

# Final appositives at the right frontier: An experimental investigation of anaphoric potential<sup>1</sup>

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**Abstract.** This paper presents two experiments testing two—not mutually exclusive—accounts of the special status of final appositive relative clauses (Syrett and Koev, 2015; Anderbois et al., 2010/2015). The speech act account (Frazier et al., 2017) argues that appositives—in contrast to restrictive relative clauses—contribute a quasi-independent speech act and are available for discourse continuations by virtue of constituting the most recent speech act when in final position. The discourse structure account (Jasinskaja, 2016; Hunter and Asher, 2016) frames the problem in terms of Segmented Discourse Representation Theory (Asher and Lascarides, 2003), arguing that only sentence-final clauses make discourse segments at the right edge of the discourse structure available and more so with coordinating relations such as NARRATION. The experiments manipulated the type of relative clause and the type of discourse relation holding between the matrix clause and the final relative clause to test the distinct predictions of these accounts. Both relative clause type and discourse relations affected the interpretation of ambiguous pronouns, providing support for both accounts. The experiments also explored differences between personal and propositional pronouns but found no conclusive evidence for an interaction of anaphora type with the other factors.

**Keywords:** anaphora, at-issueness, relative clauses, discourse structure.

## 1. Introduction

Appositive relative clauses (ARCs), as the one underlined in (1), have received attention in the semantics literature in particular as a prime example of *not at-issue content* (Potts, 2005): While the main clause content in (1) can be targeted by direct denial (1a), targeting the ARC results in infelicity (1b). However, as already noted by Potts (2005) and elaborated on by Anderbois et al. (2010/15), the outcome of the deniability test depends on the position of the ARC in the sentence. As (2) shows, the infelicity of directly denying the ARC disappears if it occurs sentence-finally. This positional effect has furthermore been supported in two experiments by Syrett and Koev (2015), which will be discussed in more detail in section 2. This current paper picks up where Syrett and Koev left off by taking the positional effect for granted and providing an experimental investigation of the accounts that might explain the special status of final ARCs, namely the speech act account of Frazier et al. (2017) and the discourse structure account of Jasinskaja (2016) and Hunter and Asher (2016).

- (1) A: Emma, who has two cats, cleaned the litter boxes.  
a. B<sub>MC</sub>: No, she didn't.  
b. B<sub>RC</sub>: #No, she doesn't.
- (2) A: Tiffany took stats with Burns, who is a happy soul.  
a. B<sub>MC</sub>: No, she didn't.  
b. B<sub>RC</sub>: No, he isn't.

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While the debate around the positional effect is framed as concerning the at-issueness status of ARCs—given that the deniability test is assumed to detect just that—there is reason to keep these notions—at-issueness and deniability—distinct from each other, as Snider (2017) notes. At-issueness, being a theoretical notion, has been defined by Simons et al. (2010) in terms of relevance of a speaker’s intention to the Question Under Discussion (QUD) (see the paper for a formal statement of the definition). However, Snider observes that two of the main diagnostics for at-issueness proposed by Tonhauser (2012)—(non-)deniability and the ability to address a QUD—differ with respect to their sensitivity to the position of an ARC. While ARCs can be directly denied if in final position, as illustrated in (1)-(2) above, addressing a QUD with an ARC is infelicitous irrespective of its syntactic position, as shown in (3) (but see Esipova, 2018). In light of this difference, Snider argues that what the deniability test detects is not at-issueness but rather the availability of a proposition for anaphoric reference—its *anaphoric potential*. This reasoning is based on the assumption that response particles like *yes* and *no* can be treated as propositional anaphors (e.g. Krifka, 2013). On this view, the unacceptability of (1b) can then be seen as resulting from the inability or difficulty to find a suitable referent.

- (3) Who is Margaret’s cousin?  
 a. #Pauline, who is Margaret’s cousin, was interviewed by Food Network.  
 b. #Food Network interviewed Pauline, who is Margaret’s cousin.

With respect to how ARCs have been featured in the debate on at-issueness, it is also worth noting that restrictive relative clauses (RRCs) have been largely ignored, despite RRCs being standardly analyzed as being presupposed and thus not at-issue according to Potts (2005), alike to the conventional implicature contributed by ARCs. While not at-issue *content* has to be distinguished from not at-issue *status*, the latter depending on the relation between the contributed content and the QUD as described above, RRCs do behave similarly to ARCs in that the applicability of the deniability test is sensitive to their position in the sentences (4)-(5). However, intuitively, targeting an RRC with direct denial still seems easier than targeting an ARC. Viewing this difference in terms of their relative anaphoric potential, as modulated by other differences between the two clause types, rather than their at-issueness status might be more promising, given that we want to maintain a close correspondence between at-issue content and status.

- (4) [Context: There are two linguists cleaning up after a party.]  
 A: The linguist that has two cats cleaned the litter boxes.  $B_{RC}$ : #No, she doesn’t.  
 (5) [Context: Tiffany has two housemates.]  
 A: Tiffany took stats with the housemate that is a happy soul.  $B_{RC}$ : No, he isn’t.

The current study can thus be viewed as part of a larger program addressing the question of what factors influence the availability of a referent for anaphora resolution, which has been extensively studied with respect to personal pronouns. The contribution of the present paper regarding this endeavor is twofold. First, the current study examines factors that have received little attention, namely the pragmatic status of the content with which a referent is introduced, as well as effects of discourse relations. Second, the experiments extend the empirical domain to propositional pronouns, which have not been studied experimentally. As the discussion above illustrates, anaphors play a big role in developing our theories of meaning such that understanding what determines a referent’s anaphoric potential may have broader implications.

The paper is structured as follows. Section 2 provides the background on the relevant findings by Syrett and Koev (2015) that play an important role in the discussion, as well as the accounts of their findings. These accounts will then be tested in two experiments in section 3. Section 4 contains the general discussion of the experimental results and section 5 concludes the paper.

## 2. Background

### 2.1. Syrett and Koev (2015): Positional Effect of ARCs

Syrett and Koev (2015) (henceforth S&K) report two experiments that manipulated the syntactic position of an ARC in the sentence. In their Experiment 2, S&K compared medial ARCs as in (6) to the final counterpart in (7) (both underlined) with respect to their availability for a direct denial.<sup>2</sup> For each item, participants were given two choices, with each option unambiguously targeting either the main clause or the ARC (for instance by virtue of tense (6) or a number (mis-)match (7)). The results indicated that final ARCs were more likely to be chosen as the target of the direct denial than their medial counterpart, receiving 35% of the choices compared to 21% for the medial ARC. Notably, while this difference was significant, the main clause thus remained to be the preferred choice even with final ARCs.

- (6) A: My friend Sophie, who performed a piece by Mozart, is a classical violinist.  
 B<sub>MC</sub>: No, she's not.  
 B<sub>RC</sub>: No, she didn't.
- (7) A: The symphony hired my friend Sophie, who performed a piece by Mozart.  
 B<sub>MC</sub>: No, she didn't.  
 B<sub>RC</sub>: No, they didn't.

In their Experiment 3, S&K used elliptical *why*-questions in a similar configuration, again varying the position of the ARC, as shown in (8). Each item was followed by the one-word question *Why?* and two possible responses, whose content targeted either the main clause (9a) or the ARC (9b). While medial ARCs were chosen as the target only 30% of the time, final ARCs received 67% of the responses. Thus, in contrast to Experiment 2, this suggests that final ARCs are not only more available than medial ones but may also be preferred over the main clause (at least numerically, given that S&K did not explicitly test whether the 67% differed from chance). I will come back to this issue in the general discussion in section 4.

- (8) a. Chloe, who decided to dress in a classical ballet style, has been chosen to audition for the 'All Stars' Dance Company.  
 b. The 'All Stars' Dance Company has chosen to audition Chloe, who decided to dress in a classical ballet style.
- (9) Choices for answer to *Why?* question  
 a. *Main clause target:*  
 Because they think Chloe could be a good addition to their company.  
 b. *Appositive target:*  
 Because she wants to be taken seriously as a classical ballet dancer.

S&K's proposed explanation for the special status of final ARCs is that they are structurally ambiguous. While both medial and final ARCs can attach to the head noun (10)-(11a), final

<sup>2</sup>This experiment also included nominal appositives, which will not be discussed here.

ARCs additionally allow attachment on a clausal level, likening them to coordinated structures (11b). By virtue of being the last assertion made in this configuration, following that of the main clause rather than being embedded inside it, the final ARC becomes available for direct denials or *why*-ellipsis.

- (10) my friend [<sub>DP</sub> Sophie [<sub>CP</sub> who is a classical violinist]] performed a piece by Mozart
- (11) a. the symphony hired my friend [<sub>DP</sub> Sophie [<sub>CP</sub> who is a classical violinist ]]  
 b. [<sub>CP1</sub> the symphony hired my friend Sophie ] [<sub>CP2</sub> who is a classical violinist ]

## 2.2. Accounts of the Positional Effect

### 2.2.1. Frazier et al. (2017): Speech Act Account

Frazier et al. provide an essentially pragmatic explanation for the special status of final appositives. Their account resembles that of S&K in that it involves a recency component but differs in remaining agnostic with respect to the syntax involved.<sup>3</sup> The authors argue that ARCs differ from RRCs in contributing quasi-independent speech acts, on a par with that of a root clause. Evidence for this view comes from contrasts such as (12), showing that only ARCs are able to felicitously host speech-act adverbs such as *hereby*. The special status of final ARCs is then accounted for—in a vein similar to S&K—in terms of recency. Final ARCs constitute the most recent speech act, whereas medial ARCs do not, due to being followed by part of the matrix clause, and it is this recency effect that makes final ARCs more available for certain kinds of anaphora.

- (12) a. This boy, who I **hereby** christen Jonathon, will grow up to be a giant among men.  
 b. #This boy that I **hereby** christen Jonathon will grow up to be a giant among men.

The speech act account thus involves the interplay of two properties: ARCs contributing a quasi-independent speech act, and their position in the sentence. Since only ARCs contribute quasi-independent speech acts while RRCs do not, the speech act account predicts that only final *appositives* have a special status while RRCs should bear less anaphoric potential relative to ARCs. Relating this reasoning back to the discussion in section 1, the idea is that this difference in terms of the speech act potential is what modulates anaphoric potential, rather than at-issueness. This prediction will be tested in the first experiment presented in section 3.1.

### 2.2.2. Jasinskaja (2016), Hunter and Asher (2016): Discourse Structure Account

A different proposal for the positional effect comes from Jasinskaja, and Hunter and Asher, who I will discuss jointly since the gist of their accounts is rather similar. Their proposal is embedded in the framework of Segmented Discourse Representation Theory (SDRT, Asher and Lascarides, 2003). On this view, a discourse can be represented as a tree (or graph) with discourse units—which, simplifyingly, correspond to clauses—being connected by different types of discourse relations. Similar to other approaches to discourse coherence such as Kehler's

<sup>3</sup>I will put S&K's account aside for now given that the syntax of ARCs is less than clear (see for instance discussion and experimental results in Dillon et al., 2018).

(2002) Coherence Theory, discourse relations differ in terms of their content, which is captured by conditions like (13a) and (14a). The mini-discourses in (13b) and (14b) illustrate the relations of ELABORATION and NARRATION respectively, with the former marking the eventuality of  $\phi_2$  as being part of the eventuality of  $\phi_1$  (eating salmon was part of Nick's lovely meal) and the latter indicating temporal precedence (Julie sat down *after* she entered the room).

- (13) a. *Condition of Elaboration*: ELABORATION( $\phi_1, \phi_2$ ) iff  $\varepsilon_{\phi_2} \in \varepsilon_{\phi_1}$   
 b. [Nick had a lovely meal last night.] $_{\phi_1}$  [He ate lots of salmon.] $_{\phi_2}$

- (14) a. *Condition of Narration*: NARRATION( $\phi_1, \phi_2$ ) iff  $\varepsilon_{\phi_2} > \varepsilon_{\phi_1}$   
 b. [Julie entered the room.] $_{\phi_1}$  [She sat down.] $_{\phi_2}$

However, discourse relations do not only differ in *content* but also in the *structure* they give rise to and how this in turn affects the accessibility of a clause for anaphoric reference. The core idea is illustrated in Figure 1. Discourse relations can either be *subordinating* or *coordinating*. If the relation is subordinating, both clauses will be in principle accessible for attachment of a new discourse unit. In contrast, if the relation is coordinating, the first unit is blocked by the second unit and thus *ceteris paribus* inaccessible for discourse continuations. This idea is referred to as the Right Frontier Constraint (RFC) (Polanyi, 1988) in (15).

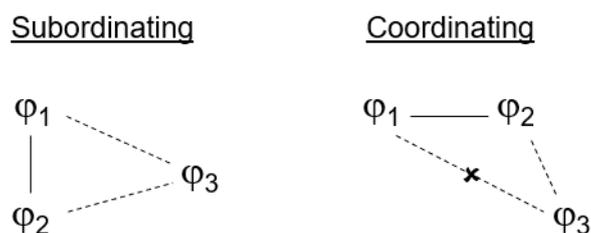


Figure 1: Illustration of Right Frontier Constraint

- (15) Right Frontier Constraint (simplified)  
 Only discourse units on the right edge of a discourse structure are available for discourse continuations.

The empirical consequence of the RFC is illustrated in (16). Depending on the discourse relation between  $\phi_1$  and  $\phi_2$ —with ELABORATION in (16b) being subordinating and NARRATION in (16c) coordinating—referring back to the quarterback in (16d) becomes more or less felicitous.

- (16) a. [At half-time, **the quarterback** waved at the fans.] $_{\phi_1}$   
 b. [The cheerleader was encouraging them to support the team.] $_{\phi_{2a}}$   
 c. [Then the cheerleader encouraged them to support the team.] $_{\phi_{2b}}$   
 d. [**He** later scored a touchdown.] $_{\phi_3}$  (✓ *after* (16b), # *after* (16c))

On a discourse structure account, final ARCs are special because they are on the right edge of a discourse tree, and more accessible than the matrix clause if in a coordinating relation to it. Medial ARCs, on the other hand, will never be on the right edge because of the way the discourse structure is updated incrementally. By assumption, the Right Frontier consists of the last processed discourse unit and any unit above (= superordinate to) it. Moreover, medial ARCs seem to be restricted to subordinating relations, illustrated in (17). Adding *then* to mark the coordinating relation NARRATION in (17a) appears to be infelicitous, whereas it

is acceptable in the final ARC in (17b). Therefore, since medial ARCs are neither the last discourse unit nor above it, they will not be at the Right Frontier and therefore inaccessible.

- (17) a. Thuy, who (#then) went home, left her keys at the department.  
 b. Thuy texted Karo, who (then) brought her her keys.

An immediate practical concern that this account raises is how to determine whether a discourse relation is subordinating or coordinating, or more generally why certain relations are one or the other. As Asher and Vieu (2005) note, discourse relations have often been impressionistically categorized as belonging to either group without being tied to reliable diagnostics, resulting in heterogeneous lists without an obvious common denominator. While finding an answer to the question of what underlies the subordinating-coordinating distinction is an important task, I will put this question aside for the current study and adopt a view of the RFC as an empirical generalization: certain discourse relations render previous material less available for anaphoric reference. To further explore this generalization, I will follow Asher and Vieu in taking ELABORATION and NARRATION to be stereotypical examples of subordinating and coordinating relations respectively, which the following experiments can be modeled after.

Before moving on to the experimental studies, one further qualification regarding the RFC is in order. In the current formulation, the RFC sounds rather absolute. However, a more accurate way to conceive of it would be as a violable constraint, or a preferential bias that interacts with similar biases that have been shown to be relevant for the interpretation of anaphoric dependencies, like topicality or Focus. This conception is supported by an experimental study by Holler and Irmen (2007), who investigated the effect of the RFC by looking at how participants interpret an ambiguous pronoun when only one antecedent is available at the Right frontier or both of them are. The experiment included a gender manipulation of the second antecedent as a control, to see what happens in the absence of ambiguity. The results showed an effect of the RFC such that there was an increase of second antecedent choices when it was the only one available at the Right frontier compared to the other two conditions. However, this increase did not go as far as rendering the second antecedent the preferred choice but only put it on a par with the first antecedent, which was (numerically) preferred in the two other conditions (65% and 67% respectively). Thus, the RFC has an effect on pronoun resolution preferences but does not override other biases that may be relevant, for instance a construal of the first antecedent as topical. Moreover, the unambiguous controls were almost exclusively resolved to the gender matching antecedent, indicating that the RFC can be overridden in the face of constraints that are evidently grammatically, such as a morphologically marked gender feature, whereas it is an open question whether we should think of the RFC as part of the grammar or rooted in processing (or both).

Thinking of the RFC as a preference rather than an absolute lets us also make better sense of the findings by S&K and the proposed explanation in Jasinskaja (2016). In a subordinating configuration – that is, when both matrix clause and ARC are on the Right Frontier – all the RFC states is that both segments are available for continuation. However, at least in Experiment 2, S&K found a strong preference for the matrix clause even when the ARC was final. To account for this apparent bias, Jasinskaja makes reference to the Main Assertion Hypothesis proposed by Frazier and Clifton (2005) in (18). Even though the Main Assertion Hypothesis is an information-structural constraint rather than a syntactic one, syntactic information can still

be used to identify what constitutes the main assertion of a complex sentence, with a clause that is higher in the syntactic structure constituting a better candidate *prima facie*. Thus, taking both the RFC and the Main Assertion into account provides a possible explanation for the findings by S&K.<sup>4</sup> Therefore, I will assume that the matrix clause constitutes the default choice and will mainly be concerned with the effects that discourse structure can have with respect to this baseline.

(18) Main Assertion Hypothesis

Other things equal, comprehenders prefer to relate material in a new sentence to the main assertion of the preceding sentence.

The prediction of the discourse structure account that will be tested in the following experiments is that the discourse relation between the matrix clause and the final relative clause should affect their anaphoric potential by virtue of the RFC. While in a subordinating relation, both matrix clause and relative clause should be in principle accessible, with a preference for the matrix clause as the Main Assertion, a coordinating relation should make the matrix clause less accessible, and in turn the relative clause more so.

### 3. Experiments

#### 3.1. Experiment 1

The goal of the first experiment is to test the predictions of the speech act account and the discourse structure account respectively, which were laid out in the previous section. According to the speech act account, final ARCs are special because they contribute the most recent speech act. Since RRCs differ from ARCs in not contributing a speech act on their own, the prediction is that ARCs will be more available for anaphoric reference than RRCs, which will be tested by comparing the two types of relative clauses.

On the discourse structure account, final ARCs contribute discourse segments that are available for anaphoric reference. Appealing to the RFC, this view predicts the discourse relation between a matrix clause and final relative clause to play a crucial role for anaphora resolution. If the relation is subordinating, both matrix clause and relative clause are available for discourse attachment but the matrix clause assumed to be preferred due to contributing the Main Assertion. For coordinating relations, however, the matrix clause is expected to become less available since it is no longer on the Right Frontier, in turn raising the anaphoric potential of the relative clause. This prediction will be tested by manipulating the discourse relation between matrix and relative clause. I will follow Jasinskaja (2016) in assuming that relative clauses stand in an ELABORATION relation—the stereotypical subordinating relation according to Asher and Vieu (2005)—to the matrix clause by default. The coordinating counterpart will be modeled after the stereotypically coordinating NARRATION relation, which will be assumed to be marked by temporal adverbs such as *then*. Additionally, the experiment will make use of grammatical aspect as cues for discourse relations. While the imperfectivity of the progressive seems to be a natural fit to express the part-whole relation of ELABORATION, perfective aspect is cross-linguistically associated with narrative progression and therefore NARRATION.

<sup>4</sup>With respect to the experiment on *why?*-ellipsis where S&K found a numerical preference for the ARC, one possible explanation might be that response particles and ellipsis differ in how they rank the different factors that contribute to the anaphoric potential of their antecedent, with ellipsis caring more about recency than the Main Assertion.

Moreover, combining temporal adverbs like *then* with progressive aspect, as in (19a), seems not fully acceptable.

- (19) a. Tiffany took a ride with Karo, who was (??**then**) getting cake.  
 b. Tiffany took a ride with Karo, who (**then**) got cake.

In addition to these two factors—relative clause type and type of discourse relation—, the experiment also aims to explore to what extent different kind of anaphora may vary in their sensitivity to the manipulated factors. As discussed in the introduction, the deniability test may be viewed as detecting the anaphoric potential of a proposition, in our case the proposition contributed by an ARC. A question one might ask is whether propositional anaphors behave differently from other anaphoric devices in this respect, for instance personal pronouns. Some suggestive evidence that types of anaphora differ in what properties of their antecedent they are sensitive to comes from the Syrett and Koev experiments discussed in section 2.1. While the final ARC remained the dispreferred option compared to the main clause with respect to direct denials, the use of *why*-ellipsis rendered the final ARC the preferred choice. This difference might have been due to a number of factors, such as particular properties of the items used in the two experiments, but it might also suggest that direct denials differ from *why*-ellipsis in how they weigh the factors that determine their referent. For instance, direct denial could care more about what the Main Assertion is, while *why*-ellipsis is primarily determined by recency. In the context of our current investigation, we might then ask how the different factors might interact with anaphora type, specifically those that take propositions versus those that refer to individuals.

The discourse structure account is concerned with discourse attachment in general rather than being restricted to particular anaphoric devices or even anaphoric reference in general. The use of anaphoric devices is primarily for convenience to unambiguously mark where in the discourse a new segment attaches.<sup>5</sup> We would thus not expect the discourse relation manipulation to be restricted to a particular kind of anaphor. With respect to the relative clause type manipulation, one might wonder whether the illocutionary force of ARCs affects the proposition it embeds more than any individual-level discourse referents that are being introduced with it. However, it should be noted that this remains speculative and the comparison of propositional anaphors with personal pronouns an exploratory aspect of the following experiment.

### 3.1.1. Design and Materials

The first experiment manipulated the three factors discussed in the previous section—RELATIVE CLAUSE TYPE (**restrictive** vs **appositive**), DISCOURSE RELATION (subordinating vs coordinating) and PRONOUN TYPE (*personal* vs *propositional*)—in a 2x2x2 design, yielding 8 conditions. All items consisted of two sentences, the first with a final relative clause and the second containing the target pronoun. A sample item is shown in (20).

<sup>5</sup>It should be noted that this is a simplification. A new discourse segment containing an anaphor does not have to attach directly to the segment it gets its antecedent from but for the discourses we will be concerned with here we can put these cases aside for now.

- (20) a. **Restrictive** – Subordinating - *Personal/Propositional*  
 At the open house, the real estate lady haggled with the potential tenants **that** the landlady was selling some furniture to.  
*She/That* was geemish.
- b. **Appositive** – Subordinating - *Personal/Propositional*  
 At the open house, the real estate lady haggled with the potential tenants, **who** the landlady was selling some furniture to.<sup>6</sup>  
*She/That* was geemish.
- c. **Restrictive** – Coordinating - *Personal/Propositional*  
 At the open house, the real estate lady haggled with the potential tenants **that** the landlady then sold some furniture to.  
*She/That* was geemish.
- d. **Appositive** – Coordinating - *Personal/Propositional*  
 At the open house, the real estate lady haggled with the potential tenants, **who** the landlady then sold some furniture to.  
*She/That* was geemish.

RC-TYPE was manipulated via the relative pronoun (*that* = **restrictive**, *who* = **appositive**), with a comma in the appositive conditions to mark an intonational break. To manipulate the DISCOURSE RELATION between matrix and relative clause, the aspect of the verb in the relative clause was varied between past progressive (subordinating) and simple past (coordinating), in addition to one of three temporal adverbs (*then*, *later*, *afterwards*)<sup>7</sup> in the *coordinating* condition, which were evenly balanced across items. As PRONOUN TYPES, the target sentence contained either a personal pronoun (*s/he*) or the propositional pronoun *that*. As antecedents for the personal pronoun, each clause contained a DP matching in grammatical or stereotypical gender, both in subject position to prevent biases due to grammatical role. The relative clause head noun was excluded as a potential antecedent for the pronoun via number mismatch. To avoid plausibility confounds, the target sentence always contained a nonce-word like *geemish* that was different for each item. There were 24 items of this type and 24 fillers, most of which were unambiguous.

The items were designed in such a way to avoid the possibility of a causal interpretation, particularly a RESULT reading that would be compatible with the temporal progression indicated by *then* (results precede their cause rather than follow it). However, it should be noted that RESULT is standardly considered coordinating as well such that a discourse structure account would predict it to behave similarly to NARRATION. I will take up this issue in the general discussion.

<sup>6</sup>It is worth noting that trying to mark an RRC with a coordinating relation results in a decrease in acceptability. This markedness may be related to the previously discussed data in (12) showing an incompatibility between RRCs and speech act adverbials. This condition was nonetheless included to keep the design balanced but should be taken with a grain of salt when evaluating the results.

<sup>7</sup>While *then* is standardly used as a NARRATION marker in the literature, the other temporal adverbs were used to add some superficial variation across items, on the assumption that they all indicate temporal progression. Although the results indicated no obvious differences among these three adverbs, ongoing work on how the RFC affects online processing suggests otherwise, with *then* as the most reliable indicator of a coordinating relation. These differences are in line with Asher and Lascarides' (2003) characterization of NARRATION as requiring a common discourse topic on top of temporal progression. I will leave this issue for future research (but see Anand and Toosarvandani, this volume, for a formal account of *then*).

A potential issue with using *that* as a propositional pronoun here is that it could also be taken to refer to the first sentence as a whole rather than just the matrix or just the relative clause. While this is a legitimate worry, the experiment is primarily concerned with how the factors affect the availability of (the material in) the relative clause, taking the matrix clause—whether on its own or including the relative clause—as a baseline.

### 3.1.2. Participants

We recruited 48 subjects from Amazon Mechanical Turk to participate in the study. Each participant was paid \$2.50. The experiment lasted approximately 15-20 minutes.

### 3.1.3. Procedure

Each item was presented to each participant with a question targeting the clause containing the pronoun, for example *Who/What was geemish?* for (20), and two response options corresponding to the matrix clause (antecedent) and the relative clause (antecedent) respectively. Again using (20) as illustration, for the personal pronoun the options would have been *The real estate lady* or *The landlady*, for the propositional pronoun *That the real estate lady haggled with the potential tenants* or *That the landlady was selling/sold furniture to the potential tenants*.

Additionally, the experiment included an exit poll to probe the concern regarding the ambiguity of *that*. Participants were given an instance of a restrictive subordinating item and an appositive subordinating item with answer options corresponding to what can be considered the simple interpretation (as shown above) and the complex interpretation (i.e. *That the real estate lady haggled with the potential tenants that the landlady was selling furniture to*), as well as a “No Response” option if they thought they rarely chose the matrix clause option during the experiment. This poll was intended to see whether participants interpreted *that* as referring to the matrix clause on its own or the whole sentence, as well as to what extent the type of relative clause affected the interpretation.

### 3.1.4. Predictions

Now that the design has been laid out, let’s take a look at how the predictions of the speech act account and the discourse structure account mentioned above would translate to the experiment. First, the speech act account predicts an increase of RC-choices for ARCs compared to RRCs. Second, the discourse structure account predicts more RC-choices with coordinating relations than subordinating ones. More tentatively, we might see an interaction between RELATIVE CLAUSE TYPE and PRONOUN TYPE if propositional anaphors are more sensitive to the illocutionary force of ARCs than personal pronouns.

### 3.1.5. Results

The results, shown in Figure 2, were analyzed with a mixed-effects logistic regression model via sum coding with a maximal random effect structures (Barr et al., 2013). All three main

effects were significant. First, ARCs received more RC-choices than RRCs ( $z = 4.21, p < .001$ ). Second, coordinating relations increased RC-choices compared to subordinating relations ( $z = 4.34, p < .001$ ). Third, there were more RC-choices for propositional anaphors than for personal pronouns ( $z = 2.06, p < .05$ ). Additionally, there was a significant interaction between RC-TYPE and DISCOURSE RELATION ( $z = 1.98, p < .05$ ) with the increase of coordinating relations being more pronounced with ARCs compared to RRCs.

Regarding the exit poll targeting the interpretation of the MC-choice, there were 26 complex interpretations for the restrictive item (13 simple, 2 no response) and 20 for the appositive (19 simple, 2 no response). 7 responses were lost to a coding error.

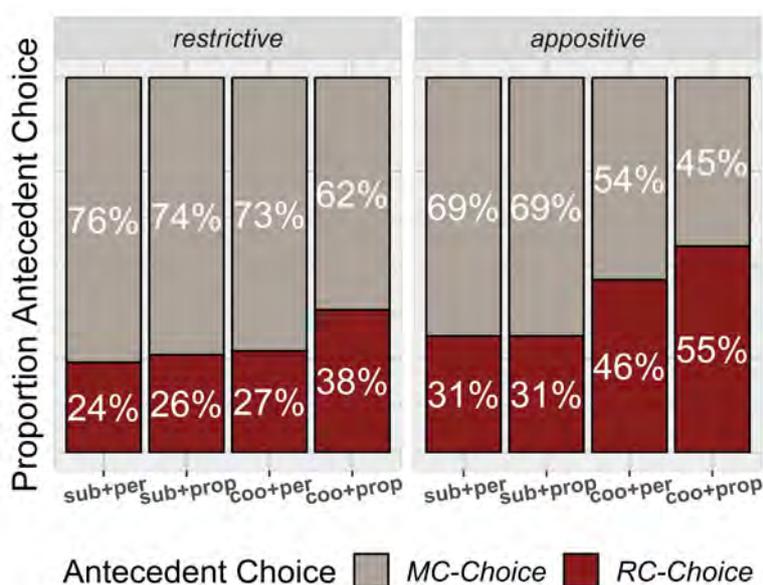


Figure 2: Proportion Antecedent Choices by Condition split by RC-Type, Experiment 1 (sub = subordinating, coo = coordinating, per = personal, prop = propositional)

### 3.1.6. Discussion

The results provided support for both accounts. Appositives were more likely to be chosen as antecedent than restrictives (41% vs 29%, pooling across conditions), in support of the speech act account, and coordinating relations increased the likelihood of RC-choices (41% vs 28% for subordinating), providing evidence for the discourse structure account. Moreover, the two factors interacted with each other such that the coordinating effect was more pronounced for appositives than for restrictives (19.5% difference for appositives vs 7.5% for restrictives). Thus, the results suggest that both factors need to be taken into account for determining the availability of final relative clauses and may in fact inform each other. As was mentioned in the introduction, the two accounts do not have to be viewed as mutually exclusive but rather as two different perspectives on the same phenomenon. One potentially promising way of bringing the two accounts together could be to think of the properties of appositives (i.e. contributing a quasi-independent speech act) as providing cues for the construction of the discourse structure. That is, appositives are more likely to be perceived as distinct discourse units and thereby more

likely to be chosen for attachment. Some suggestive evidence for this idea comes from the exit poll data, which indicated a trend towards perceiving the matrix clause choice as simple (i.e. distinct from the RC) when dealing with an appositive compared to a restrictive.

A result that is less straightforwardly explained concerns the increased likelihood of RC-choices for propositional anaphors compared to personal pronouns. In the absence of a significant interaction with either RC-type or discourse relation, this result cannot be accounted for by appealing to a difference in sensitivity to either of the factors, as it was framed previously. Rather, one would have to appeal to a more general recency kind of effect, with propositional anaphors being more likely to find their antecedent in the most recent clause than personal pronouns. However, a closer look at the data shows that the difference between anaphor types seems to be restricted to coordinating relations (10% difference vs 1% for subordinating relations). Since the relevant interaction was non-significant however ( $z = 1.6$ ,  $p = 0.11$ ), potentially due to a lack of power, attributing the pronoun type effect to this corner of the data must be treated as speculative. Moreover, even if we were to accept this interpretation, we are still left with the question why the different pronoun types should show a different sensitivity to the discourse structure.<sup>8</sup>

To further investigate this pattern in the data, we conducted a follow-up experiment.

### 3.2. Experiment 2

This experiment was meant to test whether the suspicious pronoun type pattern in Experiment 1 was merely accidental or in fact reliable.

#### 3.2.1. Design and Materials

The design was the same as for Experiment 1, except that only appositives were included, given that the discussed pattern concerned the interplay of discourse relation with pronoun type, to increase statistical power. Additionally, half the items, which were identified as allowing a causal inference (see footnote 8), were fixed. A sample item is shown in (21).

- (21) a. Subordinating - *Personal/Propositional*  
 At the open house, the real estate lady haggled with the potential tenants, who the landlady was selling some furniture to.  
*She/That* was geemish.
- b. Coordinating - *Personal/Propositional*  
 At the open house, the real estate lady haggled with the potential tenants, **who** the landlady then sold some furniture to.  
*She/That* was geemish.

<sup>8</sup>A potential clue for an explanation comes from a post-hoc item comparison. Despite the noted objective to avoid the possibility of any causal inferences in the items, half of the items were still compatible with either an EXPLANATION relation ( $n=4$ ) or a RESULT relation ( $n=8$ ). It seemed that those items showed no difference between pronoun types for the appositive coordinating conditions, while the remaining non-causal items showed a 20% difference. However, since this effect was not present in Experiment 2, it won't be discussed further.

### 3.2.2. Participants

We recruited 48 subjects from Amazon Mechanical Turk to participate in the study. Each participant was paid \$2.50. The experiment lasted approximately 15-20 minutes.

### 3.2.3. Procedure

The procedure was the same as for Experiment 1, except for the lack of an exit poll since the items did no longer include a comparison between RRCs and ARCs.

### 3.2.4. Predictions

In line with the results from Experiment 1, coordinating relations were predicted to increase RC-choices. More critically, if the pattern from Experiment 1 is real and propositional anaphors are more sensitive to the discourse relation effect, the interaction between the two factors is expected to be significant this time.

### 3.2.5. Results

The data, shown in Figure 3, were again analyzed using mixed-effects logistics regression. While the effect of DISCOURSE RELATION was replicated ( $z = 1.98$ ,  $p < .05$ ), PRONOUN-TYPE was no longer a significant factor. The critical interaction did not reach significance either.

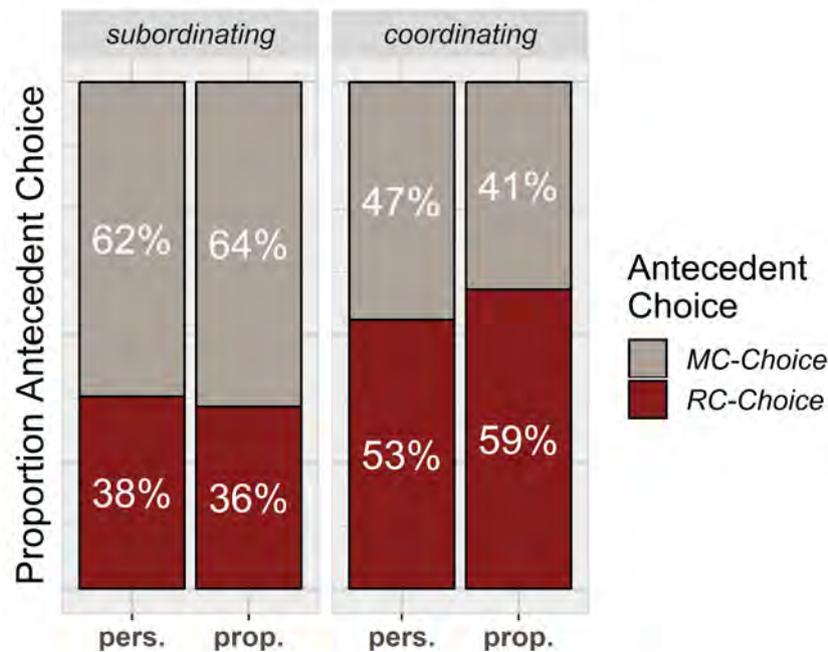


Figure 3: Proportion Antecedent Choices by Condition split by Discourse Relation, Exp 2 (pers = personal, prop = propositional)

### 3.2.6. Discussion

As in Experiment 1, coordinating relations increased the likelihood of RC-choice, replicating the discourse relation effect and providing further evidence for the RFC. However, there was no longer a significant difference between pronoun types, nor any sign of an interaction. This suggests that the pattern in Experiment 1 was only accidental and not indicative of any deeper difference between propositional anaphors and personal pronouns. While evidence for such a difference might have been informative, it is not supported by the data and therefore remains speculative. I will leave further investigations for future research and turn to the general discussion of the two experiments.

## 4. General Discussion

The two experiments provided support for both accounts of the special status of final appositives. ARCs were more likely to be chosen as an antecedent than RRCs in Experiment 1, providing evidence for the speech act account and the relevance of illocutionary force for anaphora resolution. Experiments 1 and 2 furthermore supported the discourse structure account by showing that relative clauses standing in a NARRATION relation to the matrix clause increased the number of relative clause choices compared to ELABORATION relations. These results also constitute experimental evidence for the Right Frontier Constraint, in line with Holler and Irmen (2007), in that NARRATION qua coordinating relation rendered its first argument—the main clause—less accessible, as indicated by pronoun interpretations. Taken together, the data argue for a picture in which multiple factors contribute to the anaphoric potential of an antecedent.

In addition to the individual contributions of relative clause type and discourse relation, Experiment 1 showed a significant interaction such that the discourse relation effect was amplified for ARCs rather than being purely additive. This result suggests that the syntactic-pragmatic properties of the relative clause affect how the discourse structure is determined. There are (at least) two possible avenues for conceptualizing such an interaction. The first option would be that syntactic-pragmatic properties are taken into consideration for identifying what counts as a discourse *unit*. That is, we might imagine that ARCs contributing quasi-independent speech acts are more likely to be perceived as a separate unit than syntactically integrated RRCs might be. A second possibility would be that the properties of the relative clause factor into inferring the discourse *relation*, with RRCs being more standardly taken as ELABORATION and therefore subordinating.

Suggestive evidence for the first option comes from the exit poll of Experiment 1. There was a numerical trend of participants being more likely to interpret *that* as referring to the whole sentence encompassing matrix and relative clause when the relative clause was restrictive compared to it being appositive. Although not the main focus of this paper, these data suggest a novel diagnostic for distinguishing restrictive from appositive relative clauses, and potentially the degree of syntactic integration of a clause more generally. To what extent the interpretation of propositional anaphors can serve as a diagnostic in this regard and the question of how syntactic properties of clauses interact with discourse relations will be left to future research.

As an exploratory component, the two experiments also addressed the question of how different kind of anaphora might differ in their sensitivity to particular properties of their antecedents.

In Experiment 1, propositional anaphors were more likely to be interpreted as referring to (an antecedent in) the relative clause than personal pronouns. A possible explanation for this effect could have been that propositional anaphors are more sensitive to recency. However, the numerical pattern of the data suggested that the difference in anaphora types resided in their sensitivity to the discourse relation manipulation. However, the results from Experiment 2 lacked such a pattern, as well as the overall difference between anaphora types. Since Experiment 2 had more statistical power by virtue of having only four conditions instead of eight, any interpretation of the pattern in Experiment 1 has to remain speculative. On the other hand, it suggests that the relevant factors affect individual-level and propositional-level referents similarly. Nonetheless, coming back to the indirect contrast between response particles and *why*-ellipsis found by Syrett and Koev (2015), considering a wider range of anaphoric expressions in similar paradigms might serve a fruitful area of research, for instance extending the approach taken here to VP-ellipsis, which might be taken as being more rooted in syntax and therefore more sensitive to syntactic factors.

While the experiments presented here provided data relevant to the questions outlined above, it is also important to note the caveats and restrictions that apply to their interpretation. First, the investigation was restricted to the two stereotypically subordinating and coordinating relations, ELABORATION and NARRATION. It is an open question to what extent other relations that have been categorized as subordinating or coordinating, such as EXPLANATION or CONTRAST respectively, would show the same effect. Extending the picture to other relations might be informative to determine whether the effects are something about the specific relations or about the subordinating-coordinating distinction more generally.

Relatedly, the results do not bear on the question of what underlies this particular distinction and the Right Frontier Constraint. While it seems hardly possible to find a common denominator for what makes a discourse relation subordinating or coordinating, Jasinskaja and Karagjosova (to appear) have argued that subordinating relations all address a grounding problem by providing information that ensures that a speaker's intention can be recognized. This view might provide a connection to other approaches to discourse structure such as the QUD-framework of Roberts (1996/2012) or the Table Model of Farkas and Bruce (2010), to model how particular issues are related and need to be resolved before the discourse can proceed.

Finally, the experimental design was restricted to a particular kind of continuation sentence, namely simple predicative copula sentences. While this continuation was treated as a neutral baseline, it seems possible that not only the discourse relation between matrix and relative clause plays a role but also the content, and along with it the relation established with the following sentence. Support for this view comes from data reported in Kehler et al. (2008) with respect to implicit causality verbs showing that the relation between two clauses/sentences affects the interpretation of an ambiguous pronoun contained in the second clause. Although the studies presented here were concerned with how the relation between two clauses affects the interpretation of a pronoun in a *third* clause, it seems thus possible that the discourse relation between the first/second clause and the third clause might introduce biases on their own. Moreover, since participants not only need to find an antecedent for the pronoun but also make a decision with respect to where to attach the third clause in the discourse structure—tasks that might very well be strongly dependent on each other—these effects might also be viewed in terms of discourse attachment biases. I will leave further investigation of these issues to future

research.

## 5. Conclusion

This paper presented two offline binary forced-choice interpretation experiments aimed at testing the predictions of two accounts of the special status of final appositive relative clauses, namely the speech act account and the discourse structure account. The speech act account was supported by the results of Experiment 1, which showed that both individual-level and propositional-level entities introduced via an appositive relative clause were more likely to be chosen as antecedent than via a corresponding restrictive relative clause. This effect suggests that the quasi-independent speech act contributed by an appositive increases the anaphoric potential of the material it introduces. The discourse structure account was also supported by the fact that in both experiments the coordinating relation NARRATION between matrix clause and relative clause increased choices for the relative clause antecedent, thus providing experimental evidence for the validity of the Right Frontier Constraint with respect to two types of anaphoric expressions. While the comparison between individual-level and propositional-level anaphora was only significant in one experiment, it will remain an open question to what extent different kinds of anaphora are differentially sensitive to factors like illocutionary force or discourse relations. Furthermore, Experiment 1 showed that the contribution of relative clause type and discourse relation was not purely additive but interactive, with appositives increasing the effect of NARRATION. I proposed two possible ways of drawing a connection between these two properties, one focusing on the way syntactic-pragmatic properties guide the segmentation of the parts of a discourse, another on how these properties might affect which discourse relation gets established. Addressing these issues, as well as extending the empirical landscape to different anaphors and discourse relations will be the next step to further develop a theory of how discourses are built and reference gets established.

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