SYNTACTIC AND SEMANTIC ASPECTS OF THE VERB 'PERIGAR'

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Luiz Fernando Ferreira[1]
Federal University of Roraima

Núbia Ferreira Rech[2]
Federal University of Santa Catarina

ABSTRACT: 'Perigar' is a verb that appears in several constructions of Brazilian Portuguese (BP), such as in 'periga chover', and its grammatical features were not yet described. In order to fill this gap, we provide a syntactic description following syntactic cartography (Cinque, 1999, 2006; Cinque; Rizzi, 2008; Drubig, 2001; Tsai, 2015) and a semantic description following formal semantics (Kratzer, 1981, 1991; Condoravdi, 2002; von Fintel, 2006; von Fintel; Heim, 2011; Hacquard, 2011). To provide such a description, we have adopted two methodological procedures: (i) collecting and analyzing spontaneous data from *Facebook* and (ii) applying syntactic and semantic tests using the introspective method. In the first step, we were able to get one hundred sentences with the verb 'perigar' which were analyzed syntactically and semantically in order to formulate some hypothesis about this verb. In order to test them, we have done some syntactic and semantic tests using the introspective method. The syntactic tests' goal was to verify if it was an auxiliary modal verb or if it was a lexical verb. The semantic tests' goal was to verify which aspects were lexicalized. The syntactic tests have shown that it can be considered an unaccusative lexical verb. On the other hand, the semantic tests have shown that it resembles modal verbs in some aspects since it takes only a proposition as an argument and has an existential quantification force, but it also resembles lexical verbs in some aspects since the modal base is lexicalized in the verb.
KEYWORDS: Perigar. Modal verb. Lexical verb. Syntactic cartography. Formal semantics.

RESUMO: 'Perigar' é um verbo que aparece em diversas construções do Português Brasileiro (PB), como em 'periga chover', e suas características gramaticais ainda não foram descritas. Para preencher essa lacuna, apresenta-se uma descrição sintática de 'perigar', seguindo a cartografia sintática (Cinque, 1999, 2006; Cinque; Rizzi, 2008; Drubig, 2001; Tsai, 2015), e uma descrição semântica, seguindo a semântica formal (Kratzer, 1981, 1991; Condoravdi, 2002; von Fintel, 2006; von Fintel; Heim, 2011; Hacquard, 2011). Para essa descrição, adotou-se dois procedimentos metodológicos: (i) coleta e análise de dados naturalísticos/espontâneos a partir da rede social *Facebook* e (ii) testes sintáticos e semânticos seguindo o método introspectivo. A primeira etapa resultou em um banco com cem sentenças contendo o verbo 'perigar', que foram analisadas sintática e semanticamente, servindo para formular hipóteses

[1] Professor at the Communication, Letters and Arts Center (CCLA) and from the Post-graduation Program in Letters (PPGL) of the Federal University of Roraima (UFRR). With experience in linguistics, focusing in linguistic theory and analysis, Indigenous Languages and the interface between Linguistics and Education. E-mail: l.feferreira@gmail.com.

[2] Professor at the Post-graduation program in Linguistics (PPGLIN) and from the department of Vernacular Language and Literature of the Federal University of Santa Catarina (UFSC). With experience in Linguistics, focusing in linguistic theory and analysis, investigating mainly aspect and modality. E-mail: nubiarech1971@gmail.com.

sobre o comportamento desse verbo. Os testes sintáticos e semânticos seguindo o método introspectivo foram empregados em um segundo momento. O objetivo dos testes sintáticos foi determinar se 'perigar' era um verbo auxiliar modal ou se era um verbo lexical. O objetivo dos testes semânticos foi determinar quais aspectos do sentido estavam codificados lexicalmente. Os testes sintáticos mostraram que se trata de um verbo lexical inacusativo. Já os testes semânticos mostraram que ele se assemelha a verbos auxiliares modais em alguns pontos, como o fato de tomar apenas uma proposição como argumento e realizar uma quantificação existencial, mas também se assemelha a verbos lexicais em outros pontos, como o fato de que possui o tipo de modalidade lexicalmente codificada.

PALAVRAS-CHAVE: Perigar. Verbo modal. Verbo lexical. Cartografia sintática. Semântica formal.

RESUMEN: 'Perigar' es un verbo que aparece en varias construcciones del Portugués Brasilenõ (BP), como en 'periga chover', y sus características gramaticales aún no han sido descritas. Para llenar este vacío, presentamos una descripción sintáctica de 'perigar' siguiendo la cartografía sintáctica (Cinque, 1999, 2006; Cinque; Rizzi, 2008; Drubig, 2001; Tsai, 2015), y una descripción semántica, siguiendo la semántica formal (Kratzer, 1981, 1991; Condoravdi, 2002; von Fintel, 2006; von Fintel; Heim, 2011; Hacquard, 2011). Para esta descripción, se adoptaron dos procedimientos metodológicos: (i) recolección y análisis de datos naturalistas/espontáneos de la red social Facebook y (ii) pruebas sintácticas y semánticas siguiendo el método introspectivo. La primera etapa resultó en una base de datos con cien oraciones que contienen el verbo 'perigar', las cuales fueron analizadas sintáctica y semánticamente, sirviendo para formular hipótesis sobre el comportamiento de este verbo. En una segunda etapa se utilizaron pruebas sintácticas y semánticas siguiendo el método introspectivo. El objetivo de las pruebas sintácticas era determinar si 'perigar' era un verbo auxiliar modal o si se trataba de un verbo léxical. El objetivo de las pruebas semánticas era determinar qué aspectos del significado estaban codificados léxicamente. Las pruebas sintácticas demostraron que se trata de un verbo léxico inacusativo. Las pruebas semánticas han demostrado que se parece a los verbos auxiliares modales en algunos puntos, como el hecho de que toma sólo una proposición como argumento y realiza una cuantificación existencial, pero también se parece a los verbos léxicos en otros puntos, como el hecho de que tiene el tipo de modalidad codificada léxicamente.

PALABRAS CLAVE: Perigar. Verbo modal. Verbo lexical. Cartografía sintáctica. Semántica formal.

1 INTRODUCTION

This paper's goal is to describe the verb 'perigar' from Brazilian Portuguese (henceforth BP), describing its semantics and syntax. This verb appears in constructions of BP such as (01), a song from the eighties.

> (01)   Se eu te   disser,
>   If 1SG 2SG tell.FUT.SBJV
>   **periga**   você   não acreditar   em mim.
>   **perigar.PRS.IND** 2SG   not believe.INF   in 1SG
>   'If I tell you, it's possible you won't believe me'
>   (*Óculos*, Paralamas do Sucesso' Song, 1984)

The verb 'perigar' seems to convey modality since its contribution to the sentence is expressing the possibility of something to happen. For instance, we can paraphrase sentence (01) replacing 'perigar' by 'ser possível' ('it to be possible'), as illustrated in (02).

> (02)   Se eu te   disser,
>   If 1SG 2SG   tell FUT.SBJV
>   **é**   **possível que** você não acredite   em mim.
>   **COP.PRS.IND possible that** 2SG not believe.PRS.SBJV   in 1SG
>   'If I tell you, it's possible you won't believe me'

Roughly speaking, we consider that a sentence expresses possibility when the situation it describes is compatible with our reality, but not necessarily true. Therefore, when speakers utter a sentence such as (01), what they convey is that the situation of the hearer not believing in them is according to the reality, but they do not commit to this being true.

BP has several lexical items and constructions that are used to convey possibility. For instance, we might express possibility through adjectives, as illustrated in (3a); modal adverbs, as illustrated in (3b-c); nouns, as illustrated in (3d); lexical verbs, as illustrated in (3e); auxiliary modal verbs, as illustrated in (3f); and even morphemes, as illustrated in (3g).

(03)   a. É   **possível/provável** que chova.
          COP.PRS.SBJV **possible/probable** that rain.PRS.SBJV
          'It is possible/probable that it will rain.'

         b. **Possivelmente/provavelmente** vai   chover.
          Possibly/Probably   FUT rain.INF
          'It will possibly/probably rain.'

         c. **Talvez** chova.
          Maybe rain.PRS.SBJV
          'Maybe it will rain'

         d. Há   uma **possibilidade/probabilidade** de chover   hoje.
          COP.PRS.IND a   **possibility/probability**   of rain.INF today
        'There is a possibility/probability of raining today.'

         e. **Parece**   que vai   chover.
          seem.PRS.IND that FUT rain
        'It seems it will rain.'

         f. **Pode**   chover.
          may.PRS.IND rain.INF
          'It may rain.'

         g. Esse tênis é   lav**ável** (possível de ser lavado).
          This shoe COP.PRS.IND wash**able** (possible of being washed).
   '   'This shoe is washable.'

Thus, possibility may be conveyed with lexical items from different classes and with different constructions. Items that convey the possibility of a situation occurring are modal items, since possibility is a type of modal force. In formal semantics, modality is defined as the expression of necessities and possibilities (Kratzer, 1991). Therefore, sentences that express either possibilities, such as (04a), or necessities, such as (04b), are considered modal sentences.

(04)   a. João **pode**   dirigir,   ele   tem   18 anos.
          João **can.PRS.IND** drive.INF, 3.M.SG have.PRS.IND 18 years
          'João can drive, he is 18 years old.'

     b. João **tem**   **que** usar   cinto de segurança.
          João **have.PRS.IND that** use.INF seat belt
          'João has to wear seat belt.'

Research covering modality in BP have mainly focused on the description of syntatic and semantic aspects of the auxiliary modal verbs 'dever' (must), 'ter que' (have to) and 'poder' (can/may) (see Pires de Oliveira; Scarduelli, 2009, Rech; 2011, Rech; Giachin, 2014; Pires de Oliveira; Pessotto, 2010, Pessotto, 2011; 2014; 2015; Mendes, 2019; Ferreira, 2020). However, there are descriptions of modal adverbs (Marques, 2012; Tosqui; Longo, 2003) and modal morphemes (Resende; Rech, 2020). Despite those descriptions, there is a series of items and constructions from BP that have not received any formal description/treatment in the literature, neither syntactic nor semantic, that are used to express modality such as the verb 'perigar', illustrated in (05a); the verb 'ameaçar' (threaten), illustrated in (05b); and the expression 'com cara' (with face), illustrated in (05c).

(05)   a. **Periga**   chover.
      Periga.PRS.IND rain.INF
      'It is possible that it will rain.'

      b. Tá   **ameaçando** chover.
      COP.PRS.IND **threatening**   rain.INF
      'It is possible that it will rain soon.'

      c. Tá   **com cara** que vai   chover.
      COP.PRS.IND with face that FUT rain.INF
      'It looks like it will rain.'

The lexical items/expressions in (05) seem to be modal since they can all be paraphrased as 'It is possible that it will rain' and this paraphrasis preserves the original meaning. From the aforementioned expressions, this paper will focus on the description of the 'perigar' verb. It is very likely that this verb derived from the noun 'perigo' (danger).[3] Since it is a verb, the first question we want to address is if 'perigar' is in a syntactic and semantic structure similar to lexical verbs that express possibility, such as 'parecer' (seem) in (03e), or if it is in a syntactic and semantic structure similar to functional items that express possibility, such as the modal verb 'poder' (can/may) in (03f). Another question we want to address is how different this verb is from other verbs that convey possibility and if it is grammatically different from those verbs or if it just expresses a stylistic difference, being a less formal way to express possibilities.

In order to describe this verb, we have followed two steps: (i) collecting and analyzing spontaneous data from the social network Facebook and (ii) doing syntactic and semantic tests following the introspective method. In the first step, we search for open posts on *Facebook* in which 'perigar' occurred and made a *corpus* with one hundred sentences we have found in those posts. Then, the clauses from our *corpus* were morphologically, syntactically and semantically analyzed and classified according to the following criteria: (i) TAM morphology (Tense, Aspect and Mood) in the verb; (ii) Temporal Perspective; (iii) Temporal Orientation; (iv) the subject of the embedded clause; (v) the existence of raising of a constituent from the embedded clause to the main clause; (vi) the type of raising; (vii) modal flavor; (viii) modal force and, lastly; (ix) the feeling of the speaker towards the proposition in the scope of the verb 'perigar'.

After describing the behavior of the verb in this first step, we made some hypothesis about its morphological, syntactic and semantic characteristics. In order to test them, we applied some syntactic and semantic tests using the introspective method. These tests main goals were to determine if 'perigar''s syntactic and semantic behavior was more similar to a functional item or to a lexical verb.

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[3] An anonymous reviewer has pointed out that in some dialect of BP it is possible to say "sem/zero perigo de X" ("No/Zero danger of X"). Examples of this structure would be "zero perigo de eu correr hoje" (zero danger of me running today) or "zero perigo de alagamento aqui" (zero danger of flood here). These constructions with the noun 'perigo' (danger) also have a modal interpretation since they can be paraphrased as "zero possibility of me running today" or "zero possibility of flood here". This shows that the modal interpretation is not exclusive to the verb 'perigar', but it is already present in the noun 'perigo' (danger). It is possible that in the grammaticalization process, 'perigo' (danger) first develops a modal meaning to later suffer a derivation process and start occurring as a verb.

The syntactic tests have shown that the verb 'perigar' behaves as an unaccusative lexical verb and semantic tests have shown that, in one respect, it is similar to modal verbs since it takes a proposition as its argument and existentially quantifies over possible worlds, but it is also similar to lexical verbs since its modal flavor is lexically encoded. Thus, we argue that this verb cannot be described as just an informal way to express possibilities because it has its own morphological, syntactic and semantic-pragmatic characteristics. Thus, the differences of 'perigar' from other verbs such as 'poder' (can) and 'parecer' (to seem) go beyond a stylistic variation.

This paper is divided into five sections from which this introduction was the first one. The second section describes the theoretical background of this research, exploring concepts from the cartographic syntax and formal semantics used in the analysis of the verb 'perigar'. The third section goes over the methodology used in this research in more detail. The fourth section presents the results from this research. Lastly, the fifth and last section brings the final remarks of this paper.

2. THEORETICAL BACKGROUND

This paper analyzes morphological, syntactic and semantic-pragmatic aspects from the verb 'perigar'. The syntactic analysis is done following the cartographic syntax and the semantic analysis is based on formal semantics. Since the verb 'perigar' may be paraphrased as 'É possível que' (it is possible that), we argue that it conveys modality. Thus, we explore in the next subsections how verbs associated with modality are treated in cartographic syntax and formal semantics.

2.1 SYNTACTIC DESCRIPTION OF VERBS THAT CONVEY POSSIBILITY

Our research follows the cartographic syntax assumptions and methodological procedures. This line of research attempts to draw maps as precise and detailed as possible of syntactic configurations (Rizzi; Cinque, 2008, p. 42). Gugliemo Cinque is one of the most important researchers for the cartographic model, investigating the ordering of functional heads crosslinguistically. His research has culminated in the postulation of a hierarchy of functional heads (Cinque, 1999), resulting from the application of precedence and transitivity tests with functional heads expressing mood, modality, tense and aspect. From those tests' application, the author assumes that there is just one possible order to the functional elements (Cinque, 1999; Rizzi; Cinque, 2008). The examples (06) and (07), from the creole language Sranan, illustrate how those tests are applied:

> (06)　　A　　　ben　　　　　kan　　　nyan.
> 　　　　3.SG　　PST　　　　　can　　　eat
> 　　　　"He could eat." (Cinque, 1999, p. 60)

> (07)　　A　　　kan　　ben　　　e　　　nyan.
> 　　　　3.SG　　can　　PST　　　PROG　eat
> 　　　　"He can be eating." (Cinque, 1999, p. 60)

In (06), the modal item 'kan' (can) follows the particle 'ben', which expresses past tense. In this position, 'kan' corresponds to a root modal, expressing abilitive or deontic modality. On the other hand, when 'kan' occurs before the particle 'ben', such as in (07), it expresses epistemic modality. Those examples show that epistemic and abilitive/deontic modality behave differently with past tense. From tests like these, Cinque infers that in the hierarchy of functional heads, TP is between the epistemic functional head and the root modality functional head as illustrated in (08).

> (08) …ModEpistemic > TP(Past) > ModAbility/ModPermission…

The partial ordering transcribed in (08) shows that the epistemic head occupies a position which is higher in the structure than the other functional heads which express modality and even higher than tense. In order to confirm this hierarchy inferred in (08), the author does tests with different functional heads in different languages. We present in (09) some data from Italian in which the author tests the ordering of modal verbs with inceptive aspect.

(09) a.   Ci   comincia a dover   andare anche   di notte.
           There (he)stated to have to walk   also   of night.

      b.   Lo comincio a poter suonare solo adesso.
           (I) started   to can throw   only now

(10)   a. Gli deve cominciare ad essere garantito il loro appoggio.
             To he must start to have you support for granted.

          b. Questa responsabilità non gli può cominciare ad essere attribuita di nuovo.
             This   responsability cannot start to be attributed to you again

In (09a), the inceptive aspect 'cominciare' (to start) occurs before the modal verb 'dovere' (must/has to), and this order makes the modal refer to an obligation (deontic reading). In (09b), 'cominciare' occurs before the modal verb 'potere' (can/may), and this makes the modal refer to an ability. In (10), this order is inverted, and the modal verbs 'dovere' and 'potere' occur before 'cominciare', in (10a) and (10b) respectively. When they occur in this position, the only reading allowed is an epistemic one. This test corroborates that the position of epistemic modal is higher than other modal heads and also higher than the inceptive aspect.

By using transitivity and precedence tests like those with different functional heads in different languages, Cinque (1999, 2006) has postulated a functional head hierarchy which is universal for all natural languages. This means that all languages would have the same categories in the exact same order, even if some functional heads are not present in the lexicon of a language. In (11), we present a version of Cinque's hierarchy in which there are the functional heads for tense, aspect and modality:

(11)   [Moodspeech act [Moodevaluative [Moodevidential [**Modepistemic**
[Tense(Past) [Tense(Future) [Moodirrealis [Modalethic [Aspecthabitual [Aspectrepetitive(I) [Aspectfrequentative(I) [Modvolition [Aspectcelerative(I)   [Tenseanterior   [Aspectterminative   [Aspectcontinuative   [Aspectretrospective   [Aspectproximative [Aspectdurative   [Aspectgeneric/progressive   [Aspectprospective   [**Modobligation**   [**Modability**   [Aspectfrustrative [**Modpermission** [Aspectcompletive [Voicepassive [Aspectcelerative(II) [Aspectrepetitive(II) [Aspectfrequentative(II)
(Rizzi; Cinque, 2008, p. 12; 93)

Even though this is a partial hierarchy, it is possible to verify the ordering of the functional heads that express modality and also their position with other categories such as tense and aspect. The epistemic functional head, for example, is very high in the structure, and the root functional heads (Modobligation, Modability and Modpermission) are in lower positions, after tense heads and most of the aspectual heads.

In this research, we follow the cartographic syntax assumptions and methodology proposed by Cinque – precedence and transitivity tests – to investigate if the verb 'perigar' has properties of a functional head being subject to a rigid order or if it is a lexical verb.

2.2 SEMANTIC DESCRIPTION OF VERBS THAT CONVEY POSSIBILITY

When uttering a sentence that described possibility such as 'pode chover amanhã' (it may rain tomorrow), the speaker does not commit to the fact that it will rain tomorrow, but just contemplates the possibility of such event happening. In formal semantics, possibilities and necessities are considered two different modal forces. Thus, lexical items/constructions that express modality can be classified as: (i) weak, in case they express possibility, or (ii) strong, in case they express a necessity. For instance, in BP, the auxiliary modal verb 'poder' illustrated in (04a) (repeated below as (12a)) is weak (i.e., expresses a possibility), whereas the auxiliary modal verb 'ter que' illustrated in (04b) (repeated below as (12b)) is strong (i.e., it expresses a necessity).

(12)   a. João **pode**   dirigir,   ele   tem   18 anos.
        João **can.PRS.IND**   drive.INF, 3.M.SG have.PRS.IND 18 years
        'João can drive, he is 18 years old.'

        b. João **tem**   **que** usar   cinto de segurança.
        João **have.PRS.IND**   **that** use.INF seat belt
        'João has to wear seat belt.'

The different modal forces are analyzed as different ways to quantify over possible worlds (Lewis, 1986, p. 5). For instance, in (12a), the modal verb 'poder' (can/may) indicates that, in part of the possible worlds being considered, João drives, but there are also possible worlds in which he does not drive. This type of quantification is called existential quantification, and it is represented by the operator ∃. In (12b), the auxiliary modal verb 'ter que' (has to/must) indicates that, in all possible worlds being considered, João wears a seat belt. This type of quantification is called universal quantification, and it is represented by the operator ∀. Thus, one important aspect to address when describing a modal item is if it does a universal or existential quantification over possible worlds. This is traditionally represented in formal semantics using logical forms illustrated in (13).

(13)   a. $[\![poder]\!]^w = \lambda p.\exists w'[w' \in p]$

In words: The verb 'poder' uttered in a possible word *w* takes a proposition *p* as its argument and states that there are possible worlds *w'* that belongs to the set of possible worlds in which the proposition *p* is true.

        b. $[\![ter\ que]\!]^w = \lambda p.\forall w'[w' \in p]$

In words: The verb 'ter que' uttered in a possible world *w* takes a proposition *p* as its argument and states that, all possible worlds *w'* are words that belong to the set of possible worlds in which the proposition *p* is true.

The logical forms in (13) do not completely represent the semantics of modal verbs because they only represent the modal force conveyed by the item – if it expresses a necessity (∀) or a possibility (∃). However, this is not the only relevant semantic aspect to describe about items that express modality. Another aspect that should be taken into consideration is called modal flavor, which is the criteria used to consider the possibilities (see von Fintel, 2006; Hacquard, 2011). For instance, in (14a), João driving is considered possible given our knowledge about the world. We can utter (14b) in a context in which we have seen a driver's license above João's wallet and, from that, have evidence to state 'João pode dirigir' (João can drive). When the criteria used to consider the possibilities are one's own knowledge, the modality is called epistemic. On the other hand, in (14b) João driving is possible given the Brazilian traffic laws, which allows any person over 17 to drive. When the criteria used to consider the possibilities are the rules or a body of laws, it is called deontic modality. In (14c), we consider João driving to be possible given the circumstances which did not allow him to drive before because the car was broken, but now they do. When the criteria used to consider the possibilities are the circumstances, it is called circumstantial modality. Lastly, in (14d), João driving is possible given our desire of getting a ride. When the criteria used to consider the possibilities are one's desires, it is called bouletic modality.[4]

(14)   a. O João pode dirigir, eu vi uma habilitação na carteira dele.
        'João can drive, I saw his driving license on his wallet.'
        (**epistemic**)

        b. O João já pode dirigir, ele completou 18 anos.
        'João can drive, he has just turned 18.'
        (**deontic**)

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[4] This is not an exhaustive presentation of modal flavors, but just some illustrative examples. To a more complete overview, see von Fintel (2006) and Hacquard (2011).

c. O João pode dirigir, o carro está funcionando agora.
  'João can drive, the car is working now.'
    (**circumstantial**)

d. O João bem que podia dirigir, preciso de uma carona para a festa.
  'João could drive, I need a ride for the party'
  (**bouletic**)

One characteristic of modal verbs is that they display some flexibility to the modal flavors they can convey, as illustrated by 'poder' (may/can) in (14) which can express epistemic, deontic, circumstantial or bouletic modality depending on the context it occurs. Modal flavors can be formalized as a relation R between the actual world *w*, in which the sentence was uttered, and the possible worlds *w'* being considered R(*w,w'*), as illustrated in (15).

(15)   a. $[\![poder_R]\!]^w = \lambda p.\exists w'[R(w,w') \ \& \ w' \in p]$

In words: Verb 'poder' uttered in a possible world *w* takes a proposition *p* as its argument and states that there are possible worlds *w'* accessible from the world *w* through an accessibility relation R and that those possible worlds *w'* belong to the set of possible worlds in which the proposition *p* is true.

b. $[\![ter\ que_R]\!]^w = \lambda p.\forall w'[R(w,w') \rightarrow w' \in p]$

In words: Verb 'ter que' uttered in a possible world *w* takes a proposition *p* as its argument and states that, for all possible worlds *w'*, if they are accessible from the possible world *w* through an accessibility relation R, those possible worlds *w'* belong to the set of possible worlds in which the proposition *p* is true.

Since modal force is constant and does not change according to the context, Kratzer (1977) assumes that it is lexically encoded in the verb as illustrated in the logical form in (15) by ∃w' (weak modal) and ∀w' (strong modal). However, due to the flexibility regarding modal flavors illustrated in (14), Kratzer (1977) assumes that modal flavors are pragmatic. This is represented in the logical forms (15) in which the accessibility relation R between the actual world *w* and the possible worlds *w'* is not specified. Nevertheless, this would not be the case for all verbs. Propositional attitude verbs are examples of verbs that convey only one type of modal flavor. For instance, the verb 'achar' (think) in (16a) can only express epistemic modality, whereas the verb 'querer' (want) in (16b) can only express bouletic modality.

(16)   a. Maria acha   que João dirige.
            Maria think.PRS.IND that João drive.PRS.IND
            'Maria thinks that João drives.'

b. Maria quer   que João dirija.
            Maria want.PRS.IND that João drive.PRS.SBJV
            'Maria wants João to drive.'

For verbs that expresses just one type of modality, we assume that the modal flavor is lexically encoded in the verb's denotation. For example, in the denotation of the verb 'achar' in (17), the accessibility relation R is specified as epistemic. This means that the possible worlds *w'* can only be accessed through one's knowledge.

(17)   a. $[\![achar\ \ ]\!]^w = \lambda p.\lambda x.\forall w'[R^{EPIST}(w,w',x) \ \& \ w' \in p]$

In words: The verb 'achar' uttered in a possible world *w* takes a proposition *p* and an individual *x* as arguments and states that, for all possible worlds *w'*, if those possible worlds are accessible from the possible world *w* through an epistemic accessibility relation R,

these possible worlds *w'* are part of the set of possible worlds in which the proposition *p* is true (adapted from von Fintel; Heim, 2011)

Another aspect that distinguishes a propositional attitude verb such as 'achar' from modal verbs is the number of arguments it takes. Modal verbs take as arguments just a proposition, as illustrated by λp in (15), and propositional attitude verbs, on the other hand, take two arguments, a proposition and an individual, as illustrated by λp.λx. in (17). This is intuitive if we think that the role of propositional attitude verbs is to express the attitude someone has towards a proposition, thus it is that individual that believes or wants something.

Therefore, logical forms work as a representation of the semantic analysis adopted and, in the description of items that convey modality, there are three parts in the logical form that are important to our analysis, as illustrated in (18). The first part indicates the number of argument an item takes; the second part, the type of quantification it does – being weak or strong – and; the third part R(w,w'), indicates if there is a specific modal flavor for the accessibility relation R between the actual world *w* and the possible worlds *w'* being quantified.

$$1^a \qquad 2^a \qquad 3^a$$

(18)   a. $[\![poder_R]\!]^w = \lambda$p. $\exists$w' [R(w,w') \& w' \in p]^5

          b. $[\![achar\ \ ]\!]^w = \lambda$p.$\lambda$x. $\forall$w' [R^{EPIST}(w,w', x) \& w' \in p]

There are two other relevant concepts to consider when describing items which express modality which are the temporal perspective and temporal orientation (Condoravdi, 2002). Temporal perspective is the time in which the knowledge/rules/circumstances/desires hold whereas the temporal orientation is the time of evaluation of the proposition *p* in the scope of the modal. For instance, in (19a), speaker states that, based on the available body of evidence in the present (i.e., the lights being on), it is possible that the proposition *p* of João being at home is true in the present. Thus, for (19a), both temporal perspective and temporal orientation are present. On the other hand, in (19b), the speaker states that, based on the body of laws from the past, people could smoke inside establishments. Thus, (19b) has past temporal perspective and present temporal orientation.

(19)   a. As luzes estão acesas, João pode estar em casa agora.

           'The lights are on, João must be at home now.'

          b. Não havia regulamento no passado de modo que as pessoas podia fumar dentro de estabelecimentos fechados naquela época.

          'There was no law in the past prohibiting smoking inside establishments, thus people could smoke inside establishments in the past.'

This section described syntactic and semantic aspects that we will consider for the description of the verb 'perigar'. Next section discusses the methodology we have used in this research.

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5 An anonymous reviewer has questioned whether the modal verb 'poder' is still weak in constructions such as "Pode tirar o cavalinho da chuva" and "Pode sair daqui!". In those examples, there is an interaction of the auxiliary modal verb with the imperative value of these constructions since "pode sair daqui" (you can leave!) seems equivalent to "saia daqui" (leave!). Those cases do not seem to be a declarative use of the modal since they are not being used to discuss the possibility of leaving, but to make a request for the hearer to leave. Thus, modal contribution of 'pode' (can/may) in those constructions is erased. At the moment, we do not have an explanation for the contribution of 'poder' (can/may) in imperative sentences.

3 METHODOLOGY

The first step was to do the literature review using the terms 'periga', 'perigar' and 'verbo perigar' associated with other key terms such as 'modalidade' (modality), 'modalidade epistêmica' (epistemic modality), 'sintaxe' (syntax) and 'semântica formal' (formal semantics). This research was done in the CAPES Catalog for Thesis and Dissertations, and we have also searched for papers using these keywords on Google Scholar and Scielo. There was no result with previous descriptions of the verb 'perigar'. Thus, we base our analysis on descriptions from other lexical verbs that express modality and modal verbs available in syntactic cartography and formal semantics literature.

After the literature review, we started collecting data in two steps: (i) collecting and analyzing spontaneous data from the social network Facebook and (ii) doing syntactic and semantic tests using the introspective method. The first step consisted of collecting sentences with the verb 'perigar' from open *posts* and making a corpus of one hundred sentences with the verb 'perigar'. We have chosen to start with spontaneous data because they allow us to evaluate how speakers use the verb, avoiding that the analysis is restricted to the Portuguese variety spoken by the researchers. The social network *Facebook* was chosen because most of the discussions that happen in this platform use an informal tone and we believed that this could favor the use of the verb 'perigar' and also because the search bar from the platform makes it easy to search and find data with lexical items in posts when the user makes them available for the public.

Sentences with 'perigar' were analyzed and classified morphologically, syntactically and semantically considering: (i) the TAM morphology (Tense, Aspect and Mood) on the verb; (ii) the Temporal Perspective; (iii) the Temporal Orientation; (iv) the subject of the embedded clause; (v) the existence of raising of a constituent from the embedded clause to the main clause; (vi) the type of raising; (vii) the modal flavor; (viii) the modal force and, lastly; (ix) the feeling of the speaker towards the proposition in the scope of the verb 'perigar'. This classification is illustrated in (20) below:

(20) a. Periga　　　　[virar　　　moda]
Periga.PRS.IND [become.INF fad]
'It is possible that it will become a fad.'

Tense	Indicative Present	Temporal perspective	present	Temporal Orientation	future
Embedded subject	*ec (empty category)*	Raising	no	Complement	InfP
Modality	epistemic	Modal force	weak	Feeling	negative

(20) b. Perigava　　　　　　[compreender　mais do　　que quem se　brags
Periga.PST.IPFVIND [understand.INF　more of.the　that who　3.SG grabs
em ter　　　pós-doc em Shakespeare pela Cultura Inglesa].
in　have.INF　post-doc in Shakespeare by　Cultura Inglesa
'It was possible to understand more than the ones who brags to have post-doc
in Shakespeare by Cultura Inglesa.'

Tense	Indicative Imperfective Past	Temporal perspective	past	Temporal Orientation	future
Embedded subject	*ec (empty category)*	Raising	no	Complement	InfP
Modality	epistemic	Modal force	weak	Feeling	positive

(20) c. periga   [a nossa língua estar   diabética].
Periga.PRS.IND [the 1.PL.F language COP.INF diabetic].
'It is possible that our language is diabetics.'

Tense	Indicative Present	Temporal perspective	present	Temporal Orientation	present
Embedded subject	explicit	Raising	no	Complement	InfP
Modality	epistemic	Modal force	weak	Feeling	negative

(20) d. O país   de Tom Jobin e   Villa lobos periga   [ter
the country of Tom Jobin and Villa lobos periga.PRS.IND. [have.INF
Anitta tocando na   abertura dos   Jogos olímpicos].
Anitta playing in.the.F opening of.the.M.PL games olympic.PL].
'It is possible that the country of Tom Jobin and Villa Lobos will have Anitta
playing in the opening of the Olympic Games'

Tense	Indicative Present	Temporal perspective	present	Temporal Orientation	future
Embedded subject	ec (empty category)	Raising	yes	Complement	InfP
Modality	epistemic	Modal force	weak	Feeling	negative

(20) e. Pelas   capas tenho   a   impressão que
by.F.PL cover have.1.SG.PRS.IND the.F.SG impression that
periga   em [ter   uma   surpresa positiva].
periga.PRS.IND in [have.INF a.F   surprise positive].
'By the covers, I am under the impression that it is possible that I will have a
positive surprise.'

Tense	Indicative Present	Temporal perspective	present	Temporal Orientation	future
Embedded subject	ec (empty category)	Raising	no	Complement	Em InfP
Modality	epistemic	Modal force	weak	Feeling	positive

After observing the behavior of the verb 'perigar' exemplified in (20), we formulated some hypothesis about its morphological, syntactic and semantic characteristics. In order to test them, we have applied syntactic and semantic tests using the introspective method. The syntactic tests were based in cartographic syntax (Cinque, 1999; 2006; Rizzi; Cinque, 2008; Drubig, 2001; Tsai, 2015) and their goal was to determine if 'perigar' was a lexical verb responsible to express modality or a functional item corresponding a modality head in the hierarchy. On the other hand, the semantic tests are based in formal semantics (Kratzer, 1977) and their goal was to determine if the modal force and modal flavor are lexically encoded for this verb. We explore the results from these tests in the next section.

4.1 ANALYSIS

4.1.1 Syntactic aspects

In order to analyze the syntactic properties of the verb 'perigar', we have adopted precedence and transitivity tests as proposed by Cinque (1999, 2006), testing the interaction with the following categories: TP(Past), AspProgressive, AspRepetitive, ModRoot and negation. We have also compared the results with the epistemic use of the modal verb 'poder' (can/may), which is a functional head.

Sentences in examples (21) and (22) show that the verb 'perigar' differs from the epistemic use of the modal verb 'poder' (can/may) in the interaction with tense.

(21)   a. O   terceiro   álbum do   grupo carioca   Do Amor
           The.M.SG third.M.SG album of.M.SG group carioca.SG Do Amor
           periga   se   chamar "Faces".
           Periga.PRS.IND 3.SG call.INF "Faces".
           'It is possible that the third album from the Carioca group Do Amor will
            be called "Faces"'

        b. O   terceiro   álbum do   grupo carioca   Do Amor
           The.M.SG third.M.SG album of.M.SG group carioca.SG Do Amor
           perigou   se   chamar "Faces".
           Perigou.PST.PFV.IND 3.SG call.INF "Faces".
           'It was possible that the third album from the Carioca group Do Amor
            would be called "Faces"'

(22)   a. O   terceiro   álbum do   grupo carioca   Do Amor
           The.M.SG third.M.SG album of.M.SG group carioca.SG Do Amor
               pode   se   chamar "Faces".
               may.PRS.INF 3.SG call.INF "Faces".
           'The third album from the Carioca group Do Amor may be called
           "Faces".'

        b. O   terceiro   álbum do   grupo carioca   Do Amor
           The.M.SG third.M.SG album of.M.SG group carioca.SG Do Amor
               pôde   se   chamar "Faces".
               may.PST.PFV.INF 3.SG call.INF "Faces".
           'The third album from the Carioca group Do Amor might have been
            called "Faces".'

Sentence (21b) shows that 'perigar' can be inflected for past tense and perfective aspect, showing that this verb occupies a position below the TP(Past) head in the structure. However, the functional modal verb 'poder' (may/can), when inflected for past perfective tense as in (22b), does not have the epistemic reading. This shows that the epistemic functional head is in a higher position in the structure, above the TP(Past) head. The relevant part of the hierarchy structure for functional heads proposed by Cinque (1999) is transcribed in (23).

(23)   Mood$_{speech\ act}$ > Mood$_{evaluative}$ > Mood$_{evidential}$ > **Mod$_{epistemic}$** > **TP(Past)** >
T(Future) > Mood$_{irrealis}$ > Asp$_{habitual}$ > **AspP$_{repetitive}$** > T(Anterior) > **Asp$_{perfect}$** > Asp$_{retrospective}$ > Asp$_{durative}$ > **Asp$_{progressive}$** > Asp$_{prospective}$ /
Mod$_{root}$ > Voice Asp$_{celerative}$ > Asp$_{completive}$ > Asp$_{(semel)repetitive}$ > Asp$_{iterative…}$
        (Cinque, 1999: 76)

The ordering of the functional heads in (23) shows that the epistemic head is above TP(Past) and, due to this reason, it cannot be inflected for tense. On the other hand, there is no problem for lexical verbs to be inflected for tense since they are below TP(Past), as it is the case for 'perigar'. Note that there is not, in the functional head hierarchy, a position below TP(Past) for an epistemic functional head and this suggests that the verb 'perigar' is not a functional item, but a lexical verb.

We have also tested the kind of complements the verb 'perigar' can take. In our tests and in the spontaneous data, we observed that it can occur with either an InfP or a CP, as illustrated in (24); differing from the functional modal verb 'poder' (can/may), that occurs only with an InfP, as illustrated in (25).

(24)   a. Periga   [InfP eu   levar   vaia.]
             Periga.PRS.IND [InfP 1.SG take.INF boo.]
             'It is possible that I will get booed.'

          b. Periga   [CP que eu   leve   vaia.]
             Periga.PRS.IND [CP that 1.SG take.INF boo.]
             'It is possible that I will get booed.'

(25)   a. Eu   posso   [InfP levar   vaia.]
             1.SG may.PRS.IND [InfP take.INF boo.]
             'I may get booed.'

          b. *Eu posso   [CP que eu   leve   vaia.]
             1.SG may.PRS.IND [CP that 1.SG take.INF boo.]
             'I may get booed.'

An InfP may be under the scope of lexical verbs or functional verbs, but CPs can only occur in the scope of a lexical verb.[6] Thus, the grammaticality of (24b) shows that the verb 'perigar' behaves as a lexical verb, since only lexical verbs take CPs as its arguments. The ungrammaticality of (25b) shows that the auxiliary verb 'poder' (may/can) does not admit CP in this position, as expected from a functional predicate. It is important to point out that, although the verb 'perigar' can take as a complement both InfP and CP, our spontaneous data suggest that the complementation with InfP is preferred as illustrated in the graph below.

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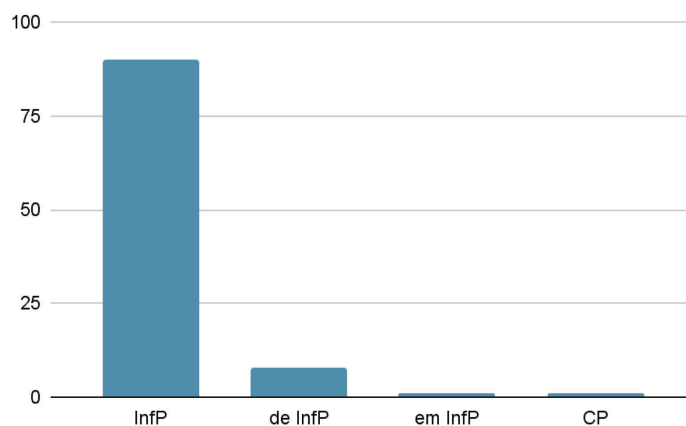
[6] An anonymous reviewer has questioned about structures such as "vai que dá certo" (it may work out). In this example, 'vai que' could be considered a counterexample if we consider 'vai' as a functional item with a CP 'que'. This is the analysis followed by Dearmas (2024). However, in our analysis, we assume that 'vai que' is the grammaticalization of a head in the left periphery of the sentence in Rizzi & Bocci (2017) configuration, behaving as a single item. Therefore, 'vai que' does not have a CP in its scope in our proposal (see Ferreira & Rech, 2024) and it is not a counterexample for the analysis presented here.

From one hundred spontaneous data collected on Facebook, the complement was an [InfP] in ninety occurrences, as illustrated in (26a), an [de InfP] in eight occurrences, as illustrated in (26b), an [em InfP] in one occurrence, as illustrated in (26c), and a [CP] in one occurrence, as illustrated in (26d).

(26) a. Periga   [InfP o   morro deslizar].
         Periga.PRS.IND [InfP the.M hill   slide.INF].
         'It is possible that the hill will slide.'

      b. Periga   [PP de [InfP o   Geno querer   pagar   isso
         Periga.PRS.IND [PP of [InfP the.M Geno want.INF pay.INF this
         ao   negacionista burro]].
         to.the.M negationist stupid]].
         'It is possible that Geno will want to pay this to the stupid negationist.'

      c. Pelas   capas tenho   a   impressão que
         by.F.PL cover have.1.SG.PRS.IND the.F.SG impression that
         periga   em [ter   uma   surpresa positiva].
         periga.PRS.IND in [have.INF a.F   surprise positive].
         'By the covers, I am under the impression that it is possible that I will
          have a positive surprise.'

      d. Periga   [CP que eu   vou   dar   bola pra essas
         Periga.PRS.IND [CP that 1.SG FUT.1.SG give.INF ball to   these.F
         notícias.]
         news.]
         'It is possible that I give a damn about this news.'

As illustrated in (26b-c), there is variation regarding the complement of the verb 'perigar'. The second part of the syntactic analysis we have observed was the subject position. Our data shows two patterns, one in which the subject remains *in situ* in the embedded clause and the subject position of the verb 'perigar' is filled by an empty category (e.c.), as illustrated in (27), and, in the second pattern, there is a subject for 'perigar' which is not an e.c., but this subject was actually an argument for the embedded predicate that has been raised to the main clause, as illustrated in (28).

(27) (ec)   Periga   [ela   desistir].
         ec   Periga.PRS.IND [3.SG.F give.up].
         'It is possible that she will give up.'

(28) [Essa eleição]$_i$ periga   [t_i ser   uma disputa   entre
         [this.F election] periga.PRS.IND [t_i COP.INF a.F competition between
      quem mais covarde].
      who more coward].
         It is possible that this election becomes a competition between who is
          more coward.'

Despite of both patterns illustrated in (27-28) being possible with the verb 'perigar', the spontaneous data show a strong tendency for the subject to remain *in situ* and not be raised to the main clause, as demonstrated by the graphs below.

Raising pattern
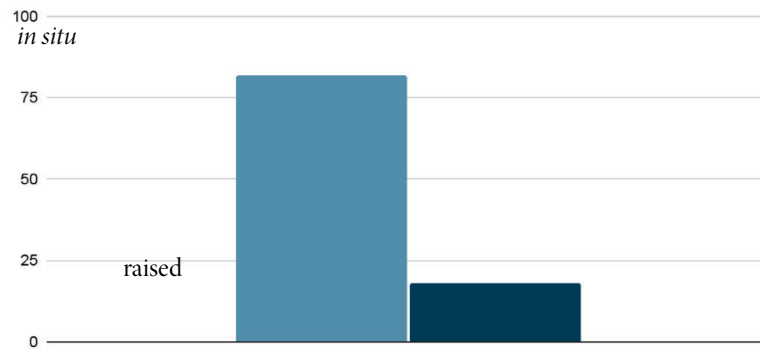
In the one hundred sentences we had with the verb 'perigar', the DP has been raised from the embedded predicate to the subject position of main clause just eighteen times. Even though raising is lower, it is important because it shows another difference from the functional verb 'poder' (may/can) since raising is optional for 'perigar', as illustrated in (29); but not for 'poder' (may/can), as illustrated in (30):

(29)   a. Periga   [ele   vetar.]⁷
             Periga.PRS.IND [3.SG.M veto.INF.]
             'It is possible that he will veto.'

         b. [Ele]ᵢ   periga   [tᵢ vetar.]
             [3.SG.M]ᵢ periga.PRS.IND [tᵢ veto.INF.]
             'It is possible that he will veto.'

(30)   a. *Pode   [ele   vetar.]
             May.PRS.IND [3.SG.M veto.INF.]
             'He may veto.'

         b. [Ele]ᵢ   pode   [tᵢ vetar.]
             [3.SG.M]ᵢ may.PRS.IND [tᵢ veto.INF.]
             'He may veto.'

We assume the raising of a DP in a structure with the verb 'perigar' to be motivated by case marking similarly to what occurs with the verb 'parecer', which is a unaccusative verb. In a structure with a functional modal verb such as 'poder' (may/can), this optionality is not present and DP raising is compulsory, as illustrated by the ungrammaticality of (30a). This occurs because 'poder' (may/can) is a functional head; thus, (30b) corresponds to a single sentence domain.

The sentences in examples (31) to (34) below show the interaction between the verbs 'perigar' and 'poder' (may/can) with two aspectual heads: progressive and repetitive. These heads occur in an intermediate position in the functional hierarchy (Cinque 1999, 2006), after the epistemic head (ModPEpistemic) and before the heads for the root modality (ModRoot) – as illustrated in part of the hierarchy in (23).

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⁷ It is also possible for the subject to occur in the embedded domain with inflected non-finite verbs, as illustrated below:
(i)   Periga   eles   vetarem.
             Periga.PRS.IND [3.PL.M veto.INF.PL]
             'It is possible that they will veto.'

The first interaction we discuss is the one of the verbs 'perigar' and 'poder' (may/can) with the progressive aspectual head:

(31)   a. Periga   ela   desistir.
           Periga.PRS.IND 3.SG.F give.up
           'It is possible she will give up.'

           b. Está   perigando   ela   desistir.
            COP.PRS.IND perigando.PROG 3.SG.F give.up
           'It is being possible that she will give up.'

(32)   a. Ela   pode   desistir.
           3.SG.F may.PRS.IND give up
           'She may give up.'

           b. Ela   está   podendo   desistir.
            3.SG.F COP.PRS.IND may.PROG give up
           'She may give up. (#epistemic reading/deontic reading)'

The fact that progressive aspect can occur in (31b) indicates that 'perigar' is in a lower position in the structure, being either a root modal or a lexical predicate. (31b) shows that the verb 'perigar' allows progressive morphology and this corroborates to its analysis as a lexical predicate, since if it were an epistemic head, it would be in a higher position. Sentence in example (32b) shows that it is possible to use progressive morphology with the functional modal verb 'poder' (may/can), but not with the epistemic reading. This contrast of progressive morphology with the 'perigar' and the epistemic use of 'poder' (may/can) corroborates that they are in different positions in the structure: the first is lower and the latter is higher.

The examples (33) and (34) show how the verbs 'perigar' and 'poder' (may/can) fare under the scope of the repetitive aspect:

(33)   a. Bolsonaro periga   ganhar as   eleições.
           Bolsonaro periga.PRS.IND win.INF the.F.PL elections
           'It is possible that Bolsonaro will win the elections.'

           b. Bolsonaro voltou   a perigar   ganhar as
            Bolsonaro return.PST.PFV.IND to periga.INF win.INF the.F.PL
        eleições.
        elections
           'Once again it is possible that Bolsonaro will win the elections.'

(34)   a. Bolsonaro pode   ganhar as   eleições.
           Bolsonaro may.PRS.IND win.INF the.F.PL elections
           'Bolsonaro may win the elections.'

           b. Bolsonaro voltou   a poder   ganhar as
            Bolsonaro return.PST.PFV.IND to may.INF win.INF the.F.PL
         eleições.
         elections
       'Once again Bolsonaro may win the elections.
       (#epistemic reading/deontic reading)'

Sentence (33b) shows that the verb 'perigar' is under the scope of the repetitive aspectual head, providing further evidence for the analysis that this verb occupies a lower position in the structure whereas sentence (34b) shows that the modal verb 'poder' (may/can) with epistemic reading cannot occur under the scope of this aspectual head. In this case, 'poder' (may/can) has other readings such as the deontic, but with these readings it is a root modal, which is in a position lower in the structure, after the progressive and repetitive aspectual heads.

Because they occupy different positions in the structure, a functional modal verb with epistemic reading might occur with a functional modal verb with root reading. If the verb 'perigar' were an epistemic functional head, we would expect it occur in a sequence with another modal item with root interpretation in the same clausal domain, but it does not as illustrated below:

(35) a. Periga   ele ter   que trabalhar no
     Periga.PRS.IND 3.SG.M have.INF that work.INF on.the.M.SG
     domingo.
     Sunday.
     'It is possible that he will have to work on Sunday.'

     b. Ele periga   ter   que trabalhar no
      3.SG.M periga.PRS.IND have.INF that work.INF on.the.M.SG
     domingo.
     Sunday.
     'It is possible that he will have to work on Sunday.'

(36) a. *Pode   ele ter que trabalhar no
      May.PRS.IND 3.SG.M have.INF that work.INF on.the.M.SG
      domingo.
      Sunday
      'He may have to work on Sunday.'

     b. Ele pode   ter que trabalhar no
      3.SG.M may.PRS.IND have.INF that work.INF on.the.M.SG
     domingo.
      Sunday.
      'He may have to work on Sunday.'

In (35a), there is no raising of the DP to the subject position of the matrix clause and the modal verbs 'perigar' and 'ter que' (have to) do not occur sequentially. However, in (35b), the DP has been raised, and this makes the modals appear sequentially. Nevertheless, it is important to point out that 'perigar' and 'ter que' are not projected in the same clausal domain, since the complement of 'perigar' might be a clause with a finite verb inside a CP: Periga [CP que ele tenha que trabalhar no domingo] (It is possible that he will have to work on Sunday). We attribute this to the fact that 'perigar' is an unaccusative verb that selects either an InfP or a CP as its complement. After the DP has been raised in (35b), the sequence *periga > ter que* is formed, but those verbs are in different clausal domains. Therefore, (35b) is not evidence that 'perigar' is an epistemic functional head. The ungrammaticality of (36a) shows that, for functional heads such as 'poder' (may/can) and 'ter que' (have to), raising is compulsory because they are in the same clausal domain, making the epistemic functional head and the root functional head appear sequentially.

Lastly, we examine the behavior of the verbs 'perigar' and 'poder' (may/can) under the scope of negation illustrated in (37) and (38).

(37) a. Periga   você não fazer papel de ridículo.
     Periga.PRS.IND 2.SG not do.INF role of ridiculous.
     'It is possible that you won't look ridiculous.'

   b. Não periga   você fazer   papel de ridículo.
      not periga.PRS.IND 2.SG do.INF role of ridiculous.
      'It not possible that you will look ridiculous.'

(38)   a. Você pode   não fazer   papel de ridículo.
           2.SG may.PRS.IND not do.INF role of ridiculous.
           'You may not look ridiculous. (epistemic reading)'

   b. #Você não pode   fazer   papel de ridículo.
      2.SG not may.PRS.IND do.INF role of ridiculous.
      'You may not look ridiculous. (epistemic reading)'

Tsai (2015) and Drubig (2001)[8] have tested the modal with negation. The authors assume that negation is under the scope of epistemic modal, since when the modal occurs after negation, the epistemic reading is not available. In sentence (37b), the epistemic possibility is being negated, and this is further evidence that the verb 'perigar' is in a lower position in the structure, below negation. (38) shows that the epistemic reading is not available for the modal verb 'poder' (may/can) when it is under the scope of negation. This is another argument to assume that the auxiliary modal verb 'poder' with epistemic reading is in a different position from 'perigar', occupying a position above negation.

The results from the tests discussed in this section have shown that the verbs 'perigar' and 'poder' do not behave alike and suggest that the first is a lexical unaccusative verb and the latter is n functional modal verb. Therefore 'perigar' is similar to other lexical predicates which express epistemic modality such as 'parecer' (to seem).

4.2 SEMANTIC ASPECTS

For the semantic analysis of 'perigar', we shall consider four aspects: (i) modal force; (ii) modal flavor; (iii) temporal perspective and; (iv) temporal orientation. We also discuss if the verb 'perigar' brings a negative feeling towards the proposition under its scope. We have assumed this hypothesis since this verb has derived from the noun 'perigo' (danger).

Our spontaneous data show that temporal perspective and temporal orientation interact with directly with the TAM morpheme occurring in the verb. In most of our spontaneous data (85%), the verb 'perigar' bear a morphology for indicative present and, in the rest of the data (15%), the verb 'perigar' bears a morphology of subjunctive imperfective past, as illustrated in the graph below.

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[8] Tsai (2015) postulates that the epistemic modal is above the negation marking of realis sentences (*mei*) and below the negation marking of irrealis sentences (*bu*).

   a. Akiu bu yiding^E bu jin   xiancheng. [Neg^{Irr} + epistemics + Neg^{Irr}]
      Akiu not surely   not enter town
      'It is unsure that Akiu will not enter the town.'

      b. * Akiu mei   yiding^E bu jin xiancheng. [*Neg^{Rea} + epistemics + Neg^{Irr}]
         Akiu   have.not surely   not enter town
         'It is unsure that Akiu will not be in town.' (Tsai, 2015, p. 12)

Through tests with sentences with auxiliary modal verbs and negative polarity items, Drubig (2001) concludes that the epistemic functional head is above negation:

      a. John may never leave early.
      b. Never may John leave early.
      c. John never may leave early. (Drubig, 2001, p. 8)
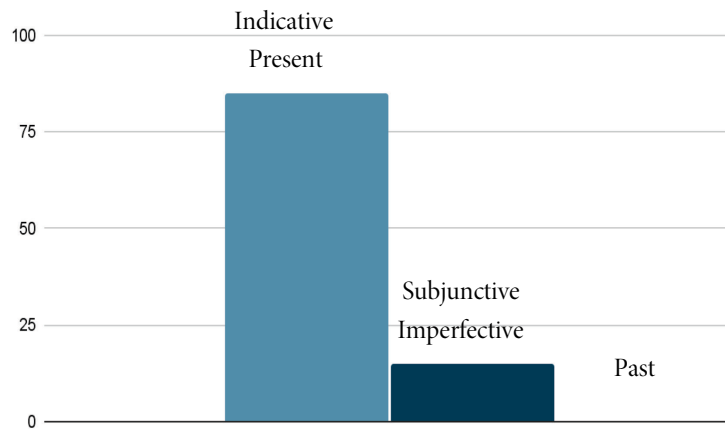
When the verb was inflected for the indicative present, the temporal perspective of the modal was present since the possibility of an eventuality to happen was considered according to the speaker's knowledge/evidence in the present, as illustrated in (39). On the other hand, the temporal orientation of the modal could be either present or future. When the predicate under the scope of the verb 'perigar' was an event, such as 'deslizar' (slide) in (39a), 'cair' (fall) in (39b) and 'desandar' (mess up) in (39c), temporal orientation was future. We could paraphrase (39a) as 'based on the knowledge available in the present, it is possible that this hill will slide in the future'.

(39)   a. Periga   [o   morro deslizar.INF].
            Periga.PRS.IND [the.M.SG hill   slide].
            'It's possible that the hill will slide.'

      b. Periga   [cair].
            Periga.PRS.IND [fall.INF]
            'It's possible that it will fall'

      c. Periga   [tudo   desandar].
            Periga.PRS.IND [everything mess.up.INF]
            'It's possible that everything will get messed up.'

On the other hand, when the predicate under the scope of the verb 'perigar' is a state, such as 'estar' (be) in (40a), 'ser' (be) in (40b) and 'ter' (have) in (40c), temporal orientation is present. For example, the sentence in example (40a) might be paraphrased as 'based on the knowledge I have in the present, it is possible that our language is diabetic in the present'.

(40)   a. Periga   [a   nossa   língua   estar   diabética].
            Periga.PRS.IND [the.F.SG our.F.SG language COP.INF diabetic.]
            'It's possible that our language is diabetic.'

      b. Periga   [ser   o   fim da   própria espécie
            Periga.PRS.IND [be.COP the.M.SG end of.the.F.SG own   species]
            'It's possible it will be the end of our own species.'

      c. Periga   [ter].
            Periga.PRS.IND [have.INF]
            'It's possible that I have it.'
(Uttered in a context in which a store's owner encourage clients to ask if she has a specific garment in stock)

The data in which the verb 'perigar' was inflected in the indicative imperfective past, temporal perspective of the modal was also past since the possibilities were considered according to the speaker's past knowledge, as illustrated in (41). The sentence in example (41a) was used on a Facebook post in which the author is narrating a story, and he mentions that he was insecure since there was the possibility of the dog biting him. Therefore, (41a) can be paraphrased as 'based on the knowledge I had in the past, it was possible that the dog would truly bit me'. Another example of past temporal perspective is sentence in (41b) which was used on a Facebook post in which the author was afraid in the past because there was a possibility of a candidate he did not like winning the elections. Thus, (41b) could be paraphrased as 'based on my past knowledge, there was the possibility of this candidate winning in the past'. Lastly, the sentence in example (41c) comes from a Facebook post in which the author tells a story and discusses that, in that moment, there was the possibility of the car overturning. It can be paraphrased as 'based on my knowledge in the past, it was possible that the car would overturn'.

(41)   a. **Perigava**   [ele   morder de verdade].
    Periga.PST.IPFV.IND [3.M.SG bite   of true]
    'It was possible that it would truly bite.'

    b. **Perigava**   [ele   ganhar].
    Periga.PST.IPFV.IND [3.M.SG win].
    'It was possible that he would win.'

    c. **Perigava**   [tombar   o   carro].
    Periga.PST.IPFV.IND [overturn.INF the.M.SG car]
    'It was possible that the car would overturn.'

This shows that the inflection on the verb 'perigar' shifts temporal perspective. When this verb bears present tense, as in (39-40), the temporal perspective from this modal is present, and when this verb bears past tense, as in (41), temporal perspective is in the past. The temporal orientation of the modal can be present of future according to the predicate under the scope of the verb 'perigar'. If it is an event, it can be present or future, but if it is a state, it can only be present as illustrated in examples (39) and (40).

The third aspect we have analyzed was the modal flavor associated with 'perigar'. In our spontaneous data, 'perigar' was only used with an epistemic reading. This is the opposite from what occurs with modal verbs that display some flexibility regarding the modal flavor they can express. Therefore, we conclude then that modal flavor of 'perigar' is not determined by the context, but it is lexically encoded. Another evidence that corroborates this analysis is that a sentence with the verb 'perigar' is not good in contexts with other modalities as illustrated in (42).

(42)   a. CONTEXT: João has just turned eighteen years old today. According to the law
    Ele   pode/#periga   dirigir.
    3.SG.M can.PRS.IND/#periga.PRS.IND drive.INF.
    'He can/#periga drive.'

    b. CONTEXT: After studying in a course for four years,
    João pode/#periga   falar   alemão.
    João can.PRS.IND/#periga.PRS.IND speak.INF German
    'He can/#periga speak German.'

    c. CONTEXT: I don't have my car today,
    João bem que podia/#perigava
    João well that could.PST.IPFV.IND/#perigava.PST.IPFV.IND
    nos dar   uma carona.
    us give.INF a   ride

'João could/#perigava give us a ride.'

d. CONTEXT: The car was broken until last week, but this week it has
already been fixed

João já   pode/#periga   dirigir.
João already can.PRS.IND/#periga.PRS.IND drive
'João can/#periga already drive'

The example (42a) shows that 'perigar' is not good in a context expressing deontic modality; (42b) shows that it is not good in a context expressing <mark>abilitive</mark> modality; (42c) shows that it is not good in a context expressing bouletic modality; and (42d) shows that it is not good in a context expressing circumstantial modality. Thus, we assume that the epistemic modal flavor is lexically encoded for the verb 'perigar' and this is responsible for making it not good in contexts with other modal flavors.

The last relevant aspect when describing modal items is modal force. Our analysis for the verb 'perigar' is that it is a weak modal. The first evidence is that it is always possible to paraphrase a construction with the verb 'perigar' replacing it with 'it to be possible', as illustrated in (43a-b), but not with 'it to be necessary', as illustrated in (43c). This shows that this verb meaning is closer to possibilities than to necessities.

(43)   Se eu te disser….
          If I tell you…

a.   **Periga**   você   não acreditar em mim.
      Periga.PRS.IND 2.SG.S not trust   in 1.SG
      'You might not trust in me.'

b.   'It is possible you won't trust me.' (paraphrasis)

c.   'It is necessary you to trust me.' (#paraphrasis)

Weak modals can be used to coordinate clauses with incompatible propositions without generating a contradiction as illustrated by the modal verb 'may' in (44a). The use of strong modals in the same context generates a contradiction, as illustrated in (44b). Similarly to 'poder' (can/may), the verb 'perigar' can be used to coordinate clauses that express incompatible propositions without generating a contradiction, as illustrated in (44c). This corroborates the analysis of the verb 'perigar' as a verb that expresses weak modality in BP.

(44)   a. Lula may win the elections, and Bolsonaro **may** win too.
         b. ?Lula **must** win the elections, but Bolsonaro **must** win too.
         c. O   Lula **periga**   ganhar, e o   Bolsonaro
            The.M.SG Lula periga.PRS.IND win.INF, and the.M.SG Bolsonaro
            periga   ganhar   também.
            periga.PRS.IND win.INF too
            'It is possible that Lula will win the elections, and it is possible that
             Bolsonaro will win the elections too.'

Based on the behavior of the verb 'perigar' described in this section, we assume that this verb's denotation to be the one in (45). Three important aspects from the verb 'perigar' are captured in this logical form. The first one, λp, indicates that the only argument that 'perigar' needs is a proposition, making it similar to modal verbs such as 'poder' (may/can), 'dever' (must) and 'ter que' (have to) and also similar to other unaccusative verbs such as 'parecer' (to seem). The second aspect in this logical form, $\exists w'$, represents that 'perigar' is a weak modal, existentially quantifying over possible worlds. This makes the verb 'perigar' closer to items that express weak modality such as 'poder' (may/can), 'possível' (possible), 'provável' (probable) etc. Lastly, the third aspect $R_{EPIST}(w,w')$

represented in the logical form indicates that the accessibility relation of the verb 'perigar' is epistemic. This means that only possible worlds *w'* accessible are the ones according to one's knowledge in the actual world *w*. In this respect, 'perigar' behaves differently from modal verbs which are more flexible regarding the modal flavor they can convey.

(45) $[\![periga\ \ ]\!]^w = \lambda p.\exists w'[R_{EPIST}(w,w')\ \&\ w' \in p]$

In words: 'Perigar' takes a proposition *p* and states that there are possible worlds *w'* and that the accessibility relation to access these possible worlds *w'* from the actual world *w* is epistemic (based on one's knowledge) and that these worlds *w'* belong to the set of possible worlds in which the proposition *p* is true.

The last aspect we will discuss is the feeling the speaker holds towards the proposition under the scope of the verb 'perigar'. Our first hypothesis was that this modal verb would also convey a negative feeling since the verb 'perigar' derives from the noun 'perigo' (danger). If our hypothesis proved correct, this negative feeling would have to be lexically encoded in the verbs' denotation in (45). However, the spontaneous data did not corroborate this hypothesis. In order to identify what kind of feeling the speaker held towards the proposition, we have analyzed the lexical items used in the embedded clause. For example, the lexical items 'roubar' (steal) in (46a), 'vetar' (veto) in (46b) and 'piorar' (get worse) in (46c) suggest that the speaker consider the possibility of these eventualities happening as something negative. We have also considered the general context of the post (the text in which the sentence with 'perigar' appeared, the picture if there was any, if the interlocutor was being ironic, etc.) and, based on these contextual elements, we determined if the creator of the post considered the proposition under the scope of the verb 'perigar' something positive or negative.

(46)   a. Periga   [ele   te   roubar as   pregas].
            Periga.PRS.IND [3.M.SG 2.SG steal   the.F.PL anal.sphincter]
            'It is possible that he will steal your anal sphincter.'

        b. Periga   [ele   vetar].
            Periga.PRS.IND [3.M.SG veto.INF]
            'It is possible that he will veto.'

        c. Periga   [piorar   misturando lama com esse dejeto].
            Periga.PRS.IND [get.worse.INF mix.PROG mud with this.M waste]
            'It is possible that it will get worse by mixing mud with this waste.'

Despite the negative tone being present in most of our data, the positive tone was used in fourteen sentences of our *corpus* and a neuter tone occurred in one sentence. We proceeded in the same manner for the identification of the positive tone, verifying lexical items of the embedded clause of the verb 'perigar'. For example, the items 'dar certo' (to work out) in (47a), 'surpresa positiva' (positive surprise) in (47b) and 'cair na dança' (dance) in (47c) are used because the speaker considers the possibility of the eventuality occurring something positive. In addition to the analysis of those lexical items, we have also considered the overall context of the post.

(47)   a. Perigava   até de [fazer   dar   certo].
            perigava.PST.IPFV.IND also of [make.INF give.INF right]
            'It was also possible to make it work.'

        b. Periga   em [ter   uma   surpresa positiva].
            Periga.PRS.IND in [have.INF a.SG.F surprise positive]
            'It is possible to have a good surprise.'

        c. Periga   [eu cair   na   dança com eles].

    Periga.PRS.IND [1.SG fall.INF   in.the.F.SG dance with 3.M.PL
    'It is possible I will dance with them.'

We have also found a sentence in which the speaker did not seem to associate any kind of feelings towards the proposition. In the sentence in example (48), the author of the post described an item that was found at his home and discussed the possibility of this item being from the nineties without associating this possibility to a negative or positive feeling.

    (48) Periga   [ser   do   final da   década de 1990].
       Periga.PRS.IND [COP.INF of.the.M.SG end of.the.F.SG decade of 1990]
       'It is possible it is from late nineties.'

The graph below sums up what we have identified in our spontaneous data. In most examples (85%) the speaker expressed a negative tone towards the proposition under the scope of the verb 'perigar', but some cases (14%) there was a positive tone and only in one example a neuter tone (1%).
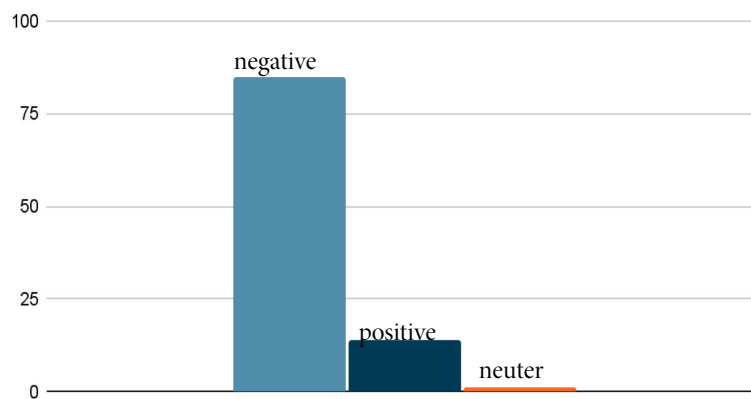
As discussed in section 2, Kratzer (1977) considers in her analysis of modal items the aspects which are constant to be lexically encoded being part of the denotation whereas the aspects that change according to the context to be pragmatic. Following this analysis, the fact that the negative feeling is not present in every context in which the verb 'perigar' is used shows that it is pragmatic and not encoded in the denotation of this lexical item. Thus, the negative tone does not appear in the denotation we assumed for this verb represented in (45).

Since it derives from the noun 'perigo' (danger), it was expected that the possibility of the eventuality would be accompanied by a negative tone. In order to explain why this does not happen, we assume that, in the first step of the grammaticalization, 'perigar' might have been associated exclusively to a negative tone. However, the verb 'perigar' is not a new verb since we have registers from this verb at least from the eighties. Thus, although it might have started being used to discuss possibilities associated with a negative feeling, in the next step of the grammaticalization, speakers might have started to adopt it to discuss possibilities towards which they have a positive attitude and later on a neuter attitude. This would explain why the negative attitude, although not the only one, constitutes the predominant attitude in our *corpus* as illustrated in the graph above.

This subsection described the semantic aspects from the verb 'perigar'. It has presented an analysis considering temporal orientation, temporal perspective, modal flavor, modal force and the attitude of the speaker towards the possibility. In our analysis, temporal perspective depends on the verb inflection whereas temporal orientation depends on the type of predicate under the scope of the verb 'perigar'. We have also seen that, in some aspects, this verb resembles modal verbs taking just a proposition as its argument and doing an existential quantification; and in other aspects, it is similar to propositional attitude verbs with its modal flavor being lexically encoded. Lastly, we have discussed how the spontaneous data did not corroborate our first hypothesis that the verb 'perigar'

was associated exclusively with a negative attitude of the speaker towards the possibility of the eventuality under the scope of the verb 'perigar'. Thus, this negative feeling is not part of the semantic denotation and could be a pragmatic implicature.

5 FINAL REMARKS

The syntactic tests show that 'perigar' differs from the functional epistemic modal verb 'poder' (may/can) in several aspects. Firstly, 'perigar' can be inflected for past tense and occur under the scope of repetitive and progressive aspect and under the scope of negation preserving it epistemic reading whereas the verb 'poder' (may/can) with an epistemic reading cannot. A second difference it that the verb 'perigar' can select a CP as its complement, whereas 'poder' (may/can) cannot. Those aspects show that the verb 'perigar', differently from 'poder', is not a functional item, but an unaccusative verb being more similar to the verb 'parecer' (to seem).

In our semantic analysis, we have shown that the type of predicate influences temporal orientation, which is present with states; of future/present, with events. Temporal orientation, on the other hand, is determined by the inflection that 'perigar' bears. We have also shown that 'perigar' expresses exclusively epistemic modality, similar to propositional attitude verbs such as 'achar' (to think) and 'acreditar' (to believe), and that this is a weak verb, similar to 'poder'. Therefore, 'perigar''s behavior is similar to functional modal verbs in some aspects and it resembles propositional attitude verbs in other aspects. We have also shown that our data did not corroborate our first hypothesis that the verb 'perigar' would be used exclusively with a negative tone towards the proposition under its scope. Thus, we analyzed this negative feeling as something pragmatic since it varies from context to context.

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