Agreement with Disjoined Subjects in German

Anke Himmelreich and Katharina Hartmann
Goethe-Universität Frankfurt am Main
himmelreich@lingua.uni-frankfurt.de
k.hartmann@lingua.uni-frankfurt.de

1. Introduction

In this talk, ...

T1: we present the findings of our experiments on agreement with disjunctive coordinations in Standard German;

T2: we analyze our findings in Optimality Theory.

Some background:

B1: **Coordination**
Combination of two conjuncts / disjuncts with a conjunctive ('and') or disjunctive ('or') coordinator. We assume the possibility of non-Boolean coordination for German and English.

(1)   [&P [DP The hairdressers] [&' 'and' / 'or' [DP the fitness centres]]] had to close again.

B2: **Agreement**
There are various strategies for verb agreement with a coordinated subject. We only illustrate closest conjunct agreement and resolved agreement (with conjunctions):

- **Closest conjunct agreement (CCA)**: The verb agrees with the linearly closest conjunct.

    (2)   [*Ich und du*] **wirst**   geimpft.
             I   and you   get.2SG vaccinated

- **Resolved agreement**: The verb resolves the conflict of having to choose between two conjuncts and agrees with the entire coordination. The coordination computes its ϕ-features from the ϕ-features of its conjuncts.

    (3)   [*Ich und du*] **werden** geimpft.
             I   and you   get.PL   vaccinated

B3: **Agreement resolution**
A standard approach to resolve ϕ-feature agreement is to list language and construction-specific rules (see e.g. Bhatt and Walkow 2013, Marušič et al. 2015).

(4)   **Computation-of-number-feature by Conj head in Slovenian** (Marušič et al. (2015:57)):
       a.   If either one of its arguments is [–singular], its output is plural; otherwise, its output is dual.
       b.   If one or both of its arguments lack ϕ-features altogether, its output is undefined.

Problems:

– Especially for number agreement there seems to be a clear cross-linguistic pattern.

– Number resolution is not arbitrary, the agreement reflects the sum-operation of the conjunction *and*, hence semantics is involved in number resolution.

– In particular, a conjunction consisting only of plurals does not trigger singular agreement.

B4: **Word order**
Due to the German V2 property the subject may either precede the verb (SV order, (3) and (4)) or follow it (VS order, (5)). This word order variation may influence agreement strategies, especially CCA.

(5)   Morgen **werden** [*ich und du*] geimpft.
        tomorrow get.PL   I   and you vaccinated

Empirical observations wrt. disjunction:

O1: Number agreement resolves to PL unless both disjuncts are SG. Then, SG agreement is possible as well, and even slightly preferred if both disjuncts are third person. This effect can be found in both SV and VS order.

O2: If the two conjuncts differ in person, PL agreement is the clearly preferred option, which suggests an interaction between person and number agreement.

O3: Closest conjunct agreement (CCA) in number is marginally possible in VS order, but not in SV order. CCA in person is rated noticably better in VS order than SV order.

O4: There are syncretism effects in disjunctions with mismatching person: If the verb form is syncretic for both persons, the sentences are judged better than sentences with non-syncretic verbs.

Theoretical questions:

Q1: How does agreement resolution work in disjunctions?

Q2: How can the optionality of agreement with sg-sg disjunctions be accounted for?

Q3: How can word order affect agreement resolution?

Q4: How can the syncretism effects be accounted for?

Roadmap:

S2: Section 2 provides a brief overview of the literature on agreement with disjunctive subjects.

S3: Section 3 discusses semantics properties of disjunctions.

S4: Section 4 summarizes the experiments on agreement with disjoined subjects in German.

S5: Section 5 discusses the implications of the experimental findings for syntactic theories of agreement and disjunctions.

S6: Section 6 summarizes.

2. Agreement in disjunctions as an understudied phenomenon

Despite a lot of work on agreement with conjoined subjects there has not been too much work on agreement with disjoined subjects. Here, we report on three experimental studies about this topic.

2.1. Foppolo and Staub (2020)

Foppolo and Staub (2020) summarizes a series of experiments about agreement with disjoined subjects in **English** and **Italian**.

- **English:** Both eye-tracking-during reading studies and rating studies showed that disjunctions consisting of two singular nouns allow for either singular or plural agreement with a slight preference for singular agreement.

- **Italian:** Both a completion task experiment and a rating study showed that plural and singular agreement are both possible with singular disjoined subjects with no preference for either of them.

- Ratings showed a lot more variability in Italian than in English: Both plural and singular agreement received the lowest rating with some speakers as well as the highest rating.

2.2. Marušič and Shen (2020)

Marušič and Shen (2020) tested gender agreement with disjoined subjects in **Slovenian**:

- In a guided elicitation experiment, participants saw a sentence with a simple subject and had to replace the simple subject with a disjoined (*either-or*) noun phrase shown to them.

  (6) 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'

- They found that disjunctions have a higher tendency to trigger closest conjunct agreement than conjunctions.

- Highest conjunct agreement and resolved agreement occur as agreement strategies with disjoined subjects just as they do with conjoined subjects.

2.3. Weiss (2015)

Weiss (2015) tested how agreement with disjoined subjects in **German** is resolved, depending on the word order:

- A rating study for disjunctions of the 2SG pronoun *du* and the 3SG pronoun *er* showed that German has closest conjunct agreement.

- The items had two word orders: VS and SV; the verb either had 3SG or 2SG agreement. The subjects appeared in '2 OR 3' (shown in (7)) or '3 OR 2' order.

(7)   a.   Fällst/fällt du   oder er den Baum, der   in der Einfahrt   steht?
              log   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   the tree   that in the driveway stands
              'Do he or you log the tree that is in the driveway?'

- The study did not separate person from number agreement - a critical point that carries over to Smith et al. (2018), nor did it provide the option of 3PL agreement.

3. Semantic properties of disjunctive coordination

3.1. Collective predicates

Collective predicates require a plural subject. This may also be a conjoined subject:

(8)   The children$_{PL}$ / [Clara and Chloe]$_{PL}$ met on the playground.

Collective predicates are not possible with disjoined subjects, irrespective of subject-verb agreement:

(9)   a. *Im   Urlaub   werde   / werden ich oder mein Mann   ein ähnliches Buch lesen.
           in.the holidays will.1SG / will.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 treffen.
           tomorrow will.1SG / will.1PL I   or   my   husband us   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 / form.1PL I   or   my   husband a   team
           'At the competition, I or my husband will form a team.'

Conclusion: The unavailability of collective predicates with disjoined structures shows that disjoined subjects do not denote plural entities.

3.2. Cumulative / distributive interpretation

Plural subjects (10-a) may give rise to cumulative (10-b) or distributive (10-c) interpretations (Haslinger et al. 2019).

(10)   a.   Ada and Bea fed exactly four pets.
       b.   Ada fed four pets, and Bea fed four pets.
       c.   Ada fed one pet, and Bea fed three pets.

Cumulative interpretations are excluded with disjunctive coordinations, see (11):

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

Conclusion: The data in (11) show once again that disjoined subjects do not denote plural entities.

3.3. Semantic vs. logical disjunction

- Logical disjunction

  It is assumed that the semantically, disjunctions in natural language have the meaning of a **logical disjunction**.

  (12) The cat sleeps or the tree is green.
  - a. *True if*:
    The cat sleeps and the tree is not green.
    The cat does not sleep and the tree is green.
    The cat sleeps and the tree is green.
  - b. *False if*:
    The cat does not sleep and the tree is not green.

- Exclusive vs. inclusive disjunction
  - Disjunctions in natural language can be inclusive, that is, both disjuncts can be true (=logical disjunction).
  - Disjunctions can also be exclusive, meaning, that only one disjunct can be true (either p or q).
  - The standard approach to the inclusivity-exclusivity distinction is to say, that, semantically, disjunctions are inclusive. The exclusivity comes about by a scalar implicature, that is the inclusivity-exclusivity distinction is part of pragmatics (see e.g. Grice 1989, Chevallier et al. 2008).

- Disjunctions as conjunctions of hidden epistemic modals:
  - There are other semantic analyses that argue against a logical-disjunction approach.
  - Free choice disjunctions, like (13), are seen as conjunctions of (hidden) epistemic modals (see Zimmermann 2000).

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

  (14) *Choice Principle (CP)*
  - a. X may A or B $\models$ X may A and X may B
  - b. $\Delta(A \lor B) \models \Delta A \land \Delta B$ (Δ: deontic possibility)

4. Experiments on agreement with disjoined subjects in German

4.1. Method

4.1.1. Procedure

- We conducted a large acceptability judgment study in three questionnaires (Q1, Q2, Q3), each comprising several experiments.

- 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.

Figure 1: Item presentation on L-Rex

- In Experiment 3 (Q3), see appendix, there was an additional reading question for whether the disjunction is understood as EXCL or INCL.

- All questionnaires were hosted on L-Rex (https://lrex.2e2a.de/).

- Test items in all questionnaires were presented in a Latin-Square-Design. All fillers were shown to every participant.

4.1.2. Participants

- Excluding non-native speakers and unattentive speakers (people who repeatedly rated clearly ungrammatical fillers as grammatical):
    - 67 participants completed Q1 ($\varnothing$age: 37.2), which comprised Experiments 1a, 1b, 1c, 1d, 1e.
    - 69 participants Q2 ($\varnothing$age: 27.5), which comprised Experiments 2a, 2b, 2c, 2d.
    - 37 participants Q3 ($\varnothing$age: 28.2) for Experiment 3.

- The links to the three questionnaires were sent to first semester students of linguistics or German studies as well as random aquaintances. All participants were naive to the purpose of the study. As a motivation, participants could win gift certificates for online shops.

4.1.3. Materials

Questionnaire 1

- In Q1, we tested how number agreement (SG, PL) is affected by the number value of the disjuncts (PL∨PL, SG∨SG, PL∨SG, SG∨PL) and by word order (SV, VS). (15) shows an example item.

- Q1 contained 32 test items and 48 fillers.

- All test items were main sentences with an auxiliary (*werden* or *haben*), the copula *sein* or a modal (*können*, *sollen*, *müssen*) in V2 position and the infinite lexical verb at the end of the sentence.

(15)   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

Questionnaire Q2

- In Q2, we tested how person agreement (1/2SG, 3SG, 3PL) is affected by the person value of the disjuncts (1/2SG∨3SG, 3SG∨2/1SG) and by word order (SV, VS).

- The disjunctions always contained a 1st or 2nd person pronoun and a full NP, see (16) for examples.

- Q2 contained 24 test items and 48 fillers. Half of the items used the modal verbs *können* ('can') and *sollen* ('should'), which are syncretic for 1st and 3rd SG; the other half used *werden* ('will') and *haben* ('have'), which are non-syncretic.

(16)   a.   *Ich oder mein Mann*   **werde/wird/werden** morgen   vorbeikommen.
        I   or   my   husband will.1SG/3SG/3PL   tomorrow come.over
     b.   *Ich oder mein Steuerberater* **kann/kann/können** *dir bei   dem Formular helfen*.
        I   or   my   accountant   can.1SG/3SG/3PL   you with the form   help
     c.   Gestern   **habe/hat/haben** [*ich oder mein Kollege*   ] einen Fehler   gemacht.
        yesterday have.1SG/3SG/3PL I   or   my   colleague a   mistake made

(We discuss questionnaire 3 in the appendix.)

4.2. Experiments and Results

4.2.1. Experiment 1a: Agreement with matching number disjunctions under SV

Design

- In Experiment 1a, we how tested how number agreement is resolved with matching number disjuncts (pl-pl, sg-sg) in SV order.

- Experiment 1a had a 2-by-2 factorial design and 32 items:
  - Number of disjuncts: singular or plural
  - Verb agreement: singular or plural

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

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

Results (see figure 2)

- A two-factorial ANOVA revealed an interaction of the number of disjuncts and agreement ($F = 316.90, p < 0.001$) (as well as a preference for plural disjuncts and a preference for plural agreement overall).

- When the disjunction consists of two plurals, plural agreement is preferred; singular agreement is unacceptable.

- When the disjunction consists of two singulars, singular agreement is slightly preferred; but plural agreement is also acceptable.
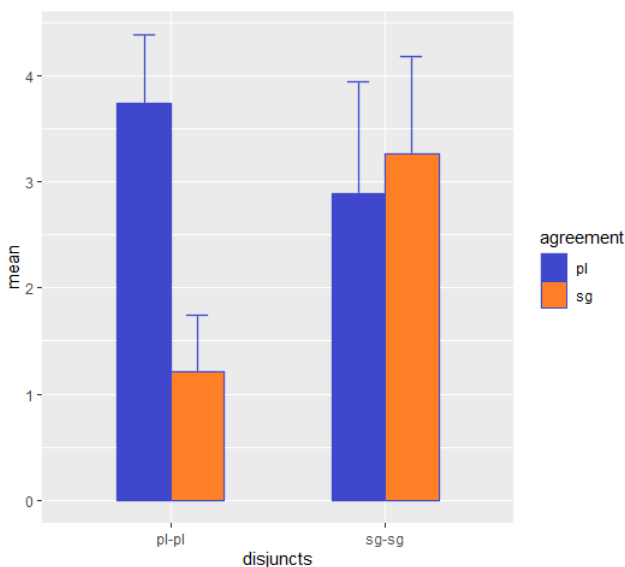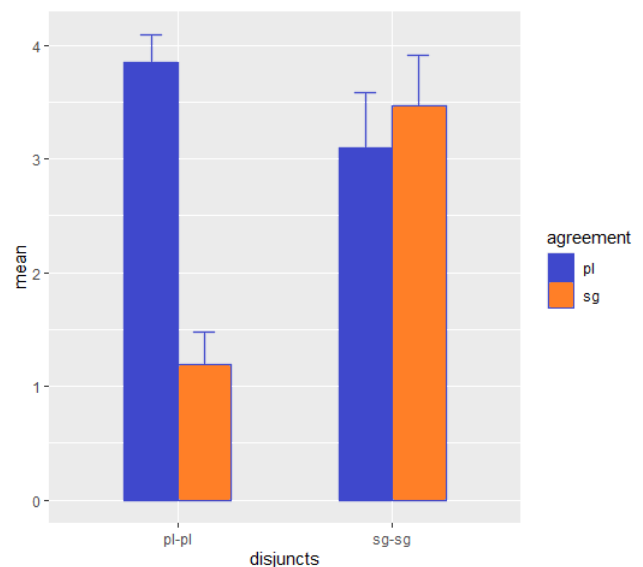

Figure 2: Results of Experiment 1a (SV)

Figure 3: Results of Experiment 1b (VS)

4.2.2. Experiment 1b: Agreement with matching number disjunctions under VS

Design

- In Experiment 1b, we tested how number agreement with matching number disjunctions is resolved in VS order.

- Experiment 1b had a 2-by-2 factorial design and 32 items:
  - Number of disjuncts: pl-pl, sg-sg
  - Verb agreement: singular or plural

(18)   a.   Morgen   **wird/werden** [*die Regale   oder die Tische*   ] geliefert.
tomorrow will.be.SG/PL   the shelf.PL or   the table.PL   delivered
b.   Morgen   **wird/werden** [*das Regal   oder der Tisch*   ] geliefert.
tomorrow will.be.SG/PL   the shelf.SG or   the table.SG   delivered

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Results (see figure 3)

- A two-factorial ANOVA revealed an interaction of the number of disjuncts and agreement ($F = 563.9, p < 0.001$) (and again a preference for plural disjuncts and a preference for plural agreement overall).

- When the disjunction consists of two plurals, plural agreement is preferred; singular agreement is unacceptable. The results are similar to SV order.

- When the disjunction consists of two singulars, singular agreement is slightly preferred; but plural agreement is also acceptable.

4.2.3. Experiment 1c: Agreement with mixed number disjunctions under SV

Design

- In Experiment 1c, we tested how number agreement is resolved with mixed number disjuncts (pl-sg, sg-pl) in SV order.

- Experiment 1c had a 2-by-2 factorial design and 32 items:
    - Number of disjuncts: singular-plural or plural-singular
    - Verb agreement: singular or plural

(19)   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.   [*Die Regale   oder der Tisch*   ] **wird/werden** morgen   geliefert.
            the shelf.PL or   the table.SG will.be.SG/PL tomorrow delivered
            'The shelves or the table will be delivered tomorrow.'

Results (see figure 4)

- A two-factorial ANOVA revealed that agreement is the strongest factor ($F = 647.202, p < 0.001$). Additionally, there is also an interaction of the number of disjuncts and agreement ($F = 9.195, p < 0.01$).

- In general, when one of the disjuncts is plural, plural agreement is clearly preferred.

- Singular agreement is slightly better in pl∨sg disjunction, suggesting a minor effect for closest conjunct agreement.
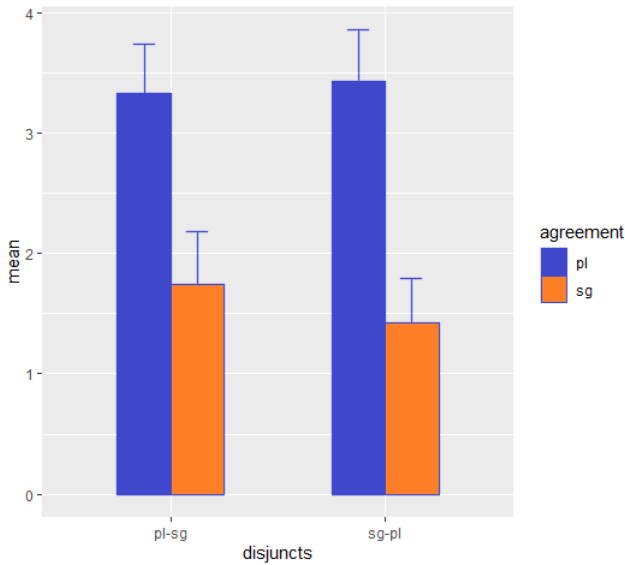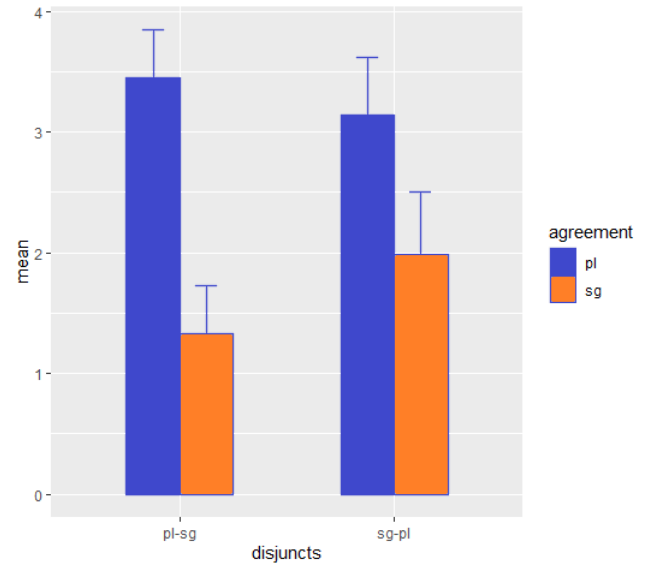
Figure 4: Results of Experiment 1c (SV)

Figure 5: Results of Experiment 1d (VS)

4.2.4. Experiment 1d: Agreement with mixed number disjunctions under VS

Design

- In Experiment 1d, we tested how number agreement with mixed number disjunctions is resolved in VS order.

- Experiment 1d had a 2-by-2 factorial design and 32 items:
  - Number of disjuncts: pl-sg, sg-pl
  - Verb agreement: singular or plural

(20) a. Morgen **wird/werden** [*die Regale   oder der Tisch*   ] geliefert.
tomorrow will.be.SG/PL   the shelf.PL or   the table.SG   delivered
b. Morgen **wird/werden** [*das Regal   oder die Tische*   ] geliefert.
tomorrow will.be.SG/PL   the shelf.SG or   the table.PL   delivered

Results (see figure 5)

- A two-factorial ANOVA revealed that agreement is the strongest factor ($F = 461.08, p < 0.001$). Additionally, there is an interaction of the number of disjuncts and agreement ($F = 39.32, p < 0.001$), which is stronger than in SV order.

- In general, when one of the disjuncts is plural, plural agreement is clearly preferred.

- Singular agreement is better with sg∨pl disjunctions, suggesting an effect for closest conjunct agreement. The results are similar to SV order.

4.2.5. Experiment 1e: Effects of word order on CCA

Design

- In Experiment 1e, we tested how word order affects closest conjunct agreement, i.e. whether it is considered better in either SV or VS order.

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- Since plural agreement is not always CCA, we compared sentences with singular agreement and mixed number disjunctions.

- Experiment 1e had 2 conditions and 32 items:
    - CCA in VS order: V_{sg} sg-pl
    - CCA in SV order: pl-sg V_{sg}

(21)　a.　Morgen **wird** [*das Regal oder die Tische*] geliefert.
　　　　tomorrow will.be.SG the shelf.SG or the table.PL delivered
　　b.　[*Die Regale oder der Tisch*] **wird** morgen geliefert.
　　　　the shelf.PL or the table.SG will.be.SG tomorrow delivered

Results

- A one-factorial ANOVA revealed that word order is a weakly significant factor ($F = 4.323, p < 0.05$).

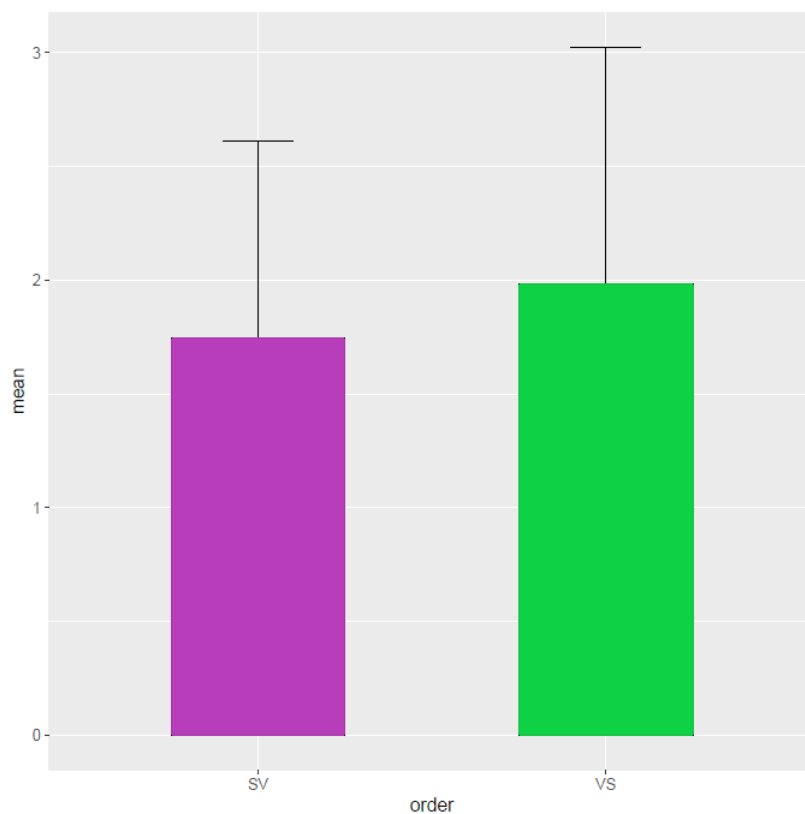- CCA is considered slightly better in VS order than in SV order.

Figure 6: Results of Experiment 1e

4.2.6. Interim Summary

1. Agreement with disjoined subjects in German shows resolved agreement: If at least one disjunct is plural, there is plural agreement.

2. If both disjuncts are singular, we see an optionality: Both singular and plural agreement are possible.

3. Closest conjunct agreement is marked at best. CCA is better in VS order than in SV order.

4.2.7. Experiment 2a: Agreement with mixed person disjunctions in SV order

Design

- In Experiment 2a, we tested agreement with mixed person singular disjunctions in SV order.

- To distangle person from number agreement, all disjuncts were singular.

- Experiment 2a had a 2-by-3 factorial design and 24 items:
    - Person of the disjuncts: local (1st, 2nd) – non-local (3rd), non-local (3rd) – local (1st, 2nd)
    - Agreement: local-singular (1st, 2nd), 3rd-singular, 3rd-plural

- Half of the items had a disjunction of the 1st person pronoun *ich* and a full NP; the other half had a disjunction of the 2nd person pronoun *du* and a full NP.

(22)   a. [*Ich oder mein Kollege*] **habe/hat/haben** gestern einen Fehler gemacht.
           I or my colleague have.1SG/3SG/3PL yesterday a mistake made
    b. [*Mein Kollege oder ich*] **habe/hat/haben** gestern einen Fehler gemacht.
           my colleague or I have.1SG/3SG/3PL yesterday a mistake made

(23)   a. [*Du oder dein Bruder*] **hast/hat/haben** gestern den Fernseher kaputt gemacht.
           you or your brother have.2SG/3SG/3PL yesterday the TV broke made
    b. [*Dein Bruder oder du*] **hast/hat/haben** gestern den Fernseher kaputt gemacht.
           your brother or you have.2SG/3SG/3PL yesterday the TV broke made

Results (see figure 7)

- A two-factorial ANOVA revealed agreement as a significant factor ($F = 95.04, p < 0.001$). Additionally, there is an interaction between the person of the disjunctions and agreement ($F = 3.268, p < 0.05$).

- In matching person singular disjunctions (see Experiment 1a and 1c), both singular and plural agreement are possible (even with a slight preference for singular agreement).

- However, in mixed person singular disjunctions, plural agreement is overwhelmingly better than singular agreement.

- Furthermore closest conjunct agreement is considered better than furthest closest agreement.
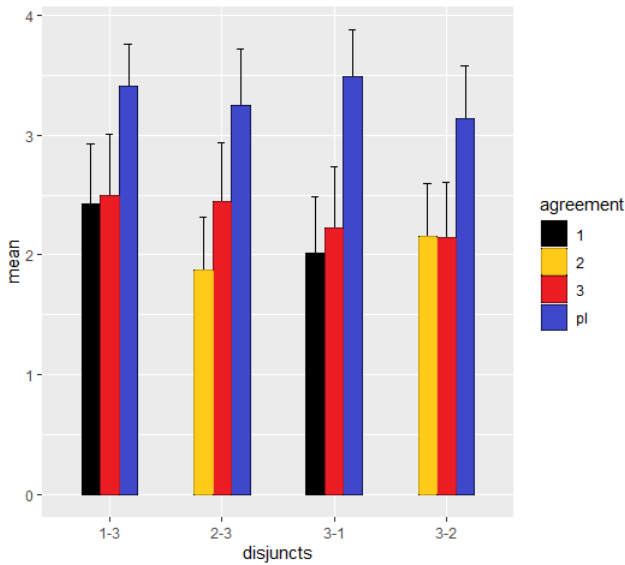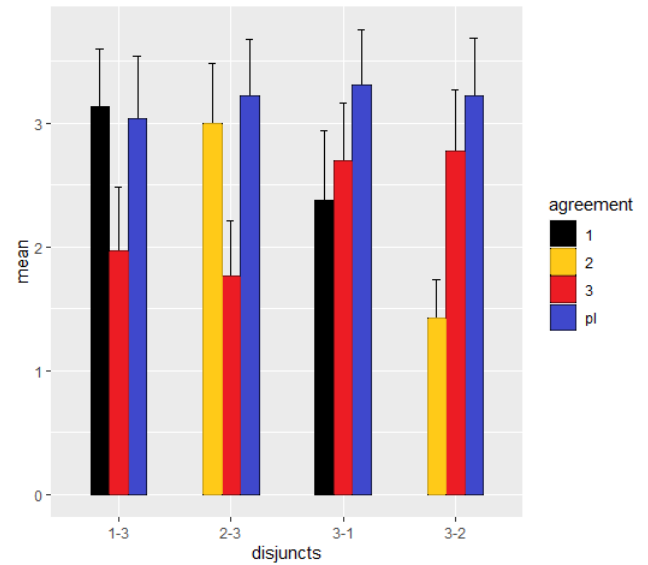
Figure 7: Results of Experiment 2a (SV)

Figure 8: Results of Experiment 2b (VS)

4.2.8. Experiment 2b: Agreement with mixed person disjunctions in VS order

Design

- In Experiment 2b, we tested agreement with mixed person singular disjunctions in VS order.

- The design was the same as in Experiment 2a, just the word order changed.

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

(25) a. Gestern **hast/hat/haben** [*du oder dein Bruder*] den Fernseher kaputt gemacht.
          yesterday have.2SG/3SG/3PL   you or   your brother   the TV   broke made
      b. Gestern **hast/hat/haben** [*dein Bruder oder du*] den Fernseher kaputt gemacht.
          yesterday have.2SG/3SG/3PL   your brother oder you the TV   broke   made

Results (see figure 7)

- A two-factorial ANOVA revealed agreement as a significant factor ($F = 54.552, p < 0.001$). Additionally, there is an interaction between the person of the disjunctions and agreement ($F = 54.000, p < 0.001$), this effect is stronger than in SV order.

- Again, plural agreement is better than singular agreement.

- But under VS order, closest conjunct agreement is almost equally good.

4.2.9. Experiment 2c: Effects of word order on closest conjunct agreement

Design

- In Experiment 2c, we tested whether closest conjunct agreement is effected by word order.

- For this experiment, we excluded sentences with pural agreement and as well as syncretic verb forms (for this see experiment 2d).

- Experiment 2c had 24 items and 2 conditions:
    - CCA in VS order: $V_{1/2}$ 1/2-3, V_3 3-1/2
    - CCA in SV order: 3-1/2 $V_{1/2}$, 1/2-3 V_3

(26)   a.   Gestern **habe**   [*ich oder mein Kollege*] einen Fehler gemacht.
             yesterday have.1SG I   or   my   colleague a   mistake made

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

(27)   a.   Gestern **hast**   [*du oder dein Bruder*] den Fernseher kaputt gemacht.
             yesterday have.2SG you or   your brother the TV   broke made

        b.   Gestern **hat**   [*dein Bruder oder du*] den Fernseher kaputt gemacht.
             yesterday have.3SG your brother or   you the TV   broke made

Results

- A one-factorial ANOVA revealed that order is a significant factor ($F = 34.62, p < 0.001$).
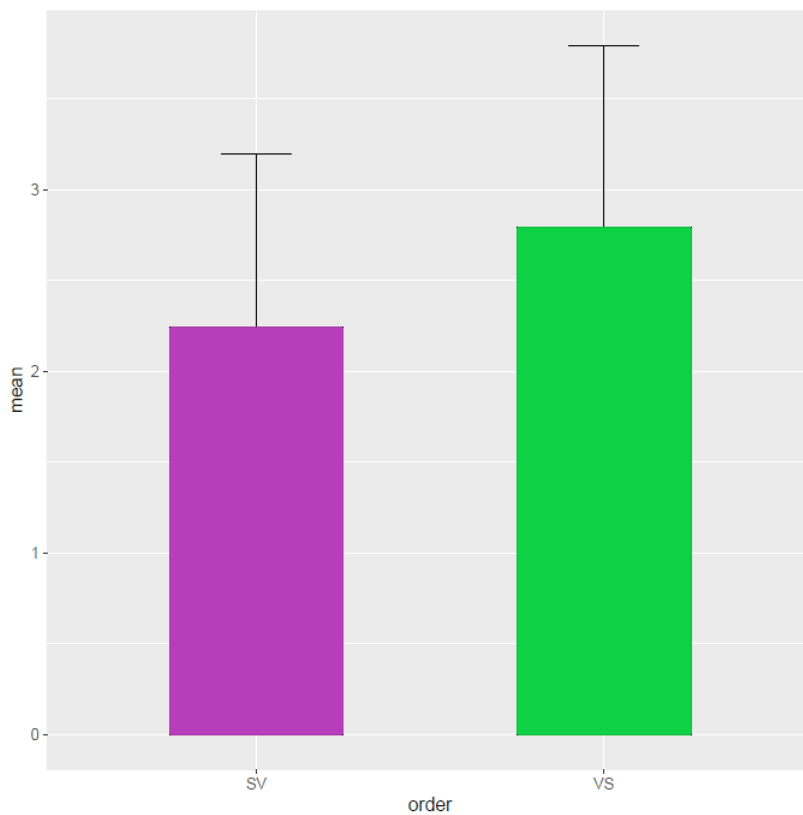
- CCA is better under VS order than SV order.

Figure 9: Results of Experiment 2c

4.2.10. Experiment 2d: Effects of syncretisms

Design

- In Experiment 2d, we tested whether there are syncretism effects.

- For this experiment, we excluded sentences with plural agreement and only looked at combinations of 1st and 3rd person.

- Half of the items contained the finite modals *können* or *sollen*, which are syncretic for 1sg and 3sg. The other items contained the auxiliaries *haben* and *werden*, which are not syncretic. As for the sentences with non-syncretic forms, we excluded all non-CCA cases. Thus, we compared pure CCA and syncretic verbs.

- Experiment 2d had a 2x2x2 factorial design and 12 items:
  - word order: SV, VS
  - agreement: 1sg, 3sg
  - syncretism: yes, no

(28) a. [*Ich oder mein Kollege*] **habe/hat** gestern einen Fehler gemacht.
          I   or   my   colleague have.1SG/3SG yesterday a   mistake made
      b. [*Mein Kollege   oder ich*] **habe/hat** gestern einen Fehler gemacht.
          my   colleague or   I   have.1SG/3SG yesterday a   mistake made

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

(30) a. [*Ich oder mein Anwalt*] **soll** morgen dem Richter Bescheid sagen.
          I   or   my   lawyer should.1SG~3SG tomorrow the   judge   notice   say
      b. [*Mein Anwalt oder ich*] **soll** morgen dem Richter Bescheid sagen.
          I   or   my   lawyer should.1SG~3SG tomorrow the   judge   notice   say
      c. Morgen **soll** [*ich oder mein Anwalt*] dem Richter Bescheid sagen.
          tomorrow should.1SG~3SG I   or   my   lawyer the   judge   notice   say
      d. Morgen **soll** [*mein Anwalt oder ich*] dem Richter Bescheid sagen.
          tomorrow should.1SG~3SG I   or   my   lawyer the   judge   notice   say

Results

- A two-factorial ANOVA revealed that syncretism is a significant factor ($F = 16.701, p < 0.001$). There is no evidence for an interaction of the factors syncretism and word order.

- Independent of the word order, a syncretic verb form increases the acceptability.
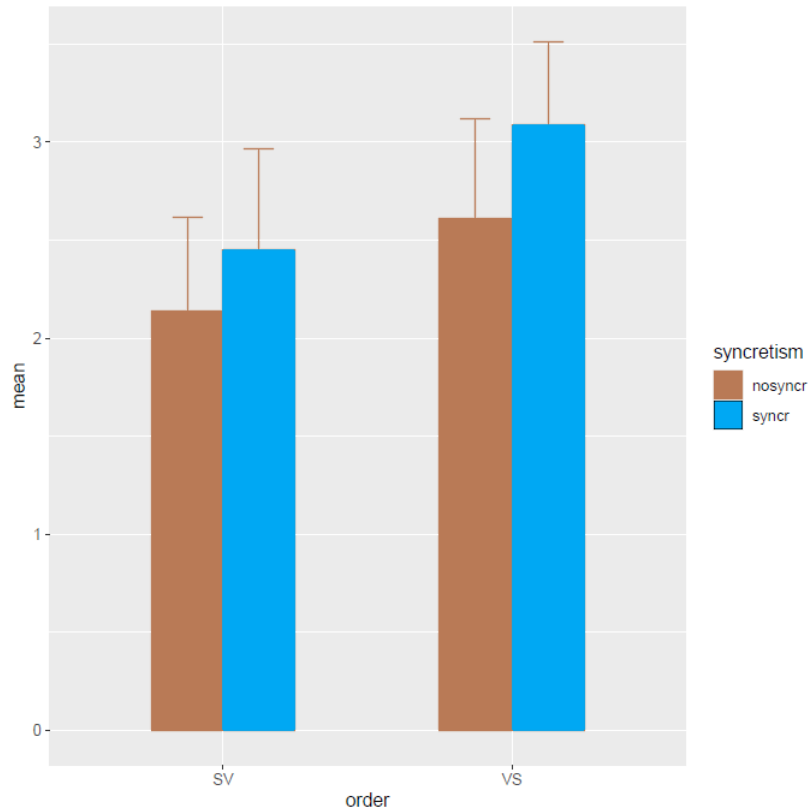
Figure 10: Results of Experiment 2d

4.2.11. Interim Summary

1. Person affects number agreement: If there is a mismatch in person, singular disjunctions trigger plural agreement.

2. Word order affects the agreement strategy: In VS order, closest conjunct agreement is considered better than in SV order.

3. There are syncretism effects: Syncretic verb forms alleviate the deviance of mismatching person.

5. Towards an analysis of agreement with disjoined subjects

Questions:

Q1: How does agreement resolution work in disjunctions?

Q2: How can the optionality of agreement with sg-sg disjunctions be accounted for?

Q3: How can the syncretism effects be accounted for?

Q4: How can word order affect agreement resolution?

5.1. Number resolution in disjunctions

Observation:

- Whenever one of the disjuncts is PL, plural agreement is preferred. Only if both disjuncts are SG, number agreement is optional with singular agreement being judged slightly better than plural agreement. We therefore differentiate the condition in (31) from the conditions in (32):

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

(32) a. [PL or SG], [SG or PL], [PL or PL]
  b. [*Das Regal / die Regale oder der Tisch / die Tische*] **wird/werden** morgen
     the shelf   the shelves or   the table   the tables will.be.SG/PL tomorrow
     geliefert.
     delivered
     'The shelf/shelves or the table/tables will be delivered tomorrow.'

Disjunctions are plural

- We assume that all disjunctions have a plural feature. We are aware of two ways to derive this property:

  1. Disjunctions have properties of conjunctions in that they contain a hidden epistemic modal (see Zimmermann 2000). We assume that plural agreement expresses the conjunction introduced by the hidden epistemic modal at the propositional level.

  (33) a. [*Das Regal oder der Tisch*] **werden** morgen geliefert.
    b. It is possible that the shelf will be delivered tomorrow AND$_{PL}$ it is possible that the table will be delivered tomorrow.

  2. Natural language disjunctions are logical disjunctions and express a set of alternatives (Viola Schmitt p.c.):

  (34) a. [*Das Regal oder der Tisch*]
    b. {{the shelf ∧¬the table}, {¬the shelf ∧ the table}, {the shelf ∧ the table}}

Disjuncts are singular or plural

- Phrasal disjunctions do not build sets of individuals: They do not license collective predicates and they do not allow cumulative interpretations (see section 3). In other words, the difference between conjunctions (35-a) and disjunctions (35-b) is that the former forms a set of individuals, but the latter does not.

(35) a. {the shelf, the table}
  b. {the shelf}, {the table}

5.2. Deriving number agreement

In a nutshell:

- The verb agrees with each disjunct as well as the disjunction itself.

- Consequently, the number feature of the verb has to match the number feature of all its agreement controllers, where matching is to be understood as the absence of a feature conflict.

- Possible constraint conflicts can lead to optionality if all solutions are optimal.

Assumptions:

- As we are dealing with optionality, implementing an analysis in any framework is notoriously difficult.

- We implement our idea in Optimality Theory, leaving open how the idea is implemented in other frameworks.

- Constraints:

  (36)   a.   MATCHCOORD: Count a violation if the ϕ-features of the verb contradict the ϕ-features of the subject coordination.
         b.   MATCHDP: Count a violation if the ϕ-features of the verb contradict the ϕ-features of at least one disjunct/conjunct in the subject coordination.
         c.   AGR: Count a violation if the verb does not have ϕ-features.

- Ranking: The two matching constraints are not ranked with respect to one another.

  (37)   AGR > MATCHCOORD, MATCHDP

Tableaux

- In case of two singular disjuncts, there is a conflict between the number feature of the disjunction (PL) and the number feature of the disjuncts (SG). Since matching the disjunction and the disjuncts is equally important, both plural and singular agreement is optimal. Note that we only count one violation independent of how many disjuncts mismatch. This makes the prediction that the number of disjuncts in a disjunctions does not matter.

  (38)

[sg or$_{pl}$ sg] ... V	AGR	MATCHCOORD	MATCHDP
☞ a. V-SG		*	
☞ b. V-PL			*
c. V	*!		

- In mixed number disjunctions, it is impossible to match the number of both disjuncts. Thus, MATCHDP is always violated and plural agreement is optimal.

  (39)

[sg or$_{pl}$ pl] ... V	AGR	MATCHCOORD	MATCHDP
a. V-SG		*	*!
☞ b. V-PL			*
c. V	*!		

- Finally, if all disjuncts are plural, there is no conflict and plural agreement is optimal.

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(40)

[pl or_{pl} pl] ... V	AGR	MATCHCOORD	MATCHDP
a. V-SG		*!	*
☞ b. V-PL			
c. V	*!		

5.3. The influence of person agreement and syncretisms

Effects of person agreement:

- If in sg-sg disjunctions, both disjuncts are 3rd person, both singular and plural agreement is possible (see section 5.1). However, if there is a mismatch in person, suddenly, plural agreement is strongly preferred (see experiment 2a, section 4.2.7 and experiment 2b, section 4.2.8).

(41) 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

- This observation follows from the present analysis without further ado: If the verb were to be marked for singular, it would have to choose which person feature it will realize. Using 3pl agreement, on the other hand, avoids this conflict.

(42)

[1sg or_{pl} 3sg] ... V	AGR	MATCHCOORD	MATCHDP
a. V-1SG		*	*!
b. V-3SG		*	*!
☞ c. V-3PL			*
d. V	*!		

Effects of syncretism:

- Singular agreement gets better again, if the singular verb is syncretic for both persons (see experiment 2d, section 4.2.10).

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

- This follows under one of two additional assumptions:
  1. The MATCH-constraints apply to word forms, i.e. a singular verb form can only match a singular determiner/noun etc. This requires a list of possible matches stored together with the syncretism constraints.
  2. Syncretism constraints (e.g. impoverishment-like constraints), which create underspecification, apply in the same grammatical domain as syntactic constraints. For (43), we can assume a constraint like (44):

(44) SYNCR_{CAN}: Count a violation if the 1st or 3rd person is not deleted on the verb CAN in context of a singular feature.

(Note that (44) is an example. Similar constraints for other modal verbs as well as for past tense verbs must exist.)

(45)

[1sg or$_{pl}$ 3sg] ... CAN	AGR	SYNCR$_{CAN}$	MATCHCOORD	MATCHDP
a. CAN-1SG		*!	*	*
b. CAN-3SG		*!	*	*
☞ c. CAN-3PL				*
☞ d. CAN-SG			*	
e. CAN	*!			

5.4. Word order effects

Observation:

- Word order affects the agreement strategy: In VS order, closest conjunct agreement is considered better than in SV order (see experiments 1e, section 4.2.5 and 2c, section 4.2.9)

(46) 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

- We hypothesize that the difference is due to a garden-path-like effect and thus not part of grammar (but see Bruening and Al Khalaf 2020 for a framework that incorporates such effects into grammar):
    - SV-order (46-a): The disjoined subject is processed before the verb. The agreement is evaluated according to the constraints above.
    - VS-order (46-b): The disjoined subject is processed after the verb. At the point where the first disjunct is processed, the verb form matches the first disjunct. This matching is 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 can be called a grammatical illusion (Haider (2011)).

6. Summary

- We observed that number agreement with disjunctions is special:

(47) a. [sg *or* sg] → PL | SG
  b. [sg *or* pl] ↘
     [pl *or* sg] → PL (> CCA)
     [pl *or* pl] ↗

- We suggested that (47) is due to disjunction being semantically plural and that the verb has to match the disjunction as well as the disjuncts in number. Thus, our account considers the semantics of the number of disjunction rather than trace the pattern back to an arbitrary agreement resolution rule.

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A. Experiment on the inclusive-exclusive distinction

Questionnaire 3

- In Q3, we tested whether or not the meaning of the disjunction affects agreement. To do so, we adapted the design by Foppolo and Staub (2020): Items had only SG∨SG-disjuncts as subjects, only appeared in SV order, and varied in the meaning of *or* (ambiguous (48-b), exclusive (48-a)) and in agreement.

- Additionally to the rating task, participants answered a question indicating whether they understood *or* as inclusive or exclusive.

- Q3 contained 16 items and 32 fillers.

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

A.1. Experiment 3: Inclusive vs. exclusive disjunctions

Design

- In Experiment 3, we tested whether the meaning of disjunction (inclusive vs. exclusive) affects agreement.

- The sentences and SV order only and contained disjunctions that consisted only of singular NPs.

- Experiment 3 had a 2x2 factorial design and 16 items:
    - agreement: sg, pl
    - meaning: exclusive, ambiguous

- Participants had to judge the sentences and answer a question whether they understood the sentence as inclusive or exclusive.

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

Results

- A two-factorial ANOVA revealed that agreement is a significant factor ($F = 8.105, p < 0.01$). There is no evidence for an interaction of the factors agreement and meaning (whether considering the meaning intended by us or considering the reading the participants actually got).
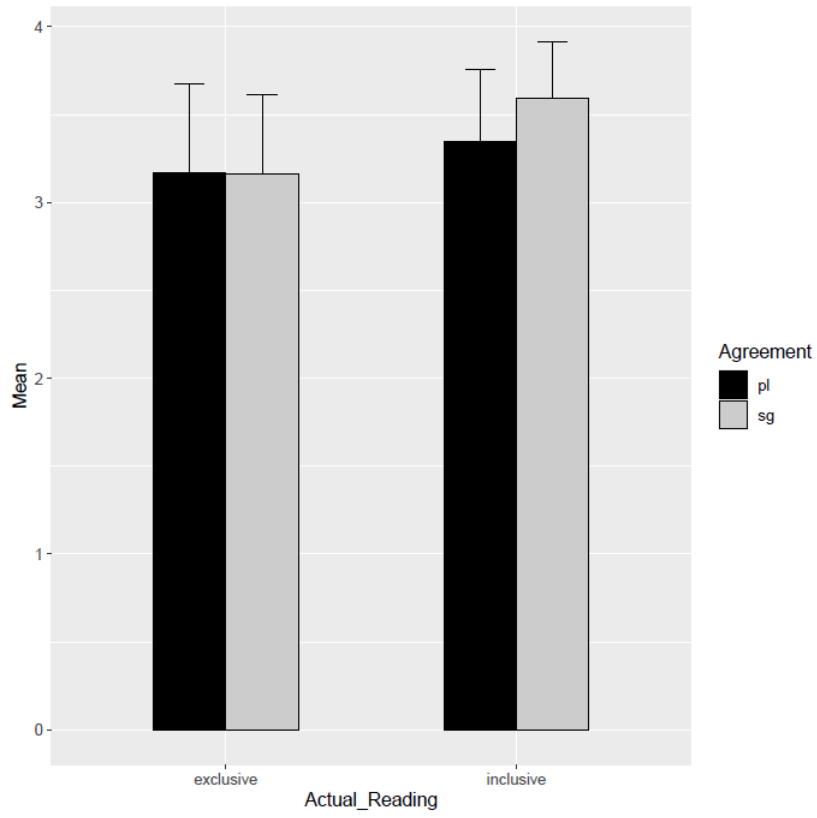
- Thus, exclusive disjunctions do not trigger singular agreement.

Figure 11: Results of Experiment 3