



On the Relation between Coherence Relations and Anaphoric Demonstratives in German^{*}

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Abstract. Recent research suggests that pronoun interpretation is guided by the semantic coherence relations between clauses. However, it is not yet well-understood whether coherence effects extend to other anaphoric expressions beyond pronouns. We report an experiment on German, a language in which human antecedents can be referred to both with personal and demonstrative pronouns. How do anaphoric demonstratives – whose referential properties have been argued to be complementary to pronouns – fit into coherence-based views? Our results suggest that although coherence does not modulate the antecedent choice of anaphoric demonstratives to the same extent that it influences pronoun interpretation, demonstratives interact with coherence-related processing by guiding comprehenders' expectations of coherence relations.

1 Introduction

One of the most-researched challenges of language comprehension has to do with the interpretation of pronouns and other 'underspecified' referring expressions. An expression such *she*, *it* or *this* is semantically under-informative: on its own, it does not provide sufficient information to identify the intended referent. However, we encounter these kinds of forms very frequently in both written and spoken language and are able to interpret them without difficulties. In this paper, I report a psycholinguistic experiment that aims to shed light on the processes involved in reference resolution by investigating the referential properties of two kinds of underspecified forms in German, namely personal pronouns (*er*, *sie* 's/he') and demonstrative pronouns (*der*, *die*). The results show that to understand the referential properties of these forms, we need to take into account the semantic coherence relations between sentences, but that pronouns and demonstratives interact with coherence-related processing in different ways.

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Various approaches to anaphor resolution have been proposed. In this section, I review some key approaches and summarize recent evidence regarding the importance of inter-sentential semantic relations. According to *attention-based approaches*, the interpretation of pronouns and other forms is guided by a correlation between referring expressions and the salience/accessibility of the antecedent (e.g., Givón 1983, Ariel 1990, Gundel et al. 1993): The most reduced referring expressions (e.g. unstressed pronouns) refer to the most salient/accessible entities, and demonstrative pronouns and other fuller forms refer to less salient entities. Salience is often regarded as being influenced by grammatical role, with subjects more salient than objects, or topicality, with topics more salient than non-topics. However, there are empirical complications for the subjecthood=salience view. In particular, Smyth (1994) and Chambers & Smyth (1998) found *structural parallelism* effects: pronouns prefer referents in parallel syntactic positions.

Recent evidence suggests that neither attention-based nor parallelism-oriented approaches are sufficient, and argues for *coherence-based approaches*. According to coherence accounts, the use and interpretation of pronouns depends on the semantic relation between the pronoun-containing clause and the antecedent-containing clause. These approaches view anaphor resolution as a by-product of general inferencing/reasoning about relations between clauses (Hobbs 1979, Kehler 2002, Kehler, Kertz, Rohde & Elman 2008). To see how coherence relations influence pronoun interpretation, consider ex.(1). In principle, ‘him’ could refer to Phil or to Stanley. However, if the relation between the sentences is semantically parallel ex.(1a), people tend to interpret ‘him’ as referring to the parallel argument, Stanley (Kertz, Kehler & Elman 2006): Comprehenders construe the two events as similar, i.e., Stanley was tickled and was poked. In contrast, if the relation between the two clauses is a result relation ex.(1b), people are more likely to interpret ‘him’ as referring to the subject Phil (Kertz et al. 2006).

- (1) a. Phil tickled Stanley, and (similarly) Liz poked *him*.
 Parallel relation: *him* => bias to object (Stanley)
 b. Phil tickled Stanley, and (as a result) Liz poked *him*.
 Result relation: *him* => bias to subject (Phil)

As shown in ex.(2), subject pronouns are also sensitive to coherence. When the relation between the two clauses is result/cause-effect, as in (2a), subject-position pronouns prefer the preceding object (Kertz et al. 2006). In contrast, when the relation between the two clauses is a temporal narrative relation (one event preceded the other but did not cause it), Kehler (2002) notes that we may observe a subject bias ex.(2b), see also Kertz et al. (2006).

- (2) a. Phil tickled Stanley, and as a result *he* laughed uncontrollably.
 Result relation: *he* => bias to object (Stanley)
 b. Phil tickled Stanley, and then *he* laughed at Mark's joke.
 Narrative relation: *he* => bias to subject (Phil)

It is important to note that particular coherence relations do not always push pronouns to antecedents with certain grammatical roles. What matters is the semantics of the clauses and their relation. E.g., a subject pronoun in a result relation does *not* have to refer to the preceding object: Both (3a) and (3b) involve a result relation but *he* can refer to the preceding subject or object:

- (3) a. Peter snapped at Ethan, and he sulked the rest of the afternoon.
 Result relation: *he* => bias to object (Kertz et al. 2006)
 b. Peter snapped at Ethan, and he felt guilty the rest of the afternoon.
 Result relation: *he* => bias to subject (Kertz et al. 2006)

As a whole, a number of studies indicate that a successful account of pronoun interpretation needs to take into account the semantic coherence relations that hold between clauses (e.g. Wolf, Gibson & Desmet 2004, Kertz et al. 2006, Kehler et al. 2008, Rohde & Kehler 2008, Kaiser 2009).

2 What about Other Anaphoric Forms?

Existing work on coherence effects has focused primarily on the behavior of overt pronouns. However, other referential forms are also used to refer to previously-mentioned entities, including null pronouns, demonstratives and definite NPs. This brings up the question of whether coherence sensitivity also extends to other referring expressions. Are coherence effects a core property of all kinds of reference tracking, regardless of form, or are they a specific phenomenon that only occurs with certain anaphoric forms? In particular, could it be the case that only the default anaphoric form in a particular language exhibits sensitivity to coherence relations, and that other forms are governed by factors such as grammatical role?

On a general level, existing work suggests that referring expressions can indeed differ in how sensitive they are to different kinds of information. For example, although Kaiser & Trueswell (2008) did not look specifically at coherence, they found that Finnish personal pronouns and demonstratives differ in how much they 'care' about a potential antecedent's grammatical role vs. its linear position/discourse-status (see also Kaiser (in press) on Dutch). Recently, Ueno & Kehler (2010) found that Japanese null pronouns are primarily sensitive to grammatical role whereas overt pronouns are more sensitive to verb aspect (see also Rohde & Kehler 2008).

Thus, as a whole, existing research indicates that referring expressions can be asymmetrical in terms of what kind of information they are sensitive to. In the present paper, to test whether referring expressions differ in how sensitive they are to coherence information, I compared the behavior of personal pronouns and demonstrative pronouns in German. Although this research is on German, it is potentially relevant to other languages as well, since demonstrative pronouns are used to refer anaphorically to human antecedents in many languages (e.g. Kibrik 1996 on Russian, Comrie 1997 on Dutch, Kaiser & Vihman 2010 on Estonian, Himmelmann 1996).

2.1 Existing Work on Pronouns and Demonstratives

In German, both personal pronouns and demonstrative pronouns can be used to refer back to human antecedents¹, but their referential biases are different: Pronouns are described as preferring an antecedent in subject position, while demonstratives prefer non-subject antecedents, as shown in (4a,b).

- (4) a. Paul₁ wollte mit Peter₂ Tennis spielen.
 Paul₁ wanted to play tennis with Peter₂.
 b. Doch {er₁/der₂} war krank.
 But {he₁/DEM₂} was sick. (Bosch & Umbach 2007)

Personal pronouns can be regarded as more default/less marked than demonstratives, based on relative frequency (Bosch, Rozario & Zhao 2003).² Before investigating the referential properties of these forms, let us consider some background facts. Demonstratives often look like definite determiners (e.g. *der Mann* ‘the man’), but differ in certain cases/numbers (see Bosch, Katz & Umbach 2007). Although demonstratives are sometimes felt to have a pejorative tone and are more common in informal registers, they also occur in written text (Bosch et al. 2007) and are not consistently felt to be pejorative.

Let us now take a look at the referential properties of pronouns and (short) demonstratives. Given that both forms can refer to human antecedents, what guides the division of labor between them? Based on the NEGRA corpus of written German, Bosch, Rozario and Zhao (2003) found that when the antecedent is in the immediately preceding sentence, pronouns refer to a nominative element in 86.7% of the cases, whereas demonstratives refer to a nominative element in only 23.6% of the cases. (Nominative is the default subject case). Based on these findings, Bosch et al. put forth the

¹ Following Bosch et al (2003, 2007), I refer to anaphoric *der* and *die* as demonstrative pronouns,

² German also has longer demonstrative pronouns (e.g., *diese(r)*, *jene(r)*), which Bosch et al. (2007) describe as less frequent than the short forms (see Abraham 2006 for further discussion of *diese(r)*). I do not discuss these forms here, but regard them as an important area for future work.

Complementarity Hypothesis: “Anaphoric personal pronouns prefer referents that are established as discourse topics, while demonstratives prefer non-topical referents.” They regard nominative case (subjecthood) as signaling topicality, so the Complementarity Hypothesis treats pronouns and demonstratives as having complementarity grammatical-role and information-structural preferences. However, psycholinguistic experiments by Bosch, Katz & Umbach (2007) found that although demonstratives prefer object antecedents, pronouns do not exhibit a clear subject preference. Consequently, Bosch & Umbach (2007) argue that pronouns prefer discourse topics and demonstratives avoid topics. Topicality is also mentioned by Zifoun et al. (1997, vol.1: 558), who suggest pronouns are used for referents already established as topics, and demonstratives for referents that are new information or contrastive. Abraham (2006) also analyzes pronouns as involving topic continuation, and demonstratives as markers of topic shift.

3 How Do Anaphoric Demonstratives Fit into Coherence-Based Views?

Let us now consider how demonstrative pronouns could fit into coherence-based views of reference resolution. As we saw in Section 1, a growing body of work on English points to a close relation between the interpretation of pronouns and the coherence relations that hold between the pronoun-containing clause and the antecedent-containing clause.

One of the key aims of the experiment reported in this paper is to test whether German personal pronouns show the coherence sensitivity observed in English. In addition to providing evidence of crosslinguistic replicability, this question is of interest given that German has a particular anaphoric form specialized for object reference, i.e., the demonstrative pronoun. English has no comparable expression.³ Thus, perhaps English subject-position pronouns can be pushed towards object interpretations by result relations (see ex.2) because there exists no dedicated object-referring anaphor? Continuing with this reasoning, one might expect that the existence of a special object-referring form in German, the demonstrative, means that personal pronouns cannot be pushed to refer to an object antecedent.

³ A possible candidate for English, *former/latter*, is rare and highly marked. The distinction between stressed/unstressed pronouns is sometimes mentioned as being similar to the pronoun/demonstrative distinction (see Bosch et al. 2003). However, existing work on English stressed pronouns led to conflicting claims: Some (e.g. Kameyama 1999) argue for a salience-based approach, but others claim use of stressed pronouns is driven by contrast (e.g. de Hoop 2003).

Furthermore, we wanted to investigate how referential dependencies influence comprehenders' assumptions about coherence. More specifically, even if the interpretation of anaphoric demonstratives is strongly object-biased and perhaps not influenced by coherence, can demonstratives nevertheless influence comprehenders' expectations about coherence? If a connective is ambiguous between a result relation and a narrative relation, can com-prehenders' assumptions about which relation to activate be influenced by the referential biases of the anaphor? I discuss this below.

3.1 Inferring Coherence Relations from Anaphoric Dependencies

The question of whether particular referential dependencies can shape comprehenders' expectations about coherence relations relates to work by Rohde (2008) and Rohde & Kehler (2008). They noted that, if different coherence relations are associated with different referential dependencies, we might expect that encountering a particular referential pattern will lead people to expect a particular coherence relation. In other words, we might find that not only do coherence relations influence the interpretation of pronouns, as argued by Kehler (2002) and Kehler et al. (2008), but that the *interpretation of pronouns also influences the construal of coherence relations*. Indeed, in a series of sentence continuation studies, Rohde and Kehler showed this to be the case, and thus argued for a *bidirectional relation* between pronoun interpretation and coherence establishment.

Because the logic of their experiments is relevant for my work, let us take a closer look at one of their studies. In Rohde (2008)'s sentence-completion study, participants read short fragments consisting of a sentence and the first word of the next sentence (ex.5a,b), and wrote continuations. The verbs in the first clause were NP1 implicit causality verbs (Garvey & Caramazza 1974). Prior work has shown that when a sentence with an NP1 implicit causality verb is followed by an 'explanation' continuation (ex.5a), the continuation is likely to start with reference to the first noun in the initial clause (the subject). Given this well-known pattern, Rohde hypothesized:

If comprehenders use cues about who has been mentioned next to determine which coherence relation is likely to be operative, then an NP1-referring pronoun is predicted to shift comprehenders' expectations in favor of NP1-biased coherence relations, whereas an NP2-referring pronoun is predicted to shift expectations in favor of NP2-biased coherence relations. (Rohde 2008:87)

- (5) a. John infuriated Mary. He... cheated at Scrabble.
- b. John infuriated Mary. She... told him to take a hike.

The results showed that (i) when the gender of the pronoun signalled a subject antecedent, participants were more likely to provide a continuation that constituted an *explanation* relation (ex.5a), and (ii) when the gender of the pronoun signalled an object antecedent, participants wrote more *result* continuations (ex.5b). Rohde (2008) concludes that “comprehenders use information about which referent has been mentioned next to update their expectations about the operative coherence relation” (p.97).

As a class of referential forms, pronouns are known to be rather flexible; a pronoun can be used to refer to a preceding subject or preceding object. Thus, one could argue that a pronoun that refers clearly to the preceding subject (or preceding object) provides information about the coherence relation, because the form *could* also have referred to the other potential antecedent. In contrast, demonstrative pronouns are ‘pickier’ and more rigid in that they have a strong preference for the object antecedent. Thus, I wanted to find out how rigid demonstratives actually are and whether a rigidly object-referring form could also influence participants’ inferences about what coherence relation is operative.

4 Experiment

To look at the scope of coherence effects in German, I used a sentence completion task where participants read a sentence followed by a prompt word (e.g. *X tickled Y and then he...*) and provided a continuation sentence. In critical items, the prompt word was a pronoun or a demonstrative. This task is a combination of comprehension and production: Participants need to interpret the prompt anaphor before they can provide a continuation.

4.1 Methods, Design

Twenty native German speakers (mostly students at the University of Potsdam, Germany) participated in a sentence-completion task with 16 targets and 32 fillers. Targets consisted of an initial transitive clause followed by a connective and either a personal pronoun or a demonstrative pronoun:

- (6) Die Schauspielerin hat die Schneiderin gekitzelt und dann hat
The actress has the seamstress tickled and then has
 {sie/die}
 {pronoun/demonstrative}...
 ‘The actress tickled the seamstress and then {PRO/DEM}...’

Participants were asked to provide natural-sounding continuations. All target sentences mentioned two same-gender characters in the first clause (e.g. *der Bauer* ‘the farmer’, *der Feuerwehrmann* ‘the fireman’, *die Kellnerin* ‘the

waitress', *die Friseurin* 'the hairdresser (f.)'). The verbs were action/ agent-patient verbs (as defined by Stevenson, Crawley & Kleinman, 1994).⁴ As shown in (6), targets contained the connective *dann* 'then' which – like English 'then' – is ambiguous between a narrative interpretation and a result interpretation. Use of a connective that is ambiguous between these two readings is crucial, as it allows us to see whether participants' interpretation of the connective is influenced by the nature of the anaphoric form.

In addition to using the ambiguous connective *dann* 'then', I tested a clearly causal connective, *demzufolge* 'therefore, as a result'. However, some native speakers find this connective to be unnatural/odd-sounding with certain types of causal sequences. In some respects, this connective is perhaps akin to English 'thus' or 'hence.' Thus, while I will briefly mention the results with *demzufolge*, I focus mostly on *dann*. More generally, the ways in which German resultative connectives (*demzufolge*, *folglich*, *deswegen*, *infolgedessen*, etc.) map to different kinds of causal relations is an interesting question (see also Pander Maat & Sanders 2001 on Dutch).

4.2 Research Questions

First, to test whether *German pronouns* show the coherence sensitivity exhibited by pronouns in English, I wanted to see whether result relations would be associated with an increased proportion of object interpretations. When faced with a pronoun prompt, if a comprehender chooses to treat two clauses as being connected by a result relation (recall that the connective *dann* 'then' is ambiguous), does this push the pronoun away from the preceding subject – presumably prominent both due to its syntactic position and due to structural parallelism – and boost the rate of object interpretations? To investigate this, I analyzed the antecedents of pronouns depending on whether the relation between the clauses was a result or non-result relation.

Second, I wanted to find out whether the strong object bias that had been previously observed with *German demonstrative pronouns* would persist regardless of coherence relation and whether it would influence participants' inferences about coherence relations. More specifically, in light of the behavior of English subject-position pronouns – namely that result relations tend to be associated with object reference (see Rohde 2008) and narrative relations tend to be associated with subject reference (suggested by Kehler 2002) – I wanted to see whether in German, demonstratives push comprehenders to expect a result relation. This is shown schematically in (7):

⁴ The perfect tense (aux + past participle) allowed us to include a verb + anaphor sequence in the second clause (German is verb-second) without constraining participants' continuation options.

- (7) a. X verbed Y and then *pronoun*... => then/next (narrative)
 b. X verbed Y and then *demonstrative*... => result

Thus, the prediction is that subject-preferring pronouns may trigger the expectation that we are dealing with a narrative ‘next’ relation, and object-referring demonstratives may trigger an expectation of a result relation.

In addition to shedding light on the referential properties of German pronouns and demonstratives, the issues investigated here can contribute to our understanding of whether and how coherence effects relate to grammatical roles. Recall that work by Rohde (2008) and Rohde & Kehler (2008) suggests that encountering a particular grammatical-role-based referential pattern (e.g. mention of preceding object) leads people to expect a particular coherence relation (e.g. result). However, as discussed with respect to ex.(3), a particular coherence relation does not force a pronoun to ‘point to’ a certain grammatical role: Following a cause-effect relation, a subject-position pronoun can refer to a preceding subject or object. This flexibility raises questions regarding the nature and robustness of the associations between certain kinds of referential dependencies and certain coherence relations. My experiment on German allows us to contribute to these issues by investigating how robustly a particular referential pattern leads people to expect a particular coherence relation – especially when the cue is in the form of a rather rigidly object-referring demonstrative pronoun.

4.3 Data Analysis

Participants’ continuations were analyzed independently by two native German speakers blind to the aims of the experiment. A third blind coder’s analyses were used to resolve any disagreements. The continuations were analyzed for (i) whether the anaphoric expression (the prompt word) referred to the preceding subject, preceding object, or whether the antecedent was unclear. Coders also noted (ii) whether the demonstrative was used anaphorically or as a definite article, since the demonstrative prompts are ambiguous between these two construals. Furthermore, since the connective *dann* ‘then’ is ambiguous (ex.8a, b), coders analyzed each *dann* token individually to see (iii) whether it involved a result or non-result relation.

- (8) a. The actress tickled the seamstress and then she
 sat down and learned her lines. [non-result, narrative
 relation]
 b. The actress tickled the seamstress and then she
 laughed really hard for 10 minutes. [result relation]

5 Results and Discussion

In this section, we first consider the results for the pronoun conditions (Section 5.1) and then the results for the demonstrative conditions (Section 5.2). At the end of this section, we consider the occasions on which participants used the demonstrative prompt as a definite article (Section 5.3), which occurred frequently, on 75.6% of all demonstrative trials.

5.1 Pronouns

Overall, when *dann* is followed by a pronoun, there are more subject continuations (73.4%) than object continuations (26.6%). The proportion of subject continuations is significantly higher than chance (one-sample t-test, hypothesized mean 0.5 (50%), $t(18)=4.9$, $p<.001$, $t(15)=2.699$, $p<.02$).⁵ Now, taking a closer look at the data, Figure 1 (next page) shows the percentage of trials on which participants used the pronoun to refer to the preceding subject or object, grouped by whether the relation between the clauses was result or non-result. (20% of *dann*+pronoun trials were coded as ‘unclear antecedent’; they are excluded from analysis.)

Figure 1 reveals a clear relationship between coherence and choice of antecedent: When participants use the pronoun to refer to the preceding subject, we find mostly non-result relations (4.7% result relations, 68.8% non-result relations). However, when participants use the pronoun to refer to the preceding object, result relations are more frequent (23.4% result relations, 3.1% non-result relations). Looking separately at subject and object continuations, we find that the distribution of result vs. non-result relations differs significantly from chance for both kinds of continuations ($p's<.02$).

5.2 Demonstratives Used Anaphorically

Figure 2 (next page) shows the behavior of demonstrative pronouns when they are preceded by *dann* ‘then’ and used anaphorically. (Five percent of *dann*+anaphoric demonstrative trials had an unclear antecedent; they are excluded from these analyses.) Now, contrary to what we saw with pronouns, there are more object continuations than subject continuations: the gray bar is taller than the black bar (88.88% object continuations vs 11.11% subject

⁵ Some degrees of freedom vary due to empty cells. Also, recall that I also tested the more marked, specifically causal connective *demzufolge* ‘therefore’; these results are not shown in Figure 1. When pronouns are preceded by this connective, there is no subject advantage: There are 49.33% subject continuations and 50.66% object continuations. This asymmetry between the ambiguous *dann* ‘then’ and the causal *demzufolge* ‘therefore’ already suggests that result relations are associated with a boost in object interpretations.

continuations). The proportion of object continuations is significantly higher than a hypothesized chance level of 50% ($p < .01$).

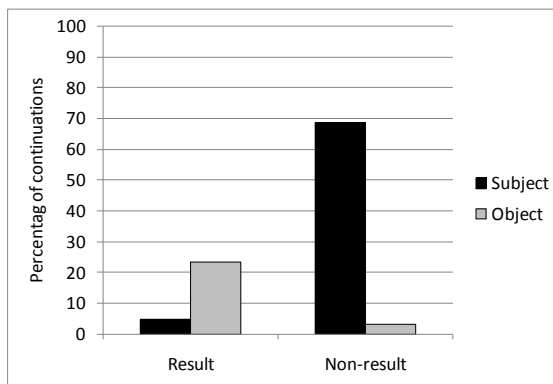


Figure 1. Personal pronouns preceded by *dann* 'then': How often did participants interpret the pronoun as referring to the preceding subject vs. object, as a function of what the relation between the clauses was.

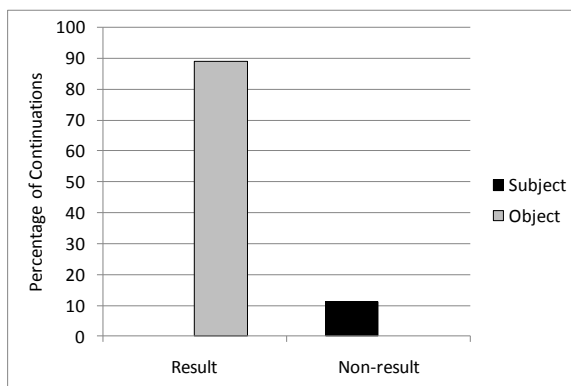


Figure 2. Demonstrative pronouns preceded by *dann* 'then': How often did participants interpret the demonstrative as referring to the preceding subject vs. object, as a function of what the relation between the clauses was.

Furthermore, it is quite striking that all of the object continuations involve result relations, and all subject continuations involve non-result relations. Thus, with demonstratives we see a very clear connection between referential dependency and coherence relation. Even when the coherence relation is

ambiguous, people tend to interpret demonstratives as referring to the preceding object and the coherence relation as being result.⁶

5.3 Demonstratives Used as Definite Articles

Figure 3 shows the behavior of demonstratives in *dann* conditions when they were used as definite articles. As with demonstratives, we find that – overall, collapsing result and non-result relations – when participants opted to produce a full noun, they were more likely to refer to the preceding object (79%) than the preceding subject (8.6%). The overall proportion of object continuations is significantly higher than chance (p 's<.01). Furthermore, echoing the findings with demonstrative anaphors, we find that object continuations are more likely to involve a result relation (65.5%) than a non-result relation (13.8%). The distribution of result vs. non-result relations in object continuations differs significantly from chance (p 's<.01.).⁷ The small number of subject continuations (8.6%) all involve non-result relations.

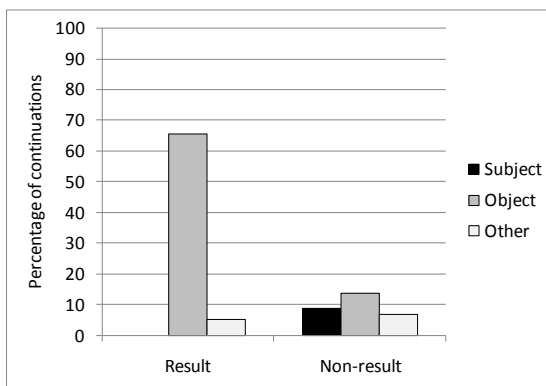


Figure 3. Demonstratives used as definite articles (in *dann* 'then' conditions): When participants used the demonstrative as a definite article, how often did the resulting noun refer to preceding subject, object, or some other entity, as a function of what the relation between the clauses was.

Thus, it is not the case that *demonstratives* are specifically associated with result relations (as Figure 2 might suggest), but rather that any kind of reference to the object – at least with *agent-patient* verbs, where the object is

⁶ The link between object reference and result relations also emerges with causal *demzufolge* 'as a result, therefore'. Demonstratives followed by *demzufolge* triggered 93% object continuations.

⁷ For one-sample t-tests, references to 'other' were excluded as a hypothesized mean of 0.5 was used. On a side note: Not surprisingly, *demzufolge* resulted in mostly object continuations (88%).

the patient – is associated with result relations. We see this with pronouns in Figure 1, demonstratives in Figure 2 and full nouns in Figure 3.

6 Conclusions

Our results shed light on the extent and nature of coherence-sensitivity in reference resolution. Our findings for German show that pronouns are more flexible in their referential behavior than demonstratives, supporting observations by Bosch et al. (2007). With regard to coherence, we found that *pronoun interpretation* is influenced by coherence relations even in a language where more specific forms for object reference are available.

In addition, regarding the *interpretation of demonstratives*, our findings show that although coherence does not modulate the antecedent choice of anaphoric demonstratives to the same extent that it influences pronoun interpretation (demonstratives have a clear object preference in all contexts that we tested), demonstratives nevertheless interact with coherence-related processing by guiding comprehenders' expectations of coherence relations. In particular, we find that object-biased expressions⁸ trigger an expectation of a result relation (see also Rohde 2008, Rohde & Kehler 2008 on English pronouns). In fact, the connection between demonstratives and result relations, combined with prior claims that demonstratives disprefer topics, brings up interesting questions for future work regarding the relation between information-structural representations and coherence representations.

In addition, these findings contribute to our understanding of the role that grammatical and thematic roles play in reference resolution. On the one hand, one of the defining traits of the coherence approach is the view that anaphor resolution cannot be explained simply in terms of grammatical role. Interestingly, at the same time, we find that grammatical roles/thematic roles (not differentiated in this study) cannot be fully ignored – in particular, there seems to be a persistent connection between result relations and reference to the object/patient. Future work will play an important role in disentangling the effects of grammatical and thematic role.

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⁸ In this study, all objects were patients; we cannot distinguish syntactic role from thematic role.

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