Split-antecedent relative clauses and the symmetry of predicates[1]

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Abstract. This paper presents the results of two experiments in German testing the acceptability of (non-)restrictive relative clauses (NRCs/RRCs) with split antecedents (SpAs). According to Moltmann (1992), SpAs are only grammatical if their parts occur within the conjuncts of a coordinate structure and if they have identical grammatical functions. Non-conjoined SpAs that form the subject and the object of a transitive verb are predicted to be ungrammatical. Our study shows that the acceptability of such examples improves significantly if the predicate that relates the parts of the SpA is symmetric. Moreover, it suggests that NRCs and RRCs behave differently in these cases with respect to the SpA-construal. We can make sense of this observation if we follow Winter (2016) in assuming that transitive symmetric predicates have to be analyzed as unary collective predicates and thus provide a collective antecedent for the RC at the semantic (not the syntactic) level. As we will argue, this accounts for some of the disagreement we found in the literature and gives us new insights into both the semantics of symmetric predicates and the semantics of NRCs.

Keywords: non-restrictive relative clause, restrictive relative clause, symmetric predicate, split antecedent.

1. Introduction

We speak of a *split antecedent* (SpA) of a relative clause when the antecedent is jointly expressed by distinct syntactic constituents in its host clause, as in (1). This constellation constitutes a challenge for the analysis of relative clauses.

(1)   Mary met a man$_i$ and John met a woman$_j$ [who$_{i,j}$ knew each other well].

(Moltmann, 1992: 262)

Moltmann (1992) assumes that split antecedents are only possible if the antecedent phrases occur within the conjuncts of a coordinate structure and if they have identical grammatical functions, which is the case in (1). This generalization correctly excludes the sentence in (2a), where we find an overt conjunction, but the first antecedent phrase is the subject of the first conjunct, and the second antecedent phrase is the direct object of the second conjunct. The generalization also correctly excludes examples such as (2b), where an overt conjunction is

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missing, and the two antecedent phrases again have distinct grammatical functions.

(2)   a.   *A woman$_i$ came and John met a man$_j$ [who$_{i,j}$ knew each other well].
       b.   *A man$_i$ saw a woman$_j$ [who$_{i,j}$ had danced together].   (Moltmann, 1992: 263)

However, we would, then, wrongly exclude (3), which is taken from Hoeksema (1986: 64). (3) is generally judged as acceptable, although, just as in (2b), an overt conjunction is missing, and the two parts of the split antecedent form the subject and the object of a transitive predicate.

(3)   We always let those boys$_i$ play with those girls$_j$ [who$_{i,j}$ know one another from elementary school].

In this paper, we will explore the idea that one reason for the contrast between (2b) and (3) might be that, in the latter case, the two antecedents are related by a symmetric predicate. According to Winter (2016), transitive symmetric predicates have to be analyzed as unary collective predicates. This might favor an SpA-construal. We will present the results of two experiments in German investigating this effect of the symmetry of the matrix-clause predicate on the acceptability of restrictive and non-restrictive relative clauses with SpAs. Our findings will not only shed new light on the diverging judgments in the previous literature but also provide insights into both the semantics of symmetric predicates and SpA-relatives.

We will first present some basic assumptions on restrictive and non-restrictive relative clauses (RRCs/NRCs), see Section 2. In Section 3, we will present the relevant ideas on symmetric predicates from Winter (2016). We derive two empirical hypotheses from these two sections and present two questionnaire studies that we carried out to test them, see Section 4. In Section 5, we will sketch an analysis compatible with our empirical findings, before we end with a conclusion, see Section 6.

2. Antecedence construal with restrictive and non-restrictive relative clauses

In this section, we will summarize the relevant observations on the relation between RRCs and NRCs and their antecedents.[2]

RRCs are interpreted as predicates where the relative pronoun marks the variable that is abstracted over. The RRC is semantically integrated as a restriction on the denotation of a nominal projection that it attaches to (Heim and Kratzer, 1998). In non-split cases, the antecedent of an RRC is always a syntactic constituent. If we carried this over to the SpA-construal, we would expect that RRCs should be impossible with SpAs unless there is independent evidence for a syntactic constituent consisting of exactly the antecedents.

In her study of relative clause extraposition, Walker (2017) follows Keller (1995) in assuming that the link between an RRC and its antecedent is based on the "local" syntactic and semantic information of the antecedent constituent. "Local" properties include the syntactic category

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[2]See Fabb (1990) and Huddleston and Pullum (2002: Chapter 7) for an overview of differences between RRCs and NRCs.

(but not constituent structure information) and lexical semantic information (but not information on quantification or definiteness). This allows for cases like (4) from Walker (2017: 181).

(4)   This list does not even include [the house and the car] [RRC: I want for my family].

In this example, the antecedent relation is established between the relevant semantic and syntactic properties of the conjunct *the house and the car*, which do not include the determiner semantics. What is important for us here is that even in such cases, there is a syntactic constituent acting as the antecedent of the RRC.

For NRCs, in contrast, it has been argued that the relative pronoun is equivalent in interpretation to a discourse-anaphoric pronoun (Sells, 1985; Del Gobbo, 2003; Holler, 2005; Schlenker, 2010). Indeed, NRCs often pattern quite consistently with their discourse-anaphoric matrix-clause paraphrases, compare a. and b. as well as c. and d. in (5).[3]

(5)   a.   *Every climber, who was French by the way, made it to the summit.
       b.   Every climber made it to the summit. *He was French by the way.
       c.   Most climbers, who were all French by the way, made it to the summit.
       d.   Most climbers made it to the summit. They were all French by the way.

                                                                (adapted from Nouwen 2007)

Arnold (2004, 2007) argues that the difference between the two types of relatives does not so much lie in their syntactic attachment —both attach to their respective antecedent — but rather in the semantics of their relative pronoun and, following from this, the antecedent construal and the semantic (non-)integration of the relative clause.

In some cases, however, relative pronouns of NRCs seem to be more restricted than their discourse-anaphoric counterparts. In particular, it can be assumed that an NRC, unlike a discourse-anaphoric pronoun, can only take a discourse referent as its antecedent if it is accessible in its host clause. The antecedent of a discourse pronoun can be introduced in a more ad hoc way – such as by "abstraction" in Kamp and Reyle (1993). In particular, so-called *complement set anaphora* (Moxey and Sanford, 1987; Nouwen, 2003) is possible with discourse-anaphoric pronouns but completely unavailable with NRCs. In (6a), the pronoun *they* can refer to the set of those children that did not eat their ice cream. Such an interpretation is not possible for the relative pronoun in (6b).

(6)   Few of the children ate their ice cream, . . .
       a.   they threw it around the room instead.   (Moxey and Sanford, 1987: 192)
       b.   *who, by the way, threw it around the room instead.

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[3]Del Gobbo (2003) assumes that NRCs such as (5c) are ungrammatical if the NRC is clause-internal. Nouwen (2007), by contrast, argues that a clause-internal NRC is possible in structures like (5c) but, unlike discourse-anaphoric pronouns, can only take the set of climbers as its antecedent, not the subset of climbers who reached the summit. Cf. Poschmann (2013) for experiments on the interpretation and acceptability of such sentences in German.

Given this state of the theoretical discussion, we expected that NRCs with split antecedents should only be possible if we can find independent motivation for the existence of an appropriate plural antecedent in the interpretation of the matrix clause. We will see in the next section that exactly this is actually possible.

3. The symmetry of predicates

Symmetric predicates are such that there are two argument slots that can be interchanged without changing the truth conditions. This is sketched in (7a) for the verb *quarrel*. A non-symmetric predicate, as expressed by *see*, does not allow for such a truth-preserving change in the grammatical function, see (7b).

(7) a. Symmetric predicate: A quarrels with B. ⇔ B quarrels with A.
     b. Non-symmetric predicate: A sees B. ⇎ B sees A.

Many symmetric predicates allow for a use with a plural in one of the argument slots and a reciprocal pronoun in the other, (8a). In addition, this reciprocal pronoun need not be there, as shown in (8b).[4]

(8) a. Reciprocal use: A and B quarrel with each other.
     b. Collective use: A and B quarrel.

These observations give rise to the following research questions: (i) Is the alternation between a binary use as in (7a) and a unary use as in (8b) productive and systematic? (ii) If so, does the collective use derive from the symmetry of the binary predicate, or does the existence of a binary realization follow from the collectivity of the unary predicate? (iii) Since the alternation has an argument-structural reflex that is semantically induced, the question is at which level of linguistic analysis the alternation will arise.

The answers to these questions are manifold. For example, Gleitman (1965) and Lakoff and Peters (1969) assume that a syntactic transformation links the binary and the unary use of symmetric predicates. They differ, however, in that Gleitman derives the unary use from the binary one, see (9a), whereas Lakoff & Peters do it the other way around, see (9b).

(9) a. John met Mary and Mary met John ↦ John and Mary met.
     b. John and Mary met. ↦ John met Mary.

Winter (2016) takes a very different approach. Instead of having a syntactic transformation

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[4]In addition to the alternations in English, we find inherently-reflexive realizations of the binary predicate in German, which clearly have the collective rather than a reciprocal meaning. In (i), only the inherently-reflexive realization can be used, not the explicitly reciprocal. We will ignore this complication here and treat the inherently-reflexive realization just on par with a collective realization, which seems to be adequate – at least semantically.

(i)   Alex und Chris streiten (sich/   *einander) immer.
       Alex and Chris quarrel themselves/ each other always
       'Alex and Chris always have a fight.'

between a binary and a unary use of a verb, he postulates an underlying *protopredicate* and derives the concrete binary and unary predicates from the denotation of the protopredicate.

The denotation of a protopredicate contains all instances compatible with a particular natural-language expression. Winter discusses the example of the verb *hug*: Some huggings are collective, which means that a protopredicate **hug** will have group objects consisting of collectively hugging people in its denotation. Other huggings are directional, i.e. there is one person hugging and another person being hugged. For these cases, the denotation of **hug** will also contain pairs whose first element is the hugger and whose second the 'huggee'.[5]

Winter (2016) does not use protopredicates directly in sentences. One reason for this is probably that the denotation of a protopredicate may contain both single objects and tuples, whereas predicates in a sentence have a fixed arity. Looking at Winter:16 analysis, there might be a second reason: the structure of the elements in the denotation of the protopredicate is clearly connected to a contentful interpretation of semantic (proto-)roles (in the sense of Dowty 1991). The semantic argument slots in a concrete predicate need not have such a clear-cut interpretation. In particular, Winter (2016) assumes that different argument slots of concrete predicates can bear the same semantic role, whereas this would not be possible for the argument slots in the denotation of a protopredicate.

Winter (2016) defines three mappings from protopredicates to concrete predicates. For the protopredicate **hug**, for example, there is a binary non-symmetric predicate **hug**^{bns} and a unary collective predicate **hug**^{uc}. The denotation of **hug**^{bns} is the subset of the denotation of **hug** that contains all hugger-hugged pairs. The denotation of **hug**^{uc} is the subset of the denotation of **hug** that consist of all hugging-sets. Winter also provides a binary symmetric predicate, **hug**^{bs}. The denotation of this predicate is such that for each of the collective huggers $x \oplus y$, it contains the pairs $\langle x, y \rangle$ and $\langle y, x \rangle$.[6]

This system directly accounts for the fact that the binary symmetric use of a predicate is synonymous to its unary collective use, even though the argument frame is different. At the same time, it captures the fact that a binary non-symmetric and a binary symmetric use are non-synonymous even though they have the same number of syntactic arguments.

The verb *quarrel* expresses an inherently-collective concept. Therefore, the protopredicate **quarrel** only contains plural objects and no pairs. Consequently, there can be a unary collective predicate **quarrel**^{uc} and a binary symmetric predicate **quarrel**^{bs}, but the corresponding binary non-symmetric predicate is not defined. Similarly, for a non-symmetric protopredicate, there

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[5]Winter (2016) uses a set notation for the collective objects, $\{x, y\}$. We will use the notation $x \oplus y$ here, which makes it clearer that we are dealing with a single entity – in contrast to a tuple of entities, $\langle x, y \rangle$, needed for the non-collective denotations.

[6]Note that symmetric readings are available even if the set consists of more than two members. In this case the symmetric reading (ia) is clearly more expressive than the reciprocal binary paraphrases in (ib). Winter (2016) takes this as evidence for his assumption that collective predicates are basic and irreducible to their binary forms.

(i)   a.   A, B and C are similar.

            b. $\neq$ A is similar to B, B is similar to C, C is similar to A.

will be no corresponding unary collective predicate nor a binary symmetric predicate.[7]

What does this mean for the possibilities of antecedent construals with relative clauses? In the case of a unary collective predicate, there is both a syntactic and a semantic unit that can serve as an antecedent for a relative clause. For a binary non-symmetric predicate, there is neither a syntactic nor a semantic unit, so no antecedent construal should be possible for any type of relative clause. The same is true, in fact, for a binary symmetric predicate: since its denotation is a set of pairs, it is ontologically indistinguishable from a binary non-symmetric predicate.

If, however, we have access to the protopredicate in addition to the concrete predicate, a possible semantic antecedent would be available in sentences with a binary symmetric predicate (and, trivially, for the unary collective predicate). Since this collective argument is not part of the syntactic structure, the antecedent-construal process can only be semantic, not syntactic. We thus expected it to be possible for NRCs but not for RRCs.

To sum up, none of the analyses of symmetric predicates would predict the acceptability of an SpA-construal for RRCs. For NRCs, the picture is slightly different: a syntactic approach à la Lakoff and Peters (1969) assumes the required plural antecedent provided that the underlying syntactic structure can be used for relative clause attachment. Similarly, the semantic analysis in Winter (2016), as it stands, does not seem to predict SpAs for NRCs. However, if we can include the protopredicate in the interpretation, an NRC would be possible, though an RRC would still be excluded.

We have carried out two questionnaire studies to get a clearer picture of the empirical facts and to see which of the approaches to antecedent construal and symmetric predicates can best account for them.

4. Experiments

In this section, we will report the results of two experiments in German that suggest that the symmetry of a binary predicate relating the parts of a split antecedent can indeed affect the acceptability of the SpA-relative clause. Moreover, we will show that RRCs and NRCs behave differently with respect to SpA-construal. Both experiments were conducted as pen-and-paper questionnaires with first-semester students in Frankfurt a.M., Germany.

4.1. Experiment 1

In a first questionnaire, with 39 participants, we tested the acceptability of non-conjoined SpAs depending on the TYPE of the relative clause (RRC vs. NRC) and the SYMMETRY (±symmetric) of the matrix-clause predicate relating the heads of the SpA.

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[7]Though, of course, there can be a non-empty reciprocal subset of the denotation of the protopredicate, i.e. all cases where both $\langle x, y \rangle$ and $\langle y, x \rangle$ occur in the denotation of the protopredicate.

4.1.1. Design

All items were constructed such that there was a plural-RC in sentence-final position and a matrix clause with definite DPs as antecedents for the SpA with one antecedent-DP forming the subject and the other the object of a transitive matrix-clause predicate. The relative clause was either an RRC or an NRC and the matrix-clause predicate either symmetric or non-symmetric.[8] Overall, we tested 12 items in 4 conditions (NRC/RRC*±Symmetry) distributed over a Latin-square design, such that every participant judged every condition three times but each item only in one condition. An example for a test item in all four conditions is given in (10).

(10)   a.   Letzte Woche hat sich mein Hausarzt mit meinem Heilpraktiker **gestritten**, die einander sonst übrigens sehr schätzen.
'Last week, my doctor quarreled with my non-medical practitioner, who by the way normally appreciate each other.'   (NRC/+SYMM)

        b.   Letzte Woche hat mein Hausarzt meinen Heilpraktiker **beleidigt**, die einander sonst übrigens sehr schätzen.
'Last week, my doctor insulted my non-medical practitioner, . . . ' (NRC/-SYMM)

        c.   Letzte Woche hat sich derjenige Hausarzt mit demjenigen Heilpraktiker **gestritten**, die einander sonst sehr schätzen.
'Last week, precisely that doctor quarreled with precisely that non-medical practitioner who normally appreciate each other.'   (RRC/+SYMM)

        d.   Letzte Woche hat derjenige Hausarzt denjenigen Heilpraktiker **beleidigt**, die einander sonst sehr schätzen.
'Last week, precisely that doctor insulted precisely that non-medical practitioner . . . '   (RRC/-SYMM)

Non-restrictive interpretations were forced by adding a discourse particle, typically *übrigens* 'by the way', inside the relative, which should rule out a restrictive interpretation.[9] In the RRC-conditions, these particles were omitted, instead the heads of the relative included the determiner *derjenige* 'precisely that', which should rule out a non-restrictive interpretation.[10]

Since in German, the plural form of the relative pronoun is syncretic with its feminine singular form *die*, we designed all test items with exclusively singular masculine subjects and objects. This ensured that the RC was not interpreted solely with respect to one of its antecedents. In all conditions, the RC was extraposed across the clause-final matrix predicate. Unlike in English (Rochemont and Culicover, 1990; Walker, 2017), extraposition from a definite DP is generally

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[8]List of predicates used in the symmetric condition: *sich streiten mit* 'to quarrel with s.o.', *telefonieren mit* 'to talk with s.o. on the phone', *sich schlagen mit* 'to fight with s.o.', *diskutieren mit* 'to debate with s.o.', *sich zusammentun mit* 'to team up with s.o.', *übereinstimmen mit* 'to come to an agreement with s.o.', *sich beratschlagen mit* 'to consult with s.o.', *zusammenarbeiten mit* 'to collaborate with s.o.', *aussehen wie* 'to look like s.o.', *sich vertragen mit* 'to make up with s.o.', *sich unterhalten mit* 'to talk with s.o.', *sich treffen mit* 'to meet with s.o.'

[9]Note that in German, unlike in English, both RRCs and NRCs are obligatorily separated by a comma.

[10]A relative clause attached to a *derjenige*-head cannot contain discourse particles:

(i)   Derjenige Heilpraktiker, der (*übrigens) Peter beleidigt hat, ist meinem Hausarzt gut bekannt.
'Precisely that practitioner, who by the way insulted Peter, is well-known to my doctor.'

judged as acceptable in German (Holler, 2005; Poschmann and Wagner, 2016), at least across minimal distances (1 word). To keep the distance between the split antecedents and the RC minimal, all test items of Experiment 1 were constructed such that the sentence-initial position (Vorfeld/prefield) of the matrix clause was occupied by a PP or a temporal or locational adverb, while the subject- and object-DPs were located adjacent to each other in the middle field of the matrix clause.

The test items were tested interspersed with 14 fillers, which included 7 examples of clearly acceptable and 7 clearly unacceptable examples of NRCs or RRCs, all without an SpA-construal.

4.1.2. Predictions

The RCs in Experiment 1 are all plural and hence looking for a plural antecedent in the matrix clause to which they can be attached. The matrix clause, however, does not provide such a plural antecedent, at least not at the syntactic level. Both the subject- and the object-DP are singular. Thus, from a syntactic point of view, the matrix clause does not provide a proper antecedent to which the RC can be attached.

Hypothesis I: $+$SYM $> -$SYM.
The semantic analysis of binary symmetric predicates could be such that the analysis of a sentence of the form *A quarrels with B* contains a unary collective predicate, *A and B quarrel*, as part of its interpretation. If this hypothesis is on the right track, one might expect that the acceptability of SpA-RCs improves if the parts of the split antecedent are connected by a symmetric predicate, since in this case the symmetric predicate provides a collective antecedent at the semantic level with respect to which the plural-RC can be interpreted. Non-symmetric predicates, by contrast, do not provide such a collective antecedent and should be judged as unacceptable.

Hypothesis II: NRC $>$ RRC
If symmetric predicates provide a collective antecedent, they do so only at the semantic, not the syntactic level. If at all, an effect of symmetry would be expected to show up only in case of NRCs. According to standard assumptions, NRCs are linked to their head-DP only anaphorically – e.g. McCawley (1981); Sells (1985); Holler (2005); Arnold (2007) – and hence might not need a single syntactic antecedent. RRCs, by contrast, are non-anaphoric and seem to need a proper syntactic antecedent to which they can be attached. We hence expected to find an interaction of RC-TYPE and SYMMETRY, such that SYMMETRY only improves the acceptability of NRCs with SpAs but not the acceptability of RRCs with SpAs.

4.1.3. Results

The data reported for Experiment 1 are based on the judgments of 36 out of the 39 tested participants. We had to exclude 3 participants because they rated more than 4 of the 9 negative
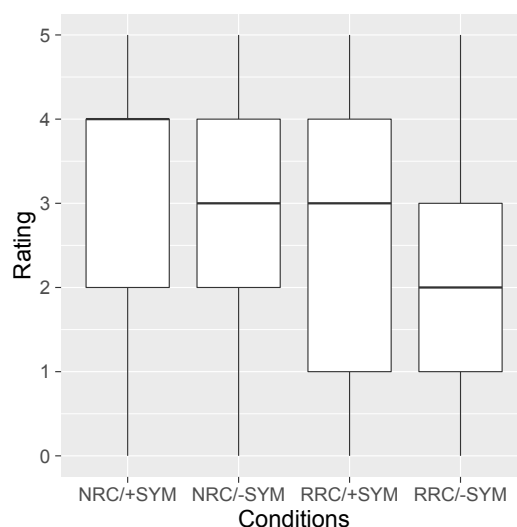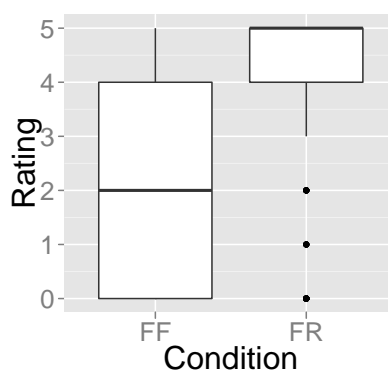
Figure 1: Experiment 1: Test conditions

Figure 2: Experiment 1: Filler conditions

fillers as good (≥ 3). The overall results of the experiment are summarized in Figure 1 for the test conditions and in Figure 2 for the filler conditions.

The results confirm that both RC-TYPE and SYMMETRY affect the acceptability of SpA-RCs. As expected, NRCs rated better than RRCs. For both types, SYMMETRY of the matrix predicate significantly improved the acceptability of the SpA-construal. The ratings show a clear downstep pattern. NRCs with a symmetric matrix predicate are rated as more or less acceptable (3.5 on a scale from 0 to 5), lower than the positive controls (4.3) but significantly higher than NRCs with a non-symmetric matrix predicate (2.9). RRCs with a symmetric matrix predicate got marginal acceptance rates (2.5), and RRCs with a non-symmetric matrix predicate rated nearly as low (2.1) as the negative controls (1.9).

Using the lme4 package in R, we fitted a model of mixed logistic regression for the interaction of RC-TYPE and SYMMETRY as fixed effects and random effects for subjects and items including the corresponding slopes (Formula: Rating $\sim$ Typ*Sym + (1+Typ*Sym | Person) +

(1+Typ*Sym | Item)). We found significant effects of RC-TYPE ($t = -3.24$) and SYMMETRY ($t = 2.17$).[11] Contrary to our expectations, however, the interaction between RC-TYPE and SYMMETRY did not turn out to be significant in our data. SYMMETRY equally affected the acceptability of NRCs and RRCs.

4.2. Experiment 2

Unlike predicted by Moltmann (1992), the results of Experiment 1 show that SpA-RCs with symmetric matrix predicate are acceptable in German, even if the parts of the split antecedent are not overtly conjoined. One possible explanation for the acceptability of the tested non-conjoined SpA-examples might be that the subject- and object-DP that formed the two parts of the antecedent stood adjacent to each other. This could have invited repair effects in which the participants treated the two antecedents as jointly forming a syntactic constituent. To rule out this possibility, we designed a second questionnaire, in which we tested whether the position of the two parts of the split antecedents with respect to each other affected the acceptability of the SpA-construal.

4.2.1. Design

In this second Experiment, with 45 different participants, we tested the 12 items of Experiment 1 with symmetric predicates only. We manipulated the RC-TYPE and, in addition, the WORD ORDER of the matrix clause, such that in one condition both head-DPs of the relative stood adjacent (+ADJACENCY) in the middle field of the clause, as in (10), whereas in a second condition, one of the antecedents occurred in the prefield and was, thus, separated from the other antecedent by an auxiliary in V2 position. In (11), we provide an example for a test item in all four conditions. As in Experiment 1, the test items were tested in comparison to 7 positive and 7 negative control items.

(11) a. **Mein Hausarzt** hat sich **mit meinem Heilpraktiker** gestritten, die einander sonst übrigens sehr schätzen.
          'My doctor quarreled with my non-medical practitioner, who by the way normally appreciate each other.'   (NRC/-ADJACENCY)
      b. Letzte Woche hat sich **mein Hausarzt mit meinem Heilpraktiker** gestritten, die einander sonst übrigens sehr schätzen.
          'Last week, my doctor quarreled with my non-medical practitioner, who by the way normally appreciate each other.'   (NRC/+ADJACENCY)

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[11] According to Baayen et al. (2008), we can be confident that the comparison is significant if the absolute value of the t-value is bigger than 2 (or: 1.96).

    c.   **Derjenige Hausarzt** hat sich **mit demjenigen Heilpraktiker** gestritten, die einander sonst sehr schätzen.
          'Precisely that doctor quarreled with precisely that non-medical practitioner who normally appreciate each other.'   (RRC/-ADJACENCY)

    d.   Letzte Woche hat sich **derjenige Hausarzt mit demjenigen Heilpraktiker** gestritten, die einander sonst sehr schätzen.
          'Last week, precisely that doctor quarreled with precisely that non-medical practitioner who normally appreciate each other.'   (RRC/+ADJACENCY)

4.2.2. Predictions

Hypothesis III: +ADJACENT > −ADJACENT

If SpA-RCs are only acceptable if the parts of the antecedent are adjacent to each other, the acceptability of the examples should decrease if subject- and object-DP are separated by the finite verb.

4.2.3. Results

Overall, the ratings for NRCs and RRCs in Experiment 2 were comparable to those of the symmetric conditions in the first experiment, see Figure 3. Again, NRCs with SpAs rated as more or less acceptable (2.9 on a scale from 0 to 5), less than the positive controls (3.6) but significantly better than the RRCs (2.5) and the negative controls (2.5). The means suggest a slight downstep pattern, such that NRCs with adjacent antecedents rated slightly better (3.0) than NRCs with non-adjacent antecedents (2.8). RRCs with adjacent heads were judged a bit more acceptable (2.9) than RRCs in which the two parts of the antecedent were separated by the matrix-clause verb (2.4). However, this downstep was not significant in our data.

Fitting a mixed model regression for the interaction RC-TYPE and WORDORDER and the corresponding random effects and slopes of items and participants (Formula: Rating $\sim$ Type$*$WO + (1+Type$*$WO | Person) + (1+Type$*$WO | Item)), we did find a significant effect of RC-TYPE ($t = -2.441$) but no effect of WORDORDER ($t = 1.681$) and no significant interaction between RC-TYPE and WORDORDER ($t = 0.428$).
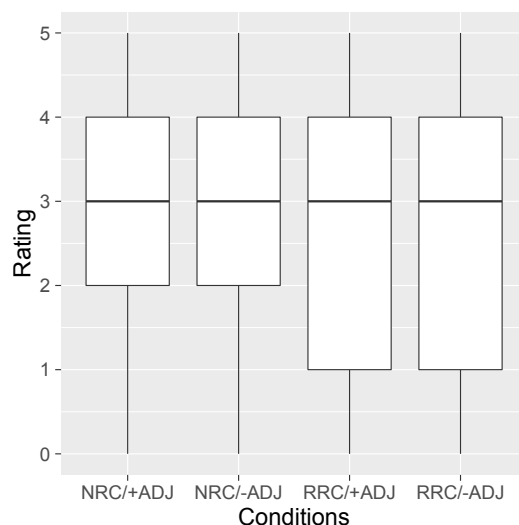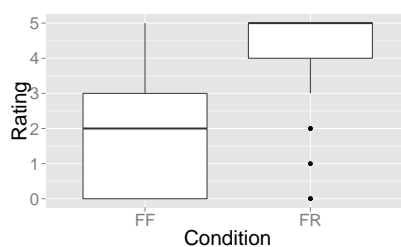
Figure 3: Experiment 2

Figure 4: Filler Experiment 2

4.3. Discussion

Our results clearly show that a split antecedent is acceptable for NRCs when the antecedent-DPs are co-arguments of a binary symmetric predicate. We saw in Section 3 that none of the presented approaches would make this prediction directly but that it is possible to mildly twist the account of Winter (2016) to make it fit. All we need to do is to make the protopredicate available in the interpretation of the matrix clause. As a result, a standard semantic-antecedent construal could be used for NRCs, given that the NRC attachment potential of binary symmetric predicates like *A quarrels with B* would be the same as that of unary collective predicates such as *A and B quarrel*. A similar construal is not possible for non-symmetric predicates, where neither the concrete predicate nor its protopredicate provides a collective antecedent.

The judgments for RRCs in our data were altogether rather marginal and significantly lower than those for NRCs. This indicates, as expected, that RRCs cannot find a regular antecedent in the SpA-constellations. It is, however, surprising that there is an effect of symmetry also for RRCs. This might point to the availability of a repair strategy for such sentences. We will come back to this in Section 5.

Another somewhat unexpected result of our experiment is that NRCs with non-symmetric predicates are rated considerably better than RRCs with non-symmetric predicates. We argued above that the antecedent construal of an NRC is a semantic rather than syntactic process, but there is no semantic antecedent available for the NRC in these cases. For cross-sentential discourse pronouns, antecedent construal is possible in such constellations, as illustrated in (12). We take it that the judgments in our study indicate that the participants were able to apply such a discourse-anaphora construal process as a repair strategy in these cases.

(12) Letzte Woche hat mein Hausarzt meinen Heilpraktiker beleidigt. Sonst schätzen sie einander sehr.
      'Last week, my doctor insulted my non-medical practitioner. Normally, they appreciate each other very much.'

The results of Experiment 2 confirmed the contrast between NRCs and RRCs. At the same time, it showed that the relative position of the two antecedent phrases in the sentence does not have any influence. This strengthens the position that an NRC finds its antecedent through semantic rather than syntactic properties. Similarly, the repair strategy speculated about for RRCs with symmetric predicates should be semantic rather than syntactic.

In the next section, we will go through the observations made in this discussion and show how we can integrate them into a concrete approach to symmetric predicates and antecedent construal for relative clauses.

5. Analysis

In this section, we will first develop a version of Winter:16 theory that allows us to account for our empirical findings directly. Then we will go through the four patterns tested in Experiment 1 in the light of our revised approach to symmetric predicates and our assumption on relative clauses from Section 2.

In our discussion of the experimental results in Section 4.3, we mentioned that we need to stipulate the simultaneous presence of the protopredicate **quarrel** and the binary symmetric predicate to account for the well-formedness of SpAs with NRCs and symmetric verbs. Our account of the data would, of course, be much smoother if we only had a single predicate.

We showed in Section 3 that the process to create the binary symmetric predicate is different in quality from the simple subdenotation formation for the other predicates. Instead, it splits plural objects into pairs. If we are, however, not bound to the assumption that a semantic predicate needs to reflect the syntactic properties, we are free to have a verb with more than one syntactic argument and interpret it as the unary collective predicate **quarrel**^{uc}. The resulting lexical entry is sketched in (13).[12]

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[12]We assume a version of a dynamic, DRT-style, semantic framework. "$[x]$" is used for the introduction of a new discourse referent, x. We use the colon, ";", for dynamic conjunction. Superscripts in the examples indicate the introduction of a new discourse referent, subscripts the use of an already present discourse referent.

(13)   Lexical entry of the binary symmetric verb *quarrel*:
     a.   semantics: $\lambda y \lambda x.[X];(X = x \oplus y);(\mathbf{quarrel}^{uc}(X))$
     b.   subject: NP
     c.   complement: *with*-PP

We can, now, use this version of Winter:16 theory to go through the four patterns tested in Experiment 1. A simple version of the pattern in example (10a) is given in (14), together with an analysis that makes use of a lexical specification of a binary symmetric verb as in (13). The main clause introduces three discourse referents: the proper names each introduce one, a (Alex) and c (Chris), and the binary symmetric predicate introduces the group discourse referent X to overcome the difference in number between its syntactic and its semantic arguments – just as indicated in its lexical entry in (13).

When the NRC is attached, its relative pronoun introduces a new discourse referent, Y, that needs to be bound to an already existing discourse referent. Since there is a plural discourse referent, X, accessible, the antecedent construal can proceed as usual.

(14)   Alex^a hat sich mit Chris^c gestritten^X, die^Y übrigens öfter mal streiten.
     Alex quarreled with Chris, who by the way quarrel every now and then.'
     a.   Main clause: $[a];[c];(a = \mathbf{alex});(c = \mathbf{chris});[X];(X = a \oplus c);\mathbf{quarrel}^{uc}(X);$
     b.   NRC: $[Y];(Y = X);\mathbf{quarrel}^{uc}(Y)$

This analysis not only simplifies the analysis of symmetric predicates from Winter (2016) in eliminating the need for the formation of binary symmetric predicates, it also directly introduces the plural object X that can serve as the antecedent for an NRC.

In (15), we provide an example with a non-symmetric predicate and an NRC – just as (10b) above. The translation of the main clause is given in (15a). When the NRC is translated, as in (15b), there is no appropriate plural antecedent available to bind Y to.

(15)   ?*Alex^a hat Chris^c beleidigt, die^Y sich sonst gut vertragen.
     'Alex insulted Chris, who get along well normally.'
     a.   Main clause: $[a];[c];(a = \mathbf{alex});(c = \mathbf{chris});\mathbf{insult}^{bns}(a,c);$
     b.   NRC: $[Y];(Y =?);\mathbf{get\text{-}along}^{uc}(Y)$

Participants who do not fully reject examples of this type might be able to backtrack and to create an appropriate plural antecedent on the fly. This will allow them to combine the two introduced discourse referents a and c into a group referent X. The corresponding parts to be inserted would look as in (16).

(16)   Created antecedent: $[X];(X = a \oplus c);$

Let us now turn to the situation with RRCs. We will start with an example with a conjoined antecedent, where the possibility of attaching an RRC is uncontested. We will, then, use the

binary symmetric version of this example and show that the ordinary RRC-interpretation mechanism does not work. Finally, we will speculate on a possible repair strategy.

A relevant example is given in (17). The conjunction is formed by the introduction of a new discourse referent, X, which consists of the referents x and y. The mechanism for RRC-attachment in Walker (2017) ensures that the relative pronoun is interpreted as the main discourse referent of the antecedent and that the entire RRC is integrated in such a way that it imposes a further restriction on this discourse referent.[13] The interpretation would be just the same if the RRC were extraposed.

(17)   Heute haben sich [diejenige^x Katze und derjenige^y Hund]^X, die$_X$ gestern so heftig gestritten haben, wieder vertragen.
         'Precisely that cat and precisely that dog who had quarreled fiercely yesterday got along again today.'
    a.   Conjunction (including the RRC):
         $[x]; \textbf{cat}(x); [y]; \textbf{dog}(y); [X]; (X = x \oplus y); \textbf{quarrel}^{uc}(X);$
         $+$ uniqueness of the referent satisfying the conditions on X up to now
    b.   Main-clause VP: $\textbf{get-along}^{uc}(X)$

In (18), we give the binary version of example (17). In this case, extraposition is the only possibility. Contrary to what happens in the unary case, it is now the binary symmetric predicate *sich vertragen* 'get along' that introduces the plural discourse referent X, not a nominal constituent. The relative clause, however, needs a nominal antecedent.

(18)   ?*Heute hat sich diejenige^x Katze mit demjenigen^y Hund wieder vertragen^X, die$_X$ gestern so heftig gestritten haben.
         'Today precisely that cat got along with precisely that dog again who had quarreled fiercely yesterday.'
    a.   Main clause: $[x]; \textbf{cat}(x); [y]; \textbf{dog}(y); [X]; (X = x \oplus y); \textbf{get-along}^{uc}(X);$
         $+$ uniqueness on x and y
    b.   RRC: $\textbf{quarrel}^{uc}(X)$

What could a repair mechanism look like that will mitigate the unacceptability of (18) but not of analogous examples with non-symmetric predicates? Given the presence of a plural discourse referent, there is at least the semantic half of what an RRC needs for its attachment, with only the syntactic part missing. Consequently, we might assume that some participants in our study added the missing syntactic information on the fly, which would, then, allow them to construct the same semantic representation as for (17).

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[13]We only provide the existential component of the definite subject and gloss over the uniqueness condition.

6. Conclusions

Our study confirms that SpAs are possible at least with NRCs and shows that the symmetry of the matrix predicate can remedy examples in which the two antecedents of an SpA are neither overtly conjoined nor have identical grammatical functions.[14] This accounts for some disagreement we find in the literature and gives us new insights into both the semantics of symmetric predicates and the semantics of NRCs.

Concerning the first point, we could show that our data motivate a simplification of the theory of symmetric predicates developed in Winter (2016), where we could eliminate the mapping from protopredicates to binary symmetric predicates. Note that Winter:16 candidate for a universal, given in (19), can still be maintained in our system.

(19)   **Symmetry as collectivity**: All symmetric binary predicates, in all natural languages, are derived from collective concepts through c-type protopredicates and the symmetric-binary strategy. (Winter, 2016: 30)

In our system, we assume the same protopredicates as Winter (2016) but only the formation of unary collective and binary non-symmetric ordinary predicates. It is, of course, more transparent to realize these predicates in such a way that the number of syntactic arguments matches the number of semantic participants. This 1-to-1 mapping is violated for binary symmetric verbs. Consequently, Winter:16 observation that unary collective predicates are primary to binary symmetric predicates is fully incorporated in our analysis.

As for the analyses of NRCs, our study provided new evidence that the antecedent of an NRC needs to be a discourse referent that is introduced within the clause hosting the NRC. This discourse referent need not be explicitly linked to a syntactic constituent, though it is not sufficient to be able to create such an antecedent by some general discourse process. Our data also support a combination of semantic and syntactic factors for RRC-attachment. This double requirement is responsible for the unavailability of SpAs with RRCs.

The careful reader will have noticed that the original well-formed examples of SpA-construal from Moltmann (1992) and her generalizations from them involved the coordination of sentences. Clearly, our paper did not say anything about such cases; we explained the contrast between (2b) and (3) but did not say anything about the contrast between (1) and (2a). Our analysis suggests that there needs to be an appropriate plural discourse referent introduced in the coordination for (1) to be grammatical and that such a discourse referent is absent in (2a).

A natural speculation would be that the subjects of the coordinated clauses in (1) form a joint discourse function. Rooth (1992: 91) explicitly connects his analysis of contrastive focus to the phenomenon of split antecedents with plural discourse anaphora, introducing an appropri-

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[14]Stockwell (2017) reports similar effects of symmetry on the acceptability of participant mismatch VP ellipsis.
(i)   a. $John_1$ **met** with $Mary_2$, even though she_2 didn't want to ⟨**meet** him_1⟩.
         b.   *$John_1$ **criticised** $Mary_2$, even though she_2 wasn't supposed to ⟨**criticise** him_1⟩.

ate joint discourse referent in the interpretation of a sentence with two foci. It is plausible to assume the formation of discourse referents for other discourse functions as well. Moltmann's observations on SpAs seem to pattern with complex topics as in (20). The question in (20) marks Alex and Chris as jointly bearing the discourse function topic. In (20a) and (20b), the two re-appear in different clauses but with the same grammatical function, which is a fully acceptable answer to the question. In (20c), the two elements of the topic have distinct grammatical functions, which blocks the association with the same discourse function.

(20)   Wie kommen Alex und Chris heute nach Hause?
         'How will Alex and Chris get home today?'
         a.   ALEX läuft und CHRIS fährt mit der U-Bahn.
               'Alex will walk and Chris will take the subway.'
         b.   Jo bringt ALEX nach Hause und Kim fährt CHRIS heim.
               Jo will walk Alex home and Kim will give Chris a ride.'
         c. ?*ALEX läuft und Kim fährt CHRIS heim.
               'Alex will walk and Kim will give Chris a ride.

If this speculation goes in the right direction, Moltmann's generalization would be reducible to general processes of the creation of discourse functions across coordination in combination with our generalization for the antecedent construal for NRCs.[15]

References

Arnold, D. (2004). Non-restrictive relative clauses in construction based HPSG. In S. Müller (Ed.), *Proceedings of the 11th International Conference on Head-Driven Phrase Structure Grammar, Leuven 2004*, Stanford, pp. 27–47. CSLI Publications.

Arnold, D. (2007). Non-restrictive relative clauses are not orphans. *Journal of Linguistics 43*, 271–309.

Baayen, R. H., D. J. Davidson, and D. M. Bates (2008). Mixed-effects modeling with crossed random effects for subjects and items. *Journal of Memory and Language 59*(4), 390–412.

Del Gobbo, F. (2003). *Appositives at the Interface*. Ph. D. thesis, University of California, Irvine.

Dowty, D. (1991). Thematic proto-roles and argument selection. *Language 67*(3), 547–619.

Fabb, N. (1990). The difference between English restrictive and nonrestrictive relative clauses. *Journal of Linguistics 26*, 57–78.

Gleitman, L. R. (1965). Coordinating conjunctions in English. *Language 41*(2), 260–293.

Heim, I. and A. Kratzer (1998). *Semantics in Generative Grammar*. Blackwell.

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[15]An initial look at a wider range of data suggests that having a joint discourse function is more important than having the same grammatical function. In (ia), the two antecedents constitute a joint discourse function but bear different grammatical functions. In the less acceptable (ib), both are subjects but differ in their discourse status.
(i)   Wer fällt dir grad im Bus auf? 'Who are you noticing in the bus right now?'
        a.   Vorn sitzt KIM und hinten sehe ich ALEX, die sich zum verwechseln ähnlich sehen.
              'Kim is sitting in the front and I spot Alex in the back, who resemble each other a lot.'
        b. ?*Vorn sitzt KIM und hinten sieht mich ALEX, die sich zum verwechseln ähnlich sehen.
              'Kim is sitting in the front and Alex spots me, ...

Hoeksema, J. (1986). An account of relative clauses with split antecedents. In M. Dalrymple, J. Goldberg, K. Hanson, M. Inman, C. Piñon, and S. Wechsler (Eds.), *Proceedings of the West Coast Conference on Formal Linguistics*, Volume 5, pp. 68–86.

Holler, A. (2005). *Weiterführende Relativsätze. Empirische und Theoretische Aspekte*. Berlin: Akademie Verlag.

Huddleston, R. and G. K. Pullum (2002). *The Cambridge Grammar of the English Language*. Cambridge: Cambridge University Press.

Kamp, H. and U. Reyle (1993). *From Discourse to Logic*. Dordrecht: Kluwer Academic Publishers.

Keller, F. (1995). Towards an account of extraposition in HPSG. In *Proceedings of the 9th Conference of the European Chapter of the Association for Computational Linguistics: Student Session*, Dublin, pp. 301–306.

Lakoff, G. and S. Peters (1969). Phrasal conjunction and symmetric predicates. In D. A. Reibel and S. A. Schane (Eds.), *Modern Studies in English. Readings in Transformational Grammar*, pp. 113–142. Englewood Cliffs, NJ: Prentice-Hall.

McCawley, J. D. (1981). The syntax and semantics of English relative clauses. *Lingua 53*, 99–149.

Moltmann, F. (1992). On the interpretation of three-dimensional syntactic trees. In C. Barker and D. Dowty (Eds.), *Proceedings of SALT II*, pp. 261–281.

Moxey, L. M. and A. J. Sanford (1987). Quantifiers and focus. *Journal of Semantics 5*, 189–206.

Nouwen, R. (2003). Complement anaphora and interpretation. *Journal of Semantics 20*, 73–113.

Nouwen, R. (2007). On appositives and dynamic binding. *Journal of Language and Computation 5*(1), 87–102.

Poschmann, C. (2013). Attaching non-restrictive relative clauses to plural quantificational heads. In M. Aloni, M. Franke, and F. Roelofson (Eds.), *Proceedings of the 19th Amsterdam Colloquium*, Amsterdam, pp. 171–178.

Poschmann, C. and M. Wagner (2016). Relative clause extraposition and prosody in German. *Natural Language and Linguistic Theory 34*(3), 1021–1066.

Rochemont, M. S. and P. W. Culicover (1990). *English Focus Constructions and the Theory of Grammar*, Volume 52 of *Cambridge Studies in Linguistics*. Cambridge, MA: Cambridge University Press.

Rooth, M. (1992). A theory of focus interpretation. *Natural Language Semantics 1*, 75–116.

Schlenker, P. (2010). Supplements within a unidimensional semantics I: Scope. Paper presented at the *Amsterdam Colloquium 2009*.

Sells, P. (1985). *Restrictive and Non-restrictive Modification*. Number 85-28 in CSLI Report. Stanford University: CSLI.

Stockwell, R. (2017). VP ellipsis with symmetrical predicates. In A. Lamont and K. Tetzloff (Eds.), *Proceedings of NELS*, Volume 47, pp. 141–154.

Walker, H. (2017). *The Syntax and Semantics of Relative Clause Attachment*. Ph. D. thesis, University Frankfurt.

Winter, Y. (2016). The reciprocity-symmetry generalization: Protopredicates and the organization of lexical meanings. In C. Piñón (Ed.), *Empirical Issues in Syntax and Semantics 11*, Paris, pp. 245–274. CNRS.