

On the T(ense) and Asp(ect) in the derivation of infinitives in Portuguese

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Abstract

In this paper, we discuss the morphosemantics of aspect and tense in the Portuguese infinitives. Specifically, within Distributed Morphology framework (Halle & Marantz, 1993), in advancing Resende & Pires de Oliveira (2022)'s recent proposal, we approach the internal constituency of Portuguese infinitives (mostly Tense and Aspect) and discuss what exactly these pieces of structure denote. Firstly, we argue that all infinitives contain AspP and that its head is featured as neutral, in the sense of Smith (1997). Secondly, we approach TP and argue for a tree-way system ($T_{[+TENSE]}$, $T_{[-TENSE]}$, $T_{[]}$), which can be associated to two different syntactic environments (in this case, DP vs. no DP), but not to different syntactic settings (for instance, raising vs. ECM). On the semantic side, $Asp_{[NEUTRAL]}$ denotes a set of time

intervals where the event denoted by the verbal stem has started. As regards Tense, if T is [-TENSE], then it renders a simultaneous reading in relation to the matrix verb and if it is [+TENSE], the infinitive is futurate in relation to the matrix verb. However, if T lacks a tense-value, the TP will denote a property of events, almost like the nP-denotation in the nominal domain.

Keywords: infinitives, tense, aspect, Distributed Morphology, morphosemantics.

1. Introduction

Speakers know as part of their linguistic competence that words carry properties that somehow determine their distribution and interpretation along the sentences in a compositional fashion. However, linguists do not agree on the best way to (theoretically) implement this trivial fact. On one hand, some scholars argue that words come from a component called “lexicon”, equipped with all their properties (phonological, morphological, syntactic, and semantic) and those properties, encoded as features, are going to determine their distribution and interpretation in the phrases by means of feature-checking/evaluation within a specific structural domain. This is the stand taken by most of Generative Grammarians looking to syntax and semantics, following the mainstream version of Minimalist Program (Chomsky, 1995), in a strong lexicalist position.

On the other hand, there are scholars who argue that words are not built in a different component or by different tools other than syntax. On this view, both sentences and words are built along the syntactic derivation, and lexicon does not feed syntax with lexical items; rather, it provides the computational system bundles of grammatical and semantic features (devoid of phonological and extralinguistic content) that compose structures of any size. Along these lines, in the light of a non-lexicalist position, as in the Distributed Morphology framework (Halle & Marantz, 1993), arriving at a phrase or a sentence starts out with the generation and the composition of every piece of its structure – that is, the morphemes.

The present paper advances a compositional derivation of infinitive phrases in Portuguese, assuming a non-lexicalist approach and relying on insights from Stowell (1982), Landau (2004), and also Raposo (1987a, 1987b), Ambar (2000), Pires (2006), Modesto (2007), Gonçalves, Cunha & Silvano (2010), Brito (2013), Gonçalves, Santos & Duarte (2014), Nunes (2015), and Resende (2016, 2021), who discuss the morphosyntax of infinitives in Portuguese in both European (EP) and Brazilian (BP) varieties. Additionally, we discuss Resende & Pires de Oliveira (2022)’s recent proposal for infinitives in Portuguese and argue that it cannot correctly account for all instances of Asp(ect) and T(ense).¹ Thus, we put forward some new insights on the matter.²

The Portuguese infinitive form is quite uniform phonologically (graphically

¹ See Ilari, Oliveira & Basso (2016) for an overview of tense and aspect system in both languages.

² This proposal covers both EP and PB infinitives, despite of some stylistic preferences and some syntactic contexts that are not crucial for our purposes – for these issues, see the work just referred.

represented by an *-r* adjacent to a verbal stem)³, although it appears in infinitive phrases that have very different morphosyntactic and semantic properties, as exemplified below. The determiner in (1a) and the auxiliary in (1b) show that the same form is sometimes the head of a nominal phrase, sometimes the head of a verbal one. In (2a), the infinitive phrase is interpreted as denoting a past event and in (2b) as future with respect to the main clause. Finally, in (3a), the infinitive phrase is imperfective, since John feeling victorious happens within his crossing the field, whereas in (3b) it is perfective, since the feeling victorious happens after the crossing.

- (1) a. O nascer do sol é lindo.
 the-MASC-SG be-born-INF of-the sun is beautiful
 ‘the sunrise is beautiful’
 b. O bebê vai nascer.
 the baby goes be-born-INF
 ‘the baby is going to be born’
- (2) a. O candidato tentou assumir o cargo (*amanhã).
 the candidate tried assume-INF the post (*tomorrow)
 ‘the candidate tried to take office (*tomorrow)’
 b. O candidato planejou assumir o cargo (amanhã).
 the candidate planned assume-INF the post (tomorrow)
 ‘the candidate planned to take office (tomorrow)’
- (3) a. Ao atravessar o campo, João se sentia
 to-the-MASC-SG cross-INF the field, John onself felt-IMPERF
 vitorioso.
 victorious
 ‘by crossing the field, John was feeling victorious’
 b. Ao atravessar o campo, João se sentiu
 to-the-MASC-SG cross-INF the field, John onself felt-PERF
 vitorioso.
 victorious
 ‘by crossing the field, John felt victorious’

The same phonological form appears in syntactic configurations that convey not only different, but rather, opposite interpretations. Resende & Pires de Oliveira (2022) argue that infinitive phrases get their different meanings as the structure moves along in syntax, in a DM fashion; they argue that infinitive phrases follow the same derivational path up to Asp. On that matter, they propose that Asp is

³ For simplicity, we assume that the infinitive marking in Portuguese is the segment *-r*, although it is not realized in the most of their occurrences in the Brazilian variety, apart from some nominal contexts and with some specific verbs, such as *pôr* (‘put’) and the verbs derived from it as *repor* (‘reset’), *compor* (‘compose’), *depor* (‘testify’), *impor* (‘impose’), *supor* (‘suppose’), *decompor* (‘decompose’), etc. and the verb *vir* (‘come’). In all other contexts, the infinitive marking in the Brazilian variety seems to be the verbal theme vowel, stressed at the final syllable – see Nunes (2015) and Resende (2016) for discussion of this topic.

underdetermined – i.e., it can assume (at least) two values: perfective and imperfective – and (im)perfectivity is dependent solely on the matrix clause. We provide empirical evidence to show that this is not the case. We argue that Asp must be determined locally and propose that it is featured as neutral⁴, along the lines of Smith (1997).

After AspP, following Resende & Pires de Oliveira, infinitives bifurcate into nominal infinitives (1a) and verbal infinitives (1b). As for verbal infinitives, they split with respect to T: an evaluated T (i.e., T_[±TENSE]) in (2) or an unevaluated T_[] (i.e., a T lacking tense specification), which leads to a “mixed infinitive”, in (3). We will detail this proposal in the following.

This paper is divided as follows: in § 2, the three types of infinitives are presented, and their common base is discussed up to AspP. In § 3, we focus on AspP, showing that it cannot be underdetermined and propose that it is a neutral viewpoint, for all instances of infinitives. In § 4, we approach the T-branch, by discussing the T marking for tense and also the mixed type (which in our system has a TP projection, but no tense-value).

The empirical range of phenomena surrounding infinitives revolves around morphophonology, syntax, and semantics. However, because of scope, we will specifically focus on the morphosemantics of infinitives, i.e., the denotation of the morphemes composing them, and overlook other (for instance, syntactic) aspects.

2. Infinitives: not always a verb, not always a noun

Under the traditional view, infinitives are taken to be one of the nominal forms of the verb – jointly with gerunds and participles. However, in the light of non-lexicalist lenses, “being a verb” is not a prime; rather, it is the outcome of merging a root with a verbalizer head (v^0). In any case, being composed out of a verbalizer head does not preclude the form from being a noun (that is, a “nominal form”), as we see in the following.

It is not our goal in this paper to discuss (or motivate) all the structures – for that, see Resende & Pires de Oliveira (2022) and references therein. Instead, we simply assume their typology, according to which infinitives in Portuguese appear in three configurations: nominal, verbal, and mixed. Although these types will render three different structures, that is, “different infinitives”, they all share a single derivational path up to AspP. Such a derivation starts out by merging a root with a verbalizer head.

In the DM spirit merging v^0 will render the structure (in this case, the verbal stem) some particular properties, such as the presence of the verbal theme vowel (Harris, 1999), licensing of the internal argument, and event reading (Alexiadou, 2001). Later, above vP , the grammar will merge the Voice head (Kratzer, 1996),

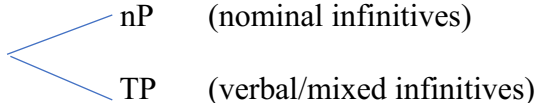
⁴ Altshuler (2013), however, makes a case, based on Russian and Hindi aspect systems, that one can dispense with the notion of “neutral aspect” by providing a fine-grained definition of (im)perfectivity. Still, in languages such as Portuguese, where there is not a clear *morphological* system of aspect-marking, constraining the inventory – instead of broadening it – does not seem empirically or descriptively accurate. In any case, as a first attempt to describe and explain the morphosemantics of /R/-infinitive, “neutral aspect” seems to be on the right track, and we leave eventual criticism for further research.

which is assumed to license the external argument and to allow for subject-oriented adjectives. Above VoiceP, the system will merge Asp, which is the head associated with encoding grammatical aspect, that is, (im)perfectivity. Thus, all infinitives are the same until AspP (whose specification we discuss later) and the derivation of the “different types” starts out above AspP.

Nominal infinitives are under a morphological perspective prototypically nouns, in that they are preceded by determiners, modified by adjectives (but not adverbs), and exhibit nominal plural marking – but see the following discussion. To this class belong the infinitive nominalizations and the so-called “lexicalized infinitives”. Examples in (4a-c), for which the structure assumed is given in (4d).

- (4) a. a meu ver
to my-MASC-SG see-INF
‘in my point-of-view’
- b. um nascer do sol incrível(*mente)
a be-born-INF of-the sun incredible(-y)
‘an incredible(*-y) sunrise’
- c. os poderes, deveres, saberes, falares
the-MASC-PL can/may-INF-PL must-INF-PL know-INF-PL speak-INF-PL
‘the powers, the duties, the knowledge, the dialects’
- d. $\sqrt{\text{ROOT}} > v^0 (> \text{VoiceP}) > \text{AspP} > \text{nP}$

By the DM fashion, those nominal properties are usually associated to a nominalizer head (n^0), merging the structure (or the root). In our system, n^0 is spelled out as *-r*, the infinitive marking – see Basílio (1987), and Raposo (1987b) for similar conclusions. Additionally, following Resende & Pires de Oliveira (2022), only nominal infinitives have nP, and this is what makes of them morphologically nouns. Contrastively, verbal infinitives are morphologically verbs; this is why they have TP (rather than nP), and the first bifurcation arises, as in (5).

- (5) $\sqrt{\text{ROOT}} > v^0 (> \text{VoiceP}) > \text{AspP}$ 

Although mixed infinitives are morphologically verbs (i.e., just as the verbal type, they have TP), they behave syntactically as nouns, because (just as the nominal type) they can appear inside DPs – hence, “mixed”. This is illustrated in (6a-c), for which we assume the structure in (6d), extracted from Resende & Pires de Oliveira (2022). Contrastively, verbal infinitives (with TPs, but with no DPs) are shown in (7a-c); their structure in (7c).

- (6) a. O saber matemática enobrece o homem.
the-MASC-SG know-INF mathematics ennoble the man
‘to know math ennoble folks’
- b. O zombarem desse nosso certo apego aos diminutivos
the-MASC-SG mock-INF-AGR of our certain attach to-the diminutives
‘their mocking of our excessive attachment to little things’

- c. Ao alugar uma casa, você deve assinar o contrato.
to-the-MASC-SG rent-INF a house, you must sign-INF the contract
'by renting a house, you must sign the contract'
- d. $\sqrt{\text{ROOT}} > v^0 (> \text{VoiceP}) > \text{AspP} > \text{TP} > \text{DP}$
- (7) a. Pedro vai / pode / deve viajar amanhã.
Peter goes / can/may / must travel-INF tomorrow
'Peter is going to / can / may / must travel tomorrow'
- b. Pedro ouviu Ana chegar.
Peter heard Anne arrive-INF
'Peter heard Anne arriving'
- c. $\sqrt{\text{ROOT}} > v^0 (> \text{VoiceP}) > \text{AspP} > \text{TP}$

The AspP and TP projections for both mixed and verbal infinitives are discussed in detail in § 3 and § 4 respectively. For now, as assumed in (4d), (6d) and (7c), the important fact is that the three infinitives have AspP above VoiceP (when it is projected), which means that all these forms will encode grammatical aspect.

3. AspP: the neutral aspect

For simplicity, on the non-finite domain, we assume that gerunds are imperfective (Rodrigues, 2006) and participles are perfective (Medeiros, 2010). As we saw in the examples in (3), infinitives also convey grammatical aspect, but their distribution is puzzling, since the ultimate aspect reading does not seem to be conveyed only by the infinitive itself. Such a puzzle revolves around two points, namely, (i) if infinitives can trigger both imperfective and perfective readings, it is not possible to encode in advance one or another value, because by assuming late insertion (Halle & Marantz, 1994), the phonological form comes out to play only after the features are determined in the syntax; otherwise, the perfective encoding would lead to the participle form, the imperfective encoding to the gerund form, and so on; (ii) the featural specification must be somehow determined in the syntax, since not only the semantic interpretation depends on that, but also some adjuncts and other modifiers are licensed in specific environments, such as *frequently*, *for x time*, etc. – see Cinque (1999), Alexiadou (2001), and others.

The data in (3) show an alternation between perfective and imperfective interpretations for the mixed type of infinitives. In the following, we show that the same alternation appears in both nominal and verbal infinitives. In (8), infinitives are nominal: in (8a) its interpretation is perfective; in (8b), imperfective. In (9), we find examples of verbal infinitives: in (9a), the interpretation is perfective; in (9b), imperfective.

- (8) a. O cantar dos pássaros me acordou.
the-MASC-SG sing-INF of-the-PL birds me woke up
'the birds' singing woke me up'
- b. O cantar dos pássaros está me irritando.
the-MASC-SG sing-INF of-the-PL birds is me annoying
'the birds' singing is annoying me'

- (9) a. João pôde construir a casa.
 John could-PERF build-INF the house
 ‘John could build the house’
 b. João pode construir a casa.
 John can/may build-INF the house
 ‘John can/may build the house’

This alternation between perfective and imperfective is what led Resende & Pires de Oliveira (2022) to propose that infinitives are underspecified in Asp, that is, it is not marked as perfective or imperfective in the infinitive derivation and would obtain its value (i.e., [PERF]/[IMPERF]) in relation to the matrix clause, in the same way the embedded (non-finite) T gets its value (see § 4). However, although this solution seems to work quite well for verbal infinitives (see also Rodrigues, 2006), where there is a T head, it struggles to handle nominal infinitives, where there is no T (rather, n^o) and mixed infinitives for which it is not the case that there is a c-commanding clause from where it is possible to check/value its tense feature. Additional challenge comes from the data in (10) and (11), where in contrast to (4c), it is not always possible to have a plural marking on nominal infinitives.

- (10) a. os saberés
 the-MASC-PL know-INF-PL
 ‘the knowledge’
 b. *os saberés de medicina
 the-MASC-PL know-INF-PL of medical science
- (11) a. os falares
 the-MASC-PL speak-INF-PL
 ‘the dialects’
 b. *os falares de português na Europa
 the-MASC-PL speak-INF-PL of Portuguese in Europe

Following insights from Alexiadou, Iordăchioaia & Soare (2010) on Romanian, for whom there is a tight relation between aspect and plurality, the grammatical differences in (10) and (11) can be accounted for by assuming the (already widespread) relation between, on one hand, perfectiveness and count-quality and, on the other, imperfectiveness and mass-quality. Thus, if only perfective (or “packed”) readings can receive plural marking, then the projection of plural marking is conditioned to a specification of Asp given locally, that is, (im)perfectivity cannot always be left to the main clause. In other words, if the projection of plural marking depends on a certain specification of Asp, then the derivation cannot proceed without its specification.

Specifically, infinitives seem to admit both perfective and imperfective readings, but the ultimate reading of it will be compositionally determined. In our system, the contrast in (10)-(11) is captured by the following: since infinitives are “open” for both aspectual readings, they cannot be packers, then when events do not receive a perfective viewpoint (i.e., Asp_[PERF]), plural marking is blocked. The

plurality is available for infinitives that do not refer specifically to events⁵, such as *deveres* ('duties'), *poderes* ('powers'), *falares* ("types of speaking"), and *saberes* ("types of knowledge"), but this is a meaning that becomes available only at the nP level, after Asp is merged, then Asp cannot be featured as [IMPERF], otherwise it would block the plural projection.

Therefore, it follows that the Asp head must be already marked (i.e., valued) in the syntax in order to allow/block the plural projection. Then, as mentioned in § 2, we argue that infinitives convey a neutral viewpoint/aspect, along the lines of Smith (1997). Thereby, the Asp_[NEUTRAL] allows us to explain why eventive infinitives cannot be pluralized, but also why some other infinitives can. Thus, such an aspect marking must be somehow flexible to license both readings as well as their respective modifiers/adjuncts.

As such, we explain the flexibility of the interpretation of infinitives, which is compatible with perfective and imperfective scenarios since the neutral marking will not block the occurrence of some adjuncts (as *totally* or *constantly*). Theoretically, such a view differs from the "underspecified" one, in that the latter keeps the Asp head without any value, along the derivation, until it can be determined (as imperfective, perfective, etc.) in a certain structural context; the former, on the other hand, marks Asp with a neutral value (a specification alongside perfective, imperfective, etc.) that is compatible with both imperfective and perfective readings and allows for the system to make decisions locally.

As regards this neutral value, Smith (1997) claims that "the interpretation of aspectual vague sentences can be shown to be neither perfective nor imperfective. Such sentences are more flexible than either viewpoints, in that they allow both open and closed readings" (p. 77-78). The neutral aspect "is weaker than the perfective in allowing open readings; it is stronger than the imperfective because it allows close readings" (p. 78).

Ultimately, Smith's proposal is that the neutral aspect conveys that the event has started; that is, the initial stage of the event is finished. Nonetheless, it should be stated that Smith presents nor a complete neither a formalized proposal for the neutral aspect, mostly in what the non-finite domain is concerned. Then what we present in the following is actually an extension of Smith's (1997) proposal, based on our understanding of it.

The crucial ingredient for approaching the neutral aspect is the initial stage of the event. As an illustration, the initial stage of an activity (such as *swimming*) or an accomplishment (such as *building a house*) is whatever counts as part of the event, indicating that the event has started. As for states (as *be Brazilian*), we assume that the "initial stage" means that the state holds at that initial span. Regarding

⁵ As an anonymous reviewer noted, it is also possible to say *os saberes dos idosos* ('the aged people's knowledge'), where Portuguese can have a plural marked infinitive followed by a PP. However, this example does not pose a problem for our system, because the eventive reading is not available as well. Thus, differently from *de medicina* and *de português* in (10)-(11), where these PPs would be taken as internal arguments (which would favor an event reading), (*d*)*os idosos em os saberes dos idosos* is interpreted as a kind of possessor: the aged people are who have that knowledge. Then, it is possible to say *os saberes dos idosos*, because it has to do with something aged people know, but not **os saberes de medicina* ('the medicine's knowledge'), that would have to do with pieces of knowledge about medicine that someone has.

achievements (as *falling from a tree*), these have only one stage, then the initial stage happens to be the event itself, because achievements are taken to be punctual events, where the two extremities of the event fall into the same point.

As Smith (1997) notes, not always both readings (i.e., perfective and imperfective) are available to the neutral specification. For instance, as Smith argues, the imperfective marking often focus on the preliminary stage(s) of the event, i.e., their preparatory phase, and, for that author, preliminary stages cannot be referred by the neutral viewpoint. Thus, in the case of achievements, whereas the neutral aspect indicates that the event has started, the imperfective aspect targets the interval prior the single stage event.

In (12a), the imperfective reading, triggered by the gerund *-ndo* ('-ing'), focuses on the preparatory stage of the dying event; this is why (12a) does not create a contradiction: gerunds do not entail that the event has reached its telos – *the imperfective paradox*. However, (12b) is contradictory; since the neutral aspect cannot target the preparatory stage, but targets its initial stage, but since the initial and the final stage converge, the reading that the dying event finished is pragmatically obtained. As Smith claims, “unlike the imperfective, the neutral viewpoint allows close readings by inference” (p. 81).

- (12) a. A Maria viu [o João morrendo], mas ele não morreu.
 the Mary saw [the John dying], but he not died
 ‘Mary saw [John dying], but he didn’t die’
 b. ??A Maria viu [o João morrer], mas ele não morreu.⁶
 the Mary saw [the John die-INF], but he not died
 ‘Mary saw [John die], but he didn’t’

Thus, we argue that infinitives encode neutral aspect and also that such a specification must be available already in the syntax in both nominal and verbal/mixed infinitives. In what follows, we further develop Smith’s definition of neutral aspect, where “I” is the initial stage of the event and represent the normal sequence of events. We assume the Event Semantics framework, where the Asp head denotes the set of time intervals in which there is at least one event that is finished or in progress or has started. The semantic value of Asp is the result of a function from a predicate of events into a predicate of intervals of time.

We also assume the canonical distinction between perfective and imperfective: if the aspect is perfective, then the time interval of the event, represented as $\tau(\text{ev})$, is included into a time interval, which counts as Reference Time (RT), i.e., $\tau(\text{ev}) \subseteq \text{RT}$, conveying that the event is complete and closed in that time interval. If it is imperfective, then the RT is included in the time interval of the

⁶ As an anonymous reviewer noted, in EP, one can say *a Maria viu o João a morrer, mas ele não morreu* (‘Mary saw John to die, but he didn’t’), without rendering a contradiction. However, this kind of structure, with a prepositioned infinitive, is the semantically equivalent to the gerund structure in BP. According to Lunguinho (2006), as for this EP construction, the preposition renders the infinitive a “progressive reading”, which can be seen in other nominal contexts, such as *a mãe está à procura de sua filha* (‘the mother is at the search for her daughter’), that is, the mother is searching for her daughter (Lunguinho, 2006, p. 475). In such an analysis, the phrase, but not the infinitive alone, triggers a progressive reading, which explains its well-formedness in EP.

event, i.e., $RT \subseteq \tau(ev)$, conveying that the event is open with respect to that time interval and has not finished. According to Smith (1997), “the neutral viewpoint includes one endpoint, the perfective both endpoints, and the imperfective neither” (p. 81). In such a view, the neutral viewpoint denotes the initial stage of the event; specifically, the neutral aspect conveys that the RT includes the initial stage of the event; that is, it has started.

So far, we have claimed that all infinitives are alike until AspP. In order to make the proper semantic composition for them, we begin with the description of the eventuality – the (descriptively) “VP-layer” –, which in our analysis is composed by the root and v^o (and Voice, when applied). The interpretation of v^o is verbal, i.e., it is a set of events, as in (13a). Along these lines, VoiceP denotes the set of events that have the property encoded by the verbal stem and the agent of the event, as represented in (13b).

In turn, Asp takes this set of events and returns a set of time intervals, which includes the initial stage of the event, since it has a neutral value. In (13c), we state the semantics for the neutral aspect: it takes VoiceP (when it is the case) and returns a set of time intervals. In (13c), we represent Asp as open to different relations (represented by “R”) between the time of the event and a time interval to which it is related. Among others (such as perfective, etc.), this relation might be one that includes the initial stage of the event, that is, the neutral value defined in (13d). Specifically, it takes VoiceP and returns a set of time intervals where there is at least one event that has begun – “Iev” stands for “initial stage of the event”, and “I” is the RT.

- (13) a. $[[vP]] = [\lambda ev. \sqrt{ROOT}(ev)] \langle ev, t \rangle$
 b. $[[VoiceP]] = [\lambda ev. \sqrt{ROOT}(ev) \wedge AGENT (ev, x)] \langle ev, t \rangle$
 c. $[[AspP]] = [\lambda i. \exists ev (\sqrt{ROOT}(ev) \wedge AGENT (ev, x) \wedge \tau(ev) R i)] \langle i, t \rangle$
 d. $[[Asp_{[NEUT]}]] = [\lambda i. \exists ev (\sqrt{ROOT}(ev) \wedge AGENT (ev, x) \wedge \tau(Iev) \subseteq i)] \langle i, t \rangle$

Built on these considerations, (13d) states that the initial stage is accomplished. Hence, the result so far is a set of time intervals where the event denoted by the verbal stem has started. Thus, assuming that all infinitives are $Asp_{[NEUTRAL]}$, the first bifurcation is between nP (for nominals) and TP (for verbs). In the first case, the absence of T leads to the projection of n^o , which abstracts the event variable, and denotes the set of events, such that its initial stage is included in the reference time interval, as in (14a) – the RT variable is left as a free pronoun.

Thus, this nP is merged with a D head, the event variable is closed by the ι -operator, entailing that the event has begun, with respect to a reference time, as in (14b). Thus, nP can merge with a D head, creating a DP. This D can be the definite article *o* (‘the-MASC-SG’) and, if so, it corresponds to the ι -operator; by allowing it to range over event predicates, we arrive at (14b). It denotes the only particular event whose initial stage is finished that belongs to that singleton.

- (14) a. $[[nP]] = [\lambda ev (\sqrt{ROOT}(ev) \wedge AGENT (ev, x) \wedge \tau(Iev) \subseteq i)] \langle ev, t \rangle$
 b. $[[DP]] = [\iota ev (\sqrt{ROOT}(ev) \wedge AGENT (ev, x) \wedge \tau(Iev) \subseteq i)] ev$

Now consider (15). Assume, for simplicity, that it has a causative meaning (whose structure is not relevant to our purposes): my wakening was caused by the

birds' singing. The nominal conveys that there is a particular event, the only event (the singing by birds) salient in the context, whose beginning is included in the contextually salient RT.

- (15) a. O cantar dos pássaros me acordou.
 b. $\iota_{ev_1}[\text{WAKE}(ev_1) \wedge \text{CAUSE}(\iota_{ev_2}(\text{SING}(ev_2) \wedge \text{AGENT}(ev_2, \text{the birds}) \wedge \tau(\text{I}_{ev_2}) \subseteq i), ev_1) \wedge ev_1 \subseteq i \wedge i < i_0]$

In (15), we have a complex definite description: $\iota_{ev_2}(\text{SING}(ev_2) \wedge \text{AGENT}(ev_2, \text{the birds}) \wedge \tau(\text{I}_{ev_2}) \subseteq i)$, where “i” is the *reference time*. The initial stage is finished with respect to i, a free variable in our proposal, whose value is established with respect to the time expressed by the finite verb, which is past. By inference, the time when the singing started precedes the time of the wakening.

If the event of singing caused the event of wakening, which is past with respect to the speech time, then the initial stage of the singing is finished before the wakening and is compatible with both a situation where the singing is over and a situation in which the singing still holds at the speech time. Therefore, it only states that the initial stage is finished.

In (16), we have a description of (7b). Assume that (16a) has also a causative meaning: my state of anger is caused by the singing of the birds. The interpretation that the birds' singing is holding at the speech time comes from the tense (and aspect) of the main verbal predicate *está me irritando* ('is annoying me'), which is progressive as the speaker utters the sentence. The nominal infinitive warrants that the initial stage of the singing is included in the reference time, which is the time of my anger; then, the singing started before it.

- (16) a. O cantar dos pássaros está me irritando.
 b. $\iota_{ev_1}[\text{ANGER}(ev_1) \wedge \text{CAUSE}(\iota_{ev_2}(\text{SING}(ev_2) \wedge \text{AGENT}(ev_2, \text{the birds}) \wedge \tau(\text{I}_{ev_2}) \subseteq i), ev_1) \wedge i_0 \subseteq ev_1 \approx ev_2]$

Following this leading idea, mixed infinitives up to AspP will behave accordingly. Take the examples in (3): *ao atravessar o campo, João se sentia vitorioso* ('by crossing the field, John felt-IMPERF victorious') in (3a) and *ao atravessar o campo, João se sentiu vitorioso* ('by crossing the field, John felt-PERF victorious') in (3b). In both sentences the infinitive has exactly the same interpretation: the initial stage of the crossing has been accomplished; the interpretation is that the event is in course or complete comes from the aspect of the main verb. In (3a), the imperfective morphology in the verbal form *sentia* ('was feeling') conveys that the state of being victorious is open and includes the crossing of the field; in (3b), *sentiu* ('felt') is perfective, then, the feeling victorious is included in the reference time and the crossing is interpreted as perfective. However, the infinitive itself only conveys that the event of crossing the field has started.

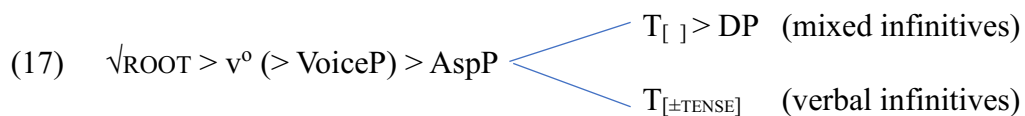
As regards the Asp of verbal infinitives, consider the sentences in (9). In (9a), *João pôde construir a casa* ('John could-PERF build the house'), the modal verb is in the past; the interpretation of the modal is of ability and conveys that the event is complete; the infinitive conveys that the initial stage of the event is finished, which is compatible with the house being ready. In turn, in (9b), *João pode construir a casa* ('John can/may build the house'), the modal verb is in the present

and conveys the meaning that there is a possibility that, given what the speaker knows, the building of the house starts in the future; the infinitive conveys that the initial stage of the event of building is in the future; thus, the house is not built yet.

By this system, we manage to address two points, namely, (i) all infinitives share a common derivational path regardless the structure where they will be embedded in; there is no looking-ahead move, neither are there cases, somehow special, that need to be treated as the result of lexicalization or as infinitives that should be stored apart (although some pieces of encyclopedic information can be associated to certain infinitives); (ii) the neutral aspect on the infinitives has the advantage to capture the flexible semantic character of these forms, creating an elegant aspect feature system, where the three non-finite forms encode a different aspect value each: gerunds are imperfective, participles are perfective, and infinitives are neutral.

4. TP: the T-values

In this section, we discuss how our system handles a structure which has a TP above an Asp_[NEUTRAL]. As assumed in (6d) and (7c), from Resende & Pires de Oliveira (2022), both verbal and mixed infinitives have TP, but only the latter is embedded into a DP. The working hypothesis is that verbal infinitives are tensed (that is, [\pm TENSE]), whereas the T head in mixed infinitives is non-specified, i.e., T_[]: neither [+TENSE] nor [-TENSE]. This subsystem is depicted in (17).



Beyond tense, the T head is also responsible for housing the information of finiteness. By being a non-finite form, the T of infinitives is always [-FINITE]. However, Portuguese infinitives, differently from most languages, have the particular property of displaying person-number agreement. It is not always the case for the Agr head to be projected; there are some syntactic environments where its projection will be allowed. Because of scope, we will not discuss the syntactic contexts where Agr is projected and simply assume Modesto (2007, p. 303) in that, in Portuguese, “infinitives are necessarily inflected in subject clauses, purpose clauses and what seems to be ECM-contexts [...]; usually inflected (but possibly not) in object-control cases and absolutely never inflected in subject-control cases”.⁷

Following Embick & Noyer (2007), we also assume that an Agr head is project at the PF-branch (specifically, at MS), as an adjunct of TP, when at the syntax, there is a finite T or, in the case of Portuguese, when there is a non-finite T appearing in some specific syntactic environments, such as those stated by Modesto (2007) and Gonçalves, Santos & Duarte (2014).

⁷ On this matter, it appears to be some interesting differences between BP and EP, which we will not discuss any further – but see Raposo (1987a) for a classical view and Gonçalves, Santos & Duarte (2014) for a reanalysis of EP and references.

Resende & Pires de Oliveira (2022) propose that the prototypical instances of mixed infinitives are subject-clauses, prepositional clauses, and cases where there are both an overt determiner and an infinitive, as shown in (18). In these cases, according to the authors, T is underspecified syntactically because there is no c-commanding TP and, therefore, no syntactic environment to bind a finite TP to the non-finite one. In our working hypothesis, the failure of binding, will render an embedded TP that will render a $T_{[]}$.

- (18) a. Dançar na chuva diverte Maria.
 dance-INF in-the rain amuses Mary
 ‘dancing in the rain amuses Mary’
- b. A menina dançar na chuva diverte Maria.
 the girl dance-INF in-the rain amuses Mary
 ‘the girl’s dancing in the rain amuses Mary’
- c. Pedro comprou um carro sem avisar / por ter
 Peter bought a car without warn-INF / for have-INF
 dinheiro / para aparecer.
 money / to appear-INF
 ‘Peter has bought a car announced / because he has money / to show off’
- d. Saber Filosofia enobrece o homem.
 know-INF Philosophy ennobles the man
 ‘Philosophy knowledge ennobles folks’
- e. Ao saber Filosofia, você adquire autoconhecimento.
 to-the-MASC-SG know-INF Philosophy, you acquire self-knowledge
 ‘by knowing Philosophy, you acquire self-knowledge’

For cases like (18), the working hypothesis is that the infinitive has a $T_{[]}$. However, since this feature must be somehow evaluated for this projection to be interpreted, we argue, following Resende & Pires de Oliveira (2022), that in the absence of a tense-value, as a last resort for saving the derivation, the subsequent projection of D makes the TP shift the denotation into a property of events, almost like the nP-denotation in the nominal derivation from (14a), repeated in (19c). Recall that we have argued for Asp to be neutral also in these cases, then a sentence like (8a)/(19a) must have the same denotation as (20a) – except for the presence of TP, which allows for agreement, causing the highlighting of the agentive role.

- (19) a. O cantar dos pássaros me acordou.
 the sing-INF of-the birds me woke up
 ‘the birds’ singing woke me up’
- b. $[[nP]] = [\lambda ev (\sqrt{ROOT}(ev) \wedge AGENT (ev, x) \wedge \tau(Iev) \subseteq i)]$.
- c. $[[DP]] = iev (\sqrt{ROOT}(ev) \wedge AGENT (ev, x) \wedge \tau(Iev) \subseteq i)$.
- (20) a. Os pássaros cantarem me acordou.
 the birds sing-INF-AGR me woke up
 ‘the birds’ singing woke me up’
- b. $[[TP]] = \lambda ev (SING (ev) \wedge AGENT^* (ev, the birds) \wedge (I\tau ev \subseteq i))$.
- c. $[[DP]] = iev (SING (ev) \wedge AGENT^* (ev, the birds) \wedge \tau(Iev) \subseteq i)$.

By examining (19c) and (20c), we observe that they are equivalent as regards the truth-conditions – similarly as in the contrast between *John’s moving the box* and *John’s moving of the box*. Syntactically, the only salient difference appears to be that in (19): the external argument is introduced by the preposition *de* (‘of’), whereas in (20), the same external argument appears as the subject of the infinitive clause and is responsible for agreement. For our purposes, this difference can be overlooked, but it could easily be captured by treating this alternation in terms of a Voice specification: [PASS] for (19) and [ACT] for (20).⁸

Thus, we suggest that it is the [ACT]-specification which will make the system merge T, rather than n^o, into the structure; thus, hosted at the Spec TP, the external argument can check/value its nominative Case. Hence, this minimal difference between (19) and (20) is represented by the star at the agent role, which means that the construction is active. Although they are truth-conditionally equivalent, the prediction is that they are discursively different; in particular, the mixed-type should have an “active” flavor.

For the last type of infinitive, the non-finite T is valued as [\pm TENSE]. First, we should re-empathize that we are not in front of a new morphological type: both verbal and mixed infinitives are verbs; that is, semantically, they denote sets of events; morphologically, they are composed by the same morphemes / functional heads. The difference relies on the upper projection, which is D for mixed infinitives.

As for verbal infinitives, we take to represent this class infinitives occurring with auxiliary verbs (including modals and aspectual auxiliaries), as in (21), and infinitives appearing in ECM-contexts, as in (22). Regarding auxiliary verbs⁹, we follow Gonçalves & Costa (2002) on the claim that the element subcategorized by an auxiliary verb must have a verbal nature. On ECM-infinitives, the working hypothesis is that, by allowing the Case-checking at specifier-position, there cannot be any maximal projection acting like a barrier; hence, as in the cases of (prototypical) verbal infinitives, TPs are embedded directly as the complement of the matrix clause.

- (21) a. A secretária vai abrir a loja.
 the secretary goes open-INF the store
 ‘the secretary is going to open the store’
 b. A secretária pode / deve / tem que abrir a loja.
 the secretary can/may / must / have-that open-INF the store
 ‘the secretary can / may / have to open the store’

⁸ A treatment considering that passives and nominalizations are alike is not new. Such a parallel has rendered some event nominals the status of “passive nominalizations” – see Alexiadou (2001) for an overview.

⁹ We are aware that the syntax of the auxiliaries is much more complex than that and involves more factors than we are assuming. In any case, because of scope, we will not approach syntactic issues in this paper. For our purposes, it suffices to pose that auxiliary verbs require a complement that has a “verbal nature” (which means they will be verbs – verbal infinitives in our system) and also that all Portuguese verbs have a TP, which is associated to the realization of *-r*, in the case of infinitives.

- c. A secretária costuma / acaba de abrir a loja.
the secretary uses / finishes open-INF the store
'the secretary uses to open / has just opened the store'
- (22) a. A secretária me fez abrir a loja.
the secretary me made open-INF the store
'the secretary made me open the store'
b. A secretária pediu para mim abrir a loja.
the secretary asked to me open-INF the store
'the secretary asked me to open the store'

In verbal infinitives, tense is valuated, that is, $T_{[\pm TENSE]}$. The basic intuition is that tense locates the event in the timeline with respect to the speech time, represented by “ i_0 ”, by relating it to the reference time, while aspect relates the time of the event with the reference time. The time interval relating to aspect is given by T , and it is interpreted as a free variable – as a pronoun. The present tense is the speech time; past tense presupposes a time interval before the speech time, and future presupposes a time interval after the speech time, as represented in (23). In (24), we give their derivation.

- (23) a. $[[PRESENT]] = i_0$
b. $[[PAST]] = g(i)$ such that $g(i) < i_0$
c. $[[FUTURE]] = g(i)$ such $i_0 < g(i)$
- (24) a. $[[AspP]] = [\lambda i'. \exists ev (\sqrt{ROOT}(ev) \wedge AGENT(ev, x) \wedge \tau(Iev) \subseteq i')]$ $\langle i, t \rangle$.
b. $[[TP]] = [i < i_0 \wedge [\lambda i'. \exists ev (\sqrt{ROOT}(ev) \wedge AGENT(ev, x) \wedge \tau(Iev) \subseteq i') (i)]]$
 $= \exists i [i < i_0 \wedge \exists ev (\sqrt{ROOT}(ev) \wedge AGENT(ev, x) \wedge \tau(Iev) \subseteq i)]$
c. $[[PAST]] = \lambda P [i < i_0 \wedge P(i)]$.

This is an elegant approach to simple sentences. Things get harder in embedded clauses. It is not trivial to keep compositionality while aiming at describing the tense of finite and non-finite complements. In any case, verbal infinitives can trigger two readings, as shown in the examples in (25), one that is compatible with futurate adverbs and one that it is not. We take this as a diagnosis for encoding T as $[\pm TENSE]$ ¹⁰.

- (25) a. Carol mandou André limpar o armário (amanhã).
Carol demanded Andrew clean-INF the locker-room (tomorrow)
'Carol demanded Andrew to clean the locker room (tomorrow)'
b. Carol viu André limpar o armário (*amanhã).
Carol saw Andrew clean-INF the locker-room (*tomorrow)
'Carol saw Andrew clean the locker room (*tomorrow)'
c. A névoa deve cobrir a cidade (amanhã).
the fog must cover-INF the city (tomorrow)
'the fog must cover the city (tomorrow)'

¹⁰ See Katz (2001) for a fine-grained analysis of this matter.

- d. A névoa parece cobrir a cidade (*amanhã).
 the fog seems cover-INF the city (*tomorrow)
 ‘the fog seems to cover the city (*tomorrow)’

Following Bošcović (1996), we claim that the relation between a given (finite) verb and its (infinitival) complement is stated in terms of s-selection, that is, the lexical content of the matrix verbal predicate is mandatory to set the temporal interpretation of the embedded infinitive. Syntactic evidence for this conclusion comes from the data in (25), showing that different syntactic settings – ECM in (a) and (b), and raising in (c) and (d) – cannot be associated to different tense-values.

If T is [–TENSE], then the time variable of the infinitive is bound by the tense from the matrix verb, rendering a simultaneous reading. On the other hand, if T is [+TENSE], the infinitive is futurate in relation to the matrix verb. In this way, our proposal additionally distinguishes epistemic and deontic modals (see Ferreira, 2020): deontic modals are [–TENSE] and epistemic are [+TENSE], as exemplified in (26).

- (26) a. João pôde viajar.
 John could-PERF travel-INF
 ‘John could travel’
 b. João pode viajar.
 John can/may travel-INF
 ‘John can / may travel’

In (26a), the travelling was in the past and it happened – the *actuality entailment* (Hacquard, 2013) –, whereas in (26b) the travelling is futurate with respect to the speech act: (26a) conveys a root interpretation of the modal, whereas (26b) conveys an epistemic one. Ferreira (2020) proposes that epistemic verbs have a covert future operator that, in Portuguese, can be spelled out as the future tense on the modal verb. The epistemic reading of (26b) conveys the same as (27a), where the future inflection is overtly given. Both can be informally captured by (27b).

- (27) a. João poderá viajar.
 John can/may-FUT travel-INF
 ‘John might travel’
 b. [Mod EPIS [T FUTURE [Asp NEUTRAL [VP...]]]]

In this schema, [+TENSE] is then relative to the speech time, whereas [–TENSE] means that the tense of the embedded infinite is bound by the matrix, giving raise to the interpretation that the event happened simultaneously to the event described in the matrix. Thus, (26a) can be schematized as (28).

- (28) [T PAST [Mod ABILITY [Asp NEUTRAL [Voice AGENT (ev, x) [√ROOT (ev)]]]]]

By this system, we can manage not only the tense-relation between the matrix finite verb and its embedded (verbal) infinitives, but also some nuances that can be accounted for if we go beyond the syntactic settings, since there seems to be no tight relation between a given syntactic configuration and the tense valuating in

Portuguese. Both ECM contexts and raising structures can convey different tense readings, and different modal readings (epistemic and capacity, for instance) can select different infinitives, as regards the T value. This fact supports the idea that infinitives must be built in the syntax, jointly with the phrases. In order to show that verbal infinitives denote the same, regardless the syntax they are embedded in, consider the examples in (29).

- (29) a. João deve sair.
 John must leave-INF
 ‘John must leave’
 b. Maria viu João sair.
 Mary saw John leave-INF
 ‘Mary saw John leave’

In (29a), the infinitive clause *João sair* (‘John leave’) is the complement of a modal, whereas in (29b), it is the complement of the (ECM-)verb *viu* (‘see-PAST-PERF’), denoting the event of seeing by Mary. The verbal infinitive in both sentences denote the set of time intervals when John left. The difference is that, in (29b), the event is simultaneous with the seeing, whereas in the epistemic interpretation of (29a), the event of John leaving is futurate with respect to the speaker’s epistemic state. In (29b), the time of the infinitive is bound by the matrix, so the resulting reading is simultaneity, as formalized in (30b). In (29a), the futurate reading is not with respect to the matrix, but to the speech time, which is the time when the hypothesis made by the speaker is uttered, given what (s)he knows in the speech time – formalized in (30a).

- (30) a. PRES MODAL EPIS [$\text{FUTURE } \exists \text{ev } (\sqrt{\text{ROOT}}(\text{ev}) \wedge \text{AGENT}(\text{ev}, \text{x}) \wedge \tau(\text{Iev}) \subseteq \text{i})$]
 b. PAST [$\exists \text{ev}_1 (\sqrt{\text{ROOT}}(\text{ev}_1) \wedge \text{AGENT}(\text{ev}_1, \text{x}) \wedge \text{THEME}(\text{ev}_1, \text{ev}) \wedge \text{ev}_1 \subseteq \text{i}_1 \wedge [\exists \text{ev } (\sqrt{\text{ROOT}}(\text{ev}) \wedge \text{AGENT}(\text{ev}, \text{y}) \wedge \tau(\text{Iev}) \subseteq \text{i}_1)])$].

Thus, we have a uniform morphosemantic analysis of the verbal infinitives. In such an approach, the differences between what we call “verbal infinitives” do not lie on the syntax strictly speaking, i.e., the type of construction relating the finite verb and its infinitive, such as ECM contexts or raising; rather, they rely on certain morpheme guided specifications.

5. Final remarks and further issues

In this paper, we discussed the morphosemantics of aspect and tense in the Portuguese infinitives. At the first part, we argued that all infinitives contain AspP and that its head is featured as neutral (Smith, 1997), against Resende & Pires de Oliveira (2022), for whom Asp ins underspecified. By this new view, we were able to expand the empirical coverage of infinitives, but also offer a fine-grained theoretical proposal.

In the second part, we approached TP and argued for a tree-way system ($T_{[+TENSE]}$, $T_{[-TENSE]}$, $T_{[\]}$), which can be associated to two different syntactic environments (in this case, DP vs. no DP), but not to different syntactic settings (for

instance, raising vs. ECM). As Resende & Pires de Oliveira (2022), we have associated $T_{[]}$ to the mixed infinitive (that is, a structure where a DP introduces the TP) and the tense valuating to verbal infinitives, which are directly introduced as the complement of a verbal layer.

However, because of scope, we left aside some not trivial syntactic issues that await further investigation. One of them has to do with (obligatory) control-contractions – the canonical syntactic setting assigned to infinitives appearing with full verbs, such as *querer* (‘want’), *tentar* (‘try’) and *afirmar* (‘claim’), etc. It should be mentioned that, regardless it is out of the scope of this paper, this is a topic that must be developed properly, in order to measure the full predictive power of the system engendered in the present work, mostly because there has been assumed in the literature (see Bošćović, 1996; Modesto, 2007) that control-contractions involve a (null) CP introducing the infinitive phrase; that is, the infinitive would be neither introduced directly (as verbal infinitives) nor by a DP (as in mixed infinitives). That would add a new ingredient to our typology, both morphosyntactically and semantically.

Additionally, based on these considerations, the proper “Null CP-hypothesis” should be reconsidered: if we can advance an analysis for mixed infinitives (with DPs), we could guess that control constructions could somehow be seen as “mixed” as well. The reasons to suspect that controlled infinitive phrases are somehow nominal are prefigured by Raposo (1987b) and recently approached by Resende (2021). In the light of our system, this is a topic for further research.

It is noteworthy, however, that none of these issues, on their face, are counterevidence for the analysis just proposed. We have discussed in this paper cases where infinitives are introduced by DPs in a non-verbal embedded environment and infinitives that are introduced directly, without any functional projection. Despite its limits, we hope that this paper provides a helpful contribution to the understating of both morphosyntax and semantics of Portuguese infinitives and the interplay of (morpho)syntax and semantics cross-linguistically.

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