Temporal Counteridentity and Imagining De Nunc

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Abstract

In temporal counteridenticals like 'Ian is imagining that it is 2030 and Sally is rich', the subject locates themself at a time other than (what they believe to be) the current time. In such reports, tense in the embedded clause can denote the time that the attitude holder imagines herself to be located at, or the time that she believes herself to be located at. I show that these two interpretations are subject to systematic constraints. The observed pattern is parallel to that discovered in Pearson (in prep.) for personal counteridenticals, such as Lakoff's famous Brigitte Bardot sentence. I propose an analysis of these findings that depends on two key assumptions: (1) there is a mechanism of 'de nunc binding' that encodes the 'subjective now' of the attitude holder; and (2) this mechanism is constrained by a principle of the grammar called 'Condition CW', originally proposed for personal counteridenticals in Pearson (in prep.). These findings support the view that attitudes de se and de nunc constitute a special class, not reducible to de re. They further suggest that there is a dedicated linguistic mechanism for encoding such attitudes that is subject to systematic grammatical constraints.

Keywords Imagination · Counteridenticals · De se · De nunc · Tense · Pronouns

1 Introduction

Imagination reports offer fertile territory for inquiry into two related issues in natural language semantics: the mechanisms giving rise to so-called *de se* interpretations, and grammatical constraints on pronominal interpretation in the scope of intensional operators. These issues have recently received particular attention in relation to so called *counteridentity* reports, where an attitude holder imagines (or wishes, dreams, pretends etc.) that she were some particular individual other than who she is (Ninan 2008; Percus and Sauerland 2003a; Pearson 2018, Pearson in prep.). Take for instance the following example.

(1) I'm imagining that I am Brigitte Bardot and that I am kissing me.

[Ninan 2008: 25, ex 5a, based on Lakoff 1972]

(1) has a salient reading on which the speaker imagines what it would be like to be Bardot and, as Bardot, to kiss the speaker. On this reading, the subject of *kiss* picks out the individual who the speaker imagines that she is (what Ninan calls the *counterfactual-self*), while the object picks out the individual who she actually is—or more precisely the individual she believes herself to be (the *belief-self*). Thus if the speaker's imagining takes place in a context where he is suffering from the delusion that he is Bardot's fellow film star Dirk Bogarde, the sentence has a true reading.

The hallmark of counteridenticals is that they set up a context where who the attitude holder imagines herself to be and who she believes that she is part company. Examples like (1) show that one and the same pronoun—the first person pronoun in the case at hand—can be construed as referring to either of these individuals. This is a striking finding, given that we typically think of first person pronouns as merely denoting the speaker of the utterance context. Understanding the expressive resources that give rise to such interpretations and how they are constrained has much to teach us about the representation of the self in natural language.

Less extensively studied are *temporal counteridentity* reports. These report an event of an attitude holder imagining that she is located at some time other than the present (or perhaps other than the time that she takes to be the present). Take for instance the following example.

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(2)   Ian is imagining that it is 2030 and Sally is rich.

Suppose that a fortune teller has told Ian that his partner Sally is going to win the lottery in a few years' time. Ian might then indulge in a daydream about what life will be like in 2030 once this happy event has taken place. (2) can be used to report this scenario. In this case, the present tense in the second conjunct of the clause introduced by *imagine* does not (as is usually thought) denote the utterance time, but rather it picks out the time that Ian imagines it to be—namely 2030: the reported imagining is an imagining of Sally being rich in 2030, not of her being rich right now. (Thus for example Ian might imagine himself and Sally having access to expensive technology not yet invented, but available to rich people in 2030.)

Does tense in temporal counteridentity reports show the same ambiguity as we have just seen exemplified for individual-type pronouns? It seems that it does: consider (3).

(3)   Ian is imagining that it is 2030 and Sally is £1 million richer than she is.

(3) can be used to report Ian imagining that in 2030, Sally's wealth is £1 million greater than it is at the time that Ian believes to be the present time. Thus the first occurrence of present tense in the second conjunct of the embedded clause denotes the time that Ian imagines it to be, while the second one picks out the time that Ian believes it to be. Crucially, the latter time may be distinct from the utterance time, given for example an utterance of (3) in 2024 in a scenario where Ian believes that it is 2025. So the present tense does not simply denote the utterance time in this case.

This paper investigates the grammatical limits on the interpretation of embedded tense in temporal counteridentity reports. We will see that these bear a striking parallel to constraints on readings of individual pronouns in personal counteridenticals, discovered in Pearson (in prep.). These findings have consequences for our understanding of so-called *de nunc* attitudes—attitudes that are about the subjective 'now' of the attitude holder (Abusch 1997). They also highlight the systematic ways in which the grammar constrains pronominal interpretation.

I will proceed as follows. Section 2 presents the core data that this paper is concerned with, involving a reading of temporal counteridenticals that ought in principle to be possible, but is in fact unattested. Section 3 demonstrates that this data is precisely parallel to that observed for personal counteridenticals in Pearson (in prep.), suggesting that a unified account for both the individual and the tense domains is needed. Sections 4 and 5 present the technical machinery employed in Pearson (in prep.) to account for the data for personal counteridenticals; the key idea is that the interpretation of these sentences is systematically constrained in a

way that can be accounted for by positing a constraint on the binding of pronouns in intensional environments, known as Condition CW. Section 6 shows how the approach can be applied to temporal counteridenticals; I argue that the data in this domain can also be explained by appeal to Condition CW, thus furnishing additional evidence that this condition is a principle of the grammar. Section 7 concludes.

2 The Puzzle: An Unattested Reading for Temporal Counteridenticals

This section will set out the core data that this paper is concerned with explaining. Before I turn to this, however, I need to convince you of the following claim: when a comparative sentence is embedded below *imagine*, the predicate in the *than*-clause can be construed with respect to the attitude holder's belief worlds, rather than the worlds compatible with what she imagines. Consider the following example.

(4)   Ian is imagining that Sally is £1 million richer than she is.

Following much work on comparatives, I will assume that the *than*-clause contains the adjective *rich*, which however undergoes ellipsis and is therefore unpronounced.[1]

(5)   Ian is imagining that Sally is £1 million richer [than she is].

The embedded clause in (4) thus contains two predicates: the main predicate *is rich(er)*, and the subordinated predicate in the *than*-clause, *is*.

I will now describe three distinct readings for (4) discussed in Pearson (in prep.); the third one, which I dub the *CC reading* is the one that is crucial for my purposes in this paper. Firstly, suppose that Ian has never met Sally before but is about to meet her for the first time on a blind date. He is keen to meet someone rich but has no information about whether Sally is rich or not. As he gets ready for the date, he imagines that the person he is about to meet is a millionaire. Unbeknown to him, Sally has in fact recently gone bankrupt and doesn't have a penny to her name. In this scenario, there is a reading on which (4) is true. On this reading, the sentence reports that the amount of money Ian is imagining Sally to have is greater than the amount that she in fact has; the predicate in the

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[1] There is much more to say about the LF structure and interpretation of comparative sentences than I will discuss here. I set aside, for instance, the contribution of the comparative morpheme *-er* and how it composes with the adjective. See Beck (2019) for an introduction to these matters.

than-clause is construed with respect to the actual world. Notice that on this reading, there is nothing comparative about the content of Ian's imagining, even though the complement of *imagine* is a comparative sentence; Ian is merely imagining that Sally is a millionaire, but he does not compare the amount of wealth that he imagines her to have to any other quantity. If someone were to ask Ian what he is imagining, he might respond, 'that Sally is a millionaire', but not 'that Sally is richer than she is'.

There is also a reading of (4) on which Ian is imagining something impossible: namely, that Sally is richer than she is. On this reading, the content of Ian's imagining is comparative and incoherent. This time, if someone were to ask him what he is imagining, he might respond, 'I'm imagining something impossible—namely, that Sally is richer than she is'. On this reading, the sentence reports (nonsensically) that the amount of money that Sally has in the worlds compatible with what Ian is imagining is greater than the amount of money that she has in the worlds compatible with what Ian is imagining; the predicate in the *than*-clause is construed with respect to Ian's imagination worlds.

Finally, and crucially for what will follow in this section, there is a reading on which (4) reports an imagining by Ian whose content is comparative, but coherent. On this reading, the comparison is between the amount of money that Ian imagines Sally to have and the amount that he believes her to have. So if someone were to ask him what he is imagining, he might respond, 'that Sally is richer than she is. If only it were true!' That Ian could report his imagining in this way suggests that the content of his imagining is comparative. Furthermore, we can show that the reading in question is distinct from the first reading describe above by considering a scenario where Sally has lied to Ian and told him that she is bankrupt, but in fact she is a billionaire. Now suppose that Ian is imagining that Sally is a millionaire—that is, he is imagining that she is richer than he believes her to be. The sentence is false in this scenario on the first reading discussed above. Furthermore, the scenario does not render the sentence true on the second reading discussed above: the content of Ian's imagining is coherent. So there must be a third reading, involving a comparison between Sally's wealth in two different sets of worlds, both of which are however attitudinal alternatives of some kind for Ian. On this reading, Ian imagines that Sally is richer than he believes her to be; the predicate in the *than*-clause is thus construed with respect his belief worlds. I will refer to this reading as the *CC reading*, to reflect that on this interpretation, the content of the reported imagining is comparative and yet coherent.

We are now in a position to introduce the key data to be accounted for in this paper. Consider again the following sentence, uttered in 2024.

(6) Ian is imagining that it is 2030 and Sally is £1 million richer than she is.

We have just seen that the predicate in the *than*-clause can be anchored to worlds that are counterfactual for Ian (imagined worlds), or worlds that are compatible with what Ian believes. (It can also be anchored to the actual world; this is the first of the three readings discussed above. I set this reading aside.) Furthermore, example (2) in the introduction provided evidence that in principle, present tense embedded below *imagine* can pick out either the time that the attitude holder imagines it to be (henceforth the *counterfactual-now*) or the time that she believes it to be (the *belief-now*). So we have four logically possible readings for the *than*-clause in (4):

(7)

(a) Counterfactual-now + counterfactual world anchoring
(b) Counterfactual-now + belief world anchoring
(c) Belief-now + counterfactual world anchoring
(d) Belief-now + belief world anchoring

It turns out that only three of these four readings are actually attested; reading (b) is unavailable. To see this, let's look more closely at each of the four readings in turn.

On reading (a), the content of Ian's imagining is comparative and contradictory: the amount of money that he imagines Sally to have in 2030 is £1 million more than the amount that he imagines her to have in 2030.

Evidence that reading (b) is unavailable comes from the fact that the sentence is false in the following scenario.

(8) Ian wrongly believes that in 2030, Sally will go bankrupt. He imagines that it is 2030 and instead of going bankrupt, Sally wins £1 million in the lottery—meaning that she is £1 million richer than he expects her to be in that year. *False*.

In this scenario, there is a comparison between what Ian imagines Sally's financial situation to be in 2030 (that is, Ian's counterfactual-now) and what he believes that it will be in that year. If the *than*-clause in (4) had a reading where the tense denotes the counterfactual-now and the predicate is construed with respect to the belief worlds of the attitude holder, then the sentence would be judged true in the scenario in (8), contrary to fact.

Readings (c) and (d) can be identified by considering scenarios where Ian holds a mistaken belief about what year it is: he believes that it is 2025, though in fact it is 2024. Thus on a belief-now reading of embedded present tense in a temporal counteridentical uttered in 2024, the tense picks out 2025 and not the utterance time. To home in on reading

(c), consider a scenario where Ian is imagining that Sally won £1 million in the lottery yesterday, and that she stands to become even richer thanks to some shrewd investing. He imagines that it is now 2030 and Sally's wealth has doubled. The sentence is true in this scenario, indicating that the predicate in the *than*-clause can be interpreted with respect to worlds that are counterfactual for the attitude holder, with the tense receiving the belief-now reading.

Reading (d) can be brought out by a scenario where in addition to holding a mistaken belief about what year it is, Ian holds a false belief about what the world is like: as in the scenario described for reading (b), he wrongly believes that Sally is currently bankrupt. This time, suppose that Ian imagines that it is 2030, and Sally has just won £1 million in the lottery. (4) is true in this scenario, indicating that this sentence can report that Sally's imagined wealth at the imagined time is greater than the amount of money that Ian believes her to have at the time that Ian believes it to be.

This, then, is the puzzle: of the four logically possible readings just identified for the *than*-clause in a temporal counteridentical with an embedded comparative, why are only three attested? Why is construal of the predicate with respect to the attitude holder's belief worlds incompatible with the counterfactual-now reading of embedded tense? I will spend the remainder of this paper working towards a solution to this puzzle. The key is a striking parallel between the unattested reading for temporal counteridenticals just discussed, and an unattested reading for personal counteridenticals, identified in Pearson (in prep.). I present evidence for this parallel in the next section.

3 A Parallel Puzzle: An Unattested Reading for Personal Counteridenticals

Consider the following sentence, discussed in Pearson (in prep.).

(9) Clint is imagining that he is Alison and he is taller than he is.

Recall from Sect. 2 that when a comparative is embedded below *imagine*, the predicate inside the *than*-clause can be construed with respect to the imagined worlds, or the belief worlds of the attitude holder. In the former case, the sentence winds up reporting an imagining whose content is comparative, and incoherent. In the latter one, it reports an imagining whose content is comparative, and coherent. Notice also that in principle, the pronoun *he* in the *than*-clause should be able to get either a counterfactual-self or a belief-self reading. On the counterfactual-self reading, the pronoun picks

out Alison, and on the belief-self reading, it picks out Clint (assuming that he is not mistaken about who he is).[2] Pearson (in prep.) notes that in principle, then, there should be four readings of the *than*-clause:

(10) *Logically possible readings of the than-clause in (9)*

  (a) Counterfactual-self + counterfactual world anchoring
  (b) Counterfactual-self + belief world anchoring
  (c) Belief-self + counterfactual world anchoring
  (d) Belief-self + belief world anchoring

Pearson (in prep.) demonstrates that only readings (a), (c) and (d) are in fact available; reading (b) is unattested. Let me now present the evidence, taking each reading in turn.

Suppose that the actor Clint Eastwood is imagining that he is the actress Alison Janney. On reading (a), Clint imagines something impossible—namely, that he (Alison) is taller than he (Alison) is. This is a possible, if nonsensical, reading of the sentence.

To check whether (b) is a possible reading of the sentence, consider the following scenario.

(11) Eastwood believes Janney to be 6 feet tall. He imagines what it would be like to be her, and in addition for her to be 6 feet 4 inches tall (say, in order to imagine what it would be like to be such a talented actress, but to be unable to get parts on the grounds of being too tall).

For the sentence to be true in this scenario, there would have to be a reading where the pronoun in the *than*-clause receives the counterfactual-self construal (and therefore picks out Alison), and the predicate in the *than*-clause is anchored to the belief worlds of the attitude holder (and therefore denotes the degree 6 feet). On such a reading, the content of the reported imagining would be comparative and coherent: it requires Alison's height in the imagined worlds to be greater than her height in the belief worlds. But there is no such reading: the sentence is false in this scenario. So reading (b) is not a possible reading of the sentence.

What about reading (c)? The following scenario will enable us to test for the availability of this reading.

(12) The actors Clint Eastwood and Alison Janney are starring in a movie together. Eastwood is 6 feet 4 inches

tall, while Janney is 6 feet tall. Clint is aware of these facts, but he imagines that it is the other way around: he imagines that he (as Alison) is taller than he (Clint) is—perhaps he is wondering what it is like for an actress to be taller than her co-star.

Here, we have a comparison between two heights in the same worlds—that is, in those worlds that are counterfactual for Clint. Notice that the content of the imagining is perfectly coherent: the heights concern two different people, Alison and Clint, and therefore there is no reason why one should not be greater than the other at the same worlds. So both the counterfactual-self and the belief-self are in play here. The sentence is true in this scenario, suggesting that reading (c) is available.

Finally, we can check whether reading (d) is available by thinking about the following scenario.

(13)   The actor Clint Eastwood is 6 feet 4 inches tall, while Alison Janney is 6 feet tall. So Clint is taller than Alison. He believes, however, that it is the other way around. That is, he wrongly believes that Janney is taller than he is—perhaps because he didn't realize that she was wearing high heels last time he met her. He imagines what it would be like to be her, which to his mind would mean being taller than he is.

In this scenario, Eastwood imagines that he (as Janney) is taller than he (Eastwood) believes himself to be. The content of his imagining is comparative, but coherent: we have a comparison between the heights of two different individuals across two different sets of worlds. The sentence is true in this scenario, suggesting that reading (d) is available.

We have seen that of the four logically possible construals of the *than*-clause, only three are in fact attested: there is no reading where the predicate is anchored to the attitude holder's belief worlds, and the pronoun receives a counterfactual-self construal. Yet belief world anchoring of the predicate and the counterfactual-self construal of the pronoun are both possible in principle: the former is demonstrated by the availability of reading (d), and the latter by the availability of reading (a). So it is the combination of counterfactual-self with belief-world anchoring that the grammar rules out.

This situation is precisely parallel to that which was described for temporal counteridenticals in the last section: of the four logically possible readings, one is unattested. In both cases, the reading that is ruled out involves a combination of belief-world anchoring of the predicate and either the counterfactual-now construal (of tense) or the counterfactual-self construal (of individual-denoting pronouns). We should therefore hope that whatever explains the observed facts for personal counteridenticals should also carry over to

the puzzle about temporal counteridentical reports identified in Sect. 2. This will indeed turn out to be the case: in Sects. 5 and 6 I present the account for personal counteridenticals proposed in Pearson (in prep.) and show that it furnishes an explanation for the temporal counteridenticals data.

4 Belief Parasitism

The first step in the account to be presented in what follows is to provide a semantics for *imagine*. The semantics that I adopt treats this predicate as parasitic on the beliefs of the attitude holder (Blumberg 2019; Ninan 2008; Yanovich 2011). In the next sub-section I present evidence for this treatment from the so-called 'puzzle of counterfactual de re'; Sect. 4.2 then shows how the approach can account for the CC reading of embedded comparatives discussed in Sect. 2.

4.1 The Puzzle of Counterfactual De Re

One of the key properties of the verb *imagine* is that its meaning is parasitic on the doxastic alternatives of the subject—that is, those worlds which, for all that she believes, might be the actual world. The data presented in Sects. 2 and 3 already point in the direction of this conclusion: we have seen that in the scope of *imagine*, predicates, tense and individual-denoting pronouns can all be construed with respect to the beliefs of the attitude holder. But since this is the very data that this article seeks to explain, it would be desirable to have independent evidence that *imagine* is parasitic on beliefs. One such piece of evidence comes from the puzzle of counterfactual de re, discovered by Dilip Ninan (2008, 2012). Consider the following example.

(14)   Ralph is imagining that Ortcutt isn't sneaking around on the waterfront.

The sentence has a reading on which it reports a de re attitude held by Ralph towards Ortcutt—that is, an attitude that is in some sense 'about' Ortcutt. On the de re reading, Ralph need not know that Ortcutt's name is Ortcutt, but he must be *acquainted* with Ortcutt in one way or another. Acquaintance may involve various types of perceptual contact with an individual (or *res*): one might have read about him in a book, heard him mentioned by a friend, or seen him give a lecture, say. Such *acquaintance relations* mediate the interpretation of de re attitude reports (Kaplan 1968). In this instance, Ninan invites us to consider a scenario where Ralph only bears one acquaintance relation to Ortcutt—that is, he is encountering him for the first time, right now, watching him sneaking around on the waterfront. It seems that in such a scenario, (14) could be true: while Ralph watches Ortcutt, he imagines that the person that he

is watching isn't sneaking around on the waterfront at all, but rather is sitting on the couch at home.

That (14) could be true in Ninan's scenario is unexpected on standard acquaintance-based accounts of de re attitude reports. To see why, let us remind ourselves of Quine's (1956) famous example (15).

(15)   Ralph believes that Ortcutt is a spy.

Suppose once again that Ralph doesn't know Ortcutt's name, but rather has seen Ortcutt sneaking around on the waterfront and has formed the belief that Orcutt is a spy. Then it seems that (15) is true in virtue of the following facts.

(16)   (i)   the man Ralph sees sneaking around on the waterfront is Ortcutt *and*
    (ii)   believes that the man sneaking around on the waterfront is a spy.
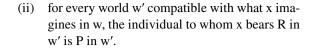
Analyses of de re belief reports thus take it that a de re report of form 'x believes that u is P' is true in a world w just in case the conditions in (17) are met (Kaplan 1968).[3]

(17)   *Truth conditions for de re belief reports* (first version) A de re report of form 'x believes that u is P' is true in a world w just in case there is some acquaintance relation R such that:

  (i)   x bears R to u in w *and*
  (ii)   for every world w′ compatible with what x believes in w, the individual to whom x bears R in w′ is P in w′.

We have seen that in Quine's case, Ralph bears the 'sees sneaking around on the waterfront' acquaintance relation to Ortcutt in the actual world, and furthermore at each of Ralph's belief worlds w′, the individual who Ralph sees sneaking around on the waterfront in w′ is a spy. (17) thus correctly predicts that (15) is judged true in Quine's scenario.

While earlier discussions of de re reports tended to focus on belief, it appears to have been generally assumed that the template in (17) would carry over straightforwardly to other attitudes. Thus a de re report of form 'x is imagining that u is P' uttered in a world w might be assigned the following truth conditions:

(18)   There is some acquaintance relation R such that:

    (i)   x bears R to u in w *and*

    (ii)   for every world w′ compatible with what x imagines in w, the individual to whom x bears R in w′ is P in w′.

Recall now that in Ninan's scenario, the only acquaintance relation that Ralph bears to Ortcutt is the 'sees sneaking around on the waterfront' relation. So if the truth conditions proposed in (18) for de re imagination reports are correct, then (14) could only be true in Ninan's scenario if the following conditions are met.

(19)

  (i)   Ralph sees Ortcutt sneaking around on the waterfront in w *and*
  (ii)   for every world w′ compatible with what Ralph imagines in w, the individual who Ralph sees sneaking around on the waterfront in w′ is not sneaking around on the waterfront in w′.

That is, for (14) to be true in a scenario where Ralph sees Ortcutt sneaking around on the waterfront and is not acquainted with him in any other way, Ralph must be imagining something impossible—namely, that one and the same individual is simultaneously sneaking around on the waterfront and not sneaking around on the waterfront. But intuitively, the sentence does not report an imagining whose content is contradictory. Indeed we have said that (14) can be true in a scenario where what is imagined is perfectly coherent—for example, that the individual he is currently watching sneaking around on the waterfront is in fact at home sitting on the couch. This is the puzzle of counterfactual de re.

Ninan (2008, Chapter 2) and Yanovich (2011) propose solutions to the puzzle based on the assumption that the semantics of *imagine* is parasitic on belief.[4] The intuition is this. When we judge (14) true in Ninan's scenario, we judge it true in virtue of the following facts.

(20)

  (i)   the man Ralph sees sneaking around on the waterfront is Ortcutt *and*
  (ii)   Ralph is imagining that the man he believes he sees sneaking around on the waterfront is a spy.

The second condition in (ii) above makes reference to two distinct sets of worlds: those that are compatible with what Ralph imagines, and those that are compatible with what he believes. In the former worlds, Ralph's 'mental representative' of Ortcutt is not sneaking around on the waterfront,

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[3] The version in (17) is not yet fully adequate; beliefs should be treated in terms of world-individual pairs and not merely worlds (see Anand 2006 for discussion of this point). (17) will do for present purposes but will be modified in Sect. 5.

[4] An alternative approach that does not rely on this assumption is developed in Ninan (2008, Chapter 3) and Ninan (2012).

but in the latter ones, he is. One can coherently imagine that p, while believing that p is false; I can imagine that Hilary Clinton is President of the USA even though I believe that she is not. So Ralph's imagination worlds and his belief worlds can be disjoint sets. Consequently, no contradiction need arise if in his imagination worlds Ralph ascribes properties to some individual that are compatible with the properties that he ascribes to that individual at his belief worlds.

The acquaintance-based approach to de re can thus be reconciled with the puzzle of counterfactual de re if one assumes that the semantics of *imagine* somehow makes reference to both doxastic alternatives and imagination alternatives. To illustrate, I will adopt the semantics proposed in Ninan (2008).

Whereas standard semantics for attitude verbs takes them to be universal quantifiers over worlds, Ninan takes *imagine* to quantify over *pairs* of worlds.[5] Call these the *imagination alternatives* of the attitude holder x in a world w.

(21) $\text{Imagine}_{x,w} = \{<w_B, w_C>: <w_B, w_C> \text{ is compatible with what x imagines in w}\}$.

Where $<w_B, w_C>$ is compatible with what x imagines in w iff (i) it is compatible with what x believes in w for w to be w_B and (ii) it is compatible with what x imagines in w relative to w_B for w to be w_C.

[Based on Ninan (2008), p. 44]

(Note that the subscripts 'B' and 'C' have no theoretical status; I merely find it convenient to use them to keep track of the contribution of the two world coordinates to the semantics.) On standard treatments of attitude predicates, they take as their complement a clause that denotes a function that applies to an element of the attitudinal alternatives associated with the attitude and return a truth value. For an attitude like *believe* that quantifies over worlds, this function is a function from worlds to truth values, type $<s,t>$. But if imagination alternatives are *pairs* of worlds, then the embedded clause must denote a function from worlds to functions from worlds to truth values, type $<s,<s,t>>$. Here then is a suitable lexical entry for *imagine*.

(22)   *Imagine* (to be revised).

$[\![\text{imagine}]\!]^{c,g} = \lambda R_{<s,<s,t>>} \lambda x_e \lambda w_s. \forall <w_B, w_C> \in \text{Imagine}_{x,w}: R(w_B)(w_C)$
     Where $\text{Imagine}_{x,w} = \{<w_B, w_C>: <w_B, w_C> \text{ is compatible with what x imagines in w}\}$

With this in place, we can give the following schematic truth conditions for a de re imagination report of form 'x is imagining that u is P'.

(23)   There is some acquaintance relation R such that

   (i)   x bears R to u in w *and*
   (ii)   for every $<w_B, w_C> \in \text{Imagine}_{x,w}$ the individual to whom x bears R in w_B is P in w_C

Where $\text{Imagine}_{x,w} = \{<w_B, w_C>: <w_B, w_C> \text{ is compatible with what x imagines in w}\}$

In Ninan's scenario, there is an acquaintance relation that meets the conditions in (i) and (ii): Ralph sees Ortcutt sneaking around on the waterfront, and furthermore at each of Ralph's imagination alternatives $<w_B, w_C>$ the individual Ralph sees sneaking around on the waterfront in w_B is not sneaking around on the waterfront in w_C. Thus the schematic truth conditions in (23) correctly predict that (14) does not ascribe a contradictory mental state to Ralph, but rather is true in Ninan's scenario.

This, then, is one of the key arguments for belief parasitism about imagination reports: the assumption that the semantics of *imagine* makes reference to doxastic alternatives makes it possible to make sense of the puzzle of counterfactual de re. We have seen that the proposed semantics depends on the assumption that the clausal complement of *imagine* denotes a function from worlds to functions from worlds to truth values, type $<s, <s,t>>$. How does this come about?

Let us assume that the syntactic structure that is interpreted by the semantics (the *LF*) contains unpronounced pronouns denoting worlds (e.g. Percus 2000). Worlds serve as arguments of predicates, specifying in which world a given predication holds. World pronouns, like other pronouns, bear indices, notated as subscripts. A world pronoun bearing an index n is bound by an abstractor over worlds in a suitable position higher in the structure, also bearing the index n. I assume that these world abstractors sit at the left edge of a clause, yielding a function from worlds to truth values—a proposition. Thus a simple sentence like 'Ortcutt is a spy' has the LF and interpretation in (24a); the sentence is true just in case the function in (24b) yields truth when applied to the actual world (cf. Percus 2000).

(24a) $[\lambda w_1 [w_1 \text{ Ortcutt is a spy}]]$
(24b) $[\![24a]\!]^{c,g} = \lambda w. \text{Ortcutt is a spy in w}$.

Following Blumberg (2019) I will assume that the complement clause of *imagine* bears at its left edge not one but two world abstractors, each of which is a potential binder for a world pronoun in its scope:

(25) $[\lambda w_1 [w_1 \dots \text{imagines} \dots [\lambda w_2 \lambda w_3 [\dots w_2 /w_3 \dots]]]]$

According to the lexical entry for *imagine* in (23), the function denoted by the complement clause is applied first to the belief coordinate w_B of an imagination alternative, and then to the counterfactual coordinate w_C. Thus in a structure such as (25), a world pronoun that is bound by the first of the two world abstractors in the embedded clause will be interpreted as ranging over the doxastic alternatives of the attitude holder, while a world pronoun that is bound by the second world abstractor will be interpreted as ranging over alternatives that are counterfactual for the attitude holder. Notice that in principle a third option is available (not depicted in (25)): the embedded clause could contain a world pronoun that is bound by the world abstractor at the left edge of the embedding clause. This pronoun would be interpreted as denoting the actual world. I set aside this possibility in what follows.

In this section, I have presented the puzzle of counterfactual de re, and shown how it can be addressed by means of a semantics for *imagine* that is parasitic on the attitude holder's beliefs. This was implemented in an extensional setting, where LFs contain covert world-denoting pronouns which are bound by abstraction operators in the clausal left periphery. In the next sub-section, I show how this approach can account for the CC reading of embedded comparatives.
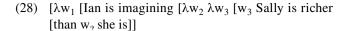
4.2 Back to Embedded Comparatives

Pearson (in prep.) notes that an approach to imagination reports that assumes belief parasitism, together with Blumberg's implementation in terms of a pair of world abstractors in the complement clause, has the potential to account for the CC reading of comparatives embedded below *imagine*. Here is a (slightly simplified) version of the key sentence discussed in Sect. 2 in connection with this reading:

(26) Ian is imagining that Sally is richer than she is.

I take it that in the embedded clause of this sentence, both the main predicate and that contained in the *than*-clause take world arguments; we thus have two world pronouns in the complement of *imagine*, each of which is bound by a world abstractor:

(27) $[\lambda w_1 [\text{Ian is imagining} [\lambda w_2 \lambda w_3 [w_? \text{Sally is richer} [\text{than } w_? \text{ she is}]]$

What index can the world pronoun within the *than*-clause bear? Assume for now that the main predicate *is rich(er)* is bound by the lower of the two world abstractors at the left edge of the embedded clause:

(28) $[\lambda w_1 [\text{Ian is imagining} [\lambda w_2 \lambda w_3 [w_3 \text{Sally is richer} [\text{than } w_? \text{ she is}]]$

I will assume, furthermore, that world pronouns cannot be free; they must be bound by some world abstractor. In principle the world pronoun in the *than*-clause may either be bound by (i) the world abstractor at the left edge of the embedding clause, (ii) the first of the two world abstractors introduced by *imagine*, which winds up being linked to the attitude holder's doxastic alternatives, or (iii) the second of these two world abstractors, which is linked to alternatives that are counterfactual for the attitude holder.[6]

(29a) $[\lambda w_1 [\text{Ian is imagining} [\lambda w_2 \lambda w_3 [w_3 \text{Sally is richer} [\text{than } w_1 \text{ she is}]]$
(29b) $[\lambda w_1 [\text{Ian is imagining} [\lambda w_2 \lambda w_3 [w_3 \text{Sally is richer} [\text{than } w_2 \text{ she is}]]$
(29c) $[\lambda w_1 [\text{Ian is imagining} [\lambda w_2 \lambda w_3 [w_3 \text{Sally is richer} [\text{than } w_3 \text{ she is}]]$

The truth conditions predicted for each of these are displayed below.

(30a) $\lambda w. \forall <w_B, w_C> \in \text{Imagine}_{\text{Ian},w}: \text{wealth(Sally)}(w_C) > \text{wealth(Sally)}(w)$
(30b) $\lambda w. \forall <w_B, w_C> \in \text{Imagine}_{\text{Ian},w}: \text{wealth(Sally)}(w_C) > \text{wealth(Sally)}(w_B)$
(30c) $\lambda w. \forall <w_B, w_C> \in \text{Imagine}_{\text{Ian},w}: \text{wealth(Sally)}(w_C) > \text{wealth(Sally)}(w_C)$

On the LF in (29a), the sentence is true just in case Ian is imagining that Sally has more money than she actually has. (29b) is assigned an interpretation on which Ian is imagining that Sally has more money than he believes her to have. Finally, on the LF in (29c), it is true if and only if the amount of money that Ian is imagining Sally to have is greater than the amount of money that he is imagining her to have. That

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[6] (29c), like several of the other LFs in this paper, is a structure with vacuous binding: the higher of the two world abstractors in the left edge of the embedded clause is not coindexed with any world pronoun in its scope. However, note that I am ignoring the de re construal of the DP *Sally* in this example. Depending on one's compositional semantics for de re, a more complete rendering might posit a world pronoun inside the DP; for instance, Percus and Sauerland's (2003b) concept generator analysis of de re would call for such a structure, with the acquaintance relation being resolved with respect to the value of this world pronoun. Given the evidence from the puzzle of counterfactual de re, this world pronoun would have to be bound by the higher of the two world abstractors, thus eliminating the issue of vacuous binding. For an imagination report that does not contain a de re DP or any predicate whose world argument is bound by the higher world abstractor, one could posit a non-belief parasitic semantics for *imagine* if one wishes to avoid vacuous binding. In general, I ignore the issue of vacuous binding in this paper, to keep the LFs as perspicuous as possible and facilitate comparison among them.

is, it is reported that Ian is imagining something impossible. The reading assigned to the LF in (29b) is of course the CC reading.

I have now shown how the CC reading can be accounted for given a belief-parasitic semantics for *imagine*. If left unconstrained, the account overgenerates, however. In the next section, I show that we need a *Binding Theory* for world-denoting pronouns to rule out unattested readings of (26).

4.3 Binding Theoretic Constraints in a Belief Parasitic Semantics

In Sect. 4.1 I presented an argument for belief parasitism about *imagine* based on the puzzle of counterfactual de re. I also show how Pearson (in prep.) applies this semantics, together with the assumption that world-denoting pronouns (and their binders) are represented in the syntax, to account for the CC reading. At the same time, the assumption that the clausal complement of *imagine* (and presumably also other counterfactual attitudes) contains at its left edge not one but two world binders raises the following question: what constraints, if any, are there on which world pronouns may be bound by which operators?

It seems, for instance, that the following LFs are not generated by the grammar:

(31a) *$[\lambda w_1$ [Ian is imagining [$\lambda w_2 \lambda w_3$ [w_1 Sally is richer [than w_3 she is]]]

(31b) *$[\lambda w_1$ [Ian is imagining [$\lambda w_2 \lambda w_3$ [w_2 Sally is richer [than w_3 she is]]]

(31a) would be assigned the interpretation, 'The amount of money that Sally has is greater than the amount that Ian is imagining her to have', while (31b) would mean that the amount of money that Ian believes Sally to have is greater than the amount that he is imagining her to have. Neither of these is a possible reading of (26), suggesting that the patterns of coindexation in (31) are impossible. Note that this is despite the fact that it is possible for the world pronoun in the *than*-clause to be bound by the lowest of the three world abstractors; we have already seen that (29c) is a possible LF. So the issue must be that the world pronoun argument of the main predicate in the embedded clause *is rich(er)* cannot be bound by the world abstractor in the embedding clause, or the higher of the two world abstractors in the embedded clause. In fact, this is expected given the assumption that the following is a principle of the Binding Theory:

(32) *Generalization X.*
The world pronoun that a verb selects for must be coindexed with the nearest λ above it.
[Based on Percus (2000): p. 201, (34)[7]]

The Binding Theory is that component of the grammar that determines the (im)possible coindexations between pronouns and their binders. While the classical Binding Theory is concerned with individual-denoting pronouns, Percus demonstrated that if one assumes that there are also world-denoting pronouns in the syntax, then one needs a Binding Theory for them as well: not all coindexations between world-denoting pronouns and world abstractors that are in principle possible are in fact attested. Percus's evidence came from the interpretation of complements of determiners in the clausal complement of *think*; he did not consider embedded comparatives. The data examined here suggest that Generalization X should really be understood as concerning the world argument of the *main* verbal predicate; that the world arguments of the main predicate *is rich(er)* cannot be bound by either of the two higher abstractors in (31a) and (31b) can then be ascribed to this generalization. By contrast, the evidence concerning the LFs in (29) suggests that the grammar permits greater latitude for the world argument of a predicate in a subordinate clause such as a *than*-clause.

In Pearson (in prep.) I argue that the Binding Theory needs to be further augmented with an additional condition on coindexation possibilities for pronouns in the scope of intensional environments such as attitude predicates; I called this *Condition CW*. This condition concerns not only world-denoting pronouns, but also individual-denoting pronouns. My evidence comes from the data concerning personal counteridenticals discussed in Sect. 3. Crucially, in such cases the complement of *imagine* contains at its left edge not only two world abstractors but also two individual abstractors. The unattested reading discussed in Sect. 3 shows that in these cases, the choice of binder for individual pronouns is constrained by the choice of binder for the world pronoun. In what follows, I show how this solves the puzzle about personal counteridenticals. The solution will then be applied to the puzzle about temporal counteridenticals in Sect. 6.

5 Counteridenticals and the Self

In this section, I present the account of the unattested reading of personal counteridenticals developed in Pearson (in prep.). The account crucially depends on the assumption that counterfactual-self and belief-self readings are generated by the grammatical machinery that is responsible for the derivation of de se readings. In the next sub-section, I therefore introduce the phenomenon of de se and show how it has been analysed. In 5.2, I show how this treatment of

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[7] Percus formulates the constraint in terms of situation pronouns rather than world pronouns; the distinction between the two is not important for present purposes.

de se generates counterfactual-self and belief-self readings in counteridenticals. In 5.3, I present Condition CW, and show how it accounts for the unattested reading of personal counteridenticals.

5.1 De Se Reports

A wealth of literature in formal semantics suggests that in so called *de se* reports, the left edge of the embedded clause contains not only a world abstractor, but also an individual abstractor. Consider the following scenario, taken from an episode of the US hospital drama *ER*.

(33) Some Valium has gone missing in the ER and must be found before the nurses will be allowed to go home. Dr. Kerry Weaver snaps at the nurses for their mistake and says (sincerely) that whoever lost it is an idiot. Later the Valium is found in Dr. Weaver's lab coat pocket; she is the one who misplaced it!

[storyline from *ER* season 10, episode 11]

Now consider the following sentence.

(34) Dr. Weaver believed that she was an idiot.

Is the sentence true? Yes and no. On the one hand, we might be inclined to judge the sentence true on the grounds that it turned out that Dr. Weaver was the person who lost the Valium. On the other hand, Dr Weaver crucially did not know that she was the person who she considered to be an idiot; since her belief was not one that she would express with the words 'I am an idiot', arguably we have grounds to judge the sentence false. So it seems that the sentence is ambiguous between a reading on which it is true—the de re reading—and a reading on which it is false—the de se reading. On both readings, the subject of *believe* entertains a thought about herself. But the crucial property of the 'mistaken identity' scenario in (33) is that the belief holder does not know that she is the person that she is thinking about. Our judgments about (34) in this context teach us that there is a reading of the embedded pronoun on which this fact does not matter for the truth of the sentence (the de re reading), and a reading on which it constitutes grounds to judge the sentence as false (the de se reading). On the latter reading, (34) would only have been true if Dr. Weaver had a belief that she could express by saying 'I am an idiot'—that is, if she was thinking about herself under a first person perspective.

An attitude report containing a pronoun read de se reports that the attitude holder holds a certain de se attitude—that is, an attitude that involves a crucially first personal perspective on the self. I follow Anand (2006) in assuming that there are

(at least) two distinct grammatical routes to de se readings; I describe each of these in turn.

Firstly, a tradition beginning with Lewis (1979) holds that attitudes de se involve self-ascription of properties. On its de se reading, (34) reports that Dr. Weaver self-ascribed the property of being an idiot. That she did not do so in the scenario in (33)—she merely ascribed the property of being an idiot to some individual who she did not realize was herself—constitutes grounds for judging the sentence false. Chierchia (1989) implements this idea by proposing an LF for embedded clauses in de se reports that is assigned a property denotation (type $<e, <s,t>>$) rather than a propositional denotation (type $<s,t>>$). This is obtained by positing an individual abstractor in the left periphery of the embedded clause, which binds the de se pronoun. Thus the de se reading of (34) comes about via the following LF.

(35) $[_{CP1} \lambda w_1 [w_1$ Dr. Weaver believed $[_{CP2} \lambda x_2 \lambda w_3 [w_3$ she$_2$ was an idiot]]]].

The embedded clause CP2 receives the following property-type denotation.

(36) $[\![CP2]\!]^{c, g} = \lambda x \lambda w.$ x is an idiot in w.

On this view, attitude verbs are not quantifiers over worlds, but rather quantifiers over world-individual pairs (so-called *centred worlds*). For instance, the doxastic alternatives quantified over by *believe* are defined as follows.

(37) $\text{Dox}_{x,w} = \{<w', x'> :$ it is compatible with what x believes in w for x to be x' in w'$\}$.

The underlying intuition is that de se attitudes involve not only an attitude holder's candidates for the actual world (ways the world might be), but also her candidates for herself (properties that she might have). This move to treat attitude verbs as quantifiers over centred worlds rather than merely worlds ensures that an individual argument is supplied for the type $<e, <s,t>>$ function denoted by the embedded clause. Here is the lexical entry for *believe*.

(38) $[\![believe]\!]^{c, g} = \lambda P_{<e,<s,t>>} \lambda x_e \lambda w_s. \forall <w', x'> \in \text{Dox}_{x,w}:$ P(x')(w')

Where $\text{Dox}_{x,w} = \{<w', x'> :$ it is compatible with what x says in w for x to be x' in w'$\}$

The following denotation is assigned to the LF in (35).

(39) $\lambda w. \forall <w', x'> \in \text{Dox}_{Dr.Weaver,w}:$ x' is an idiot in w'.

The sentence is predicted to be true on the de se reading just in case for every $<w', x'>$ such that it is compatible with

what Dr. Weaver believes in w for her to be x′ in w′, x′ is an idiot in w′. This correctly predicts that the sentence is judged false on this reading in the mistaken identity scenario in (33): in this scenario, Dr. Weaver ascribed the property of being an idiot to herself, but she didn't ascribe this property to any individual that she took to be a candidate for herself.

The second route derives de se readings as a special case of de re readings; these arise in case the res is the attitude holder herself, and the acquaintance relation that mediates de re construal is a distinguished relation known as SELF. In the literature on de se, this assumption has been argued to be sufficient to account for de se readings without a need to appeal to a mechanism of de se binding (Reinhart 1990), while others have argued that both routes to de se are needed (e.g. Anand 2006, Pearson 2018). SELF is essentially the identity relation:

(40) SELF(x, y, w) = 1 iff x = y.

I now modify the template for the truth conditions of de re belief reports given in (17) to incorporate the assumption that doxastic alternatives are world-individual pairs, and not merely worlds[8]:

(41) *Truth conditions for de re belief reports* (final version) A de re report of form 'x believes that u is P′ is true in a world w just in case there is some acquaintance relation R such that:

 (i)   x bears R to u in w *and*
 (ii) for every world-individual pair <w′, x> such that it is compatible with what x believes in w for x to be x′ in w′, the individual to whom x′ bears R in w′ is P in w′.

We can say then that 'Dr. Weaver believed that she was an idiot' is true in w just in case the following conditions are met:

(42) There is some acquaintance relation R such that:

 (i)   Dr. Weaver bears R to Dr. Weaver in w *and*
 (ii) for every world-individual pair <w′, x′> such that it is compatible with what Dr. Weaver believes in w for her to be x′ in w′, the individual to whom x′ bears R in w′ is an idiot in w′.
 (iii) R = SELF

This is equivalent to the following:

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[8] Note that this modification is required anyway in order to give an adequate semantics for all de re reports, and not only for de se cases. See Anand (2006) for discussion.

43.

 (i)   Dr. Weaver = Dr. Weaver in w *and*
 (ii) for every world <w′, x′> such that it is compatible with what Dr. Weaver believes in w for her to be x′ in w′, the individual to whom x′ is identical in w′ is an idiot in w′.

Given the triviality of clause (i) above, and that the individual to whom x′ is identical is x′, these truth conditions are equivalent to those assigned by the first route to de se in (39).

We have now set out two routes to deriving de se readings of belief reports. Note that the second route comes for free in the sense that it appeals to the treatment of de re, which is needed anyway. In the next subsection, I show how these two routes work to derive de se readings of imagination reports, and that this technology is able to generate counterfactual-self and belief-self readings.

5.2 De Se Imagination and Counteridentity

What of de se imagination reports? Consider the following scenario, adapted from (33), along with the sentence in (45).

(44) Some Valium has gone missing in the ER and must be found before the nurses will be allowed to go home. Dr. Kerry Weaver contemplates the punishment that should be meted out to whoever lost it; she imagines a departmental meeting where the decision is made to suspend the culprit for one month. Later the Valium is found in Dr. Weaver's lab coat pocket; she is the one who misplaced it.

(45) Dr. Weaver imagined that she was suspended for one month.

Again, there is a reading on which the sentence is true, and a reading on which it is false. On the latter, de se reading, the sentence is judged false on the grounds that Dr. Weaver did not realize that she was the person that lost the Valium; while she was imagining something about herself, she did not realize that she was the person who figured in her imagining.

It seems then that pronouns can be read de se in the scope of *imagine*; this suggests that quantification over centred worlds should figure in the semantics of this predicate. To reconcile this with the belief parasitic semantics, we can now treat imagination alternatives not as pairs of worlds, but rather as pairs of centred worlds (cf. Liefke and Werning 2021):

(46) *Imagination alternatives (centred quantification)*

$\text{Imagine}_{x,w} = \{<<w_B, x_B>, <w_C, x_C>> : <<w_B, x_B>, <w_C, x_C>>$ is compatible with what x imagines in w$\}$.

Where $<<w_B, x_B>, <w_C, x_C>>$ is compatible with what x imagines in w iff (i) it is compatible with what x believes in w for x to be x_B in w_B and (ii) it is compatible with what x imagines in w relative to $<w_B, x_B>$ for x to be x_C in w_C.

We have now introduced two individual coordinates, x_B and x_C; again the subscripts 'B' and 'C' do not have theoretical status, but will be useful for keeping track of the contributions of each variable to the compositional semantics. The individual coordinate of the first world-individual pair, x_B stands for an individual who, for all the attitude holder believes, she might be; the individual coordinate of the second world-individual pair, x_C is an individual who, according to x's imagining (relative to $<w_B, x_B>$), she might be. Here is the amended lexical entry for *imagine*, now treated as a quantifier over pairs of centred worlds.

(47) Imagine *(de se variant)*
$[\![\text{imagine}]\!]^{c, g} = \lambda R_{<e,<s,<e,<s,t>>>>} \lambda x_e \lambda w_s. \forall <<w_B, x_B>, <w_C, x_C> \in \text{Imagine}_{x,w}: R(x_B)(w_B)(x_C)(w_C)$.

$\text{Imagine}_{x,w} = \{<<w_B, x_B>, <w_C, x_C>> : <<w_B, x_B>, <w_C, x_C>>$ is compatible with what x imagines in w$\}$.

The clausal complement of *imagine* now denotes a type $<e, <s, <e, <s,t>>>>$ function. This can be implemented by positing that the left edge of this clause contains two individual abstractors, in addition to the now familiar pair of world abstractors. For present purposes, I will find it convenient to suppose that individual and world abstraction are performed by a single centered world operator, written $\lambda <x_i, w_j>$. Structures containing this operator are interpreted as in (48).

(48) *Centred world abstraction.*
$[\![[\lambda < x_i, w_j > [\alpha]]]\!]^{c, g} = \lambda x \lambda w. [\![\alpha]\!]^{c, g'}$
Where g' is just like g except that (i) $g'(i) = x$ and (ii) $g'(j) = w$.

The structure of an imagination report can then be represented schematically as follows.

(49) $[\lambda w_1 [w_1 \ldots \text{imagines} \ldots [\lambda <x_2, w_3> \lambda <x_4, w_5> [\ldots \text{pro}_2 /w_3 /\text{pro}_4 /w_5 \ldots]]]]$.

Given this semantics, if an individual type pronoun is bound by the higher of the two centred world operators, it will be interpreted as a variable ranging over individuals x_B such that it is compatible with what the attitude holder x believes for her to be x_B (in the corresponding belief-world w_B). If it is bound by the lower centred world operator, it will be construed as ranging over individuals x_C such that it is compatible with what x imagines (relative to $<w_B, x_B>$) for her to be x_C (in w_C). Much of the time, these individuals will turn out to be one and the same. But now let's

return to the case of counteridentity reports, introduced at the beginning of this paper. I will start with a case from Pearson (in prep.) that does not involve a comparative:

(50) Yesterday, Margaret was imagining that she was Helen. She imagined that she was engaged to Mr. Wilcox.

Recall that in personal counteridenticals, an individual-denoting pronoun can (in principle) have a counterfactual-self or a belief-self reading. On the counterfactual-self reading, the pronoun picks out the individual who the attitude holder counterfactually supposes herself to be—Helen, in (50) above. On the belief-self reading, the pronoun corresponds to the individual who the attitude holder believes herself to be. Assuming that Margaret is not mistaken about who she is, this is Margaret herself in (50).

The pronoun in the second sentence in (50) has both the counterfactual-self and the belief-self reading. To see this, consider the two scenarios below.

(51) *Scenario 1: Helen's Engagement.*
We are at the beginning of the novel *Howard's End*. Margaret Schlegel has just received a telegram from her younger sister Helen announcing that she is going to marry a Mr. Paul Wilcox, whom she has only known for a short time. Margaret, concerned for her sister and wondering how she can have been so impulsive, tries to put herself in her shoes—she imagines that she is Helen.

(52) *Scenario 2: Margaret's Engagement.*
A few years later, Paul Wilcox's father Henry proposes to Margaret, who accepts. Helen disapproves of the marriage and is fearful of losing her elder sister. Margaret, concerned for her sister and wondering what it feels like for her to anticipate a wedding she cannot look forward to, tries to put herself in her shoes—she imagines that she is Helen.

In each of these scenarios, Margaret imagines that she is Helen (but believes that she is Margaret). In *Helen's Engagement*, it is Helen who is going to marry a Mr. Wilcox, while in *Margaret's Engagement*, it is Margaret who will do so. Thus for the second sentence in (50) to be true in *Helen's Engagement*, the pronoun must receive the counterfactual-self reading, while it will be true in *Margaret's Engagement* if the pronoun gets the belief-self reading. In fact, the second sentence is true in each of these scenarios, suggesting that both readings of the pronoun are available.

The assumption that the left edge of the complement of *imagine* contains two individual abstractors provides a way of accounting for the two readings of the pronoun in counteridenticals. Recall that the higher of these operators is linked to the individual who the attitude holder believes

herself to be, while the lower one is linked to the individual who the attitude holder imagines (relative to her beliefs) herself to be—these are of course precisely the individuals corresponding to the belief-self and counterfactual-self readings respectively. Below I display the computations for the counterfactual-self (53) and belief-self (54) readings.[9]

(53a) $[_{CP1} \lambda w_1$ Margaret imagined $[_{CP2} \lambda <x_2, w_3> \lambda <x_4, w_5> [w_5$ she$_4$ was engaged to Mr. Wilcox]]]

(53b) $[\![CP2]\!]^{c, g} = \lambda x \lambda w \lambda x' \lambda w'$. x' is engaged to Mr. Wilcox in w'.

(53c) $[\![CP1]\!]^{c, g} = \lambda w$. $\forall <<w_B, x_B>, <w_C, x_C>> \in$ Imagine$_{Margaret,w}$: x_C is engaged to Mr. Wilcox in w_C.

(54a) $[_{CP1} \lambda w_1$ Margaret imagined $[_{CP2} \lambda <x_2, w_3> \lambda <x_4, w_5> [w_5$ she$_2$ was engaged to Mr. Wilcox]]].

(54b) $[\![CP2]\!]^{c, g} = \lambda x \lambda w \lambda x' \lambda w'$. x is engaged to Mr. Wilcox in w'.

(54c) $[\![CP1]\!]^{c, g} = \lambda w$. $\forall <<w_B, x_B>, <w_C, x_C>> \in$ Imagine$_{Margaret,w}$: x_B is engaged to Mr. Wilcox in w_C.

The truth conditions in (53c) are met just in case (roughly) the individual who Margaret imagines herself to be—i.e. Helen—is engaged to Mr. Wilcox at every world compatible with what Margaret imagines. Those in (54c) require that the individual who Margaret *believes* herself to be—Margaret—is engaged to Mr. Wilcox at every world compatible with what she imagines. The counterfactual-self and belief-self readings are thus derived.

In fact, it turns out that there is a second route to deriving belief-self readings: via the second route to de se discussed in 5.1, as a special case of de re construal. Recall that I said earlier that a de re imagination report 'x is imagining that u is P' is true in w just in case the following conditions are met.

(55) There is some acquaintance relation R such that
  (i) x bears R to u in w *and*
  (ii) for every $<w_B, w_C> \in$ Imagine$_{x,w}$ the individual to whom x bears R in w_B is P in w_C

If *imagine* quantifies over pairs of centred worlds, then the clause in (ii) should read as follows.

(56) There is some acquaintance relation R such that.
  (i) x bears R to u in w *and*

(ii) for every $<<w_B, x_B>, <w_C, x_C>> \in$ Imagine$_{x,w}$ the individual to whom x_B bears R in w_B is P in w_C[10]

On a de re reading of *she* in (50), the sentence should then have the following truth conditions.

(57) There is some acquaintance relation R such that

  (i) Margaret bears R to Margaret in w *and*
  (ii) for every $<<w_B, x_B>, <w_C, x_C>> \in$ Imagine$_{Margaret,w}$ the individual to whom x_B bears R in w_B is engaged to Mr. Wilcox in w_C

Suppose we pick SELF as the value of R in (50). Then the sentence will be true if the following conditions are met.

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  (i) Margaret = Margaret *and*
  (ii) for every $<<w_B, x_B>, <w_C, x_C>> \in$ Imagine$_{Margaret,w}$ the individual y such that $x_B = y$ is engaged to Mr. Wilcox in w_C.

Clause (i) is trivially satisfied; the conditions in (58) are equivalent to the following.

(59) $\forall <<w_B, x_B>, <w_C, x_C>> \in$ Imagine$_{Margaret,w}$: x_B is engaged to Mr. Wilcox in w_C.

These are the same truth conditions as are derived via de se binding of the pronoun by the higher centred world operator, as shown in (54). We thus have two routes to the belief-self reading.[11] Crucially, I argue in (Pearson 2018, in prep.) that the de re route is not available to derive the counterfactual-self reading: this would require anchoring of the acquaintance relation to the second centred world coordinate of the imagination alternatives, but the puzzle of counterfactual de re teaches us that acquaintance relations in imagination reports must be evaluated with respect to doxastic alternatives.

We have now seen how Ninan's treatment of *imagine* as a quantifier over pairs of centred worlds

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[10] In clause (ii) above, the subject of the acquaintance relation is not the attitude holder, but rather an individual coordinate of a centred world; this is standardly assumed in analyses of de re that take attitude predicates to be quantifiers over centred worlds. In the specific case of *imagine*, I follow Ninan (2008 chapter 2) in taking the relevant individual coordinate to be the individual coordinate x_B of the doxastic alternatives of the attitude holder rather than alternatives that are counterfactual for the attitude holder.

[11] The analysis that I will ultimately endorse will entail that in the particular case of (54) the belief-self reading does not come about via de se binding, but as a special case of de re. I take it that de se binding can yield belief-self readings in other cases, however.

derives counterfactual-self and belief-self readings in counteridentical reports.[12] In addition, de re construal makes available a second route to the belief-self reading, which however cannot derive the counterfactual-self reading. The treatment made use of the notion of 'de se binding'—binding of a pronoun by an individual abstractor in the left edge of the complement of an attitude. Given belief parasitism, this entails positing two such abstractors, in addition to two world binders. We have also seen, following Percus (2000), that a Binding Theory is needed for world pronouns. Next, I present the argument from Pearson (in prep.) that this theory needs to be augmented further still to accommodate constraints on de se binding of individual pronouns. The evidence for this comes from the unattested reading of personal counteridenticals discussed in Sect. 3.

5.3 Condition CW

We are now in a position to set out the explanation for the unattested reading of personal counteridenticals proposed in Pearson (in prep.); in the next section, I will show how this solution can be applied to the analogous puzzle about temporal counteridenticals that this paper is concerned with. Here again is the personal counteridentical sentence that we are interested in:
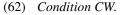
(60)   Clint is imagining that he is Alison and he is taller than he is.

Recall that of the four logically possible readings of the *than*-clause in (60), only three are attested; reading (b) is unavailable:

61.

(a)   Counterfactual-self + counterfactual world anchoring
(b)   *Counterfactual-self + belief world anchoring
(c)   Belief-self + counterfactual world anchoring
(d)   Belief-self + belief world anchoring

Pearson (in prep.) proposes that there is a principle of the Binding Theory that entails that two pronominal arguments of the same predicate cannot be bound by distinct centred world operators. I call this *Condition CW* (for 'centred worlds'):

(62)   *Condition CW.*
Given a predicate P that occurs in the complement of an attitude predicate, no two arguments of P may be bound by distinct centred world operators.
[Based on Pearson (in prep.)]

Given the assumptions set out so far, reading (b) would require the following LF:

(63)   *$[\lambda w_1$ [Clint is imagining [$\lambda <x_2, w_3> \lambda <x_4, w_5>$ [w_5 he$_4$ is taller [than w_3 he$_4$ is]]]]].

The LF violates Condition CW: the world argument of *is* is bound by the higher centred world operator, but the individual argument is bound by the lower one. This correctly derives the unavailability of reading (b).

The acceptability of readings (a) and (d) is also predicted: on reading (a), both pronominal arguments are bound by the lower centered world operator, which winds up being linked to alternatives that are counterfactual for the attitude holder. On reading (d), they are bound by the higher centred world operator, which winds up associating with the attitude holder's doxastic alternatives. What about reading (c)? Recall that this is a possible reading of the sentence. But if Condition CW is indeed a principle of the Binding Theory, then this reading cannot arise via binding of the individual pronoun in the *than*-clause by the higher of the two centred world operators. That is, the following LF, like that in (63), violates Condition CW:

(64)   *$[\lambda w_1$ [Clint is imagining [$\lambda <x_2, w_3> \lambda <x_4, w_5>$ [w_5 he$_4$ is taller [than w_5 he$_2$ is]]]]].

How then can we explain the availability of this reading? We saw in Sect. 5.2 that there are two routes to the belief-self reading: binding by a centred world operator, and via de re construal mediated by the SELF acquaintance relation, which is evaluated with respect to the doxastic alternatives of the attitude holder. Pearson (in prep.) takes it that reading (c) arises via this route to the belief-self construal of the individual pronoun:

(65) $[\lambda w_1$ [Clint is imagining [$\lambda <x_2, w_3> \lambda <x_4, w_5>$ [w_5 he$_4$ is taller [than w_5 he$_{de-re}$ is]]]]].

Note that de re construal does not preclude anchoring of the predicate to counterfactual worlds: we know from the puzzle of counterfactual de re that a predicate that is anchored to such worlds can combine with a de re DP, whose interpretation is mediated by an acquaintance relation that is evaluated with respect to doxastic rather than counterfactual alternatives. If the acquaintance relation in

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[12] An anonymous reviewer points out that there is evidence that *imagine* is not always parasitic on beliefs, but in some cases displays parasitism on other attitudes, such as dreams (Blumberg 2019; Maier 2017). This raises the question of whether such cases give rise to 'dream-self' or 'dream-now' readings instead of belief-self or belief-now readings. This is an interesting empirical question that I must leave for future work.

question is SELF, the LF in (65) is assigned the following truth conditions.

66.

(i) Clint = Clint *and*
(ii) for every $<<w_B, x_B>, <w_C, x_C>> \in \text{Imagine}_{\text{Clint},w}$, x_C's height in w_C is greater than the height in w_C of the individual y such that $x_B = y$

This is equivalent to (67); the compatibility of the belief-self reading with counterfactual-world anchoring of the predicate is thus explained.

(67) $\forall <<w_B, x_B>, <w_C, x_C>> \in \text{Imagine}_{\text{Clint},w}$: x_C's height in w_C is greater than x_B's height in w_C.

I have now presented the explanation for the unattested reading for personal counteridenticals developed in Pearson (in prep.). Crucial to this account is the assumption that there is a principle of the Binding Theory that governs the binding of pronouns in the scope of attitude predicates, known as Condition CW. In the next section I will argue that this binding condition also explains the unattested reading for temporal counteridenticals that was observed in Sect. 3. The absence of this reading thus provides further evidence for Condition CW as a grammatical constraint.

6 Counteridenticals and the Subjective 'Now'

6.1 De Nunc Reports

As a first step, let me introduce some assumptions about the interpretation of tense in attitude reports. Just as individual pronouns can receive de se interpretations, so can tense receive *de nunc* interpretations—that is, it can be interpreted as picking out the subjective 'now' of the attitude holder—the time that she takes herself to be located at (Abusch 1997). To see this, consider the following example.

(68) *Jetlagged Malte*
Malte has just taken an overnight flight from the US to Germany, as a result of which he is jetlagged and confused about what time of day it is. He sees a clock showing *3.00* on the display, but wrongly concludes that it is early in the morning rather than the middle of the afternoon.
    [Uttered at 3 pm]: Malte believes that it is 3am.

The sentence in (68) contains an embedded present tense, *is*. In unembedded contexts, the present tense denotes (roughly) the time of the utterance context, t_c: *It is raining* is true if and only if it is raining at t_c. But this cannot be what embedded present tense denotes in (68). If it were, then in the intended context the sentence would report that Malte believes the following proposition.

(69) $\lambda w. 3am = 3 pm$.

That is, the sentence would entail that Malte believes a contradiction. Yet intuitively, Malte is not irrational, but merely confused. A possible solution is to take the time of the embedded predicate to be not the utterance time, but rather the time that the attitude holder takes to be the current time. To implement this, let's now treat doxastic alternatives as centred worlds of a richer type—in addition to the world coordinate and individual coordinate, there is now a temporal coordinate:

(70) *Doxastic alternatives* (time coordinate included).
$\text{Dox}_{x,w,t} = \{<w', t', x'> : \text{it is compatible with what x believes in w at t for x to be } x' \text{ in } w' \text{ at } t'\}$.

In what follows, I will not discuss sentences containing both de se pronouns and de nunc tense. Thus for simplicity's sake I suppress the individual coordinate of these centred worlds:

(71) *Doxastic alternatives* (individual coordinate suppressed).
$\text{Dox}_{x,w,t} = \{<w', t'> : \text{it is compatible with what x believes in w at t for w to be } w' \text{ and t to be } t'\}$
    We now need a lexical entry for the variant of *believe* that occurs in de nunc reports—a quantifier over world-time pairs. I assume a basic type i as the type of time intervals.

(72) *Believe* (de nunc variant).
$[\![\text{believe}]\!]^{c, g} = \lambda P_{<i,<s,t>>}\lambda x_e \lambda t_i \lambda w_s. \forall <w', t'> \in \text{Dox}_{x,w,t}: P(t')(w')$
    Where $\text{Dox}_{x,w,t} = \{<w', t'> : \text{it is compatible with what x believes in w for w to be } w' \text{ and t to be } t'\}$

The clausal complement of *believe* now denotes a property of *times*—a function from times to functions from worlds to truth values. Adapting the de se binding strategy, we can posit an abstractor over times in the left edge of the complement of *believe*, which binds the tense pronoun.

(73) $[_{CP1} \lambda w_1 [w_1 \text{ Malte believes } [_{CP2} \lambda<t_2, w_3> [w_3 \text{ it is}_2 \text{ 3am}]]]]$.

Predicates now take both time and world arguments; the latter are denoted by unpronounced pronouns as before, while

the former are contributed by tense. The truth conditions of (73) are calculated as follows.

(74a) $[\![CP2]\!]^{c,\,g} = \lambda t \lambda w.$ it is 3am at t.

(74b) $[\![CP1]\!]^{c,\,g} = \lambda w_s.\ \forall <w',\, t'> \in \underline{Dox}_{Malte,w,tc}:$ it is 3am at t'.

(74b) is true just in case for every world and time $<w',$ t'> such that Malte takes w' to be a candidate for the actual world and t' to be a candidate for the actual time, it is 3am at t'. Note that there is nothing requiring possible values for t' to be the actual time; indeed, in any scenario where Malte is mistaken about what time it is, such as *Jetlagged Malte,* t' will not be the actual time. Thus these truth conditions are compatible with (68) being uttered at 3 pm without it being entailed that Malte holds incoherent beliefs.

We saw in Sect. 5.2 that de se binding provides a mechanism for deriving counterfactual-self readings in counteridenticals. We have now added a mechanism of 'de nunc binding' to our toolkit: binding of a tense pronoun by an operator in the left edge of the complement of an attitude verb. In the next section, I'll show that this mechanism, together with the machinery already put into place to account for the unattested reading of personal counteridenticals, solves the puzzle of temporal counteridenticals identified in this paper.

6.2 De Nunc Imagination and Counteridentity

Let's return to a simple temporal counteridentity report.

(75) Ian is imagining that it is 2030 and Sally is rich.

The first conjunct of the embedded clause sets up a context involving a counterfactual-now—namely, the year 2030. Intuitively, the sentence reports an imagining where Sally is rich not at the actual time, or the time that Ian believes it to be, but rather in 2030. To incorporate de nunc readings of tenses embedded below *imagine*, I now treat this predicate as a quantifier over pairs of centred worlds, this time enriched with a temporal coordinate:

(76) $Imagine_{x,w,t} = \{ <<w_B,\, t_B,\, x_B>, <w_C,\, t_C,\, x_C>> : <<w_B,$ $t_B,\, x_B>, <w_C,\, t_C,\, x_C>>$ is compatible with what x imagines in w at t $\}$

Where $<<w_B,\, t_B,\, x_B>, <w_C,\, t_C,\, x_C>>$ is compatible with what x imagines in w at t iff (i) it is compatible with what x believes in w at t for x to be x_B in w_B at t_B and (ii) it is compatible with what x imagines in w at t relative to $<w_B,$ $t_B,\, x_B>$ for x to be x_C in w_C at t_C.

Once again, I suppress the individual coordinate to keep things manageable:

(77) $Imagine_{x,w,t} = \{ <<w_B,\, t_B>, <w_C,\, t_C>> : <<w_B,$ $t_B>, <w_C,\, t_C>>$ is compatible with what x imagines in w at t $\}$

Where $<<w_B,\, t_B>, <w_C,\, t_C>>$ is compatible with what x imagines in w at t iff (i) it is compatible with what x believes in w at t for w to be w_B and t to be t_B and (ii) it is compatible with what x imagines in w at t relative to $<w_B,\, t_B>$ for w to be w_C and t to be t_C.

Here then is a lexical entry for *imagine* that is suitable for cases involving embedded tense construed de nunc:

(78) $[\![imagine]\!]^{c,\,g} = \lambda R_{<i,<s,<i,<s,t>>>>} \lambda x_e \lambda t_i \lambda w_{si}.\ \forall <<w_B,$ $t_B>, <w_C,\, t_C> \in Imagine_{x,w,t}: R(t_B)(w_B)(t_C)(w_C)$

Where $Imagine_{x,w,t} = \{ <<w_B,\, t_B>, <w_C,\, t_C>> : <<w_B,$ $t_B>, <w_C,\, t_C>>$ is compatible with what x imagines in w at t $\}$

And here is a schematic representation of a suitable LF:

(79) $[\lambda w_1 \ [w_1 \ldots \text{imagines} \ldots [\lambda <t_2,\, w_3> \lambda <t_4,\, w_5> [\ldots$ $TNS_2/w_3/TNS_4/w_5 \ldots]]]]$

With these pieces in place, let's return to the counteridentical in (75). The counterfactual-now reading of embedded tense can be obtained by positing the following LF.

(80a) Ian is imagining that it is 2030 and Sally is rich.

(80b) $[_{CP1} \lambda w_1 \ [w_1 \ \text{Ian is imagining} \ [_{CP2} \lambda <t_2,\, w_3> \lambda <t_4,$ $w_5> [w_5 \ \text{Sally is}_4 \ \text{rich}]]]]$

(80c) $[\![CP2]\!]^{c,\,g} = \lambda t \lambda w \lambda t' \lambda w'.$ Sally is rich in w' at t'.

(80d) $[\![CP1]\!]^{c,\,g} = \lambda w_s.\ \forall <<w_B,\ t_B>, <w_C,$ $t_C>> \in Imagine_{Ian,w,tc}:$ Sally is rich in w_C at t_C.

(80d) says that each of Ian's imagination alternatives $<<w_B,\, t_B>, <w_C,\, t_C>$ is such that Sally is rich in w_C at t_C. The coordinates w_C and t_C are worlds and times that the attitude holder counterfactually supposes himself to be located at. Since the first conjunct of the *that*-clause tells us that Ian is imagining that he is located in the year 2030, it is correctly predicted that his imagining locates the time at which Sally is rich not in the present, or at a time that Ian believes to be the present, but rather in 2030.

We have seen that tense embedded below *imagine* can receive a *counterfactual-now* interpretation: it can pick out a time t_C that the attitude holder imagines to be the actual time, while simultaneously being aware that t_C is not in fact the actual time. We also know from Sect. 2 that tense below *imagine* can receive a *belief-now* interpretation, corresponding to the time that the attitude holder believes to be the actual time. Here again is (a simplified version of) the key sentence that was discussed in that section.

(81) Ian is imagining that it is 2030 and Sally is richer than she is.

The data described in Sect. 2 showed that like with personal counteridentity reports, only three of the four logically possible readings for the *than*-clause are attested for temporal counteridenticals. I summarize the findings below.

(82) *(Im)possible readings for the temporal counteridentical.*

 (a) Counterfactual-now + counterfactual world anchoring
 (b) *Counterfactual-now + belief world anchoring
 (c) Belief-now + counterfactual world anchoring
 (d) Belief-now + belief world anchoring

(83) *(Im)possible readings for the personal couunteridentical.*

 (a) Counterfactual-self + counterfactual world anchoring
 (b) *Counterfactual-self + belief world anchoring
 (c) Belief-self + counterfactual world anchoring
 (d) Belief-self + belief world anchoring

How can we explain the parallel between temporal and personal counteridenticals? Here are the LFs that would derive each of the four putative readings of (81):

(84) Reading (a): Counterfactual-now + counterfactual world anchoring.

$[\lambda w_1 [w_1$ Ian is imagining $[\lambda <t_2, w_3> \lambda <t_4, w_5> [w_5$ Sally is$_4$ richer [than w_5 she is$_4]]]]]$

(85) Reading (b): *Counterfactual-now + belief world anchoring (unattested)

$[\lambda w_1 [w_1$ Ian is imagining $[\lambda <t_2, w_3> \lambda <t_4, w_5> [w_5$ Sally is$_4$ richer [than w_3 she is$_4]]]]]$

(86) Reading (c): Belief-now + counterfactual world anchoring.

$[\lambda w_1 [w_1$ Ian is imagining $[\lambda <t_2, w_3> \lambda <t_4, w_5> [w_5$ Sally is$_4$ richer [than w_5 she is$_2]]]]]$

(87) Reading (d): Belief-now + belief world anchoring.

$[\lambda w_1 [w_1$ Ian is imagining $[\lambda <t_2, w_3> \lambda <t_4, w_5> [w_5$ Sally is$_4$ richer [than w_3 she is$_2]]]]]$

As before, the semantics of *imagine* ensures that the higher centred world operator winds up linked to the doxastic alternatives of the attitude holder, whereas the lower one is linked to alternatives that are counterfactual for the attitude holder. Thus binding of tense in the *than*-clause by the higher temporal abstractor yields the belief-now reading, while binding by the lower one yields the counterfactual-now reading. As an example, below I work through the computations for the unattested reading (b).

(88a) $*[_{CP1} \lambda w_1 [w_1$ Ian is imagining $[_{CP2} \lambda <t_2, w_3> \lambda <t_4, w_5> [w_5$ Sally is$_4$ richer [than w_3 she is$_4]]]]]$

(88b) $[\![CP2]\!]^{c, \ g} = \lambda t \lambda w \lambda t' \lambda w'.$ wealth(Sally)(t')(w') > wealth(Sally)(t')(w)

(88c) $[\![CP1]\!]^{c, \ g} = \lambda w_s. \quad \forall <<w_B, \quad t_B>, \ <w_C, t_C>> \ \in \ Imagine_{Ian,w,tc}:$ wealth(Sally)(t$_C$)(w$_C$) > wealth(Sally)(t$_C$)(w$_B$)

We saw that for personal counteridentity statements, reading (b) can be ruled out by assuming a principle of the Binding Theory, referred to as Condition CW:

(89) *Condition CW.*
Given a predicate P that occurs in the complement of an attitude predicate, no two arguments of P may be bound by distinct centred world operators.

We are now working with an enriched notion of what a centred world operator is, incorporating a binder of time intervals as well as worlds and individuals. This move is motivated by the phenomenon of de nunc interpretations of tense and also provides a means of deriving counterfactual-now interpretations. On the assumptions that we have set out, the LF in (88a) that would give rise to the unattested reading (b) would also violate Condition CW: on this LF the world argument of the predicate in the *than*-clause is bound by the higher centred world operator, while the time argument is bound by the lower one. I take it then that the unavailability of reading (b) for counteridenticals about time constitutes additional evidence for Condition CW as a principle of the Binding Theory.

As with personal counteridenticals, however, we are faced with the question of why reading (c) is possible: doesn't this violate Condition CW as well? Here I see two potential avenues of reply. The first is to maintain the parallel with personal counteridenticals and posit a second route to belief-now construals as a special case of de re.[13] A second possibility is to deny that the embedded tense gets a genuine

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[13] Note that this second route comes for free if Abusch (1988, 1991, 1997), Ogihara (1996) and von Stechow (1995) are correct that embedded tenses can be construed de re.

belief-now construal on the reading on which (81) is true in the scenario in question. An alternative is to think of the scenario as involving multiple imaginings by Ian: he imagines that Sally is currently rich, and he also imagines that it is 2030 and she is even richer. The predicate in the *than*-clause would then be anchored to the counterfactual worlds of the first imagining. Notice that the first imagining involves no temporal counteridentity: the counterfactual-now t_C is identical to the belief-now t_B. Thus the reading in question can be derived on a counterfactual-now construal of the tense in the *than*-clause.

The data presented in this paper do not as far as I can see offer a basis for deciding between the two possible replies that I have just described. To do so, one would need to construct a temporal counteridentity statement that unequivocally involves only a single imagining by the attitude holder. I leave this as a task for future work. Whichever of the two explanations for the (putative) availability of reading (c) turns out to be the correct one, the key point for present purposes is that temporal counteridentity statements provide further evidence for Condition CW as a principle of the Binding Theory imposing restrictions on the interpretation of pronouns in the scope of intensional operators.

7 Conclusion

To imagine that p is (roughly) to entertain a thought about what it would be like if p were true, where p is a content that one does not believe to be true. A wealth of earlier work has established that the intimate connection between imagination and belief is built into the very semantics of the verb *imagine* (Ninan 2008; Maier 2017; Blumberg 2019). The predicate's meaning is a composite of two mental states—one that can be modelled in terms of modal alternatives that are counterfactual for the attitude holder, and another that is delineated in terms of the attitude holder's doxastic alternatives. This property of *imagine* renders it possible for a single imagination report to involve comparison across sets of worlds, times or individuals that are systematically related to one another, but may be crucially distinct. In the realms of times and individuals, we see these distinctions at work when we engage in a close examination of counteridentical reports.

The crucial steps of the argument developed in this paper were as follows. After presenting the puzzle about temporal counteridenticals, I showed that it is precisely parallel to a puzzle about personal counteridenticals observed in Pearson (in prep.) To explain this parallel, I first presented an argument that the semantics of *imagine* is parasitic on belief. The crucial evidence came from Ninan's puzzle of counterfactual de re, which can be solved by assuming that de re acquaintance relations are resolved in the attitude holder's doxastic

alternatives. Next, I presented a treatment of imagination reports in terms of a belief parasitic semantics for *imagine*, coupled with the assumption that the left edge of the complement of *imagine* bears not one but two centred world operators. I then showed how this toolkit accounts for the ambiguity of individual-type pronouns between counterfactual-self and belief-self readings in counteridentity reports. Following Pearson (in prep.) I argued that the availability of these readings is systematically constrained in a way that is predicted if one assumes Condition CW as a principle of the Binding Theory.

The novel contribution of the paper stems from the demonstration that the interpretation of tense in temporal counteridentity reports is constrained in a manner parallel to what we find with personal counteridenticals. This can be explained by enriching the system with a grammatical mechanism of de nunc binding which, like de se binding, is constrained by Condition CW.

If the analysis developed in this paper is along the right lines, then it has striking consequences for our understanding of mental attitudes and how they are reported in natural language. First, the analysis entails a form of 'de se exceptionalism': contrary to arguments put forth in the philosophy literature by de se skeptics (Boër and Lycan 1980; Cappelen and Dever 2013; Magidor 2015) there is something special about de se mental states that is not reducible to a corresponding attitude de re under a SELF acquaintance relation. That this is so is revealed in counteridentical reports: given what we know about counterfactual de re, counterfactual-self readings are not equivalent to any de re reading, but instead come about via a dedicated mechanism of de se binding. Here I follow arguments first developed in Pearson (2018, in prep.) but applied now to the realm of tense and de nunc: close study of temporal counteridenticals reveals that de nunc mental states likewise cannot be reduced to de re, and that counterfactual-now readings demand a mechanism of de nunc binding. The assumption that the expressive resources of the grammar include de se and de nunc binding of individual and tense pronouns respectively provides a means of accounting for the unattested (b) readings of counteridenticals: if counterfactual-self and counterfactual-now readings arise via binding, then we might expect them to be subject to Binding Theoretic constraints. This is precisely what we find, in the form of the Condition CW principle proposed in Pearson (in prep.), for which additional evidence has been provided in this paper.

There remains the task of understanding why there should be such a principle as Condition CW in the grammar. Is it merely a structural constraint, akin to the other Binding Theoretic conditions? Or does it follow from semantic properties of centred world quantification? One possibility is that Condition CW serves to ensure that the integrity of a given centred world is preserved in a way that guarantees that its various coordinates behave as a unit, without being decoupled from one another in the semantic component.

A further question is whether there are alternative ways of formulating the constraints on coindexation observed in this paper. An anonymous reviewer suggests that perhaps what rules out the unattested readings is that they would require the individual-denoting pronoun or tense to be bound by an operator that is structurally *lower* than the one that binds the world argument of the predicate; perhaps what the data in Sects. 2 and 3 teach us is that such a configuration is impossible. On this view, the reason why belief-now and belief-self readings are available when the predicate is anchored to counterfactual worlds is that these readings involve binding of the tense or pronoun by an operator that is *higher* than the operator that binds the world argument. The reviewer suggests that the data thus highlight an asymmetry in permitted binding configurations that shed lights on what it means for counterfactual attitudes to be parasitic on beliefs; after all, the reverse does not hold, since beliefs are not parasitic on counterfactual attitudes. I leave to future work the task of comparing this intriguing account with the one proposed here.

Declarations

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