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Effects of coherence on anaphor resolution, and vice versa: Evidence from French personal pronouns and anaphoric demonstratives

1 Introduction

How do language users successfully interpret pronouns and other “underspecified” referring expressions that do not provide sufficient information to identify the intended referent? In this paper, we report a psycholinguistic experiment on French that investigates the referential properties of two kinds of underspecified forms in French, namely personal pronouns (*il* ‘he’, *elle* ‘she’) and proximal and distal demonstrative pronouns (*celui/celle-ci* ‘this one [masc/fem]’ and *celui/celle-là* ‘that one [masc/fem]’), in order to shed light on the question what kinds of information guide reference resolution and how referential patterns relate to other aspects of discourse. As we will see, the semantic coherence relations between sentences play a role in guiding language users’ interpretation of these forms in French, but, crucially, personal pronouns and demonstrative pronouns interact with coherence-related processing in different ways.

Traditionally, the interpretation of pronouns and other referential forms has been regarded as a process guided by a link between referring expressions and the salience/accessibility of their antecedents (e.g. Givón 1983; Ariel 1990; see also Gundel, Hedberg, and Zacharski 1993 for an implicational-scale based approach). Simplifying somewhat, the basic idea is that the most reduced referring expressions, e.g. (unstressed) pronouns, refer to the entities that are most activated, most accessible in the speaker’s and/or addressee’s mental representations, and that demonstrative pronouns and other fuller forms refer to entities that are less highly activated in the interlocutors’ mental models of the discourse. The precise definition of these notions is still under debate, and it is not unusual to see terms like “salience”, “accessibility” and “prominence” being used as near-synonyms

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(see also Masharov 2008; Chiarcos, Claus, and Grabski 2011 for related discussion). Broadly speaking, these notions are often regarded as linked to (i) grammatical role, with entities realized in subject position being more salient than objects, and/or (ii) topicality, with topical entities being more salient than non-topics.

However, in the past 10–15 years there has been an increasing amount of research moving away from salience-focused accounts and highlighting the importance of the semantic relations between sentences. These coherence-based approaches argue that the production and interpretation of pronouns depends on the semantic relation between the pronoun-containing clause and the antecedent-containing clause (e.g. Hobbs 1979; Kehler 2002; Kehler et al. 2008).

For an example of how coherence relations influence pronoun interpretation, consider (1). When the two clauses are connected by a result relation (1a) (where the second clause describes an event/situation caused by the event/situation described in the first clause), subject-position pronouns are often interpreted as referring to the preceding object (e.g. Kertz, Kehler, and Elman 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 (1b), see also Kertz et al. (2006).

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

It is important to note that particular coherence relations do not necessarily push pronouns towards antecedents with particular grammatical roles. Ultimately, what matters is the semantics of the clauses and their relationship with each other. For example, a subject pronoun following a result relation does not have to refer to the preceding object: Both (2a) and (2b) involve a result relation but *he* can refer to the preceding subject or object:

- (2) a. Peter snapped at Ethan, and he sulked the rest of the afternoon.
Result relation: *he* \Rightarrow bias to object
(Kertz, Kehler, and Elman 2006: Ex. 17)
b. Peter snapped at Ethan, and he felt guilty the rest of the afternoon.
Result relation: *he* \Rightarrow bias to subject
(Kertz, Kehler, and Elman 2006: Ex. 17)

However, despite this semantic flexibility, there does seem to be a bias for causal/result relations to be associated with object interpretations (1), at least when the first sentence has an action verb (see Kaiser 2011a for discussion).

As a whole, a growing 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, and Desmet 2004; Kertz, Kehler, and Elman 2006; Kehler et al. 2008; Rohde and Kehler 2008; Kaiser 2009, 2011a, Kehler and Rohde 2013). Furthermore, recent work combines insights from both salience-based and coherence-based approaches and suggests that both coherence relations and topicality-based/subjecthood-based factors are necessary for a full understanding of coherence pronoun production and comprehension (e.g. Kehler and Rohde 2013).

2 Looking beyond personal pronouns

Existing work on coherence effects has tended to focus mostly on personal pronouns, especially in English. However, crosslinguistically, a variety of other anaphoric forms are also used to refer to previously-mentioned entities, including null pronouns, demonstrative pronouns (anaphoric demonstratives) and definite NPs. Thus, if our aim is to understand reference resolution, then to properly understand the contribution that coherence relations make to reference resolution, we need to know whether coherence sensitivity extends to referring expressions beyond personal pronouns. One possibility is that coherence effects are a core property of all kinds of reference tracking, regardless of referential form. Another possibility is that coherence effects only occur with certain anaphoric forms, with certain kinds of properties. For example, it could be the case that only those referring expressions that are sufficiently ambiguous are susceptible to coherence effects – in other words, the coherence relations between clauses influence the interpretation of referring expressions only when there exists some ambiguity about the intended referent. In (1) above, there are two same-gender referents in the preceding clause, and thus the pronoun *he* is morphologically ambiguous. As we saw, its interpretation (whether it refers to the preceding subject or object) is influenced by the coherence relation between the two clauses. However, if we have an example like (3), with two different-gender referents, then the gender marking on the pronoun disambiguates the intended referent, and the referent does not change even if the coherence relation changes. So, in (3a), the one who laughed must be Phil – perhaps he is someone who is amused by the act of tickling others. In (3b), the one who laughed is again Phil. Similar examples could be constructed using number marking. Thus, it seems reasonable to posit that coherence effects only arise in contexts where the anaphoric form is in principle ambiguous, and is not morphologically disambiguated (e.g. by gender or number marking).

- (3) a. Phil tickled Kate, and as a result *he* laughed uncontrollably.
 b. Phil tickled Kate, and then *he* laughed at Mark's joke.

An additional possibility is that only certain anaphoric forms are, in any context, potentially susceptible to coherence effects. For example, in a language that uses both personal pronouns and anaphoric demonstratives to refer back to humans (e.g. Finnish, German, Dutch, French), perhaps only the default anaphoric forms of a language (e.g. personal pronouns) are susceptible to coherence effects, but more marked forms such as anaphoric demonstratives are not.

The general idea that different anaphoric forms differ in how sensitive they are to different kinds of information has already been proposed by Kaiser and Trueswell (2008) under the name of the form-specific multiple-constraints approach. For example, although Kaiser and Trueswell 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 2011b on Dutch and Kaiser 2011a; Bosch and Hinterwimmer 2016 on German). Additional data suggesting that different anaphoric forms differ in how sensitive they are to different kinds of information comes from Ueno and Kehler (2010), who found that Japanese null pronouns are primarily sensitive to grammatical role whereas overt pronouns are more sensitive to verb aspect. Recently, Fedele and Kaiser (2015) showed that in Italian, null and overt pronouns differ in how sensitive they are to verb semantics (implicit causality verbs) and to the presence/absence of sentence boundaries. These findings show that earlier views that focused on the preferences that Italian null and overt pronouns had for the grammatical role of their antecedents are not sufficient. Thus, as a whole, existing research indicates that referring expressions can differ in terms of how sensitive they are to different kinds of information. Given this, a finding that personal pronouns are sensitive to coherence effects but demonstrative pronouns are not would in fact provide further support for Kaiser and Trueswell's (2008) form-specific approach.

The present experiment tests whether different anaphoric forms differ in how sensitive they are to coherence information, by comparing the interpretation of personal pronouns and demonstrative pronouns in French. We test sentences where the intended antecedent is not morphologically disambiguated by number or gender (see [3] above), in order to focus on the question of whether the identity of the anaphoric form itself (personal pronoun vs. demonstrative) results in differences in coherence sensitivity. Our second main aim is to explore the possibility of a bidirectional relation between anaphoric dependencies and coherence relations (Rohde 2008): Perhaps, even if some forms are not susceptible to coherence effects, they could still interact with coherence-level representations by guiding

people's assumptions about what coherence relations are operative. We discuss this idea more below.

Although this research is on French, 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 and Vihman 2010 on Estonian; Himmelmann 1996; Kaiser 2011a on German; Kaiser and Trueswell 2008 on Finnish).

3 Personal pronouns and anaphoric demonstratives in French

As mentioned above, many languages use not only personal pronouns but also other kinds of anaphoric forms when referring back to human antecedents, including proximal and distal demonstratives. Broadly speaking, personal pronouns tend to refer to the preceding subject whereas anaphoric demonstratives (e.g. *this/that*) tend to refer to the preceding object (or other non-subject, oblique argument), at least in sentences with canonical subject-before-object word order. This object preference is exemplified below for anaphoric demonstratives in French, using an example from the newspaper *Le Monde*. In this example, the anaphoric demonstrative *celui-ci* is used to refer to the preceding indirect object *Pierre-Christian Taittinger*, and not the preceding subject *Georges Mesmin*.

- (4) *Georges Mesmin (UDF-CDS), élu du secteur depuis un quart de siècle, député de la moitié sud de l'arrondissement depuis 1973 et qui en fut maire de 1983 à 1989, veut reprendre à Pierre-Christian Taittinger (UDF-PR) le fauteuil que celui-ci lui a ravi il y a six ans.*

'Georges Mesmin (UDF-CDS), who has been elected in this area for the last 25 years, who is member of Parliament for the southern part of the district since 1973 and who was mayor of it from 1983 until 1989, wants to recover from Pierre-Christian Taittinger (UDF-PR) the seat which this one deprived him of six years ago.'

(*Le Monde* du 18 octobre 1994; cited by Demol 2007b: 31 [translation by Demol])

More specifically, in French, human antecedents can be referred to with third-person pronouns (*il* 'he', *elle* 'she') and with demonstrative forms such as (i) the proximal forms *celui-ci* 'this one (masc)' and *celle-ci* 'this one (fem)' and the (ii) distal ones *celui-là* 'that one (masc)' and *celle-là* 'that one (fem)'. The demonstra-

tive forms also have deictic uses (see e.g. Kleiber 1994; Cornish 1999; Demol 2007a, 2007b for discussion), but here we focus on their anaphoric uses, in particular for human antecedents (4).¹

The third-person pronouns (*il/elle*) are commonly regarded as markers of referential continuity, whereas the demonstrative forms are described as signaling a switch to a less-salient referent (e.g. Cornish 1999: 67–68). For example, in (5) below, the demonstrative *celle-ci* ‘this one’ is used to refer to the object of the preceding sentence, which is commonly regarded as less salient/less accessible than the subject (see Cornish 1999 for discussion). In fact, as noted by Kleiber (1994) and Cornish (1999: 67), if the demonstrative in (5) were replaced with the personal pronoun *elle* ‘she’, then the personal pronoun would be interpreted as referring to the subject of the preceding sentence. These observations are largely in line with the general salience/accessibility-based claim that personal pronouns tend to be used for more salient/more accessible referents than demonstrative pronouns (Section 1).

- (5) *L'ouvrière redit naïvement son mensonge à M^{elle} Vatnaz; celle-ci vint à parler au brave commis.*

‘The female worker naïvely repeated her lie to Miss Vatnaz; this one_{Vatnaz} ended up speaking to the good clerk.’

(Flaubert, cited by Kleiber 1994b).

In recent work, the referential properties of French personal pronouns and demonstratives have been explored in corpus studies as well as psycholinguistic experiments. Demol (2007a, 2007b) conducted a detailed corpus analysis of personal pronouns and proximal demonstratives in French, using a corpus of newspaper texts from *Le Monde* (1995–1996). In terms of the grammatical role of the antecedent, her data corroborates the patterns discussed by Kleiber (1994) and Cornish (1999) with respect to (5) above: Demol found that the proximal demonstratives *celui-ci/celle-ci* (when used anaphorically) are mostly used for non-subject, oblique antecedents. In contrast, the third person pronouns (*il/elle*) tend to refer to the subject. Demol suggests, in line with prior work, that salience/topicality plays an important role in guiding the use of these two forms.²

¹ In addition, similar to English, French also has the forms *ce dernier* ‘the latter (masc)’ and *cette dernière* ‘the latter (fem)’, but we will not investigate these forms in this paper.

² See also Demol (2007a: 229) for discussion regarding the role of contrast (see also Fossard and Rigalleau 2005). The potential role that contrastiveness plays in the use and interpretation of the French demonstrative anaphors is an important question for future work.

The interpretation of French personal and demonstrative pronouns has also been investigated experimentally. Fossard and Rigalleau (2005) conducted a reading-time study to explore the interpretation of both personal pronouns and anaphoric demonstratives, and their results are largely compatible with the corpus-based findings of Demol (2007a, 2007b). One of their studies used stimuli like (6), with two same-gender referents introduced in the second sentence (ii), and a personal pronoun or a demonstrative pronoun in the subject position of the third sentence (iii) which is semantically disambiguated towards either the subject of the preceding sentence (e.g. being punished) or object of the preceding sentence (e.g. getting a bruise).

- (6) (i) *Les élèves de l'école se défoulaient pendant la récréation.*
'The schoolchildren were letting off steam at playtime.'
- (ii) *Maria a donné un coup de pied à la maîtresse dans la cour.*
'Maria kicked the schoolmistress in the playground.'
- (iii) *{Elle/Celle-ci} a été sévèrement punie.*
'{She/This one} was severely punished.'
[disambiguated to preceding subject]
- OR
- (iii') *{Elle/Celle-ci} a eu un gros hématome.*
'{She/This one} got a nasty bruise.'
[disambiguated to preceding object]

Fossard and Rigalleau (2005) measured the reading time for the target sentence (sentence [iii] in [6]), normalized for sentence length, and found that sentences with demonstratives were read faster when the demonstratives referred to preceding objects than when they referred to subjects, whereas sentences with pronouns were read faster when they referred to subjects than when they referred to objects (see also Fossard 2006). Based on these results as well as other data, Fossard and Rigalleau (2005) conclude that third person pronouns (*il/elle*) tend to be interpreted as referring to the first-mentioned entity (which in their sentences was the subject), and that the anaphoric demonstratives *celui-ci/celle-ci* prefer objects.³

³ Related to this, Fossard and Rigalleau (2005) suggest that anaphoric demonstratives are also governed by another constraint, namely they are used to pick out an "element from a class of similar elements" (Fossard and Rigalleau 2005: 298). For example, in (6) above there are two human feminine antecedents, and so the demonstrative can be used to refer to the less salient of the two. This suggests that using an anaphoric demonstrative to refer to a "lone" referent that is not part of a set is not felicitous. Our experimental items, like those of Fossard and Rigalleau (2005), had two same-gender referents and so follow Fossard and Rigalleau (2005) in assuming that they fulfil this additional criterion.

Fossard and Rigalleau's (2005) finding that personal pronouns tend to prefer subject antecedents receives partial support from recent work by Hemforth et al. (2010). Hemforth et al. (2010) used visual-world eye-tracking and questionnaire tasks to probe how people interpret personal pronouns in French, English and German. For example, participants were presented with sequences like (7a) with a main clause and an embedded clause, as well as sequences like (7b) with two separate matrix clauses, and answered questions about the second clause (e.g. *who went home*). In both cases, the third person pronoun is in the subject position of the second clause, which is either a subordinate clause (with the verb in the subjunctive) as in (7a) or a separate main clause as in (7b).

- (7) a. *Le facteur a rencontré le balayeur avant qu'il rentre_{subjunctive} à la maison.*
 'The postman met the street-sweeper before he went home.'
 b. *Le facteur a rencontré le balayeur. Puis il est rentré chez lui.*
 'The postman met the street-sweeper. Then he went home.'

Hemforth et al. (2010) found that in contexts with two separate matrix clauses (7b), personal pronouns in all three languages exhibit a tendency to be interpreted as referring to the preceding subject – thus, in line with what Fossard and Rigalleau (2005) found. However, in contexts with a matrix clause and a subordinate clause (7a), French personal pronouns surprisingly show a preference for the preceding object, in contrast to English and German pronouns which still display a subject preference. Hemforth et al. (2010) suggest that this crosslinguistic asymmetry may be due to the fact that French (like English) has alternative infinitival construction without an overt subject, illustrated in (8). This alternative construction unambiguously refers to the subject of the matrix clause, and Hemforth et al. (2010) argue for a Gricean account: When a comprehender is faced with a personal pronoun in a context such as (7a) above, then – given that the option in (8) also exists for referring to the subject – they might assume that the pronoun in (7a) refers to the preceding object instead. (See Hemforth et al. [2010] for additional discussion as to why English does not show the same patterns as French, related to the fact that French constructions like [7a] above require the subjunctive voice, unlike English.)

- (8) *Le facteur a rencontré le balayeur avant de rentrer à la maison.*
 'The postman met the street-sweeper before returning home.'

Colonna, Schimke, and Hemforth (2012) build on this earlier work and test a wide range of contexts, including topicalization and focusing. Their results are largely in line with Hemforth et al.'s (2010) findings, in showing that in embedded clause contexts, French personal pronoun have an object bias, which they attribute to

the existence of an unambiguous alternative without an overt pronoun (see also Colonna, Schimke, and Hemforth 2014 for additional experiments).

In sum, corpus work and psycholinguistic work on French personal pronouns and demonstratives show that pronouns usually prefer subject antecedents whereas demonstratives opt for object antecedents. Furthermore, as Hemforth et al.'s (2010) results for personal pronouns show, the picture is somewhat more complex when an unambiguous alternative construction exists, providing evidence for a Gricean effect on interpretation.

4 How do richer anaphoric paradigms relate to coherence-based views?

Let us now consider how demonstrative pronouns could fit into coherence-based views of reference resolution. As discussed in Section 1, a growing body of work on English, mostly on personal pronouns, suggests that the coherence relations that hold between the pronoun-containing clause and the antecedent-containing clause play a role in guiding pronoun interpretation.

One of the aims of the experiment reported in this paper is to test whether French personal pronouns exhibit the coherence effects that we expect based on English. In addition to testing the crosslinguistic generality of coherence effects, this question is important because French has anaphoric forms specialized for object reference – the anaphoric demonstratives discussed at length in Section 3. English has no directly comparable expression.⁴ The absence of a specialized object-referring anaphor in English raises the following question: Can coherence relations push English subject-position pronouns towards object interpretations precisely because there is no dedicated object-referring anaphor in English? Conversely, in a language with a specialized object-referring anaphor, could it be that coherence effects are unable to push the personal pronouns towards object interpretations, since the anaphoric demonstrative can take care of those? Looking at a language like French allows us to investigate these issues.

⁴ A possible candidate, *former/latter*, is infrequent and highly marked (see also Footnote 1). Stressed/unstressed pronouns are sometimes mentioned as resembling the pronoun/demonstrative distinction (see Bosch, Rozario, and Zhao 2003). However, prior work on English stressed pronouns has mixed results: While some (e.g. Kameyama 1999) argue for a salience-based approach, others argue that the use of stressed pronouns is triggered by contrast (e.g. de Hoop 2003).

The second main aim of this paper is to investigate how referential dependencies influence assumptions about coherence relations. In particular, if the anaphoric demonstratives are consistently interpreted as referring to non-subjects and if their interpretation is not influenced by coherence relations, it might still be the case that they can influence comprehenders' expectations about coherence, e.g. in a context where the coherence relation between two clauses or two sentences is ambiguous. The idea that particular referential dependencies can shape comprehenders' expectations about coherence comes from Rohde (2008) and Rohde and Kehler (2008). They pointed out that, if different coherence relations are associated with different referential patterns (e.g. reference to preceding subject vs. reference to preceding object), then we would expect that seeing a particular referential pattern would trigger an expectation for a particular coherence relation. Putting it differently, the idea is that the relation between coherence relations and anaphor resolution is bidirectional: Coherence relations influence pronoun interpretation, and pronoun interpretation also influences the establishment of coherence relations. Rohde and Kehler (2008) conducted a series of experiments that support this idea.

Their studies are closely related to the logic of the current experiment, so let us take a closer look at one of their studies, reported in Rohde (2008). Participants read short fragments consisting of a sentence and the first word of the next sentence ([9a], [9b]), and wrote continuations. The verbs in the first clause were NP1 implicit causality verbs (e.g. Garvey and Caramazza 1974). When a sentence with this type of verb is followed by an "explanation" continuation (9a), the continuation is likely to start with reference to the preceding subject. Given this well-known pattern, Rohde (2008) 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 [subject-referring] is predicted to shift comprehenders' expectations in favor of NP1-biased coherence relations, whereas an NP2-referring pronoun [object-referring] is predicted to shift expectations in favor of NP2-biased coherence relations. (Rohde 2008: 87)

(9a) shows a subject-referring pronoun and (9b) an object-referring pronoun. Note that Rohde (2008) used gender-marking to disambiguate what the pronouns refer to.

- (9) a. John infuriated Mary. He . . . cheated at Scrabble. ⇒ explanation relation
 b. John infuriated Mary. She . . . told him to take a hike. ⇒ result relation

Rohde and Kehler found that (i) when the gender of the pronoun disambiguated it as referring to the subject, participants were more likely to write a continuation that involved an explanation relation (9a), but (ii) when the gender of the pronoun disambiguated it as referring to the object, participants created more result continuations (9b). In light of these results, Rohde (2008) concludes that “comprehenders use information about which referent has been mentioned next to update their expectations about the operative coherence relation” (Rohde 2008: 97).

In light of these findings for English, we tested whether French anaphoric demonstratives can provide similar kinds of cues about coherence relations. It is worth emphasizing a key difference between personal pronouns and anaphoric demonstratives: As a class of referential forms, pronouns are generally known to be rather flexible; a pronoun could 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 (consider [9] above). However, anaphoric demonstratives have generally been found to be more rigid in that they have a strong preference for the object antecedent – this observation has been made for Dutch by Comrie (1997), and for German by Bosch, Katz, and Umbach (2007) and Kaiser (2011a), and the prior research on French suggests that this holds for French as well. Thus, we wanted to (i) check how rigid French anaphoric demonstratives really are and, presuming that we replicate the strong object bias found in earlier work, to test (ii) whether a strongly object-preferring form could also influence participants’ inferences about what coherence relation is at play.

Initial steps to investigate whether different anaphoric forms differ in how sensitive they are to coherence information and whether bidirectional effects exist with demonstratives were done by Kaiser (2011a), who looked at the interpretation of personal pronouns (*er/sie* ‘he/she’) and so-called “d-pronouns” (*der/die*) in German. The results of her sentence-completion study show that in German, personal pronouns are indeed more flexible than d-pronouns: Although personal pronouns tend to prefer subjects, they can also be interpreted as referring to the preceding object (in particular with a result relation), whereas d-pronouns have a very strong object preference (see also Bosch, Katz, and Umbach 2007). Furthermore, Kaiser (2011a) also found that although the interpretation of German d-pronouns is not modulated by coherence relations (unlike personal pronouns), there is evidence for bidirectionality. More specifically, d-pronouns interact with coherence-related processing by guiding people’s expectations of coherence relations: Object-biased expressions trigger an expectation of a result relation.

Morphologically, the German d-pronouns tested by Kaiser (2011a) and Bosch, Katz, and Umbach (2007) are the same as the masculine and feminine definite

articles in German (*der, die* ‘the’) and are thus temporally ambiguous between these two uses (see e.g. Kaiser 2011a for a discussion of how this ambiguity is reflected in participants’ responses in a sentence-completion task). German also has longer, explicitly demonstrative pronouns (e.g. *diese(r/s)* ‘this one’, see Abraham 2007), but their anaphoric use is less frequent (e.g. Bosch, Katz, and Umbach 2007). Thus, the d-pronouns that have been investigated in German involve some complexities, especially if we are interested in the division of labour between personal pronouns and demonstrative pronouns used anaphorically. Looking at French allows us to explore a system where the anaphoric demonstratives under investigation are more straightforward in that they are more clearly identifiable as free-standing words that cannot be interpreted as definite articles (which is the case with German d-pronouns) or as prenominal demonstrative modifiers (which is the case with Finnish anaphoric demonstratives tested by Kaiser and Trueswell 2008). Furthermore, French also allows us to explore potential differences between proximal and distal demonstratives (used anaphorically), something that could not be done with the German d-pronouns because they do not encode that distinction.

5 Experiment

We conducted a sentence-completion study that tested participants’ interpretation of personal pronouns and proximal and distal anaphoric demonstratives in French. Crucially, we manipulated the ambiguity of the connective linking the two clauses, so that we could test whether particular anaphoric dependencies (e.g. an anaphoric form referring to the preceding subject vs. preceding object) influence participants’ interpretations of what the coherence relation is.

One of our main aims is to test if French personal pronouns exhibit the coherence effects that we expect based on English, given that French (unlike English) has specialized object-referring anaphoric forms. If we find significant effects of coherence relations on the interpretation of French personal pronouns (e.g. result relations making personal pronouns more likely to be interpreted as referring to the preceding object), this would provide additional crosslinguistic evidence for the effects of coherence on reference resolution. However, if we find that coherence relations have no effect on reference resolution in French, this would be compatible with the idea that in a language with specialized object-referring anaphors, coherence may be unable to push personal pronouns towards object interpretations, perhaps because anaphoric demonstratives already exist and can take care of those.

Our second main aim is to test how/whether referential dependencies influence people's interpretations of coherence relations, building on the bidirectionality idea of Rohde (2008) and Rohde and Kehler (2008): Coherence relations influence pronoun interpretation, and pronoun interpretation also influences the establishment of coherence relations. Thus, if anaphoric demonstratives are consistently interpreted as referring to non-subjects, can they influence people's expectations about coherence? This is something that could be detected in a context where the coherence relation between clauses is potentially ambiguous (e.g. due to a connective that could be interpreted as causal or as temporal, such as *then*). In such a context, does being faced with an object-preferring form (e.g. an anaphoric demonstrative) vs. a subject-preferring form (e.g. a personal pronoun) influence people's interpretation about whether the coherence relation is causal or temporal? If so, this would provide crosslinguistic evidence for the bidirectional relationship between coherence and anaphoric dependencies, and would go beyond the data from English personal pronouns from Rohde (2008) and Rohde and Kehler (2008) in showing that demonstratives can also have such effects.

5.1 Method, design, participants

Twenty-four native French speakers (from France) participated. The study was conducted over the internet. Participants were presented with sentence fragments like (10) and asked to write natural-sounding continuations for them. Some examples are provided in (11). All target items involved transitive action verbs (e.g. *chatouiller* 'to tickle', *gifler* 'to slap', *bousculer* 'to push/shove') and mentioned two singular, same-gender referents. No verbs or names were repeated. Target items included a location and a time expression after the object ([10]–[11]) to make the sentences sound more natural.

We manipulated (i) the form of the anaphoric expression and (ii) the connective. The anaphoric expression was a personal pronoun (*il/elle* 'he/she') or a proximal demonstrative expression (*celui-ci, celle-ci* 'this one [masc/fem]') or a distal demonstrative (*celui-là, celle-là* 'that one [masc/fem]'). The connective was *alors* 'so, as a result' or *et après* 'and then/and after that'. This resulted in a total of six conditions. All critical items ended in an anaphoric prompt (personal pronoun or demonstrative).

- (10) *Aurélie a bousculé Thérèse hier au cinéma, alors elle/celle-ci/celle-là . . .*
Aurélie a bousculé Thérèse hier au cinéma, et après elle/celle-ci/celle-là . . .

'Aurélie shoved Thérèse yesterday at the movies, and as a result / then she/this one . . .'

(11) Example continuations

- a. *Aurélie a bousculé Thérèse hier au cinéma, alors celle-ci s'est mise à pleurer.*
'Aurélie shoved Thérèse yesterday at the movies, so this one started to cry.'
- b. *Arnaud a battu Pascal pendant la soirée chez des amis, et après il lui a présenté ses excuses.*
'Arnaud beat Pascal during the evening with friends, and then he apologized to him.'
- c. *Philippe a poussé Jacques dans l'escalier Dimanche, et après celui-ci s'est fait mal en tombant.*
'Phillippe pushed Jacques on the stairs on Sunday, and then this one hurt himself while falling.'

All critical sentences had two same-gender, singular referents. Thus, neither the personal pronoun nor the anaphoric demonstrative was disambiguated morphologically and could, in principle, refer to either the preceding subject or object (since both match in terms of number and gender).

A crucial part of our design is the connective manipulation, i.e., whether the connective was *alors* 'so, as a result' or *et après* 'and then/and after that'.⁵ The former is interpreted as marking a cause-effect/result relation, whereas the latter is, like English *then*, ambiguous between a temporal interpretation and a causal/result interpretation. This ambiguity of *et après* is crucial, because it allows us to test whether being faced with an object-preferring form (e.g. an anaphoric demonstrative) vs. a subject-preferring form (e.g. a personal pronoun) will influence participants' assumptions about what coherence relation is at play. Will we find evidence of bidirectional effects between anaphoric dependencies and coherence relations? Will participants be more likely to interpret the ambiguous connective as being causal when faced with an anaphoric demonstrative?

We created a total of 24 targets and 30 fillers. The fillers included a range of different constructions and connectives, and ended in a variety of prompt words (e.g. names, nouns, plural pronouns). Lists were created using a Latin Square

⁵ It is worth noting that *et après* contains the coordination *et* 'and', in contrast to *alors*. This raises interesting questions regarding potential differences regarding coordination and subordination, which are unfortunately beyond the scope of this paper, but offer an interesting avenue for future work.

design, and then, to shorten the duration of the experiment, each list (with 24 targets and 30 fillers) was split in half, for a total of 12 lists. Thus, each participant saw 12 targets and 15 fillers, for a total of 27 items.⁶

It is important to note that Hemforth et al.'s (2010) finding that subject pronouns in subjunctive *avant que* 'before' clauses exhibit an object preference (which Hemforth et al. attribute to the existence of a simpler alternative with an infinitival verb) is not directly relevant for our stimuli. This is because our stimuli do not involve any "competition" between an infinitival construction and a more complex subjunctive-voice construction: Our sentences do not involve the subjunctive tense, nor do they have straightforward infinitival alternatives. Interestingly, however, the *et après* conditions would potentially allow coordination without an overt subject (if no prompt pronoun were provided). We return to these issues in the discussion section.

It is also worth noting that the proximal and distal forms *celui-/celle-ci* (proximal) and *celui-/celle-là* (distal), when used anaphorically, may differ in how "far back" they reach in the text for their antecedents and may highlight an opposition between their referents (e.g. if the proximal form is used for one referent and the distal form for another, see e.g. the web resources of the Centre National de Ressources Textuelles et Lexicales [CNRTL] for discussion). Because we are focusing on simple sentences with two main arguments (rather than three or more arguments), we do not investigate these potential distinctions in the current paper, but we emphasize that they constitute an important direction for future work.

5.2 Data analysis

The data was analysed by two annotators, one of whom was blind to the experimental condition. The coder did not know which of the two connectives and which of the three anaphoric forms participants saw on a given trial, but was informed about the range of possible connectives and anaphoric forms. We accomplished this by using "cropped" versions of the sentences with the connective+referential form part of the sentence omitted, e.g. *Aurélie a bousculé Thérèse hier au cinéma . . . s'est mise à pleurer*. 'Aurélie shoved Thérèse yesterday at the movies . . . started to cry'. The data was analysed for (i) what the anaphoric form refers to and (ii) what the coherence relation between the first and second clause is (see e.g. Kehler 2002; Rohde 2008 for more discussion of what the possible coherence re-

⁶ The lists were split in half for practical reasons (to shorten the duration of the experiment, which encourages more participants to complete it). We are aware that this decision has potential detrimental effects on power on the participant level.

lations are). Trials where annotators could not reach an agreement on whether the subject or object was the intended referent were removed from further analysis. Thus, the resulting dataset is categorical (reference to subject or object). We thus analysed it using mixed-effects logistic regression (the function `lmer` in R, <http://www.R-project.org/>).

6 Results and discussion

6.1 Interpretation of pronouns and demonstratives

As can be seen in Figure 1, regardless of connective, personal pronouns tend to be interpreted as referring to preceding subjects whereas anaphoric demonstratives (both proximal and distal) have a strong preference to be interpreted as referring to preceding objects. We tested whether these patterns differ significantly from chance. In this case, chance is 0.5, because only subject and object continuations were included in the final dataset. To test if the patterns shown in Figure 1 differ from chance, we fitted a logistic mixed effects model (with `lmer`) with only an intercept (as well as random effects) for each condition. The outcomes confirm that, for both connective types, personal pronouns are used for subjects at above-chance rates (*alors* ‘so’: intercept=1.206, Wald Z= 2.301, $p < .05$; *après* ‘then’: intercept=1.833, Wald Z=3.402, $p < .001$). We also see that both proximal and distal demonstrative pronouns are used for objects at above-chance rates (*alors* ‘so’: *celui-là* intercept= 2.0149, Wald Z=3.785, $p < .001$; *après* ‘then’: *celui-là* intercept=2.08, Wald Z=3.921, $p < .001$, *celui-ci*: intercept=1.537, Wald Z=3.108, $p < .01$).⁷ In the *alors celui-ci* (as a result + proximal demonstrative) condition, the object preference was so strong that a lack of variance prevented the regression models from converging. As a whole, these findings fit well with prior work: Personal pronouns tend to be interpreted as referring to subjects, and anaphoric demonstratives tend to be interpreted as referring to objects.

⁷ All of these intercept-only models included random effects for subject and item, except for two cases where including both (1|subject) and (1|item) resulted in a model that failed to converge (presumably due to lack of variance): In the *alors celui-là* and the *après celui-là* condition, only a random effect of item was included.

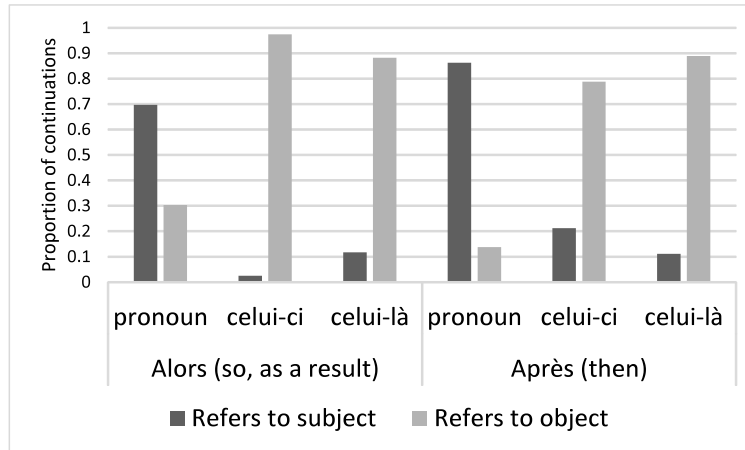


Fig. 1. Proportion of continuations where participants used the prompt expression (personal pronoun or anaphoric demonstrative) to refer to the preceding subject or preceding object. (Continuations where the intended referent of the anaphoric expression was unclear are excluded.)

We also compared more directly the strength of the referential biases for the three anaphoric forms. We used mixed-effects logistic regression with anaphor type, connective and their interaction as the fixed effects, and included random effects for subjects and items.⁸ We compared each form to each other form.

Analyses of the rate of subject continuations in the *celui-ci* (proximal demonstrative) vs. *celui-là* (distal demonstrative) conditions reveal no significant effects of connective ($p > .11$), no effects of anaphor type ($p > .5$), and no interaction ($p > .12$). In other words, the two demonstrative types pattern alike, and are equally strong in their dispreference for the preceding subject (and preference for the preceding object). Comparing the rate of subject continuations in the pronoun vs. proximal demonstrative (*celui-ci*) conditions, we find no significant effects of connective ($p > .2$), a significant effect of anaphoric form ($\beta = 9.259$, Wald $Z = 2.414$, $p < .02$) which is modulated by an anaphor-by-connective interaction ($\beta = -7.619$, Wald $Z = -1.987$, $p < .05$). This suggests that the rate of subject continuations is higher with pronouns than with proximal demonstratives but that the size of this effect depends

⁸ When specifying the structure of random effects, we started with fully crossed and fully specified random effects, tested whether the model converges, and reduced random effects until the model converged (see Jaeger at <http://hlplab.wordpress.com>, May 14, 2009 and links from the blog). Then, we used model comparison to test each random effect; only those that were found to contribute significantly to the model were included in the final analyses. However, we retained random intercepts for subjects and items in all models.

on the connective. Comparing the rate of subject continuations in the pronoun vs. distal demonstrative (*celui-là*) conditions, we find a marginal effect of connective ($\beta=0.4506$, Wald $Z=1.952$, $p=.051$), a significant effect of anaphoric form ($\beta=2.2641$, Wald $Z=7.125$, $p<.001$), and (perhaps surprisingly) no interaction ($p>.5$). As can be seen in Figure 1, the rate of subject continuations is higher with pronouns than with distal demonstratives. Based on Figure 1, we may have expected a significant interaction as well, since pronouns appear to be more sensitive to connective type than the distal demonstrative, but this effect did not reach significance, perhaps due to the relatively small sample size. (The planned comparisons reported below shed further light on this.)

In sum, the effects of anaphoric form confirm what we expect based on Figure 1 above: Personal pronouns are significantly more likely to be interpreted as referring to the preceding subject than anaphoric demonstratives, and proximal vs. distal anaphoric demonstratives do not differ from each other.

Because some analyses revealed an interaction and others revealed a marginal effect of connective while others didn't, we conducted planned comparisons looking at effects of connective type, separately for each of the three anaphoric forms. We find no significant effect of connective on the rate of subject (or object) continuations for any of the three anaphoric forms (pronoun conditions: $\beta=0.507$, Wald $Z=1.528$, $p=.126$, distal demonstrative *celui-là* conditions: $\beta=-0.032$, Wald $Z=-.086$, $p=.931$; proximal demonstrative *celui-ci* conditions: $\beta= 6.664$, Wald $Z=0.223$, $p=.823$). Given the small magnitude of the differences between the two connectives in the demonstrative conditions (see Figure 1), this is to be expected. However, the lack of a significant connective effect may seem surprising for the pronoun conditions, but it is important to keep in mind that because *et après* 'and then' is ambiguous and can be interpreted causally or noncausally, this result is hard to interpret.⁹ Furthermore, although we are dealing with a relatively small dataset, the numerical patterns for personal pronouns are indeed in the expected direction: more object interpretations with pronouns after *alors* (30%) than after *et après* (14%).

⁹ Additional planned comparisons on the pronoun conditions used the result vs. non-result coding produced by the annotators (see next section) to capture the fact that some uses of *après* may be causal. The results show that (i) there are more object interpretations with pronouns after result relations than after non-result relations (though the effect of relation type does not reach significance) and (ii) this pattern is numerically slightly stronger compared to what we obtain if we just use the two connective labels (*après* vs. *alors*).

6.2 Bidirectional relationship between anaphoric forms and coherence relations

In this section, we take a closer look at participants' interpretation of the ambiguous connective *et après* 'and then'. However, recall that *et après*, just like English *and then*, is ambiguous between a temporal interpretation (e.g. *Peter kicked John and then he ate lunch*) and a causal/result interpretation (e.g. *Peter kicked John and then he fell over*). Thus, we want to know when are people interpreting *et après* causally and when are they interpreting it temporally?

Figure 2 below takes the right half of Figure 1 (the *et après* 'then' conditions) and shows, within each of the bars, what proportion of continuations used *then* causally and what proportion used *then* temporally. (In other words, the basic heights of the bars in Figure 2 below are the same as those in the right half of Figure 1 above, because it is the same data. Figure 2 below simply provides more information about the interpretation of the ambiguous connective. The detailed numbers are shown in Table 1).

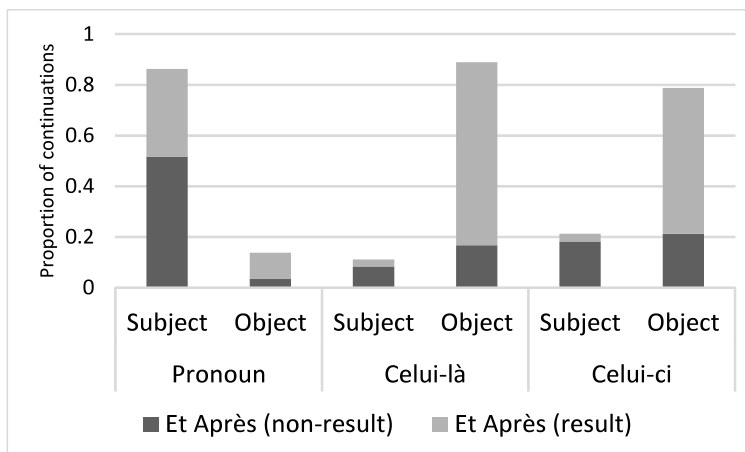


Fig. 2. Proportion of continuations where the connective *et après* 'and then' was used to signal a result relation vs. a non-result/temporal relation, shown as a function of anaphoric form and subject vs. object reference. (Continuations where the intended referent of the anaphoric expression was unclear are excluded.)

As we can see in Figure 2 and Table 1, in the conditions with an anaphoric demonstrative prompt, (i) these forms tend to be interpreted as referring to the prior object (as we already saw in Figure 1 above; 89% object interpretations overall with

Table 1. Proportion of continuations where the connective *et après* ‘and then’ was used to signal a result relation vs. a non-result/temporal relation, as a function of anaphoric form and subject vs. object reference. (Continuations where the intended referent of the anaphoric expression was unclear are excluded.)

		Et après (non-result)	Et après (result)	Total
Pronoun	Subject	0.52	0.34	0.86
	Object	0.03	0.10	0.14
<hr/>				
Celui-là (distal demonstrative)	Subject	0.08	0.03	0.11
	Object	0.17	0.72	0.89
<hr/>				
Celui-ci (prox. demonstrative)	Subject	0.18	0.03	0.21
	Object	0.21	0.58	0.79

the distal *celui-/celle-là* and 79% object interpretations overall with the proximal *celui-/celle-ci*) and (ii) the connective *et après* tends to be interpreted causally (as indicated by the lighter shading in Figure 2). If we take a closer look at the “result” (causal use) columns in Table 1, we see distal demonstratives are interpreted as referring to the preceding object 89% of the time, and this 89% is made up of 72% causal/result interpretations and only 17% non-causal/non-result interpretations. So, if we look just at those trials where *celui-/celle-là* is interpreted as referring to the preceding object, we see that on a very high proportion of these trials – 80% of trials (72% out of 89%) – the connective is interpreted as being causal. Statistical analyses confirm that the rate of causal uses is significantly higher than chance (0.5) (intercept=1.466, Wald $Z=3.238$, $p=.001$). A similar pattern obtains for the proximal demonstratives (*celui-/celle-ci*), which are interpreted as referring to the preceding object 79% of the time, and this 79% is made up of 58% causal/result interpretations and only 21% non-causal/non-result interpretations. So, if we focus just on those trials where *celui/celle-ci* is interpreted as referring to the preceding object, then on 73% of these trials (58% out of 79%), the connective is interpreted as being causal. This is again significantly higher than chance (intercept= 0.998, Wald $Z=2.258$, $p=.02$). In other words, we again see a clear preference for causal interpretations.

Furthermore, when we look at the small number of trials where an anaphoric demonstrative was interpreted as referring to a preceding subject, we see a strong preference to interpret the ambiguous connective *et après* temporally/non-causally: With the distal demonstrative *celui-/celle-là*, only 11% of trials exhibit subject reference and this is made up of 8% non-causal uses of *et après* (i.e., 73%

of all trials where *celui-/celle-là* is interpreted as referring to the subject involve a non-causal interpretation of the ambiguous connective). With the proximal demonstrative *celui-/celle-ci*, only 21% of trials exhibit subject reference and this is made up of 18% non-causal uses of *et après* (i.e., 86% of all trials where *celui-/celle-ci* is interpreted as referring to the subject involve a non-causal interpretation of the ambiguous connective). The number of datapoints is too low for statistical analyses, but we see a clear bias towards non-causal, temporal interpretations on those trials where participants interpreted the anaphoric demonstrative as referring to the preceding subject.

In sum, with anaphoric demonstratives, we see clear evidence in favor of bidirectionality: These forms consistently show a strong object bias, and this object bias leads participants to interpret the ambiguous connective as encoding a causal/result relation.

Let us now consider what happens in the conditions with a personal pronoun prompt when the connective is the ambiguous *et après*. We find that (i) personal pronoun tend to be interpreted as referring to the prior subject (86% of the trials) and (ii) the ambiguous connective *et après* is used in both causal and non-causal ways. If we take a detailed look at Figure 2 and Table 1, we see that a personal pronoun after *et après* is interpreted as referring to the preceding subject 86% of the time, and this 86% is made up of 34% causal/result interpretations and 52% non-causal/non-result interpretations. So, if we look just at those trials where the personal pronoun is interpreted as referring to the preceding subject, we see that on 60% of these trials (52% out of 86%), the connective is interpreted as being non-causal, i.e. used in a temporal, non-result manner. Although this is not significantly higher than chance ($p > .2$), the pattern is in the expected direction. Interestingly, if we look at the small proportion of trials where the personal pronoun is interpreted as referring to the preceding object (14%), we see that on 71% of these trials (10% out of 14%), the connective is interpreted as causal. The number of data points here is too small for statistical analyses, but again, the pattern is in the expected direction.

Thus, the overall pattern with personal pronouns echoes what we saw with the anaphoric demonstratives: Object interpretations are associated with causal uses of the ambiguous connective, and subject interpretations are associated with non-causal, temporal uses of the connective.

7 General discussion and conclusions

We took as our starting point the need to explore the nature of coherence effects in a language with a richer anaphoric paradigm than English. Our sentence-completion study investigated the interpretation of personal pronouns (*il* ‘he’, *elle* ‘she’) and proximal and distal demonstrative pronouns (*celui-/celle-ci* ‘this one [masc/fem]’ and *celui-/celle-là* ‘that one [masc/fem]’) in French. We explored two main questions: First, we wanted to assess how French speakers interpret personal pronouns and anaphoric demonstratives in an experimental setting, where verb type is controlled and the coherence relations between sentences are manipulated. In light of prior work on English highlighting the importance of coherence relations and verb types on reference resolution, we wanted to see whether the referential patterns observed in earlier work on French would be replicated in our study. Our second aim was to see whether we could find evidence of a bidirectional relationship between anaphoric dependencies and coherence relations (i.e., anaphoric dependencies influencing coherence relations, in addition to coherence relations influencing anaphoric dependencies), which Kehler and Rohde (2013) had observed in a different context in English. Let us consider each of these aims in turn.

Our first aim was to experimentally investigate the interpretation of personal pronouns and anaphoric demonstratives in French, and to explore whether French personal pronouns exhibit the coherence effects that we might expect based on English. English personal pronouns seem quite susceptible to being pushed around by coherence effects (e.g. “willing” to refer to objects when a causal/result relation is involved). Since French has a specialized object-referring anaphor, could it be that coherence effects are unable to push French personal pronouns towards object interpretations, since the anaphoric demonstrative can take care of those? Our results are somewhat ambiguous on this point: We find that French personal pronouns exhibit a clear subject bias, in contrast to distal and proximal anaphoric demonstratives which both exhibit an object bias¹⁰ – but the subject bias is present with personal pronouns even with the causal alors

¹⁰ It is important to acknowledge that the experiments reported in this paper only investigate subject-verb-object order and do not look at noncanonical constructions where the object linearly precedes the subject, such as certain kinds of clefting/dislocation. Existing work on pronouns and anaphoric demonstratives in other languages suggests that word order and information-structure can play an important role (e.g. Kaiser and Trueswell 2008 on Finnish), but work on French by Colonna, Schimke, and Hemforth (2012) on sentences with noncanonical word orders where either the subject or object was fronted by means of topicalization or clefting/focus did not find clear effects of word order in French across the board, but they did find that likelihood

connective, which seems unexpected based on prior work on English. However, the subject bias is numerically weaker with causal *alors* than with *et après*, which is in line with what we would expect. (As mentioned above, these analyses are complicated by the ambiguity of *et après*.) Broadly speaking, if we abstract away from effects of connective type and if we assume that grammatical role is connected to salience/accessibility (with entities realized in subject position being highly salient), our findings are in line with the view that personal pronouns are used for highly salient/accessible referents.

As regards proximal anaphoric demonstratives (*celui-ci, celle-ci*), our work is in line with earlier work that used different methods: Observations by Kleiber (1994) and Cornish (1999), as well as Fossard and Rigalleau's (2005) reading time experiments and Demol's (2007a, 2007b) corpus study, all point towards an object preference. If we assume that grammatical role is connected to salience/accessibility – with entities realized in subject position being more salient than entities realized in object – then these findings are in line with the hierarchy-based view (e.g. Ariel 1990; Gundel, Hedberg, and Zacharski 1993) that demonstratives tend to have less accessible, less salient referents than personal pronouns. In addition, our results show that this object preference extends to the distal anaphoric demonstrative (*celui-là, celle-là*).

Furthermore, our results also show that personal pronouns and demonstratives differ in their 'referential strictness': Personal pronouns are more flexible than anaphoric demonstratives: Although pronouns are mostly used for subjects, they can also be used to refer to objects, whereas demonstrative anaphors strongly prefer objects and are rarely used to refer to subjects. This is in line with similar observations made for Dutch (Comrie 1997; Kaiser 2011b) and German (Bosch, Katz, and Umbach 2007; Kaiser 2011a).

Our findings regarding personal pronouns also have implications for Hemforth et al.'s (2010) finding that personal pronouns have a subject bias – except in certain contexts where another alternative infinitival structure without an overt pronoun is also available. Our stimuli do not involve competition between an infinitival construction and a more complex embedded subjunctive-voice construction, and thus do not bear directly on Hemforth et al.'s findings. However, if we interpret Hemforth et al.'s findings in a broader Gricean sense, our results may be relevant for their claims. Hemforth et al. explain their results by making reference to the Gricean Maxim of Manner: "Listeners hearing a French sentence with 'avant

of participants choosing the first-mentioned referent as the antecedent of a subsequent personal pronoun was greater when it was a topicalized object than when it was a subject in a "regular" SVO sentence or when it was a topicalized subject.

que' followed by a full pronoun will assume that the speaker would have used the unambiguous infinitival form [. . .] had she intended the temporal clause to relate to the subject of the matrix clause. The pronoun is thus preferentially interpreted as relating to the object of the matrix clause for which no such alternative exists" (Hemforth et al. 2010: 2, emphasis added). In other words, if there exists an unambiguous (or less ambiguous) option for referring to the preceding subject, and if the speaker opted not to use that option, that is a signal to the hearer to assume that the speaker did not intend to refer to the preceding subject. Although our sentences do not have an alternative infinitival form, the *et après* conditions have a potential variant without an overt pronoun, as illustrated in the corpus example below:

- (12) . . . *Elle m'a demandé mon numéro d'appartement et après s'est excusée en m'expliquant qu'il y avait des gens, a priori, qui venaient profiter de la piscine et que des personnes de la résidence s'étaient plaintes de ce fait . . .*
 ' . . . She asked me for my apartment number and then [null] excused herself while explaining to me that there were people who, earlier, had used the pool and the people at the holiday residence had complained about this . . .'
 (www.tripadvisor.fr; translation by the authors, emphasis added)

Here, leaving out the overt pronoun unambiguously signals reference to the preceding subject. Thus, according to a Gricean approach, we might expect that use of an overt pronoun in the *et après* conditions competes with the unambiguous alternative (coordination without an overt pronoun, as shown in [12]). Thus, we might expect that overt personal pronouns in our *et après* conditions should also have shown an object preference. The same reasoning does not apply to the *alors* conditions, because they do not allow the same kind of null pro variant.

However, as our results showed, there is no sign of personal pronouns in *et après* conditions exhibiting a preference for the object over the subject – if anything, their subject preference is numerically stronger than that of overt pronouns in the *alors* condition. This is not a problem for the claims we are making in this paper, but suggests that the patterns we found cannot be fully derived from a Gricean account that focuses on the presence of other more reduced (e.g. null) options.

The second main question we investigated is how referential dependencies influence comprehenders' assumptions about coherence relations. We tested Kehler and Rohde's (2013) idea that the relation between coherence relations and anaphor resolution is bidirectional: Coherence relations influence pronoun interpretation, and pronoun interpretation also influences the establishment of relations. Rohde (2008) illustrated this with gender-marked pronouns in English,

and showed that object-referring gender-unambiguous pronouns lead people to expect result/causal relations. We used French to test whether anaphoric demonstratives can provide similar kinds of cues about coherence relations. Anaphoric demonstratives and personal pronouns differ in an important way: As a class of referential forms, personal pronouns are generally known to be rather flexible, and can refer to both subjects and objects. Thus, it could be that a pronoun that refers clearly to the preceding subject (or preceding object) provides novel information by virtue of the fact that the form could also have referred to the other potential antecedent. However, anaphoric demonstratives have generally been found to be more rigid in that they have a strong preference for the object antecedent (and we also found this for French, in line with other work). Thus, the question is whether a strongly object-preferring form can also influence participants' inferences about what coherence relation is at play, or whether such inferences are only triggered by more flexible forms like personal pronouns. Our results reveal clear bidirectionality effects with anaphoric demonstratives: When participants interpret anaphoric demonstratives as referring to the preceding object,¹¹ they also exhibit a significant preference to interpret the ambiguous *et après* 'and then' connective as being causal/involving a result relation. This suggests that bidirectionality effects are not restricted to personal pronouns and points to an interesting connection between object reference and causality (at least with action verbs).

Indeed, our findings contribute to our understanding of the role that grammatical/thematic roles play in reference resolution. On the one hand, one of the defining traits of the coherence approach is the idea that anaphor resolution cannot be explained simply in terms of grammatical role. However, 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. This offers an interesting avenue for future work.

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¹¹ In this study, all objects were patients; we cannot distinguish syntactic role from thematic role.

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