

The unavailability of temporal *de re* in English infinitives *

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1. Introduction

A point of contention regarding infinitives is whether infinitival complements contain semantic tense. Due to the lack of tense morphology, traditional grammars have classified English infinitives as tenseless. But this view has also been challenged. Stowell (1982) pointed out that certain infinitives may have a temporal interpretation, at least in some manner. In particular, he claimed that control infinitives have a temporal interpretation situating the time of the complement at a time later than the matrix tense. This can be seen in a sentence like (1), where Nova's eating of a salad necessarily takes place after Nova's decision to do so. The possibility of the adverbial *tomorrow* is further evidence for this.

- (1) Nova decided [to eat a salad (tomorrow)].

Unlike control infinitives, it appears that exceptional case-marking (ECM) infinitives do not require a pre-specified forward-directed temporal orientation, but their interpretation can involve a simultaneous (2a), futurate (2b), or past (2c) relation with respect to the matrix tense. Instead, in many cases, it is the embedding predicate that determines the temporal properties of the infinitive.

- (2) a. David considers [himself to be the smartest].
b. I expect [Nova to eat the most food].
c. I remember [Danny to have been the smartest].

A main question in the works on infinitives is whether the temporal relations observed are the result of syntactic/semantic tense, similar to tense in finite contexts. In Wurmbrand (2014), it is argued that infinitives are in a sense tenseless and that the nature of T differs in finite and non-finite clauses. Among the reasons in favor of the lack of tense in infinitives are differences in the distribution of infinitival simultaneity and finite present (PRES) tense.

*We would like to thank Jonathan Bobaljik, Kathryn Davidson, Amy Rose Deal, David Pesetsky, and Toshiyuki Ogihara for feedback and discussions. The work in this paper has been supported by the Austrian Science Fund (FWF) Project *Implicational hierarchies in clausal complementation* (P34012-G).

It is well known that English PRES is indexical and must include the utterance time, which extends to finite future, which is typically assumed to include a PRES component. As can be seen in (3a), finite *will* cannot refer to a time entirely before the utterance time, whereas the parallel infinitive can. Similarly, in (3b), finite PRES triggers a *double access* reading, which must include the utterance time and the time of the matrix event, leading to a pragmatically impossible situation in the finite version of (3b). In contrast, the parallel infinitive does not show this restriction, which Wurmbrand (2014), following Ogihara (1995), takes as evidence for the lack of tense in infinitives.

- (3) a. Leo decided a week ago [that he will go to the party (*yesterday) / to go to the party yesterday].
 b. 5 years ago, she claimed [#that she is pregnant / ✓to be pregnant].

Recently, this view has become a point of contention again. Pesetsky (2021) has revived the debate by reconsidering the properties noted in Wurmbrand (2014). Specifically, according to Pesetsky, infinitives do involve true semantic tense, however, that tense is not fixed but can include either semantic PRES or PAST. In both cases in (3a) and (3b), the infinitive is generated with PAST, which is then deleted under *sequence of tense* (SOT), leading to tenselessness in the same sense as Wurmbrand's. In (4), on the other hand, an embedded PRES is present in the infinitive, which blocks the deletion of the PAST on *were*. This disallows the interpretation where the meal occurs simultaneously with Leo's telling.

- (4) Leo will promise me tonight to tell his mother tomorrow that they were having their last meal together (when...).

Allowing infinitives to include PRES or PAST, with PAST being deleted in exactly the cases where infinitives behave as tenseless, makes the two views indistinguishable in the core cases. Since SOT PAST is equivalent to tenselessness, and PRES has a meaning that is very similar to tenselessness, it appears that the two approaches make the same predictions in almost all possible scenarios. However, there is one difference, which we aim to address in this paper: the *de re* nature of PRES tense (see Ogihara 1995), which is not identical to tenselessness.

The key to untangling the issue of tense in infinitives is thus to study further the *de re/de se* properties of infinitives that would be characterized as including PRES tense (Pesetsky 2021) or being tenseless (Wurmbrand 2014). Concretely, a PRES tense view predicts the possibility of *de re* readings in an infinitive, whereas a tenseless view does not. To probe this question, we have conducted an experiment testing the possibility of temporal *de re* in English propositional infinitives. This paper summarizes the results and provides novel experimental evidence in favor of a tenseless approach to infinitives.

The paper is structured as follows. Section 2 provides the background and motivation for the experiment. Section 3 discusses the experimental design of the survey conducted on Prolific. Section 4 presents the results and implements them theoretically.

2. Background: *de re* and *de se*

As is well-known at least since Castañeda (1966), infinitival subjects (e.g., PRO), are obligatorily interpreted *de se*. Evidence for this is given in (5), which illustrates a contrast between overt pronouns, which allow *de re* construals, and PRO, which must be interpreted *de se*. The context is constructed to bring out a *de re* interpretation, i.e., the interpretation of the actual person Leo, which contrasts with a *de se* interpretation where a claim about who someone considers oneself is made. Due to the fact that in the context in (5), Leo does not realize that he himself is on fire, he does not bear a *de se*, self-acquaintance relation to the man he believes to be on fire, in this case, himself, but a different acquaintance relation, namely *the man Leo sees in the mirror*. As shown, the overt pronoun *he* in (5a) can be read *de re*, while PRO in (5b) cannot be.

- (5) Leo is very drunk and on fire. He says the man in the mirror is on fire, not realizing that it is in fact himself.
- a. Leo claimed he was on fire.
- b. # Leo claimed to be on fire.

Following Chierchia (1989), we assume that the clausal complement contains a lambda abstraction operator, binding a variable associated with the subject. This semantics makes it possible for one to bear an attitude *de se* towards a property just in case that property is self-ascribed. This rules out the possibility of *de re* interpretations.

- (6) Leo claimed [λx [x to be on fire]]

Following Heim (1994) and Abusch (1997), among others, we suggest that this operator necessarily binds tense in propositional infinitival clauses as well (similar to the attitude holder's NOW in Wurmbrand 2014), and as a result makes tense also dependent on the self-acquaintance relation. More specifically, SOT readings of embedded 'zero' tense (whether via base-generation or deletion) also involve binding of the embedded tense variable by an abstraction operator. In other words, SOT tense is simply a variable that is abstracted over and then bound by the matrix tense, leading to a *de se* interpretation with respect to the matrix attitude predicate.

- (7) a. Mary claimed that she was pregnant.
- b. Mary PAST₀ claimed $\lambda 1$ [that she t_1 -be pregnant]

As for *de re* interpretations, we follow Heim (1994) in assuming res-movement. Though Heim originally applied res-movement to tense, it has been used for pronouns in the literature as well. In a *de re* interpretation of a pronoun, the res, *he* in (8) (=5a)), moves out of the embedded clause to an argument position (the *res*) of the attitude verb.¹

- (8) Leo [claimed he_1] [$\lambda 1$ [t_1 was on fire]]

¹An alternative to Heim's semantics for *de re* readings of tense is presented in Percus and Sauerland (2003) for so-called "concept generators". For our purposes, either approach could be used.

Importantly for our purposes, double access interpretations have been treated as special cases of *de re* interpretations (see Heim 1994, Ogihara 1995, Abusch 1997, among others). Following these accounts, sentences such as (9a) can be treated as involving a *de re* interpretation of the embedded PRES tense, rather than an indexical tense, which yields the same result, namely that the utterance time must be included.

- (9) a. Mary claimed that she is pregnant.
 b. Mary [claimed PRES₁] $\lambda 1$ [that she t_1 -be pregnant]

We've seen above that PRO needs to be read *de se*, whereas overt pronouns can be read *de re*. This begs the question: does infinitival tense need to be read *de se* as well? If Abusch (1997) and Schlenker (2004) are right in extending the same *de se* restriction to tense in infinitives, then we would expect this to be the case. On the empirical side, the goal of this paper is to provide empirical justification by experimentally testing whether *de se* is obligatory. On the theoretical side, the results will then inform the question of whether infinitives involve tense.

The foundation of our experiment is related to a claim in Ogihara and Sharvit (2012). As noted there, some, but not all, speakers accept an interpretation of (10a), in which the embedded PRES tense is read *de re*, i.e., evaluated with respect to the matrix utterance time (and not the shifted two months later time). This is represented in the LF in (10b).

- (10) a. In 2 months, Mary will tell her mother that she is going to the Catskills tomorrow.
 Mary will tell her mother: "I went to the Catskills about 2 months ago."
 b. Mary PRES₁ woll [tell^{*de re*}-PRES₃] her mother $\lambda 3 \lambda 1$ [she t_3 -be-going to the Catskills]

To derive the well-formed interpretation of (10a) in the given context for the subset of speakers that allow this interpretation, deletion of the embedded PRES via the SOT operation would not take place (otherwise a double access interpretation should arise). In other words, PRES is interpreted *de re* exactly because SOT is not taking place in the embedded clause, but the embedded tense undergoes res movement. The possibility of *de re* readings in PRES-under-*will* constructions leads to the following prediction: such an interpretation should be allowed in infinitives and finite clauses alike, at least for the aforementioned subset of speakers, if infinitives contain PRES tense at some stage of the derivation. Examples such as (11) are thus potentially able to distinguish between a tensed and a tenseless view of infinitives. To assess the empirical distribution of such cases, we conducted an experiment to isolate speakers that allow *de re* readings in finite PRES-under-*will* constructions, and to test whether these speakers also allow the *de re* interpretation in infinitives.

- (11) Brian is preparing to buy a car tomorrow for his wife as a present, but he's keeping it a secret for her birthday next week, when he will tell his wife "I bought you a car last week!"
 a. Next week, Brian will claim that he is buying a car for his wife. *finite*
 b. Next week, Brian will claim to be buying a car for his wife. *infinitive*

In the remainder of this paper we discuss the experiment and results and their consequences.

3. Experiment

3.1 Experimental design

As Ogihara and Sharvit (2012) point out, judgments of sentences and situations such as (10a) are subtle and subject to idiolectal variation. We therefore prepared an experiment to determine whether a finite/non-finite contrast exists among speakers who accept *de re* interpretations with embedded present. The survey was a forced-choice experiment with 600 native English speakers, which was conducted on Qualtrics and participants were recruited from Prolific. A custom pre-screening for native English speakers was applied to ensure that someone who is not a native speaker of English could not take the survey. The experiment consisted of four baseline context–sentence pairs and four novel pairs at a ratio of 1 to 1. This does not count the preliminary questions that were asked to separate the survey takers into groups.

Given how few native English speakers accept (10a) (as verified further by the experiment), the large sample size was necessary. Our goal was to first isolate speakers who accepted Ogihara and Sharvit (2012)’s *de re* interpretation in (10a), then determine whether this group preferred the finite or the infinitival form in cases like (11). Speakers were isolated in the following way. The participants were asked if they found pairs like (10a) acceptable. If they answered yes, they were placed in Group A (n=76). If they answered no, they were placed in Group B (n=524). Although we found that speakers tend not to accept shifted readings in (10a) (see the relatively small proportion of Group A), we believe that the number of speakers still confirms Ogihara and Sharvit (2012)’s observation and is large enough to further test our predictions.

3.2 Start of the survey

The survey takers were given instructions at the start of the survey in order to ensure that they understood what to do. Since throughout the survey they were asked to pick the most natural sounding sentences from two options, we gave them the following examples. They were then asked to not think too deeply about the questions.

- (12) I asked my wife what time it is.
 - a. Natural option: What time is it?
 - b. Unnatural option: What time it is?
- (13) John and Mary are school kids. John complains to a school teacher that Mary teased him.
 - a. Natural option: John said that Mary teased him.
 - b. Unnatural option: John said that Mary teased himself.

After the survey taker read the instructions, they needed to be assigned to the right groups: whether they accepted Ogihara and Sharvit (2012)’s *de re* interpretation of PRES-under-will, or not. This was done by asking them to answer "yes" or "no" for one of the following questions. Each survey taker only saw one of these questions.

- (14) John is preparing to go on a trip to Hawaii tomorrow, but he is keeping it a secret until the trip is completed. So, in two months, he is going to tell everyone that he had gone on a trip to Hawaii.

Question: Do you believe that this sentence is an acceptable way of describing this context?

- a. In two months from now, John will claim that he is going to Hawaii tomorrow.

- (15) Mary is preparing to give birth in the next few days, but she is keeping it a secret for a year because of her country's one child policy—she already has one child. Next year, once her country relaxes its restrictions, she is going to tell her family and friends that she had given birth.

Question: Do you believe that this sentence is an acceptable way of describing this context?

- a. Next year, Mary will tell her family and friends that she is giving birth soon.

The survey taker was then taken to the next page of the survey, in which they were given 4 context–sentence pairs, consisting of 2 baseline and 2 novel questions. The template for the next page of the experiment was as follows (the questions were randomly ordered):

- (16) Baseline questions:

- a. 1 question regarding whether PRO needs to be read *de se*
b. 1 question regarding whether the infinitive has a double access reading

- (17) Target questions:

- a. 1 question with the *de re* interpretation of PRES/infinitive-under-*will* with simultaneous PRES
b. 1 question with the *de re* interpretation of PRES/infinitive-under-*will* with futurate PRES

3.3 Baseline questions

For both baseline and target questions, participants were presented with a context and two sentences, which differed in finiteness. The question participants were then asked to answer was: *Out of these two sentences, please pick the one which you think fits with this context more naturally?* We omit this question in the test items below for space reasons.

- (18) Mary is an elderly woman with dementia. She watches a video of a high school student solving a very difficult math problem in front of all of her classmates, and the teacher congratulates that student. Mary says "that girl is very clever!" But that student is actually Mary herself, though Mary doesn't know it.

- a. Mary claimed that she was clever.
b. Mary claimed to be clever.

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- (19) At a party, John gets so drunk that he can't even feel pain. He accidentally lights himself on fire while trying to light a cigarette. He sees a man who he thinks is someone else in the mirror and says "that guy is on fire!" but he doesn't realize that it is himself.
- a. John claimed that he was on fire.
 - b. John claimed to be on fire.

In order to ensure that the claims in the literature that have been made regarding PRO and double access are correct, we presented the survey takers with baseline questions such as the examples above, which test whether PRO must be read obligatorily *de se*. Similarly, we had two examples involving the lack of double access interpretations with infinitives.

- (20) Back in 2016, Julia informed all her family and friends of her pregnancy. She gave birth the next year. It is currently 2021.
- a. Five years ago, Julia claimed that she is pregnant.
 - b. Five years ago, Julia claimed to be pregnant.
- (21) A week ago, Dick caught the flu. He told his workplace that he was sick and couldn't make it to work. He is no longer ill.
- a. A week ago, Dick claimed that he is sick
 - b. A week ago, Dick claimed to be sick.

With these baseline questions established, we now move onto the questions that were the object of investigation in the survey.

3.4 *de re* readings within infinitives

The main target sentences were matrix future sentences embedding a finite PRES tense or an infinitive. The survey takers were presented with one of the two following context–sentence pairs. In addition, for the sake of consistency, this survey only used the propositional control predicate *claim*.

- (22) It is currently 2021, and Emily is pregnant. She will give birth in December of 2021. She refuses to inform anyone of her pregnancy until the start of 2022, but she will definitely tell everyone "I was pregnant in 2021!" once 2021 is over.
- a. Next year, Emily will claim that she is pregnant.
 - b. Next year, Emily will claim to be pregnant.
- (23) Caitlin hasn't eaten all day because she has an essay due, so she's very hungry. But in an hour, she will finally get to eat with her friends. Right after she is done eating, she is going to say "Wow, I was starving!"
- a. In an hour, Caitlin will claim that she is starving.
 - b. In an hour, Caitlin will claim to be starving.

In addition to two questions with a PRES interpretation, we also had two examples with futurate interpretations of the embedded clause. The survey taker was presented with one of the two following context–sentence pairs.

- (24) Brian is preparing to buy a car tomorrow for his wife as a present, but he's keeping it a secret for her birthday next week. In a week, he will tell his wife "I bought you a car last week!"
- a. Next week, Brian will claim that he is buying a car for his wife.
b. Next week, Brian will claim to be buying a car for his wife.
- (25) Grace is preparing to go on a trip to Hawaii tomorrow, but she is keeping it a secret until the trip is completed. So, in two months, she will tell her friends "I went to Hawaii two months ago!" once she returns.
- a. In two months from now, Grace will claim that she is going to Hawaii.
b. In two months from now, Grace will claim to be going to Hawaii.

3.5 Results

The results we obtained are summarized in Table 1 for Group A—speakers who accept a *de re* interpretation in finite PRES-under-*will* contexts, and Table 2 for Group B—speakers who only accept a double access interpretation in these contexts. As for the baseline questions, the results confirm the claims in the literature, for both groups of speakers. First, finite PRES shows a clear preference for a double access interpretation in cases such as (26) (repeated), whereas infinitives can lack the double access construal.

- (26) a. Five years ago, Julia claimed that she is pregnant. *double access*
b. Five years ago, Julia claimed to be pregnant. *double access not necessary*

Second, *de re* readings as in (27) (repeated) are possible for pronouns (i.e., finite contexts), but not for the non-finite contexts involving PRO. Thus, as expected, PRO is strongly preferred to be read *de se*.

- (27) a. Mary claimed that she was clever. *de re possible*
b. Mary claimed to be clever. *de re not possible*

Table 1: *Group A results*

Type	Finite	Infinitive	Sample size	p<0.001?
Lack of double access	31.58%	68.42%	76	Yes
<i>de re</i> reading of PRO/pronoun	69.74%	30.26%	76	Yes
<i>de re</i> reading of PRES-under-<i>will</i>	63.16%	36.84%	152	Yes

Lastly, as for the target configurations, we find a clear difference between Group A and Group B. Among the among people who allow a *de re* interpretation of embedded PRES-under-*will* in cases like (10a) (Group A), the finite form is significantly preferred over the

Table 2: Group B results

Type	Finite	Infinitive	Sample size	p<0.001?
Lack of double access	21.05%	78.95%	524	Yes
<i>de re</i> reading of PRO/pronoun	73.68%	26.32%	524	Yes
<i>de re</i> reading of PRES-under-will	48.03%	51.97%	1048	No

infinitive in cases like (28) (repeated), whereas Group B speakers show no preference for finite or non-finite uses in these contexts. More concretely, Group A preferred the finite form 63.16% over the infinitive 36.84% at ($p < 0.001$), whereas Group B speakers (the ones who find (10a) unacceptable) did not make a contrast (48.03% vs. 51.97%).

- (28) It is currently 2021, and Emily is pregnant. She will give birth in December of 2021. She refuses to inform anyone of her pregnancy until the start of 2022, but she will definitely tell everyone "I was pregnant in 2021!" once 2021 is over.
- Next year, Emily will claim that she is pregnant.
 - Next year, Emily will claim to be pregnant.

It can thus be concluded that, like PRO, infinitival tense must be read *de se* and, in contrast to finite PRES, does not allow *de re* construals.

3.6 Discussion

According to tensed approaches to infinitives, such as Pesetsky (2021), Group A (the speakers who accept *de re* in finite PRES-under-will contexts) is predicted to not prefer the finite or infinitive form in temporal shifting contexts like (11) or (28). By contrast, under a tenseless approach, such as Wurmbrand (2014), Group A should prefer the finite form over the infinitive because tense in propositional infinitives is predicted to be read obligatorily *de se* due to the bound nature of infinitival tense. The results show that the prediction of the tenseless view are borne out: Group A clearly preferred the finite form over the infinitive. On the other hand, Group B speakers, who find (10a) unacceptable, did not make a contrast because this group requires the use of SOT with embedded PRES.

A further interesting result of this experiment is that claiming PRO is obligatorily read *de se*, following Chierchia 1989, among others, is not strictly speaking correct—about 30% of speakers allowed *de re* interpretations of PRO. It is therefore not surprising that there are still speakers who accept *de re* construals of tense in non-finite contexts as well. Even so, we have found a clear tendency for PRO and tense to be interpreted *de se* (around rates of 70%). Since the numbers are very similar for *de re* PRO and *de re* tense (about 30%), we do not believe this is problematic for our hypothesis. One *prima facie* possibility is that res movement is a marked option for both PRO and infinitival tense. This in turn, however, suggests that in exceptional cases, it is possible for infinitives to involve PRES, although we believe our results clearly indicate that this is the non-preferred option.

4. Conclusion

The paper has shown that the question of whether infinitives involve tense is still not fully settled, although the new data provided by our experiment suggest that the default is for infinitives to lack tense. We provided the results of an experiment testing whether speakers allow *de re* construals of PRES-under-*will* contexts, whether PRO and pronouns can be construed as *de re*, and whether double access readings arise in finite PRES and infinitival contexts. Our results reconfirm the claims that both PRO and infinitival tense show a clear tendency for *de se* interpretations and that the behavior of *de re* tense tracks the behavior of *de re* PRO, thus showing that they are part of the same system restricting *de se*. We suggested that tense in propositional, possibly also irrealis, infinitives is best seen as a tense variable bound by a higher λ -operator. An approach whereby infinitival tense, like PRO, involves obligatory binding by an abstraction operator, in contrast to true tense such as PRES or PAST, seems to be the most straightforward way to capture the observed patterns.

References

- Abusch, Dorit. 1997. Sequence of tense and temporal *de re*. *Linguistics and Philosophy* 20:1–50.
- Castañeda, Hector-Neri. 1966. 'He': A study in the logic of self-consciousness. *Ratio* 8:130–157.
- Chierchia, Gennaro. 1989. Anaphora and attitudes *de se*. In *Semantics and contextual expression*, 1–32. Dordrecht.
- Heim, Irene. 1994. Comments on Abusch's theory of tense. In *Ellipsis, tense and questions*, ed. by Hans Kamp, 143–170. University of Amsterdam.
- Ogihara, Toshiyuki. 1995. Double-access sentences and reference to states. *Natural Language Semantics* 3:177–210.
- Ogihara, Toshiyuki, and Yael Sharvit. 2012. Embedded tenses. In *The Oxford Handbook of Tense and Aspect*.
- Percus, Orin, and Uli Sauerland. 2003. On the LFs of Attitude Reports. In *Proceedings of Sinn und Bedeutung* 7, ed. by Matthias Weisberger, 228–242. Universitat Konstanz.
- Pesetsky, David. 2021. Exfoliation: towards a derivational theory of clause size. URL <https://ling.auf.net/lingbuzz/004440>.
- Schlenker, Philippe. 2004. Sequence Phenomena and Double Access Readings Generalized: Two Remarks on Tense, Person, and Mood. In *The syntax of time*, 27–53. MIT Press.
- Stowell, Tim. 1982. The tense of infinitives. *Linguistic Inquiry* 1:561–570.
- Wurmbrand, Susi. 2014. Tense and aspect in english infinitives. *Linguistic Inquiry* 45:403–447. URL https://doi.org/10.1162/LING_a_00161.