c) would be ungrammatical since the individual disjuncts each would violate the plural requirement of the subject. Note, however, that disjoined subjects allow for plural agreement on the verb, even if both disjuncts are singular, as shown in detail in the last section. Thus, plural agreement cannot be derived by Conjunction Reduction unless the number feature of at least the second disjunct is plural before deletion. We conclude that DP-coordination is available for disjunctions, see also Smith et al. (2018). The problem with collective predicates illustrated in (13) is therefore the incompatibility of these predicates with disjoined subjects, which do not denote pluralities.[9]

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[9] As for the distribution of singular and plural agreement, we conducted a third study in a separate questionnaire which addressed the question of whether or not the inclusive-exclusive distinction of disjunctions plays a role for agreement. (This study is modeled after Foppolo & Staub's 2020:12 experiment 5 for English.) We used the same method as in the studies reported in Section 3. Altogether, 37 native speakers of German participated in the study with the same demografics as in the other studies. Items had only SGVSG disjunctions as subjects, only appeared in SV order, and varied in the interpretation of *or* (ambiguous (ib), exclusive (ia)) and in agreement. Additionally to the rating task, participants answered a question indicating whether they understood *or* as inclusive or exclusive (henceforth referred to as the reading). The experiment had 16 items and 32 fillers.

(i) a. [*Der Schweizer oder der Italiener*] **wird/werden** morgen das Rennen gewinnen.
the Swiss or the Italian will.3SG/3PL tomorrow the race win
[Q:] CAN THE SENTENCE MEAN THAT BOTH ATHLETES WILL WIN?

b. [*Der Schweizer oder der Italiener*] **wird/werden** morgen am Rennen teilnehmen.
the Swiss or the Italian will.3SG/3PL tomorrow in.the race participate
[Q:] CAN THE SENTENCE MEAN THAT BOTH ATHLETES WILL PARTICIPATE?

An ordinal logistic regression analysis revealed that only agreement but not interpretation or reading is a significant factor: Like in Experiment 1, singular agreement has slightly higher ratings in all conditions than plural agreement, but importantly, both plural and singular agreement are in the grammatical range of the scale in all cases, see (ii). This once again replicates our results of Experiment 1.

(ii)

	Intended: Ambiguous		Intended: Exclusive	
	SINGULAR	PLURAL	SINGULAR	PLURAL
Reading: inclusive	**3.62**	3.23	3.50	**2.75**
Reading: exclusive	3.35	3.24	3.34	3.12

4.2 Cumulative and distributive interpretations

Plurality denoting subjects may give rise to cumulative or distributive interpretations. Again, the plural requirement can be satisfied by conjoined subjects. This is shown in (14), from Haslinger et al. (2019). The sentence in (14a) is ambiguous, it may receive either a distributive (14b) or a cumulative (14c) interpretation.

(14) a. [*Ada* and *Bea*] **fed** exactly four pets.
      b. DISTRIBUTIVE: Ada fed four pets, and Bea fed four pets.
      c. CUMULATIVE: Ada fed one pet, and Bea fed three pets.

Strikingly, cumulative interpretations are excluded with disjoined subjects, see the German example in (15):

(15) [*Klaus oder Peter*] **haben**   genau   vier Schweine gefüttert.
        Klaus or   Peter   have.3PL exactly four pigs   fed
        'Klaus or Peter fed exactly four pigs.'

(15) can only mean that either Klaus or Peter fed exactly four pigs. It cannot mean that the feeding was done in cooperation. The sentence is also not distributive. It cannot mean that Klaus fed four pigs and that Peter also fed four pigs.

This shows again that disjoined subjects do not denote pluralic entities in the same way conjoined subjects do.

4.3 Anaphoricity

A further piece of evidence to show that disjunctions do not denote pluralic entities are reciprocal pronouns, which require plural antecedents. Such an antecedent can be provided by a conjoined, not by a disjoined subject, see (16).

(16) a. [*Ich und du*] **haben**   einander   lieb.
          I   and you   have.3PL each.other dear
          'I and you like each other.'

      b. *[*Ich oder du*] **haben**   einander   lieb.
          I   or   you   have.3PL each.other dear

The best fit model is one that only includes agreement as a factor (AIC = 1305.8). This simple agreement model was weakly significantly better than the null model (AIC = 1308.5, $p < 0.05$). Also, the model including agreement, the reading (inclusive/exclusive) and their interaction (AIC = 1307.2, $p < 0.05$) was weakly significantly better than the null model. However, the more complex model with the interaction was not better than the agreement model ($p > 0.2$). We observe that there is no evidence for an interaction of the factors agreement and meaning (whether considering the interpretation intended by us or considering the reading the participants actually got). Thus, we can conclude that exclusive disjunctions do not correlate with singular agreement.

Furthermore, it is possible to refer back to a conjoined subject with a plural pronoun, as shown in (17a). And again, disjoined subjects behave differently in that they do not allow coreference with anaphoric pluralic pronouns, see (17b). The effect is also perceptible if no person mismatch is involved, see (17c).

(17) a. [*Ich und du*], wir **schaffen** das.
           I   and you   we manage this
         'I and you, we will manage this.'

    b. *[*Ich oder du*], wir **schaffen** das.
           I   or you   we manage this

    c. *[*Ada oder Bea*], sie   **schaffen** das.
           Ada or Bea   they manage this

To conclude, all data show that disjoined subjects do not denote semantic pluralities, clearly differing from conjoined subjects, which denote plurals, see also Schmitt (2013). This finding will play an essential role in our analysis, which we present in the following section.

5 Analysis

This section provides an analysis of the data presented in Sections 3 and 4. Concretely, we attempt to answer the following questions: (i) How does agreement resolution work in disjunctions?, (ii) How can the optionality of agreement with SG-SG disjunctions be accounted for?, (iii) How can the effects of person, syncretism, and word order be accounted for?, (iv) What are the predictions for disjunction agreement cross-linguistically?

Ultimately, we suggest that disjunctions, much like conjunctions, carry plural number, albeit a special type which causes the verb to agree with the disjunction and with the disjuncts. This might create a conflict if the number of the disjuncts and the number of the disjunction (that is plural) mismatch. We implement this idea in an Optimality Theoretic framework that is able to derive the data of Section 3.

5.1 Number resolution in disjunctions

Before we come to our analysis of number agreement, we discuss our assumptions about the number feature of disjunctions. Remember from the discussion in Section 3 that plural agreement is preferred whenever one of the disjuncts is plural and that number agreement is optional when both disjuncts are singular.

Now, there are three possibilities for the number feature on a disjunction: no number feature, singular, or plural. The first option is proposed in Foppolo & Staub (2020) (see also Peterson 2005). We discuss each of these options in turn and conclude that disjunctions are inherently plural.

5.1.1 Disjunctions do not have no number

The first option for the number feature on disjunctions is to say that they do not carry any number feature, as argued for in Foppolo & Staub (2020). This renders verbal agreement with disjunctions a "grammatical lacuna". The consequence of this option is that speakers might apply default strategies for agreement with disjunctions.

However, this idea runs into a problem with German where default number seems to be syntactically singular. Evidence for this comes from impersonal passives in embedded clauses such as (18).

(18)   weil   getanzt wurde/*wurden
        because danced was/were
        Lit.: 'because it was danced'

In impersonal passives, no expletive is necessary, in contrast to English for example. This means that there is no syntactic subject in (18) that could assign number to the finite passive auxiliary. In this case, the verb must appear with singular agreement. Using plural agreement yields an ungrammatical structure. We consider this to be evidence for the assumption that singular is default agreement in German, not plural.

Speaking of expletives, the fact that there are no plural expletives further suggests that singular is the default number. The example in (19) illustrates this for the German expletive *es*, which appears in the prefield if no other constituent is fronted.

(19)   Es/*sie   komm-en Vögel   geflogen.
        3SG.EXPL/3PL come-3PL bird.PL flown
        'Birds come flying.'

Finally, also the impersonal *man* in German shows that singular is the default. It cannot be used with plural agreement, even if it can in principle refer to a group of people, as shown in (20).

(20)   Man glaub-t/*glaub-en,   dass die Erde   rund ist.
        IMP believe-3SG/believe-3PL that the earth round is
        'One believes that the earth is round.'

In conclusion, singular appears to be the default number in German. If this is true, the no-number hypothesis cannot be maintained.[10]

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[10] Of course, this argument does not rule out the "Grammatical Lacuna" approach by Foppolo & Staub (2020). However, the approach says that default number is always unpredictable, an assumption which cannot be falsified.

5.1.2 Disjunctions do not have singular number

The second option can be quickly ruled out: If disjunctions were inherently singular, we would expect that there is no influence of the number of the disjuncts on agreement, similar to what we observe in conjunctions in German, where agreement is always plural independent of the conjuncts. So the optionality in (21a) vs. the absence of optionality in (21b) would stay unexplained.

(21) a. [*Das Regal   oder der Tisch*   ] **werden/wird** morgen   geliefert.
          the shelf.SG or   the table.SG will.be.PL/SG tomorrow delivered
          'The shelf or the table will be delivered tomorrow.'

      b. [*Die Regale   oder die Tische*] **werden/*wird** morgen   geliefert.
          the shelf.PL or   the table.PL will.be.PL/SG tomorrow delivered
          'The shelves or the tables will be delivered tomorrow.'

5.1.3 Disjunctions have plural number

The last option is that all disjunctions have a plural feature. We are aware of two ways to derive this property: As for the first way, it has been claimed that disjunctions have properties of conjunctions in that they express a conjunction introduced by a hidden epistemic modal at the propositional level. Thus, at least certain disjunctive structures do not correspond to logical disjunctions. One such example is free choice disjunctions, like (22) (see Zimmermann 2000).

(22) Mr. X may take a bus or a taxi.

(23) *Choice Principle (CP)*
      a. X may A or B ⊨ X may A and X may B
      b. $\Delta(A \vee B) \vDash \Delta A \wedge \Delta B$ (Δ: deontic possibility)

If we generalize this claim to all disjunctions, we would expect that they represent a conjunction of options.

(24) It is possible that the shelf will be delivered tomorrow AND$_{PL}$ it is possible that the table will be delivered tomorrow.

This account, however, suffers from drawbacks. As Geurts (2005) notes, the account only makes correct prediction for the modal *may,* but not necessarily for *must* (whether it is epistemic or deontic). Compare (22) with (25).

(25) Mr. X must take a bus or a taxi.

If the Choice Principle in (23) were not modified for *must,* the sentence in (25) would incorrectly be assigned the meaning in (26).

(26) Mr. X must take a bus and Mr. X must take a taxi.

Clearly, this is not the intended meaning. Zimmermann's theory therefore needs further adaptions if the idea of hidden conjunctions is to be maintained (see Geurts 2005 for a possible solution to the problem).

Instead of pursuing this idea further, we would like to suggest a different reason for the plurality of disjunctions. Concretely, we suggest that disjunctions are plural because they express a set of alternatives (Viola Schmitt p.c.). By this, we do not mean that disjunctions, unlike conjunctions, express a plurality of entities, see Section 4. But they introduce a set of alternatives similar to conjunctions and this set introduces a plural feature by assumption. We assume that the two parts of a coordination can be considered to be members of the same alternative set, much in the spirit of what Rooth (1992) proposes focus to denote, with the coordinating elements *and* (and probably *or*, too) functioning as an operator selecting elements from the alternative set as second conjunct(s). This is illustrated in (27) for conjunction and in (28) for disjunction (Foc is the focus constituents).

(27) Q: What did Joan and Peter bring?
      A: Joan brought [the STRAWberries]$_{Foc}$ and Peter brought [the CREAM]$_{Foc}$

(28) Q: Who brought the strawberries?
      A: [JOAN]$_{Foc}$ brought the strawberries or [PEter]$_{Foc}$ brought the strawberries.

This does not, however, mean that disjunctions and conjunctions are inherently focused.[11] What we mean is that any conjuncts or disjuncts of a coordination are equally relevant given a question

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[11] To check this we ran a small study where we asked 25 participants (excluding inattentive subjects) to rate sentences using a 5-point Likert scale. The sentences were all SV order with a SG-SG disjunction consisting of two proper names. The experiment had a 2 × 2 factorial design: The agreement could either be singular or plural and the disjunction could either be focus or background. The target sentences were provided with context in the form of a dialog. An example of an item is given in (i) and (ii) with (iB) and (iiB) being target sentences and (iA)–(iiA) being the context.

(i) *Disjunction not in focus*
     A: Ich glaube, *Hans oder Maria* **haben/hat**   die Pizza aufgegessen.
         I   believe Hans or   Maria have.3PL/3SG the pizza eaten.up
         'I believe that Hans or Maria ate up the pizza.'

     B: Nein, *Hans oder Maria* **haben/hat**   [den KUCHEN]$_{Foc}$ aufgegessen.
         no   Hans or   Maria have.3PL/3SG the cake   eaten.up
         'No, Hans or Maria ate up the CAKE.'

(ii) *Disjunction in focus*
     A: Ich glaube, die Kinder   haben   / Peter hat   den Kuchen aufgegessen.
         I   believe the children have.3PL / Peter have.3SG the cake   eaten.up
         'I believe that the children/Peter ate up the cake.'

     B: Nein, [*Hans oder Maria*]$_{Foc}$ **haben/hat**   den Kuchen aufgegessen.
         no   Hans or   Maria   have.3PL/3SG the cake   eaten.up
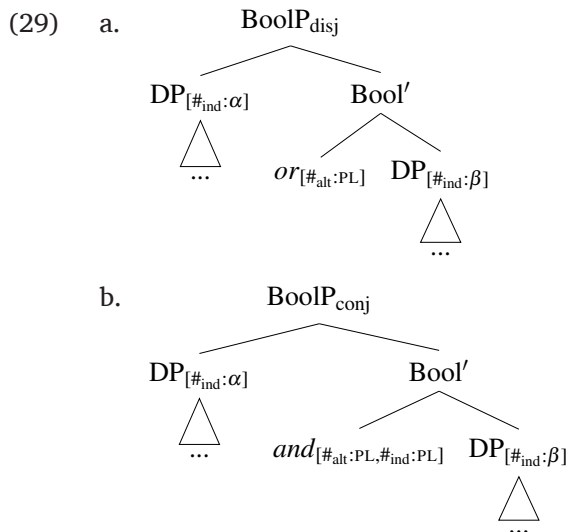   'NO, HANS OR MARIA ate up the cake.'

under discussion (QUD) in providing a partial answer each, see Hartmann (2000). The set of all partial answers, hence all conjuncts or disjuncts, constitutes the complete answer to a QUD. The fact that more than one answer is given leads to a plurality even in the case of a disjunction. Thus, just the presence of the coordinating element *or* leads to the understanding that there are alternatives for the subject of an event.

Note that the plurality of alternatives does not lead to disjunctions referring to a pluralic set of entities. Here disjunctions differ from conjunctions (see Schmitt 2013). For this reason, they do not allow cumulative interpretations, collective predicates, binding reciprocals or simply be replaced with a coreferential plural DP, as shown in Section 4.

Summing up, we assume that disjunctions carry a plural meaning which does not correspond to plural entities, but to a set of alternatives. This may be formalized as a plural feature $[\#_{alt}:\text{PL}]$,[12] in contrast to the (normal) individual plural feature $[\#_{ind}:\text{PL}]$ that conjunctions carry.[13]

Before moving on to deriving the distribution of number agreement, it is important to note that the disjuncts themselves are normal DPs and are, as such, expected to bear their own number feature. Thus, phrasal nominal coordinations would have a structure as in (29).

(29)   a.   BoolP$_{disj}$

DP$_{[\#_{ind}:\alpha]}$ Bool′

...   *or*$_{[\#_{alt}:\text{PL}]}$ DP$_{[\#_{ind}:\beta]}$

...

b.   BoolP$_{conj}$

DP$_{[\#_{ind}:\alpha]}$ Bool′

...   *and*$_{[\#_{alt}:\text{PL},\#_{ind}:\text{PL}]}$ DP$_{[\#_{ind}:\beta]}$

...

We analyzed the data with ordinal logistic regression. The model containing both factors agreement and focus and an interaction of the two factors (AIC = 642.3) was not significantly better than the null model (AIC = 640.7, p > 0.2). We conclude from this that the information-structural status of the disjunction does not determine the agreement. Nevertheless, this study confirms again the results of the first study that number agreement is optional with SG-SG disjunctions.

[12] We exclude the possibility of $[\#_{alt}]$ being singular. The reason is that a coordination always consists of at least two conjuncts or disjuncts and thus can never introduce a singular set of alternatives. Note that the individual number feature, which is responsible for the (non-)plurality of entities, can be singular.

[13] In a way, it can be argued that this is in line with Foppolo & Staub (2020). The disjunctions actually really lack an individual number feature and only have a plural alternative feature.

(29a) illustrates that disjunctions do not introduce a pluralic entity. This is formalized by a lack of the individual plural. Conjunctions as (29b), on the other hand, do have such a feature (in addition to the number feature for alternatives). This derives an asymmetry between conjunctions and disjunctions: Conjunctions are plural sets of alternatives and plural sets of entities, while disjunctions are plural only in the sense of alternatives.[14]

Finally, note that we do not claim that the distinction between alternative and individual number corresponds to the distinction between syntactic and semantic number (Perlmutter 1972; Smith 2015; 2017). We assume that this distinction is orthogonal to the alternative vs. individual number distinction, as the syntactic-semantic distinction is about what we assume to be individual number. Importantly, though, it does not affect the alternative number feature, which is plural.[15]

5.2 Deriving agreement with disjunctions

Above, we have established our assumption that disjunctive phrases carry a plural alternative number feature, but no individual number feature. In this part, we develop an analysis of the agreement facts of Section 3 based on this assumption. In a nutshell, we propose that the verb has to agree with each disjunct as well as with the disjunction itself. Consequently, the number feature of the verb has to match the number feature of all its agreement controllers. If there is a feature conflict, there might be multiple optimal solutions for this conflict. We suggest that this is the reason for the optionality of verbal agreement.

Concretely, we assume that the verb wants to match the subject in both number features: the alternative number feature and the individual number feature. A DP may have one of four possible number feature combinations. First, it can have both an individual and an alternative number feature, as in conjunctions. As argued above, conjunctions denote a plurality of individuals, but they also introduce a set of alternatives. Disjunctions, on the other hand, are not pluralities, but they introduce a set of alternatives. Thus, they constitute the second possible case for number on DPs: no individual, but an alternative number feature. Similarly, it is possible to have no alternative number feature, but an individual number feature. This would be the case of normal uncoordinated DPs. Finally, it is possible to have no number feature at all. It might be argued that this is the case for expletives, but nothing hinges on this. The four configurations are summarized in (30).[16]

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[14] We do not discuss the question of dual number. Whether $[\#_{alt}]$ can be dual or whether $[\#_{ind}]$ outranks $[\#_{alt}]$ in dual number languages is something we have to leave to future research.

[15] This means that the individual number feature might be further split up into semantic individual and syntactic individual number. We leave this issue open here.

[16] For sake of simplicity we depict the configurations with the verbal agreement feature on V instead of T, which is standardly assumed. Nothing hinges on this.

(30) a. *Conjunction: Alternative number + individual number*
      [... [DP *and* DP]$_{[\#_{alt}:PL,\#_{ind}:PL]}$ ... V$_{[\#_{alt}:--,\#_{ind}:--]}$ ...]

   b. *Disjunction: Alternative number + no individual number*
      [... [DP *or* DP]$_{[\#_{alt}:PL]}$ ... V$_{[\#_{alt}:--,\#_{ind}:--]}$ ...]

   c. *Simple: No alternative number + individual number*
      [... DP$_{[\#_{ind}:SG/PL]}$ ... V$_{[\#_{alt}:--,\#_{ind}:--]}$ ...]

   d. *Expletives: No alternative number + no individual number*
      [... Expl ... V$_{[\#_{alt}:--,\#_{ind}:--]}$ ...]

For the cases (30a), (30c), and (30d), agreement is clearly determined: Conjunctions have to result in plural agreement (30a) as the alternative number and the individual number feature are both plural. The individual number features of the DP conjuncts do not matter because the verb will find its [$\#_{ind}$] goal on the conjunction. Uncoordinated DPs trigger agreement depending on their individual number value (30c). Expletive subjects are equivalent to having no subject. Thus, the result is singular agreement, which is default number agreement (30d), see also Section 5.1.1. The only case that might lead to optionality is the case of disjunctions with *or* (30b). Here the verb may take the alternative number feature from the disjunction and the individual number feature from the disjuncts. This last scenario is depicted in (31).

(31)
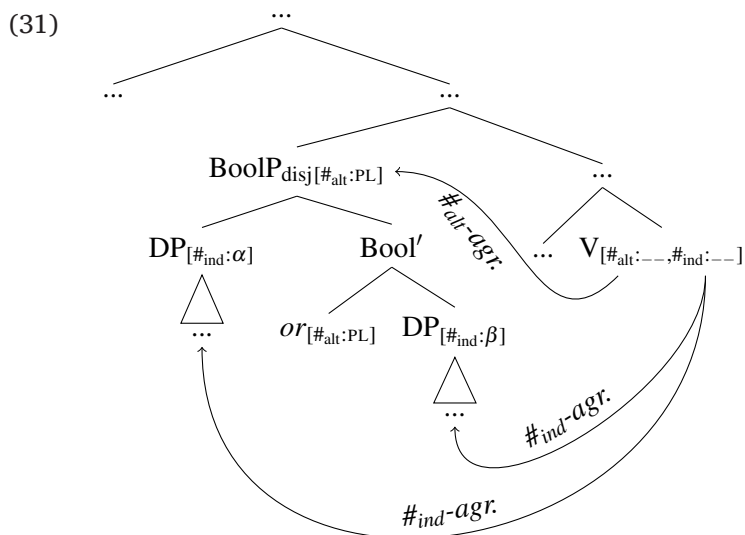
Note that we assume equidistance between the disjuncts in a disjunction (see e.g. van Koppen 2006; Bošković 2009; Arregi & Nevins 2013; Crone 2016). Therefore, the verb finds multiple goals for agreement in individual number.

Based on these assumptions, we can now turn to the analysis of number agreement in disjunctions. We are dealing with optionality in the data, which is notoriously difficult to

implement in any theoretical framework. For concreteness' sake, we implement our analysis in Optimality Theory (Prince & Smolensky 1993), though any other constraint-based framework (e.g. *Harmonic Grammar,* Legendre et al. 1990) seems to be equally well-suited.[17]

Within our approach, we assume the constraints in (32) with the ranking in (33).

(32)   a.   MATCH-$\#_{ALT}$: Count one violation if there is at least one case where the [$\#_{alt}$]-features of the agreement target contradict the [$\#_{alt}$]-features of the agreement controller.
       b.   MATCH-$\#_{IND}$: Count one violation if there is at least one case where the [$\#_{ind}$]-features of the agreement target contradict the [$\#_{ind}$]-features of the agreement controller.
       c.   AGR: Count a violation if the agreement target does not have any ϕ-features.

(33)   AGR ≫ MATCH-$\#_{ALT}$, MATCH-$\#_{IND}$

The constraints (32a,b) have the effect for disjoined subjects that the verb has to match the number of the disjunction as a whole (MATCH-$\#_{ALT}$) as well as the number of *all* the disjuncts (MATCH-$\#_{IND}$). Otherwise a violation will occur. Note that there is at most one violation per constraint independent of the number of mismatches. This predicts that a disjunction with more than two disjuncts does not behave differently from a disjunction with only two conjuncts.

As for the ranking, the matching constraints for the two number features are tied in the sense of Prince & Smolensky (1993) (see also Müller 2003 and references cited therein). Two constraints that are tied are not clearly ranked, which means that two constraint orderings are possible simultaneously:

(34)   a. R_1: MATCH-$\#_{ALT}$ ≫ MATCH-$\#_{IND}$
       b. R_2: MATCH-$\#_{IND}$ ≫ MATCH-$\#_{ALT}$

The result of a tie is that there can be potentially two candidates that are optimal and hence grammatical: one candidate that is optimal by ranking R_1 and another candidate that is optimal by ranking R_2. This is what happens in the analysis below. This idea amounts to saying that there are two parallel grammars that one speaker can have simultaneously (see Section 3.2.4).

The tableau in (35) illustrates what happens in disjunctions with two singulars – the case that shows optionality in the data.

(35)

[SG or$_{PL}$ SG] … V	AGR	MATCH-$\#_{ALT}$	MATCH-$\#_{IND}$
☞ a. V-SG		*	
☞ b. V-PL			*
c. V	*!		

In the case of two singular disjuncts, there is a conflict between the alternative number feature of the disjunction, which is plural, and the individual number feature of the disjuncts, which is singular in both cases. Since matching the disjunction and the disjuncts is equally important, both plural and singular agreement is optimal. A verb form without agreement marking (35c) is ruled out by the high-ranked AGR-constraint.

Next, we have the case of mixed number disjunctions, which empirically show plural agreement. In these disjunctions it is impossible to match the number features of both disjuncts. Thus, MATCH-$\#_{\text{IND}}$ is always violated in these cases. As a consequence the constraint MATCH-$\#_{\text{ALT}}$ determines the winner, namely plural agreement. This competition is shown in the tableau in (36).

(36)

[SG or$_{\text{PL}}$ PL] … V	AGR	MATCH-$\#_{\text{ALT}}$	MATCH-$\#_{\text{IND}}$
a. V-SG		*	*!
☞ b. V-PL			*
c. V	*!		

Finally, if all disjuncts are plural, there is no conflict and plural agreement is optimal. This is shown in (37).

(37)

[PL or$_{\text{PL}}$ PL] … V	AGR	MATCH-$\#_{\text{ALT}}$	MATCH-$\#_{\text{IND}}$
a. V-SG		*!	*
☞ b. V-PL			
c. V	*!		

5.2.1 The influence of person

So far, we have shown how the facts about number agreement can be derived by the assumption that disjunctions only have an alternative, but not an individual number feature. Next, we turn to another finding of the experimental study, namely the effect of person.

Our study shows that, if in SG-SG disjunctions both disjuncts are 3rd person, both singular and plural agreement is possible (see Section 3.2). However, if there is a mismatch in person, suddenly, plural agreement is strongly preferred (see experiment 2 in Section 3.3).

The effects of person follow if one adjustment to the previous analysis is made: Since the agreement suffix in German marks both number and person, it is reasonable to assume that the number feature should not be treated separately. Instead, we assume that it is part of the ϕ-feature set (cf. Marušič et al.'s 2015 "Consistency Principle"). Combined with our assumption about number above, we suggest that the effects of person can be accounted for if there are two sets of ϕ-features: $[\phi_{\text{alt}}]$ and $[\phi_{\text{ind}}]$. Furthermore, the two matching constraints must be adapted accordingly.

(38) a. MATCH-ϕ_{alt}: Count one violation if there is at least one case where the [ϕ_{alt}]-features of the agreement target contradict the [ϕ_{alt}]-features of the agreement controller.

   b. MATCH-ϕ_{ind}: Count one violation if there is at least one case where the [ϕ_{ind}]-features of the agreement target contradict the [ϕ_{ind}]-features of the agreement controller.

By assumption, the alternative ϕ-features of a disjunction are 3PL, but see Section 5.3. With these assumptions in place, the person data follow without further ado. (39) illustrates this for the case of a 2SG-3SG-disjunction.

(39)

[2SG or$_{\text{3PL}}$ 3SG] … V	AGR	MATCH-ϕ_{ALT}	MATCH-ϕ_{IND}
a. V-2SG		*	*!
b. V-3SG		*	*!
☞ c. V-3PL			*
d. V	*!		

As shown in the tableau in (39), matching the disjunction is optimal, which means that matching the ϕ_{alt}-features is optimal. The reason is that in a mismatching person scenario, it is impossible to satisfy the MATCH-ϕ_{IND} constraint.

5.2.2 The influence of syncretisms

A further observation from the test in Section 3.3.4 is that singular agreement gets better again, if the singular verb is syncretic for both persons, see (40).

(40) [*Ich oder mein Steuerberater*] **kann/können**   dir bei dem Formular helfen.
      I   or   my   accountant   can.1SG~3SG/3PL you with the   form   help

This observation follows under the assumption that grammatical operations that govern syncretisms apply in the same domain as agreement marking. For instance, it can be assumed that syncretisms are created by the morphological operation of impoverishment (Halle & Marantz 1993; 1994), which deletes features and therefore creates an underspecification of two elements. These two items can then correspond to the same form.

Now, if impoverishment can apply in the syntax (Keine 2010), it can interact with agreement, which means that syncretisms can interact with agreement.[18] Within the OT-analysis developed above, this would mean that syncretism constraints (i.e. impoverishment constraints), which create underspecification, apply in the same grammatical domain as the syntactic Match constraints. For (40), for example, we can assume a constraint like (41).[19]

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[18] Alternatively, one can assume that the syntactic part of the Agree operation is carried out in syntax and that the actual feature resolution done by the matching constraints happens post-syntactically together with impoverishment, cf. Arregi & Nevins (2012). Nothing hinges on this for our purposes.

[19] The syncretism constraints must be verb-specific since, in German, 1SG and 3SG are not syncretic throughout. This is why we only provide one example of such a constraint.

(41) SYNCR$_{\text{CAN}}$: Count a violation if the 1st or 3rd person is not deleted on the verb *könn-* in context of a singular feature.

The deletion of the person feature on the verb *könn-* leads to a verb that only has a singular feature. If ranked high enough, the constraint in (41) triggers a deletion of the person features [1] and [3] on the agreement suffix in the context of the verb *can* in German. This has the effect that the person becomes irrelevant for the matching constraints since they can no longer cause a feature conflict. The tableau in (42) shows how this affects the agreement possibilities.

(42)

[1SG or$_{3PL}$ 3SG] … CAN	AGR	SYNCR$_{\text{CAN}}$	MATCH-ϕ_{ALT}	MATCH-ϕ_{IND}
a. CAN-1SG		*!	*	*
b. CAN-3SG		*!	*	*
☞ c. CAN-3PL				*
☞ d. CAN-SG			*	
e. CAN	*!			

The candidates (42a) and (42b) are ruled out because they both still carry a person feature and therefore violate the syncretism constraint for *can*. Candidate (42c) carries plural and does not trigger the specific syncretism constraint. (42d), finally, is the impoverished version of (42a/b) with the person feature deleted. This candidate does not violate MATCH-ϕ_{IND} as there is no contradiction between the ϕ-features marked on the verb and the ϕ-features of the two disjuncts.

As for the matching constraints, there is now a similar situation as before with the matching person disjunctions: There is one candidate, namely (42c), which satisfies MATCH-ϕ_{ALT}, and one candidate, (42d), which satisfies MATCH-ϕ_{IND}. The result is that both candidates are optimal, which is in line with the empirical observation about syncretisms.

5.2.3 The influence of word order

Finally, word order seems to affect the agreement strategy: In VS order, CCA is considered on average better than in SV order (see Section 3.2.3 and 3.3.3).

(43) a. [*Ich oder mein Kollege*] **??hat/haben** gestern einen Fehler gemacht.
I or my colleague have.3SG/3PL yesterday a mistake made

b. Gestern **habe/haben** [*ich oder mein Kollege*] einen Fehler gemacht.
yesterday have.1SG/3PL I or my colleague a mistake made

The effect of word order turned out to be significant. So the question is whether CCA is an actual part of the grammar in German. Remember that CCA did not consistently produce grammatical judgments but that really only the configuration exemplified by (43b) was rated as good as resolved agreement (both for 1st and 2nd person). Given all aspects of German syntax, we

assume that CCA is not a part of the German grammar. Standardly it is assumed that subject-verb agreement is fixed in the TP (Chomsky 2001) prior to the derivation of V2, meaning prior to finite verb movement to C and fronting of some phrasal constituent to the German "prefield", Spec-CP, which can (44a) but does not have to be (44b) the subject (e.g. Grewendorf 1988; Holmberg 2015).[20] This implies that the surface structure of a German root clause does not represent the underlying configuration for verbal agreement. In the example in (44), the agreeing subjects and verbs in the TP are printed in bold.

(44)   a.   [$_{CP}$ Mein Kollege   hat [$_{TP}$ <**mein Kollege**> [$_{VP}$ einen Fehler   gemacht] <**hat**>]]]
             my   colleague has   a   mistake made
             'My colleague made a mistake.'

       b.   [$_{CP}$ Einen Fehler   hat [$_{TP}$ **mein Kollege**   [$_{VP}$ <einen Fehler> gemacht] <**hat**>]]]
             a   mistake has   my   colleague   made
             'A mistake, my colleague made.'

Thus, the CCA-effect observed in (43b) cannot be explained to follow from surface agreement between the verb (in C) and the disjoined subject (in Spec-TP) simply because German surface structure does not necessarily represent an agreement configuration. We therefore hypothesize that the effect of word order is due to a garden-path-like effect caused by processing (but see Bruening & Al Khalaf 2020 for a framework that incorporates such effects into grammar): As for SV order, the disjoined subject is processed before the verb. So, the subject is already given when the verb is processed. This means that agreement can be evaluated according to the constraints above.

   In VS order, however, the disjoined subject is processed after the verb. At the point where the first disjunct is processed, the verb form in (43b) matches the first disjunct. This matching is then perceived as grammatical. Once the second disjunct is processed, plural agreement becomes possible, but the speaker has already processed the verb together with the first disjunct. Thus, the effect of CCA might be called a grammatical illusion, see, e.g., Haider (2011).[21]

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[20] Note that even under the assumption of feature inheritance (Chomsky 2007; 2008) where C transfers the ϕ-features to T, the final word order is only fixed after Spec-CP is filled. So, we think it is plausible that this implies that agreement must be fixed before the final word order is fixed.

[21] We do not exclude that CCA might be a true part of the grammar in other languages. We hypothesize that there are two ways to handle this in our analysis.

First, the probing domain might be reduced in languages that have CCA, such that only the linearly closest disjunct can be a goal for the verbs individual ϕ-features. Certainly this demands a special interaction of Agree and linearization (cf. Marušič et al. 2015). Under this assumption, the constraints in the analysis in Section 5.2 would not have to be changed.

The second option is to add an additional constraint. What is presumably needed is a constraint that disallows a sequence of α-β-α with respect to ϕ-features in an agreement configuration, that is, a constraint that bans furthest conjunct agreement. This could be formulated as in (i).

5.3 Predicted typology

A natural question for any OT-analysis is what winners could be possible with a reranking of the constraints. While the main focus of this paper is to provide a formal analysis for the German data, this section briefly discusses the typology predicted from the analysis above.

In the analysis, there are three main constraints: AGR, MATCH-$\#_{ALT}$, and MATCH-$\#_{IND}$. These three constraints can be ranked in six different ways. These rankings with their specific outcomes for SG-SG-disunctions and for PL-SG-disjunctions are shown in (45).[22]

(45)   *Overview of the predicted agreement typology under the OT approach*

	Ranking					*SG-SG-disj*	*PL-SG-disj*
(i)	AGR	$\gg$	MATCH-$\#_{ALT}$	$\gg$	MATCH-$\#_{IND}$	pl agr.	pl agr.
(ii)	AGR	$\gg$	MATCH-$\#_{IND}$	$\gg$	MATCH-$\#_{ALT}$	sg agr.	pl agr.
(iii)	MATCH-$\#_{ALT}$	$\gg$	AGR	$\gg$	MATCH-$\#_{IND}$	pl agr.	pl agr.
(iv)	MATCH-$\#_{IND}$	$\gg$	AGR	$\gg$	MATCH-$\#_{ALT}$	sg agr.	**no/df agr.**
(v)	MATCH-$\#_{ALT}$	$\gg$	MATCH-$\#_{IND}$	$\gg$	AGR	**no/df agr.**	**no/df agr.**
(vi)	MATCH-$\#_{IND}$	$\gg$	MATCH-$\#_{ALT}$	$\gg$	AGR	**no/df agr.**	**no/df agr.**

The first two orders in (45(i)–(ii)) are the orders already discussed in Section 5.2. The question is if the constraint AGR can be lower ranked than the matching constraints. In these cases, either singular agreement or default agreement shows up, which in the case of German (and many other languages) is also singular. The effect that literally no marker shows up is something that is not expected to occur, as this would violate word formation rules in morphological agreement languages. Instead, we expect that a default marker should show (df agr.), as is the case with expletive or absent subjects that do not have any ϕ-features, see (30d).

While it is intuitive that the AGR constraint should be high ranked in morphological agreement languages, there is nothing that in principle rules out that a MATCH constraint is higher ranked than AGR. In fact, given the distribution of the ϕ-features according to (30), only disjunctions are a case where there could be potential conflicts between the constraints. As it stands for

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(i)   *α-β-α-AGR: Count one violation if the ϕ-features of the agreement target T match the ϕ-features $[\phi:\alpha]$ of one agreement controller C_i and there is another agreement controller C_j with mismatching ϕ-features $[\phi:\beta]$ that linearly intervenes between C_i and T.

We speculate that this constraint might be present in a slightly different version talking about hierarchical intervention. This would then derive highest conjunct agreement (see Marušič et al. 2015; Marušič & Shen 2021). In languages like German, the *α-β-α-AGR-constraint would be lower ranked then the Match constraints, but languages with CCA would have it higher ranked.

[22] For PL-PL disjunctions, singular agreement is never possible under any ranking, as plural satisfies all three constraints. As for conjunctions, both the individual and the alternative number feature are plural, so there is no conflict. Finally, simple DPs do not have an alternative number feature, which means that there is no conflict again. See (30) in Section 5.1.3 for more details.

number agreement, we would thus expect that there are three possible options for agreement with SG-SG disjunctions: singular agreement, plural agreement, and default agreement (which in most languages is singular). Interesting would be cases where there is a separate default agreement form and cases where there are more number features. As for the first case, consider the Somali data in (46) and (47), which we collected with four speakers.[23]

(46)   [*Wiilka iyo ninku*   ] **waa~ay ordaan**.
       boy.SG and man.SG   they   run.3PL
       'The boy and the man run.'   *(Somali)*

(47)   a.   [*Wiilka ama ninku*   ] **waa~ay ordaan**.
           boy.SG or   man.SG   they   run.3PL

       b.   [*Wiilka ama ninku*   ] **waa~uu ordayaa**.
           boy.SG or   man.SG   he   run.PROG.3SG

       c.   [*Wiilka ama ninka*   ] **ayaa orda**.
           boy.SG or   man.SG   DF   run.DF
           'The boy or the man run.'   *(Somali)*

In (46) we see how agreement with SG-SG conjunctions works: We get plural agreement. With disjunctions, however, in (47), we have three different options: plural (47a), singular (47b), or a default form (47c). This could be the result of a tie in Somali between all three constraints, see (48).

(48)

[SG or$_{PL}$ SG] … V	AGR	MATCH-#$_{ALT}$	MATCH-#$_{IND}$
☞ a. V-SG		*	
☞ b. V-PL			*
☞ c. V	*		

More evidence for this analysis comes from mixed number disjunctions. In these, both plural and default agreement is possible, while singular is not, see (49).

(49)   a.   [*Wiilasha ama ninku*   ] **waa ay ordaan**.
           boy.PL   or   man.SG   they   run.3PL
           'The boys or the man run.'

       b.   [*Wiilasha ama ninka*   ] **ayaa orda**.
           boy.PL   or   man.SG   DF   run.DF
           'The boys or the man run.'   *(Somali)*

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[23]   The data have been collected for a separate project on the typology of agreement forms in coordinative constructions.

This is exactly what is predicted by a tie between the three constraints, see (50).

(50)

[PL or$_{PL}$ SG] … V	AGR	MATCH-#$_{ALT}$	MATCH-#$_{IND}$
a. V-SG		*	*!
☞ b. V-PL			*
☞ c. V	*		

As for non-binary number systems, we have languages like Slovenian. According to judgments of one speaker (Franc Marušič p.c.), SG-SG disjunctions with singular agreement are judged better than with dual agreement (51), in contrast to SG-SG conjunctions which need dual agreement (52).

(51) [*Grmovje   ali drevo*   ] **bo**   **posajeno** / ?**bosta posajeni**   za   hišo.
    shrubs.N.SG or tree.N.SG   will.SG planted.N.SG / will.DU planted.N.DU behind house
    'A shrub or a tree will be planted behind the house.'   *(Slovenian)*

(52) [*Grmovje   in   drevo*] ***bo**   **posajeno** / **bosta posajeni**   za   hišo.
    shrubs.N.SG and tree.N.SG   will.SG planted.N.SG / will.DU planted.N.DU behind house
    'A shrub and a tree will be planted behind the house.'   *(Slovenian)*

This fits also nicely to the analysis developed so far: Disjunctions do not lead to sum formation similar to what we find with conjunctions (see Harbour 2020).[24]

Lastly, the question is what happens in the case of mismatching person. In German, plural was the preferred option and the theory so far predicts that singular agreement is ruled out due to an inevitable violation of the MATCH-ϕ_{IND} constraint. In fact, data from Hebrew that we elicited with multiple speakers suggest that singular is indeed impossible when the person features mismatch, see (53), but singular becomes possible if both disjuncts are third person (and focused) (54b).[25]

(53) a. [*ani o   ata*   ] **ratsnu**
        I   or you.M.SG   ran.1PL
        'I or you ran.'

    b. [*ata   o   hu*] **ratstem**
         you.M.SG or he   ran.2PL
        'You or he ran.'   *(Hebrew)*

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[24] See footnote 14 for a discussion of dual.

[25] That plural agreement is present with mismatching person SG-SG disjunctions is quite consistent. For reasons of space, we cannot include more data from other languages. At this point, we have nothing to say about the focus effect for singular agreement with third person disjunctions in Hebrew. This is self-reported by speakers, but we did not test this consistently. Since this is only a side note to the actual topic of the paper, which is German, we leave this to further investigation.

(54) a. [*ha-jeled o ha-gever*] **ratsu**
         the-boy or the-man   ran.M.PL
         'The boy or the man were running.'

      b. [*ha-jeled   o ha-gever*   ] **rats**
         the-boy.FOC or the-man.FOC   ran.M.SG
         'The BOY or the MAN were running.'   *(Hebrew)*

But what we see in the data, is a person hierarchy effect. The person feature on the verb agrees with the person that is higher on a scale of $1 > 2 > 3$. This cannot be tested well in our study, as 1PL and 3PL are syncretic in German verb agreement. Further, the 2PL form is infrequent. Still, data that we informally elicited with a few speakers suggest that in 2–3 pronominal disjunctions, 2PL agreement is at least an option for some speakers (even though speakers prefer 3PL agreement). If correct, this is similar to person resolution in conjunctions (Findreng 1976; Corbett 1983; Timmermans et al. 2004; Fuß 2014; 2018; Driemel 2018). This issue deserves additional attention but for now let's assume that even in German, the person feature in disjunctions can be resolved to the higher person. How would the theory derive that? The alternative number feature is plural because there are always multiple focus alternatives. This is reminiscent of the way that the individual number feature is computed in conjunctions. We suspect that the person feature of focus alternatives might also be computed similar to person resolution in conjunctions. The person feature of the alternative ϕ-set equals the highest-ranked person feature among its alternatives, see (55).[26]

(55) a. {you, the man, she, …} → ϕ_{alt}[2PL.(M)]
      b. {the man, I, she, …} → ϕ_{alt}[1PL.(M)]
      c. {the man, my cat, she, …} → ϕ_{alt}[3PL.(M)]

At this point, we must leave the issues of a greater typology of disjunction partially unresolved, since the main point of this paper is German and an analysis of the German pattern. Still, we hope that this section provides some deeper insights for future research.[27]

6 Conclusion

In this paper, we presented new data on agreement with disjoined subjects in German. We observed that number agreement is special: If two singular DPs are disjoined, agreement on

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[26] Similar rules would hold for gender resolution, where in many languages mismatching conjunctions are resolved to masculine agreement. If correct, this would also hold for the computation of ϕ_{alt}.

[27] A final point that we could not address in depth is how the syncretism constraints play into the typology. First note that these constraints must be language and verb specific. As idiosyncratic as they are, it is highly probable that they cannot be low-ranked, as this would predict that these constraints have only a minor effect, which is exactly the opposite of what such word-formation constraints empirically do.

the verb can be either singular or plural. In all other cases (that is if there is at least one plural disjunct), the verb must be plural.

This generalization can be derived by assuming that disjunctions are plural in the sense that they evoke a set of alternatives. On the other hand, they do not form a set of entities and do not express plurality of individuals. This idea is formalized by the introduction of two types of number features: $[\#_{alt}]$ for the number feature that expresses the set of alternatives and $[\#_{ind}]$ that expresses the number of individuals. Assuming that the verb has to match both types of features, the verb essentially agrees with both the disjunction as well as the disjuncts in number. This can lead to a conflict which can be resolved either in favor of the number of the disjuncts or the number of the disjunction. We showed that this conflict modeled as a constraint tie in Optimality Theory derives the data easily. Importantly, the account considers the semantics of the number of disjunction rather than tracing the pattern back to an arbitrary agreement resolution rule.

We further extended the account to derive the influence of person agreement and syncretisms. For the former, we generalized the number distinction to a ϕ-distinction. This ensures that the different ϕ-features for the agreement marking must come from the same goal (either a disjunct or the disjunction), which provides an explanation for why plural agreement with the disjunction is favored when the singular disjuncts mismatch in person. For syncretisms, we suggested that syncretism constraints render the person feature irrelevant (by impoverishment). When they apply in the same domain as the agreement constraints, this derives the observation that person syncretisms alleviate singular agreement with singular mismatching person disjuncts. Finally, we discussed an outlook on how the cross-linguistic typology of disjunction agreement might be. We found that, on a first glance, the predictions of the OT-analysis are fulfilled.

All in all, the analysis developed in this paper provides a fairly straightforward account to the German data. With respect to language variation there is in principle no work yet, but we hope that our work inspires further research about disjunctions.

Abbreviations

Glosses

1/2/3	=	1st/2nd/3rd person
AUX	=	auxiliary
DU	=	dual
EXPL	=	expletive
F	=	feminine
FOC	=	focus
IMP	=	impersonal
M	=	masculine
N	=	neuter
PL	=	plural
PROG	=	progressive
PST	=	pst
SG	=	singular

Other abbreviations

#	=	number
~	=	syncretic with
φ	=	phi-features (person, number, gender)
agr	=	agreement
AIC	=	Akaike Information Criterion
alt	=	alternative
CCA	=	Closest Conjunct Agreement
df	=	default
Foc	=	focus
ind	=	individual
p(-value)	=	(statistical) probability value (that the null hypothesis is true)
QUD	=	question under discussion
SV	=	subject verb
VS	=	verb subject

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