

**A Study on The Semantics of Portuguese Imperfective
Modals in Epistemic Contexts***

*Um estudo da semântica dos modais imperfectivos
do Português em contextos epistêmicos*

*Roberta Pires de Oliveira***

Grammar determines broad interpretations

Kratzer (2018)

ABSTRACT

58 The paper argues that Brazilian Portuguese imperfective modal auxiliaries *tinha que/devia/podia* convey a “past perspective” in contexts other than justification ones (against HACQUARD, 2006; FERREIRA, 2018; VIANA MENDES, 2019; in favor of VON FINTEL; GILLES, 2006; RULLMANN; MATTHEWSON, 2018). In ignorance contexts, both present and past perspectives are felicitous (against VIANA MENDES, 2019), but in some contexts, the present perspective gives the wrong interpretation. The past perspective is a byproduct of the semantics of the modal, that has an “anchor”, variable to be contextually fulfilled (KRATZER, 2018), and the past imperfective inflection. The past imperfective inflection allows for two anchors: the past situation, $s < s_0$, which is included in the event denoted by the prejacent which may extent until the speech situation, or the anchor may be the speech situation, s_0 , and its surrounding evidences. The event is evaluated according to what the speaker knew or to what the speaker knows. The paper tries to clarify these two readings. The anchor provides the premises against which the modal is evaluated (YALCIN, 2007). If the anchor is a past state of mind, then it implies uncertainty and low probability.

Keywords: modals, past imperfective inflection, epistemics.

*This paper would not be possible without Ferreira (2018) and Viana Mendes (2019). My gratitude to Angelika Kratzer, a source of inspiration, to Kai von Fintel, an anonymous reviewer, Isabella Flud and Diego Rodrigues Lopes. The mistakes are all mine.

** Universidade Federal do Paraná/Universidade Federal de Santa Catarina/CNPq

O artigo argumenta que auxiliares modais imperfeitos no Português Brasileiro *tinha que/devia/podia* expressam “perspectiva passada” em contextos outros além daqueles de justificativa (contra HACQUARD, 2006; FERREIRA, 2018; VIANA MENDES, 2019; a favor de VON FINTEL; GILLES, 2006; RULLMANN; MATTHEWSON, 2018). Em contextos de ignorância, tanto a perspectiva presente quanto a passada são felizes (contra VIANA MENDES, 2019) mas, em alguns contextos, a perspectiva presente dá resultados equivocados. A perspectiva passada é um produto da semântica do modal – que tem uma âncora, uma variável a ser preenchida contextualmente (KRATZER, 2018) – e a flexão de passado imperfeito. Essa flexão permite duas âncoras: a situação passada, $s < s_0$, que está incluída no evento denotado pela prejacente e que pode se estender até o momento de fala, ou a âncora pode ser a situação de fala, s_0 , e suas evidências circunstanciais. O evento é avaliado de acordo com o que o falante sabia ou de acordo com o que ele sabe. O artigo tenta esclarecer essas duas leituras. A âncora provê as premissas contras as quais o modal é avaliado (YALCIN, 2007). Se a âncora é um estado epistêmico passado, então há uma implicatura de incerteza ou de pouca probabilidade.

Palavras chaves: modais, flexão de passado imperfeito, epistêmicos.

Relying on my own intuition, the paper argues that in epistemic contexts past imperfective modals - *tinha que/devia/podia* – *when combined with infinite clause as in (1) can be interpreted as past perspective:*

- (1) A chave dev/pod-ia estar na gaveta¹.
 The key dev/pod-ia to+be in+the drawer.
 The key might be in the drawer

In epistemic contexts, the background against which the modal is evaluated is the set of facts that constitute the evidence for the reasoning. Viana Mendes argues that in those contexts, the past perspective is restricted to because or justification contexts. In contexts of ignorance, she claims, the present perspective is the default one if not the only one. This is not my own intuition. Moreover, the present perspective cannot be the interpretation in situations of ignorance where there is no present evidence, whereas the past perspective may. We argue that imperfective modals allow for an epistemic past perspective systematically. The paper is also a study in Kratzer’s (2018) proposal, since it argues that the past perspective is due to the combination of the modal auxiliary, which has an anchor, and the past imperfective inflection.

1 The paper ignores the force of the modal verbs.

The first section introduces some basic semantics for modality and the notion of anchor (KRATZER, 2018). Relying mainly on Rullmann and Matthewson (2018), the second section reproduces in Portuguese the contexts which the literature argues are cases of past epistemic perspective in English and other languages, in order to evaluate modal verbs in Portuguese. The conclusion is that in those contexts the past perspective is the most natural reading for the epistemic interpretation of imperfective modals in BrP. The third section studies a solution for the past perspective, relying on Kratzer's (2018) proposal. It argues that the past perspective is a byproduct of the semantics of modal auxiliaries combined with the imperfective inflection. The anchor is where the premises are drawn in order to interpret the modal, as suggested by Yalcin (2007). If we assume a standard semantics for the past imperfective, two situations are available as anchor for the modal. We assume some familiarity with contemporary formal semantics. The derivations should be standard, though. In the end, at least at this stage, the proposal is purely semantic, though it may be described as Aspect over the Epistemic Modal (LACA, 2018).

1. Epistemic Modal auxiliaries

It is well known in the literature on modality that modal sentences are under-determined (KRATZER, 2012). Out of context, it is unclear whether by uttering (1) the speaker is conveying a statement about an obligation/permission, about his beliefs, or about his desires. Since Kratzer's seminal work on modality, the linguistic literature understands that these different interpretations are due to conversational backgrounds, which play a double function in the interpretation of a modal sentence: (i) they define the modal bases, and (ii) they order the worlds in the modal basis according to some ideal situation.

Consider the following conversational backgrounds in A and B below, against which (1) might be uttered:

- (1) A chave deve/pode estar na gaveta.
The key must be in the drawer.

- A – There is a norm according to which the key's place is in the drawer.
B – The speaker is looking for the keys.

Both conversational backgrounds are realistic; one is reasoning according to what the actual world is. For situation A, there must be the norm that states where the key should be. For situation B, the speaker is relying on some piece of evidence, something that s/he knows, and that allows a conclusion. In A the modal basis includes all worlds where that particular rule is in place. In B, the modal basis includes all worlds that are compatible with what the speaker knows. In none of the contexts, one ordinarily infers the truth of the prejacent²:

2 The prejacent is the terminology introduced by von Stechow (2006) in order to designate the infinitive clause that is the complement of the modal. See next sections for a more formal approach.

(2) The key is in the drawer.

In fact, at least in our everyday interactions, (1) is fine in a situation where (2) is not the case.

Kratzer proposes that the worlds in the modal basis are ordered by some ideal which is also conversationally given. In the ideal worlds, one does not break the law, there are no accidents, and people do not change their mind. The universal quantifier is restricted to those ideal worlds. Thus, (1) may be true, and (2), false because the actual world is not ideal, something happened. Epistemic reasoning relies on what the speaker (or the community) knows, thus, the common ground is shared knowledge, organized by normalcy: the most ordered worlds are those where there are no accidents, no changes of mind, where the course of events is normal. The ordered modal basis is called the modal domain (KRATZER, 2018). Thus, given what the speaker knows in the most normal worlds, the key is in the drawer.

In this paper, we focus on epistemic modal basis, an ordered body of knowledge which the speaker takes for granted in order to utter his/her modal statement felicitously. Both conversational backgrounds enter the semantic interpretation of the modal sentence by the fulfilment of the anchor situation. Kratzer distinguishes epistemic from the circumstantial modal bases. The same sentence may be interpreted against an epistemic or a circumstantial basis depending on the context (the background information available for the inference). Consider the following sentence:

(3) Orchids must grow here.

If the speaker utters (3) relying on what he knows about the place without inspecting it, the modal basis is epistemic. He is reasoning from his previous knowledge, and conveying his certainty that there are orchids in that place; it is a matter of finding them. If he relies on evidence gathered from inspection of the place, the soil, the temperature, the reasoning is circumstantial. Thus, he might grow orchids in that place even if he does not expect any orchids in the place. This is a prospective interpretation. We come back to this issue in the conclusion since it seems to play a role in the interpretation of imperfective modals.

Modal domains are projected from modal “anchors”, which are contextually dependent. Is the anchor the soil and the conditions to grow orchids or is the anchor about orchids and where to find them? Ordered semantics are very sensitive to what is the point of the reasoning, what the speaker of (3) is reporting is his conclusion from what sort of facts. Conversational backgrounds are highly ordered, and must include space for expressing the beliefs of the speaker. One who utters (3) also conveys that s/he is not sure about where there are orchids or not.

Consider (4), an example discussed by Kratzer in her 2018 lecture in Florianópolis in order to show how her proposal may explain the controversy about the strength of modal sentences. The controversy opposes Karttunen (1972) and

von Fintel and Gilles (2010), and it spins around whether (4) is stronger or weaker than (5):

(4) There must be a dripping faucet.

(5) There is a dripping faucet.

Kratzer claims that Karttunen (1972) observes that (5) is stronger – $(5) \rightarrow (4)$: if there is a dripping faucet, there must be a dripping faucet, but not the other way around. Von Fintel and Gilles (2010) claim that (4) is stronger than (5) – $(4) \rightarrow (5)$: if there must be a dripping faucet, then there is a dripping faucet. Kratzer (2018) argues that both may be right, because the reasoning depends on the “anchor”, which gives the set of premises, and an “ambiguity” in the interpretation of (5). Imagine someone who utters (5) looking at a dripping faucet. Now imagine (5) as an existential claim about some dripping faucet. Let’s first look at the logical form of (4), the modal sentence:

(6) $s_0 \leq w_0 \ \& \ \forall w (w \in fact(s_0) \rightarrow \exists s (s \leq w) \ \& \ faucet-dripping(s))$

(6) says that in all worlds which share the facts with s_0 , a slice of the actual world w_0 , there is a situation of a dripping faucet. Thus, in all the worlds compatible with the facts in s_0 , there is a dripping faucet. If the anchor is the dripping faucet, then (5) entails (4), since in all the worlds the faucet is dripping, thus there must be a dripping faucet. If the anchor is the water meter, then (4) entails (5), in all worlds compatible with the evidence about the water meter, there is a dripping faucet, thus there is a dripping faucet. (5) may be interp

(7)

- a. $s_0 \leq w_0 \ \& \ faucet-dripping(s_0)$
- b. $\exists s (s \leq w_0) \ \& \ faucet-dripping(s)$

(7a) states that a faucet is dripping in the actual situation; whereas (7b) affirms that there is a situation, which is part of the actual world, where a faucet is dripping. Modality involves reasoning with inferences; the anchor is the evaluation point from which the premises are established. If the anchor includes knowing about an actual dripping faucet, (7a), then it must be the case that there is a dripping faucet. If the anchor are the facts minus knowing about a dripping faucet, then one can infer that there is a dripping faucet (7b) but not necessarily in the situation of utterance. In (7a), a particular faucet is dripping, pointing into a particular faucet, as one can clearly see on the slide 19 of Kratzer’s lecture.

Kratzer does not mention that it is pragmatically awkward to utter (4) in a situation in which (7a) is true, but it is. If we see that the faucet is dripping, it is out of the target to utter (4), though it is of course possible. (4) makes more sense in the

context of the water meter, where one is trying to understand the bill checking the water meter.

There is a lot to be spelled out about Kratzer's proposal, for us, the important point is that the anchor gives the facts that motivated the speaker to utter a modal sentence, such as (5), in order to express the conclusion of a reasoning that sustains his claim. If the speaker sees that there is a dripping faucet then, he knows that this is the case, then that must be the case. But if he does not know whether or not there is a dripping faucet, then the modal tells us to reasoning with the facts that we have, ordered according to normalcy: in all the normal worlds, assuming that the actual world is normal, when a water meter says what this one says, there is a dripping faucet. The epistemic state of the speaker is contextually dependent. S/he reasons with what is known, and knowledge is partial, and subjected to revision.³

2. Past perspective: empirical motivation.

Condoravdi (2001) distinguishes the perspective of the modal from the orientation of the event described by the preajcent. In (8a), the perspective is present because the speaker is accessing what he knows about the key, and the orientation is simultaneous with respect to the perspective⁴:

- (8)
- a. The key must be in the drawer.
 - b. $[\forall w_{\text{present evidence}} \text{ [the key is in the drawer]}]$

Laca (2014) claims that the time from which the relevant alternatives (sets of possible worlds, modal bases, ordering sources) are accessed is the perspective of the modal. It is against this background that the sentence is semantically evaluated. If the key is the anchor, then (8a) is trivial, as we saw in the discussion about the dripping water. If the speaker does not know where the key is, then he is reasoning with what he knows and concluding that in all worlds that share those evidences and are normal the key is in the drawer. The reasoning is a motivation to go to the drawer to pick up the key.

Our understanding of epistemic statements is even less clear when one is trying to understand modal statements that carry formal marks of past tense. There is no consensus in the literature about the possibility of a past perspective for epistemic modals. Cinque (1999), Hacquart (2006), Ferreira (2018) and Viana Mendes (2019) argue that the past perspective is only available in "because" contexts. Thus, the literature agrees that in (9), the interpretation of *might must* be

3 This is a reformulation of my previous version, because of a comment from one of the referees. We come back to this issue in the conclusion, but those are very hard and difficult philosophical issues. Our proposal is to reproduce how we talk about possibilities.

4 We will not discuss the role of actionality - the distinction between events and states - in the orientation.

past perspective. The example is an answer in the following situation, presented by von Fintel and Gilles (2006):

Context 1: Sophie is looking for some ice cream and checks the freezer. There is none in there. Asked why she opened the freezer, she replies:

(9) There might have been ice cream in the freezer.

The speaker is reporting his/her past knowledge about the ice cream. This is the only possible reading in this situation, since when s/he utters (9), s/he knows that there is no ice cream in the freezer. The present perspective gives the wrong interpretation since it says that according to the speaker's present state of knowledge, there is ice cream in the freezer. However, this is not possible, if he knows that there is no ice cream. On the other hand, if (9) conveys what s/he knew about ice-cream in the freezer up to the point where s/he actually checks and finds out that there is none, then we have the right interpretation, since this reading is compatible with direct evidence that the prejacent is false. Hacquard (2006) claims that those are because contexts, so (9) is in fact (10), but *I believed that* was not uttered:

(10) ~~I believed that~~ there might be ice cream in the freezer.

The past perspective in (9) is then the result of agreement with the time of covert matrix. The perspective of the modal is present with respect to the time of the matrix. There is no consensus on the logical form of (9) even for those that understand that there is no covered belief verb in the interpretation of (9). Some authors claim that tense is over the modal, others that it is aspect that is over the modal. As we will discuss in the next section, we argue that the paraphrase of (9) in (11) is due to the combination of the modal and the imperfective inflection:

(11) For all the speaker knew, there was ice cream in the freezer.

We believe that (11) is the paraphrase for (12b) in Brazilian Portuguese which is the natural answer in the context of justifying why the speaker acted as he did:

(12)

- a. Por que você abriu a geladeira?
- b. Podia ter sorvete no freezer.

Viana Mendes (2019) claims that in Brazilian Portuguese the most natural translation of *might have been* in epistemic contexts is *podia ter* (personal infinitive) e não *podia ter tido* (perfect infinitive)⁵. We assume this is correct. (12) is a context of justification, and the speaker knows that there is no ice-cream in the freezer. In other contexts, for instance, one of ignorance, where the speaker does not have

⁵ I will not discuss the issue further, see Viana Mendes (2019) for solid arguments.

information about something, the prediction is that the only possibility, or at least the default one, is the present perspective. Thus, (12b), in a context of ignorance, is interpreted as present perspective of a past state of ice-cream in the freezer that might still be the case: for all that is known now, there was ice-cream in the freezer.

Now imagine that s/he has no present evidence that there is some ice-cream, but he knows that he had bought some ice cream a week ago and placed it in the freezer. Right now, he is searching for the ice cream – imagine one of those big freezers – and is not finding it. S/he thinks:

(13) Devia ter sorvete no freezer.

If the present perspective imposes that the speaker relies on his present evidence, then (13) could not be uttered felicitously, since it is plainly false, in the context of looking for the ice-cream, that there is ice-cream. In the worlds compatible with present evidence, there is no ice-cream in the freezer. But (13) may express his/her (maybe not so strong) beliefs that there is ice-cream in the freezer. S/he may be reasoning with past evidence since he bought the ice-cream and placed it in the freezer. Given what he knows there is no ice-cream, but given what he knew there is ice-cream, something he is realizing that might not be the case, i.e. something might have happened. He may find out that the actual world is not normal. Only the past perspective is compatible with evidence contrary to the fact, so to say.

Here is another scenario of ignorance. Imagine that the speaker does not know where the key is, and s/he is wondering where it might be: the sentence in (14) is according to Ferreira (2018) only interpreted as taken into consideration what the speaker knows at speech time. The author argues that the past morphology moved to the modal for syntactic reasons, but it scopes over the prejacent, as represented in (15b), paraphrased in (15c)⁶:

- (15)
- a. A chave dev/pod-ia estar na gaveta.
 - b. $[\forall/\exists \text{ [Past -ia [key-in-the-drawer]]}]$
 - c. For all the speaker knows, there is a past interval and the key is in the drawer in this interval.

The modal is above the past operator which scopes over the proposition. Thus, although pragmatically odd, (15a) is compatible with factual knowledge that the key is in the drawer, and inconsistent with no evidence that the key was in the drawer. Thus, if the speaker is staring at an empty drawer, with no indication that the key might be there, then stating (15b) is saying something that is no sense, since in all

6 This is not Ferreira's proposal but it is faithful to it. He also proposes that there is a position for Epistemics higher than the modal. The modal is, so to say, modified by epistemic or deontic operators. For our purposes it just matters that the past has scope over the prejacent.

the worlds compatible with the evidences there are no keys in the drawer. This is so because s/he is reasoning from the facts. Thus, if there is no eviden

However, this is not the case if one interprets (15a) as about what s/he knew. The speaker is reasoning with evidence from the past. Thus, even if there is no key in the drawer, the reasoning is sound, as we have argued. This explains the because readings. What is a matter of debate is whether the past perspective is possible in ignorance contexts. To my mind, this is precisely what happens when one is searching madly for the key, and hasn't found it yet but hasn't given up on his beliefs. This is to my mind the default interpretation of (15a).

Past and present perspectives is very subtle. It is important to keep in mind that present perspective means that the source of evidence comes from what the speaker knows, whereas the past perspective relies on what was known (no inspection of the world is involved). Present perspective seems to be linked to circumstantial modal basis, whereas the Past Perspective is epistemic. We hope to shade some light into this distinction by revising some contexts that appear in Rullmann and Matthewson (2018) as examples of past perspective. The following is another example of a because context:

*“Context: Yesterday, my friend John was playing a game. At the time, I didn’t know if he won, but I bought a bottle of champagne just in case. I found out when I got home that John had lost. My spouse asked me why I had bought the champagne. I replied: Because John **might have won the game.**”*

(16)

- a. Por que você comprou champanhe?
- b. O João podia ganhar o jogo.

Viana Mendes analysis this example, which parallels the one discussed in (10), and assumes that the past perspective is the effect of a covert *belief* verb, as in Hacquard (2006). Thus, in her approach (16b) is in fact (17):

(17) ~~Eu achei que~~ o João podia ganhar o jogo.

I believed that John might have won the game

The modal sentence is embedded into a propositional attitude verb (*achei/believe*) which is not uttered. The epistemic ranges over the present alternatives with respect to the time of the matrix. The example shows that there is no cognitive reason for not having the past perspective with modal verbs.

Even if past perspective is the most natural in *because-contexts*, my own intuition is that it also appears in ignorance contexts and it is the most appropriate interpretation when we have direct evidence that something might not be the case. Let's examine a context of ignorance:

“Context (epistemic): I was looking for Jan last night. I had searched all his usual haunts except his house and hadn’t found him yet. John had to be home”

(18) O João tinhaque/dev/pod-ia estar em casa.⁷

This is not a *because* context. The present perspective relies on present evidence, whereas in the past perspective the speaker is reasoning with the information s/he had before the speech time and which holds up to the present. If the speaker does not have new information about the whereabouts of João, both past and present perspectives are intermingled. Thus, it is very hard to know whether in (18) it is past or present evidence. The point is the past perspective is a possible interpretation for (18)

The following contexts are again about the key in the kitchen drawer. Rullmann and Matthewson are discussing the past epistemic reading with the German verb *moest* and *kon*; none of them are *because* contexts:

*“Yesterday, when I wanted to go to work, I couldn’t find my key anywhere. I tried to remember where I might have left it the previous night. I felt in the pocket of my pants, looked in my nightstand, and even searched the waste basket, but all in vain. Suddenly I knew. **It had to be in the kitchen drawer.**”*

(19) (A chave) Tinhaque/Dev/pod-ia estar na gaveta da cozinha.⁸

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The speaker is trying to remember where he left his key. So, he is relying on what he knew, not on present evidence. In fact, he has no present evidence, so he does not have grounds to utter (19). He utters (19) soundly because this is the conclusion from facts in the past. Given that the key is not in my pants,... Suddenly he realizes where the key might be. (19) seems plausible in this context, because he does not have any other information about the key. He is reasoning with past evidence which is historically connected to his present state of knowledge. But the evidences are in the past. The present perspective does not work because the speaker does not have any present evidence about the key except what he knew.

*“When I arrived at work yesterday, I discovered that I didn’t have my key on me. I called my wife and asked if I had left it somewhere at home by any chance. She asked me where she should look. I tried to remember where I might have left it the previous evening. **It might have been in the kitchen drawer,** so I asked her to look there.”*

(20) (A chave) Tinhaque/Dev/Pod-ia estar na gaveta da cozinha.

⁷ The most natural translation in this context is *O João tinha que estar em casa*. We will not pursue the issue here because the force of the modal is not our focus.

⁸ Again the most natural sentence for me is *Tinha que estar na gaveta da cozinha*. In context, the most natural is without the definite description which is anaphorically in the null pronoun.

Notice that in (20) the speaker is thinking about the possibilities given past evidence. Given that the key is not in several places, then it must be in the kitchen drawer. Somehow this is the least possible place for the key to be. The present perspective is not available because from her present evidence she can only conclude where the key is not. She has no ground to conclude that it might be in the drawer.

Corpora search of imperfective modals in BrP, experiments on the interpretation, reading time, are all welcome.⁹ They will certainly help us understanding whether the reading is available, whether it is somehow marked as Viana Mendes (2019) claims, and how speakers interpret those sentences. To my mind, the past perspective fits very well into those contexts. In justification contexts, *because* contexts, the perspective must be past because there is direct evidence that the prejacent is false. In contexts of ignorance it is possible to have both interpretations: the present perspective about past events, and the past perspective about present events with respect to the perspective. There are, however, contexts where just the past perspective gives the intended interpretation; the context does not allow for a present perspective. In contexts with no present evidence, the present perspective gives the wrong results.

2.1 Present and Past Perspectives: does it make any difference?

We discuss below two contexts in which, we believe, the present and past perspectives make different predictions. Suppose we are looking at something in the tree in front of us and we see that there is something moving and we wonder what sort of animal that thing is:

(21) Dev/Pod-ia ser um pássaro.

Ferreira (2018) and Viana Mendes (2019) predict that in such a context (21) should be felicitous because it means that given what the speaker knows at the speech time it is possible that it was a situation of a bird. It may be pragmatically odd since the thing is still there. If the thing flies away, then (21) is fine and very natural. The past perspective accounts for this reading as well: given the evidence the speaker had, it was possibly a bird. But it makes different predictions if the thing is still there. In this context, the speaker may utter (21) to convey that it is unlikely or that the reasoning is not very safe, more evidences are in need, but maybe it is a bird. This is perhaps a very exceptional case, but maybe it is worth investigating it. The present perspective cannot generate this reading. Maybe the past perspective can: to assume a past perspective is to assume a perspective where you know less, then given the precarious evidence that you have, it is a bird. Given this precarious knowledge, it might be a bird, but it is very likely that it is not a bird after close inspection. It goes without saying that this is just a first hint, but since we are dealing with ordering,

⁹ Flud and Lopes (2019) for experiments on this issue.

the past perspective may be an indication that the actual world is probably not the ideal.

Perhaps another situation where the present and past perspective give rise to different predictions is the following. Suppose John always parks his car in the same parking lot but at different places. He did it this morning, and is coming back to pick up his car after working the whole day. He goes to the place where he thinks his car is, but it is not there. He does not know where the car is, but for all he knew this was the place where he parked his car - it might have been stolen, he might be wrong about where he parked it, he does not know. He thinks:

(22) O carro dev/pod-ia estar aqui.¹⁰

The present perspective predicts that (22) is not adequate because the speaker does not have present evidence that the car is there, for instance, tyre marks on the carpet or some sort of evidence, from which he is reasoning. In fact, he has no present evidence about his car. Thus, there is no reason for the speaker to utter (22), if he is relying on present evidence about a past situation where there was a particular car. This seems to be a context where only the past perspective makes sense.

Finally, imperfective modals are fine in epistemic contexts but only if the perspective is past can it describe a situation where the speaker is not relying on any direct evidence of orchids. He has looked around for them, but hasn't found any, and still maintains his belief that there are orchids there given what the knowledge he had so far (he might have to revise it):

(23) Devia ter orquídea aqui.

Uttering (23) in such a situation conveys that the speaker is no longer so sure as he used to be. Thus, let's suppose the past perspective is productive and available in other contexts besides justification.

3. Modal anchor and Past Perspective

The last sections gave empirical support for the existence of the past perspective interpretation of imperfective modal auxiliaries besides because contexts. As we have already said, more empirical work is in need. If this is so, then the explanation in Hacquart (2006) has to be extended to other contexts besides those of justification. The section aims to present a draft of a proposal that assumes Kratzer's semantics, as exemplified in (22) for the necessity modal root dev- :

(22) [[dev]-] $\lambda p \lambda s. \forall w' (w' \in f(s) \rightarrow p(w'))$

¹⁰ Flud and Rodrigues Lopes are experimentally testing whether this is a case where only the past perspective is admissible.

Assume that the temporal-aspectual inflection, represented by *-ia* in Portuguese, scopes over the argument structure, as Kratzer assumes in her lectures and is common ground in contemporary linguistics:

$$[\text{Modal} [\text{Tense} + \text{Aspect} [\text{Argument structure}]]]]$$

Dev ia P

Assume that Epistemic modals are above Tense and Aspect. As she claims, the anchor may come from the argument structure - individuals, events -, and from higher functional heads: situation arguments. Assume that the *-ia* carries two information: past tense and imperfective aspect. Assume the definitions of aspect and tense standard in the literature:

(23) Imperfective Aspect

$$\lambda P \lambda s. \exists e (P(e) \ \& \ s \subseteq \tau(e))$$

The situation of reference *s* is included in the time interval of the eventuality which has the property *P*. Assume the following definition of past tense:

(24) $\lambda p \lambda s. (\text{past}(s) \ (s_0) \ \& \ p(s))$

The following is a sketch of the semantic derivation up to the modal:

(25) $[[_{VP} \text{chave na gaveta}]]^c = \exists e (\text{key-in-the-drawer}(e))$

$$[[_{ASPP} \text{IMP chave na gaveta}]]^c = \lambda P \lambda s_1 \exists e (P(e) \ \& \ s \subseteq \tau(e)) (\exists e (\text{key-in-the-drawer}(e)))$$

$$= \lambda s_1 \exists e (\text{key-in-the-drawer}(e) \text{ in } s_1 \ \& \ s_1 \subseteq \tau(e))$$

$$[[_{TP} \text{PAST IMP chave na gaveta}]]^c = \lambda p \lambda s (\text{past}(s) \ (s_0) \ \& \ p(s)) (\lambda s \exists e (\text{key-in-the-drawer in } s_1 (e) \ \& \ s \subseteq \tau(e)))$$

$$= \lambda s (\text{past}(s) \ (s_0) \ \& \ \exists s_1 \exists e (\text{key-in-the-drawer}(e) \text{ in } s_1 \ \& \ s_1 \subseteq \tau(e))(s))$$

$$= \lambda s \exists e (\text{key-in-the-drawer}(e) \text{ in } s \ \& \ s \subseteq \tau(e) \ \& \ \text{past}(s) \ (s_0))$$

The set of past situations which are included in the interval in which the key is in the drawer. Now we plug in the modal. In epistemic readings the modal domain is factual. The modal needs an anchor in a situation from which the facts will be drawn. The past-imperfective provides two choices for the anchor: either the anchor is the situation that is included in the time of the event and is in the past, *s*, or the anchor is the situation of utterance, *s*₀.

If the anchor takes *s*₀, then the source of the information is what is known in the present, we get the present perspective as following:

$$\begin{aligned}
(26) & [[\text{dev}]] \lambda p \lambda s. \forall w (w \in \text{fact}(s) \rightarrow p(w)) (\lambda s1 \exists e (\text{key-in-the-drawer}(e) \text{ in } s \\
& \& s1 \subseteq \tau(e) \& \text{past}(s1)(s0)) \\
& = \lambda s. \forall w (w \in \text{fact}(s) \rightarrow \exists s1 \exists e (\text{key-in-the-drawer}(e) \text{ in } s1 \& s1 \subseteq \tau(e) \& \\
& \text{past}(s1)(s0)(w)) = \lambda s. \forall w (w \in \text{fact}(s) \rightarrow \exists s1 \exists e (\text{key-in-the-drawer}(e) \text{ in } \\
& s1 \& s1 \subseteq \tau(e) \& \text{past}(s1)(s0) \text{ in } w) = \\
& s0 \leq w0 \& \forall w (w \in \text{fact}(s0) \rightarrow \exists s1 (s1 \leq w) \exists e (\text{key-in-the-drawer}(e) \text{ in } s1 \\
& \& s1 \subseteq \tau(e) \& \text{past}(s1)(s0))).
\end{aligned}$$

In all the worlds that share the relevant facts in $s0$, there is a situation which is included in the state of the key been in the drawer. This is compatible with Ferreira's proposal that the past scopes over the prejacent, and the perspective is present. Since the situation of utterance is the source, in his epistemic state the key might still be in the drawer, i.e. the speech situation may be also included in the time interval of the state of the key being in the drawer. The speaker does not know. However, it is somehow infelicitous if the speaker knows that the key is in the drawer. This is connected to the issue of the dripping faucet. It is somewhat weird to utter *there might be a dripping faucet* if the speaker knows that there is a dripping faucet.

If the source of information is the situation in the past, then the speaker is reasoning with what she knew at that point in the past.¹¹ The speaker declares that for all he knew in the past, the key is in the drawer in the worlds compatible with the information in the past; the actual world must be one of them at that particular point, since there is a historical link with the present speech situation, and it does not have to be the case that the key is in the drawer in the presently actual world. The speaker assumes that she is relying on past knowledge, thus things might have changed. So, s/he is not sure. Here is a tentative description:

$$\begin{aligned}
(27) & s \leq_h w0 \& \forall w (w \in \text{fact}(s_{<s0}) \rightarrow \exists s' \exists e (\text{key-in-the-drawer}(e) \text{ in } s' \& s' \subseteq \tau \\
& (e) \& \text{simultaneous}(s')(s) \text{ in } w).
\end{aligned}$$

Where h indicates a historical chain to the present world.

The fact that the inflection is imperfective is absolutely necessary for the reasoning since the event might still hold in the present, but it is evaluated with respect to a past point. Thus, the key might be in the drawer. There is a lot to be spelled out, but main idea is that the anchor is a situation where the speaker knew less. At that point in the past, he was sure that the key is in the drawer. In (27), for all worlds compatible with the evidence in the past situation, the key is in the drawer at that particular moment in time, i.e. it is present with respect to the perspective. Thus, the sentence is compatible with the speaker being presently ignorant about the key, and with the speaker knowing that the key is not in the drawer, because the

¹¹ In a first version of this paper, I thought that it functioned like a monster, but a reviewer showed me that this is not right with the sentence: *A Maria devia estar na cidade onde eu resido*. He also advised me to read Yalcin. I believe the new version is immune to this criticism, but this needs to be shown.

world evolved historically in a way that changed the place of the key. The world is not normal with respect to the key in the drawer.

The past perspective is a byproduct of the semantics of the modal verb which targets the situation in the past as the anchor, shifting the set of premises from which the reasoning is drawn. It is not that Tense scopes over the Epistemic. It seems closer to Yalcin (2007) who introduces an information parameter as one of the indexes relative to which the semantic values of an epistemic modal are calculated. This seems to be compatible with Kratzer's notion of anchor and a way of dealing with imperfective modals in epistemic contexts. The temporal connection with the present situation warrants that in all the situations at a particular point in the past, the key was in the drawer at that point. Thus, it may be used as an explanation for a rational behavior: I went to the freezer to check whether there was ice-cream because I believed there were ice-cream in the freezer. It turned out that there isn't any, so I know that there is no ice-cream but there was a possibility in the past. Targeting past evidence justifies the behavior of someone who spends hours looking for something in a place where he has clear evidence that the thing is not, but the belief is still active though not so strong. It is also compatible with not having any direct evidence that something is the case, as in the example of the car in the parking lot. It conveys that the speaker is less certain, because assuming a past perspective is assuming that the world might have changed, and things are different now.

4. Conclusion

The paper is an exercise into the semantics of past-imperfective modals in Brazilian Portuguese. The aim was to investigate my own intuition about the differences between past and present perspective when the modal is combined with a past imperfective inflection - *tinha que/dev/pod-ia*. Many issues are just mentioned. The paper explores Kratzer's proposal (2018) and the idea of modal anchor to explain the past perspective interpretation that raises with past-imperfective modals. It suggests that Yalcin's (2007) account of epistemic modals is compatible with our proposal, but this is a topic that should be further investigated.

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