

**Cross-linguistic variation in the semantics of temporal adverbial sentences.  
The case of *BEFORE* and *AFTER*-clauses in Karitiana**

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## 1. Introduction

This paper discusses crosslinguistic variation in the semantics of Temporal Adverbial Clauses (hereafter TACs). TACS express a relation between the running time of the eventuality they denote (their Event Time) and the running time of the eventuality denoted by the matrix clause (Sæbø 2019). This relation may be one of overlap, as expressed by the connectives *when* and *while* (1a), but it may also be one of anteriority, as expressed by the connective *before* (1b), or of posteriority, as with English *after* (1c).

- |     |   |              |
|-----|---|--------------|
| (1) | a. [ <sub>MATRIX</sub> <i>Mary sang</i> ] [ <sub>TAC</sub> <i>when/while John danced</i> ]. | OVERLAP      |
|     | b. [ <sub>MATRIX</sub> <i>Mary sang</i> ] [ <sub>TAC</sub> <i>before John danced</i> ].     | ANTERIORITY  |
|     | c. [ <sub>Além</sub> <i>Mary sang</i> ] [ <sub>TAC</sub> <i>after John danced</i> ].        | POSTERIORITY |

In this paper, we will focus on the relations exemplified by the English sentences (1b) and (1c) and we investigate the semantics of *after*- and *before*-clauses in Karitiana, an Amazonian language of the Tupi family. Previous work on the formal semantics of TACS that express anteriority and posteriority relations has been based on languages displaying subordinating conjunctions similar, in their semantics, to English *before* and *after*; therefore, the semantics of event ordering between the TAC and its matrix clause has largely been made dependent on the meaning of these connectives (see Ogihara 1996; Kubota et al 2009; Krifka 2010; Beaver & Condoradvi 2003; a.o.). Karitiana sheds a new light on the characterization of TACS because in this language *before* and *after* relations are expressed, we claim, without temporal connectives comparable to *before* and *after*. Let's consider the sentences (2a) and (2b) below.

- |     |   |
|-----|---|
| (2) | a. [ <i>boroja</i> <i>taso</i> <i>popi</i> <i>byyk</i> ] <i>Ø-na-otam-t</i> <i>João</i><br>[snake        man    kill    BYYK]-ADJ   3-DCL-arrive-NFT   João<br>‘After the men had killed the snakes, João returned home.’ |
|-----|---|

- b. [João        yry     ki] -t       Ø-na-otam-t       Maria.  
      [João       come   KI]-ADJ 3-DCL-arrive-NFT       Maria.  
      ‘Before João came, Maria arrived.’

As we can see in these examples, the items that seem responsible for expressing different temporal relations in the two sentences are the morphemes *byyk* and *ki* in Karitiana; we will show, however, that *byyk* and *ki* cannot be considered temporal connectives similar to English *before/after*. We therefore present the Karitiana facts against the following background question: what are the ingredients that human languages put to use in order to express anteriority and posteriority between event running times? More specifically, how can a language like Karitiana express anteriority and posteriority without the use of Tense or ordering connectives? We compare the realisation of TACs in Karitiana with that of a selected set of languages, and argue what is responsible for expressing anteriority and posteriority relations in Karitiana is aspectual information: *byyk* and *ki* are in fact aspectual markers, which alone are responsible for the interpretation of a posteriority relation (2a) and an anteriority relation (2b), respectively. We conclude that, across languages, the meaning conveyed by *before*- and *after*-clauses is the output of the interaction of a limited number of functional tools, such as aspect, temporal relations between matrix and subordinate clauses and temporal connectives.

The reminder of this paper is organized as follows. In Section 2, we give an overview of the semantics of TACs, by looking at three languages that are representative of cross-linguistic variation. Section 3 introduces the main grammatical properties of Karitiana and of its TACs, and describes the methodology that we adopted for data elicitation. Section 4 focuses on the semantics of Karitiana TACs, zooming in on *after*- and *before*-clauses. Finally, our conclusions are presented in section 5.

## 2. Cross-linguistic variation in TACS: the role of temporal connectives and Tense

In this section, we describe *before*- and *after*-clauses in three typologically distinct languages: Brazilian Portuguese (Indo-European), Japanese (Japonic) and Mandarin Chinese (Sino-Tibetan). The three languages are representative of cross-linguistic variation for the phenomenon under investigation: all of them make use of connectives similar to *before* and *after* to express the relations of anteriority and posteriority between the event times of their matrix and subordinate clauses, but they vary in a significant way as for their use of overt tense in both matrix and subordinate clause.

### 2.1 Temporal connectives and Absolute Tense: Brazilian Portuguese

Brazilian Portuguese (an Indo-European language of the Romance group) makes use of two temporal connectives, *antes* ‘before’ and *depois* ‘after’, to introduce subordinate adverbial clauses. Brazilian Portuguese obligatorily makes use of tense morphology in its matrix clauses, as illustrated in (3); in adverbial clauses, tense is mostly absolute in Brazilian Portuguese, that is, it is anchored to Speech Time (3a).<sup>1</sup> This means that the information conveyed by verbal tense does not tell us anything about the ordering of the

<sup>1</sup> In certain contexts, the past perfective may have a relative interpretation (see Ferreira 2017).

subordinate event relative to the matrix event: the meaning of anteriority and posteriority are essentially encoded in the connectives. And indeed, tense inflection may be optional in subordinate clauses: as shown by the contrast between (3a) and (3b), the main predicate of TACs can have finite inflection (displaying agreement and tense) or be inflected in the infinitive.

- (3) a. O João \*sair/ saiu [antes/depois que Maria chegou].  
the João leave-INF/PFV [after/before that Maria arrive-PFV]  
‘João left after/before Maria arrived.’
- b. João \*sair/saiu [antes/depois de Maria chegar].  
João leave-INF/PFV [after/before of Maria arrive-INF]  
‘João left after/before Maria arrived.’

There is evidence that Brazilian Portuguese temporal connectives do not act as simple functional subordinators, but, just like English *before* and *after*, they have semantic content; in fact, they can express anteriority or posteriority relations also when used as prepositions introducing phrasal constituents (4a) or as general temporal adverbials (4b).

- (4) a. Depois da meia-noite, não há mais ninguém nas ruas.  
after of-the midnight NEG have more nobody on-the streets  
‘After midnight, there is nobody on the streets anymore.’
- b. Naquela época o João morava no Rio, ele foi para outro país depois.  
at-that time the João live.IMP in-the Rio, he went to other country after  
‘At that time, João lived in Rio, he left for another country afterwards.’

## 2.2 Temporal connectives and Relative Tense: Japanese

Japanese (Japonic) displays tense inflection both in the matrix and in the subordinate adverbial clause; contrary to Brazilian Portuguese, however, the subordinate tense is not anchored to the Utterance time, but it is interpreted relative to the matrix tense. In other words, in the sentence (5a) below, the Present (Non Past) Tense in the subordinate is not evaluated as the present of the speaker, but it is used to express that the running time of the event denoted by the predicate (*Ken arrive*) is non-past with respect to the running time of the event of the matrix (*Ana leave*), because the matrix one happens before it. Conversely, past tense on the subordinate verb means that the event it denotes is past with respect to the one of the matrix one, as the matrix one happened after it. Anteriority and posteriority are enforced also by two dedicated temporal connectives, respectively *mae-ni* and *ato-ni*.

- (5) a. [Ken-ga ku-ru mae-ni] Anna-ga kaet-ta.  
[Ken-nom arrive-NPAST before-in] Anna-NOM leave-PAST  
‘Anna left before Ken arrived.’ (Kubota et al 2012)
- b. [Ken-ga ki-ta ato-ni] Anna-ga kaet-ta.  
[Ken-NOM arrive-PAST after-in] Anna-NOM leave-PAST  
‘Anna left after Ken arrived.’ (Kubota et al 2012)

In Japanese as well, these two temporal connectives can express relational notions with NPs or with respect to spatial location (6).

- (6) *Ie no mae-ni otera ga arimasu*  
 house GEN before-in temple SUBJ exist  
 ‘There is a temple in front of the house.’

### 2.3 Temporal connectives and no overt Tense: Mandarin Chinese

As it is well-known, the third language we consider here, Mandarin Chinese (Sinitic), has no morphological Tense at all, therefore Tense is not marked in the matrix nor in the subordinate clause. Temporal relations can be expressed, in this case as well, by means of the two temporal connectives *zhiqian* ‘before’ and *yihou* ‘after’ alone.

- (7) a. *Chū guó zhīqián Lìqián hé nǚpéngyou fēnshǒu le*  
 leave country before Liqian with girlfriend break-up ASP  
 ‘Before he went abroad, Liqian broke up with his girlfriend.’  
 b. *Huìyì jiéshù yǐhòu wǒ dǎsuàn qù kāfēidiàn*  
 meeting end after I plan go coffee.shop  
 ‘I’m planning to go to the coffee shop after the meeting ends.’

The connectors *zhiqian* ‘before’ and *yihou* ‘after’ have a full semantic content, as they can be also used as prepositions introducing NPs (as in (8) below), and may also have a general meaning of “before/afterwards”.

- (8) *èrzhàn yǐhòu, shìjiè jiù bù yīyàng le*  
 WW2 after, world then NEG similar ASP  
 ‘After the Second World War, the world was different.’

### 2.4 Summing up

The picture of the role of Tense and temporal connectives in the expression of *before*- and *after*-TACs is given in Table 1.

Language	Tense	Connectives
English	Absolute	before/after
Brazilian Portuguese	Absolute / ∅	antes/depois
Japanese	Relative	mae/ato
Mandarin	∅	zhiqian/yihou

As we can see, these four languages vary with respect to the functional tools they use to convey temporal ordering information. While Tense information is not relevant in English or Brazilian Portuguese, it becomes relevant in Japanese, where tense encodes the dependency relation between the matrix and the subordinate clause; in all four languages, however, the temporal ordering seems to be necessarily conveyed in the semantics of dedicated connectives; it seems that we can safely say, then, that in languages where TACs are introduced by temporal connectives, the construction itself, *via* the connective, contributes information about the relative temporal order of the eventualities in the matrix and subordinate clause. As a consequence, studies focusing on these sets of languages have analysed event ordering as largely dependent on the lexical content of the connectives and, when relevant, of the embedded tense (Krifka 2010; Ogiwara 1996; Kubota et al 2009, a.o.). What about a language that lacks both connectives and relative tense? This is the case of Karitiana, which we discuss in this paper.<sup>2</sup>

### 3. About Karitiana

Karitiana is a Tupian language, spoken in the state of Rondônia in Northwestern Brazil. Although some Karitianas have moved to the city and may not have been taken into account in the censi, the number of speakers is believed to be approximately 400, spread over 5 villages within the Karitiana Reservation (Storto & Rocha 2018). Karitiana is a rare language in the sense that it is the only surviving member of the Arikem branch of the Tupi stock.

#### 3.1. Tense and Aspect in Karitiana

Contrary to other better known Tupian languages like Guarani, which does not display any (overt) Tense inflection (Tonhauser 2011; Thomas 2014), Karitiana obligatorily displays overt Tense morphology in its matrix clauses (9), where tense morphology realises a FUTure vs. NON-FUTure tense system (Storto 1999; Müller & Ferreira 2020): the Tense morpheme for the future is opposed to a non-future one, which is used to express reference to temporal coordinates present or past with respect to utterance time. Besides tense, Karitiana matrix clauses are obligatorily overtly marked for sentence mood (such as the declarative mood in (9)), and may also be optionally (overtly) marked for Aspect and Evidentiality, as in (10).

- (9) a. *Ivan Ø-naka-monoxa-t*      *Sandra*  
       Ivan 3-DCL-hug-NFT      Sandra  
       ‘Ivan hugs hugs/hugged/\*will hug Sandra.’

- b. *Ivan Ø-naka-monoxa-j*      *Sandra*  
       Ivan 3-DCL-hug-NFT      Sandra  
       ‘Ivan \*hugs/\*hugged/will hug Sandra.’

- (10) *Taso*    *Ø-naka-m-’a-t*                      *tyka-t*                      *sary-t*                      *gooj*  
       man    3-DECL-CAUS-cop-NFT           IMPF-NFUT    EV-NFUT           canoe

<sup>2</sup> See also Bonhnemeyer (1998) on Yukatec Maya.

‘O homem está fazendo canoa (disseram).’

(Alexandre, 2016, p. 78)

As opposed to matrix clauses, however, Karitiana subordinate clauses bear no agreement, tense or mood morphology (Storto 1999); also, they are obligatorily verb final and bear no complementizers or other types of connectives (11-13). Nevertheless, aspectual (12) and evidential (13) markers may optionally occur in these clauses.

- (11) *Yn Ø-na-aka-t i-soot-t [Joao tata]-ty*  
 I 3S-DCL-cop-NFT PART-see-ADJ [Joao walk]-OBL  
 ‘I see/saw João walking.’/ ‘I see/saw that João walks’
- (12) *Y-py-so ’oot-yn [Inacio ’ep opĩ tyka ]-ty*  
 1sg-ASP-see-NFT Inacio tree cut PROG]-OBL  
 ‘I saw that Inacio was cutting a tree.’ (Storto 2012)
- (13) *Ø-pyry-hadn-t José [Porto Velho pip Maria tat saryt]<y>ty*  
 3-AS-say-NFT José [Porto Velho to Maria go EVD]<EPV>-OBL  
 ‘José says that Maria, they say, went to Porto Velho.’ (Vivanco 2007)

### 3.2 Karitiana TACS

In this section, we tackle the question of how Karitiana expresses the relations of anteriority and posteriority between matrix and temporal adverbial clauses. While we rely on previous work on tense and subordination in Karitiana (Storto 1995, 2012; Muller & Ferreira 2020; Vivanco 2021), this is, to our knowledge, the first study focusing on *before*- and *after*-clauses in the language. Our claim is that Karitiana TACS make use of the Perfect Aspect to express *before*- and *after* meanings. Specifically, we claim that *after*-meanings (‘A after B’) are generated by use of the affirmative perfect aspect; whereas *before*-meanings (‘A before B’) are generated by the use of a negative perfect aspect. Before we discuss the general properties of these two types of adverbial clauses, we wish to make a brief methodological point about the way in which empirical data has been collected; we will then present evidence that shows that the morphemes *byyk* and *ki* are to be considered aspectual markers.

#### 3.2.1 On data elicitation.

Unless otherwise stated, this work is anchored on data elicited during fieldwork sessions by both authors. The metalanguage used with our Karitiana informants was Brazilian Portuguese; elicitation methods were based on Matthewson (2004) and involved the steps described below.

1. truth-value judgment 1: The consultants were presented with an explicit context in the form of a situation set within a more general framework (a feast at the village, a hunting hike, etc). Then, they were presented to a Karitiana sentence, and asked whether that sentence described the situation depicted by the context.
2. cross-check: If the sentence was judged true, they were subsequently asked to translate it into Portuguese.

3. amendment: If the sentence did not fit the context, they were asked to produce a sentence that they considered appropriate to describe it
4. truth value judgement 2: We then presented the same context with the amended sentence and asked again for a judgment (recycle steps 2 - 3).

### 3.2.2 *Byyk* and *Ki* as aspectual markers

Sentences (14) and (15) illustrate the use of *byyk* to express the posteriority relation; whereas sentences (16) and (17) illustrate the use of *ki* to express the anteriority relation. Below the translation that makes use of the canonical English temporal connectives, we present a tentative paraphrase that seems to us closer to the literal meaning of the Karitiana sentences.<sup>3</sup>

- (14) [boroja taso popi byyk]-t                      Ø-na-otam-t                      João.  
[snake man kill PERF]-ADJ                      3-DCL-arrive-NFT                      João  
'João returned home after the men had killed the snakes.'  
Tentative paraphrase: 'The men having killed the snakes, João returned (home).'
- (15) [Luiz terek.terek byyk]-t,                      Ø-na-terek.terek-t him.boryt-ty pip Byyj.  
[Luiz dance PERF]-ADJ                      3-DCL-dance-NFT game.party-OBL at chief  
'After Luiz danced, the chief danced at the game feast.'  
Tentative paraphrase: 'Luiz having danced, the chief danced.'
- (16) [João yry ki]-t                      Ø-na-otam-t                      Maria.  
[João come NEG.PERF]-ADJ                      3P-DCL-arrive-NFT                      Maria.  
'Maria arrived before João came.' (Guimarães, 2018)  
Tentative paraphrase: 'João not having come, Maria arrived.'
- (17) [Diretor otam ki]-t                      Ø-na-amejn-t                      owã  
Principal arrive NEG.PERF-ADJ                      3-DCL-enter-NFT                      kid  
'Before the principal arrived, the kids entered (the school).'  
Tentative paraphrase: 'The principal not having arrived, the kids entered [the school].'

In this section we support our claim that the items *byyk* and *ki*, which show up at the right edge of *before*- and *after*-subordinate clauses in Karitiana, are perfect aspectual auxiliaries and not adverbial connectives (Rocha 2022). First, we show that *byyk* and *ki* occur in matrix clauses in canonical aspectual auxiliary position, that is, on the right of the main verb according to the canonical structure of the verbal complex in Karitiana (18).

(18) PERSON - SENTENCE.MOOD - VERBAL.HEAD - ASPECTUAL.AUXILIARY - TENSE

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<sup>3</sup> Our Karitiana informants used to translate these sentences in Portuguese using the connectives *antes* and *depois*, cf. section 2.1.

Sentences exemplifying (18) are given in (20) to (22) below. All these sentences present a very regular paradigm, in the sense that their aspectual markers all occur in exactly the same position: the progressive and prospective auxiliaries in (19)-(20) occur at exactly the same position as *byyk* and *ki* in (21)-(22). Next, all these aspectual markers may be inflected for future (-i) and for non-future (-t) tense in main clauses.

(19) PROGRESSIVE ASPECT

<i>agora</i>	<i>taso</i>	<i>Ø-naka-m- 'a</i>	<i>tyka-t</i>	<i>gooj</i>
now	man	3-DECL-CAUS-make	PROG-NFT	canoe
'The man is building a canoe now.'				(Carvalho, 2009, p. 25)

(20) PROSPECTIVE ASPECT

<i>jonso</i>	<i>Ø-na-amang&lt;a&gt;</i>	<i>pasagng&lt;a&gt;-t</i>	<i>gok.</i>
woman	3-DECL-plant<EV>	PROSP-NFUT	manioc
'The woman was going to plant manioc'			

(21) *byyk* – PERFECT ASPECT

<i>Jonso</i>	<i>Ø-na-amang</i>	<i>byyk-i</i>	<i>dibm</i>	<i>gok</i>
woman	3-DECL-plant	PERF-FUT	tomorrow	manioc
'The woman will have planted (all) the manioc by tomorrow.'				
'The woman will have finished planting the manioc by tomorrow.'				

(22) *ki* – NEGATIVE PERFECT ASPECT

<i>Jonso</i>	<i>Ø-na-amangã</i>	<i>ki-t</i>	<i>gok</i>	<i>koot</i>
woman	3-DECL-plant	NEG.PERF-NFT	manioc	yesterday
'Yesterday the woman had not (yet) planted (all) the manioc.'				

We now show that *byyk* and *ki* are, more specifically, *perfect* aspect markers, that is, that they express anteriority with respect to a Reference/Topic Time (cf. Klein 1995). Consider sentence (21), repeated below as (23), which is inflected for future tense. The event denoted by the sentence is that of <planting manioc> and its Reference or Topic Time is [tomorrow], i.e. the day after UT. The relations between the Utterance Time, the Event Time and the Topic Time expressed by sentence (23) are depicted in (24), which represents the timeline of the relevant time interval. The event of planting manioc – the Event Time – is described as occurring before tomorrow – the Topic Time. Thus, we may conclude that *byyk* expresses perfect aspect and contributes both meanings of temporal precedence and of boundedness.

(23)	<i>Jonso</i>	<i>Ø-na-amang</i>	<i>byyk-i</i>	<i>dibm</i>	<i>gok</i>
	woman	3-DECL-plant	PERF-FUT	tomorrow	manioc
'The woman will have planted (all) the manioc by tomorrow.'					

(24)	[UT] -----[ planting (all) the manioc] -----tomorrow-----→
	UtteranceT                      Event Time                      TopicT

Let us now turn to the meaning of *byyk* in temporal subordinate clauses, as in sentence (25). The subordinate clause event of <the men killing the snakes> occurs before the



subordinate's implicit Topic Time, and the matrix clause event of <João coming> occurs strictly after the subordinate event. This sequence of time intervals is depicted in (26).

- (25) [boroja taso popi byyk]-t Ø-na-otam-t João.  
[snake man kill PERF]-ADJ 3-DCL-come-NFT João  
'After the men had killed the snakes João arrived.'  
Tentative paraphrase: 'The men having killed the snakes, João arrived.'

- (26) <The men killing the snakes>-----[TopT]-----<João arriving>-----UT-----→  
<Event Time<sub>TAC</sub>>-----Topic Time-----<EvT<sub>Matrix</sub>>-----UT-----→

Just as *byyk*, *ki* is a perfect auxiliary with an extra meaning component, which is negation: *ki* also contributes a negative meaning. Let's consider sentence (27); the context and the offered translations make it very clear that the interval corresponding to the event description of planting manioc strictly precedes the Topic Time ('tomorrow'); consequently, the aspectual auxiliary *ki* contributes a perfect aspectual meaning. The timeline depicted in (28) illustrates the sequence of time intervals involved in the interpretation of the sentence. Sentence (29) and its corresponding timeline in (30) make a similar point. Thus, in sentences with the auxiliary *ki*, the Perfect contributes the meaning of a bounded interval that strictly precedes a TopT, whereas negation denies the occurrence of the event within that interval.

- (27) Jonso Ø-na-amangã ki-j gok dibm  
woman 3- DECL-plant NEG.PERF-FUT manioc tomorrow  
'The woman will not have planted all the manioc tomorrow'  
'The woman will not finish planting (all) the manioc by tomorrow.'

- (28) [UT] -----[ planting manioc ] -----tomorrow-----→  
UT Event Time TopT

- (29) myhin-t myhin-t Ø-na-otam ki-t jonso koot  
one-ADJ.one-ADJ 3-DCL-arrive NEG.PERF-NFT woman yesterday  
'The women have not arrived one by one yesterday.'

- (30) [women arriving]-----yesterday-----[UT]-----→  
Event Time TopT UT

When used in TACs, *ki* consistently expresses a *before*-clause meaning. The before meaning is generated by negating the occurrence of the event denoted by the temporal clause until a certain Topic Time. In sentence (31), the combination of the perfect and the negation yields the interpretation that the subordinate event has not occurred until TopT, which is the time at which the director was expected to arrive. The interpretation is then that at TopT the event of the kids entering the school occurs and the director's arrival has not occurred: that is, the kids enter the school before the director's (expected) arrival. As we will see in more detail in section 4.2, it is important to note that, as it is the case for *before*-clauses in general, the event denoted by the subordinate may or may not take place at TopT, although in most cases there is an expectation for it to take place. The order of the

time intervals involved in the realization of the events denoted by sentence (31) is depicted in (32).

Context: *The kids are waiting for the principal in front of the school at the village, but he doesn't show up in due time, so the kids enter the school anyway.*

- (31) [Diretor otam ki]-t Ø-na-amejn-t owã  
 [principal arrive NEG.PERF]-ADJ 3-DCL-enter-NFT kid  
 'Before the principal arrived, the kids entered (the school).'  
Tentative paraphrase: 'The principal not having arrived, the kids entered [the school].'

- (32) -----[principal's arriving] -----TopT<sub>TAC</sub>-----[kids entering] -----UT---→  
 EvTime<sub>TAC</sub> EvTime<sub>MATRIX</sub>

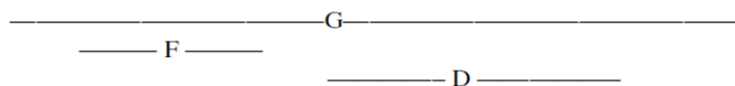
#### 4. The semantics of *before*- and *after*-clauses in Karitiana

##### 4.1 *After*-clauses

Our semantics for *byyk* as an aspectual marker makes the prediction that Karitiana *after*-clauses differ in meaning from English *after*-clauses and possibly from *after*-clauses of other languages that make use of *after*-like connectives. More specifically, we show that, while in English the running time of the event denoted by *after*-clauses may overlap with the running time of the event denoted by its matrix clause, in Karitiana the running time of the event denoted by *after*-clauses cannot overlap with the one of the event denoted by the matrix.

Consider the scenario represented in (33) (Anscombe 1964; Beaver & Condoravdi 2003). There are three characters involved in a dancing scene: Ginger, Fred and Delores. Ginger starts dancing first and goes on dancing on stage throughout the whole time interval. At a certain point, Fred starts dancing, but he stops before Delores starts dancing; then Delores goes off the stage before the end of Ginger's routine.

- (33) The dancing scenario  
 ○ G = Ginger dances;  
 ○ F = Fred dances;  
 ○ D = Delores dances.



Beaver and Codoravdi (2003) report that in the dancing scenario, English speakers provide the truth-value judgments described in (34-36). In such a scenario, where Fred starts dancing after Ginger starts, 'Fred dances after Ginger dances' is considered adequate, in spite of the fact that Ginger goes on dancing well after Fred drops out of the stage. 'Ginger dances after Delores dances' is also true in the situation in which Ginger goes on dancing after Delores stops. However, sentence (36), which claims that Fred dances after Delores dances, comes out false in this scenario. The dancing scenario leads us to the conclusion

In section 3.2, we have shown that the *before*-meaning is obtained by means of the perfect negative marker *ki* in Karitiana (see Rocha 2008; Muller & Donazzan 2024). This is illustrated by sentence (31), repeated as (42) below. In this section, we show that Karitiana *before*-clauses differ in the inferences they trigger from English *before*-clauses. They also possibly differ from *before*-clauses in other languages that make use of *before*-like

There is, nonetheless, disagreement in the literature on whether this implication is part of the *semantics* of the *before*-clauses or rather arises as result of a pragmatic inference. According to Ogihara (1995) and Condoravdi (2010), the meaning of *before*-sentences is intensional since it involves truth in reasonable alternative worlds, as stated in (47).

- (47) The statement [A before B] is true iff A holds for a time before the earliest time at which B becomes true in *reasonable alternative worlds*.

Krifka (2010), on the other hand, offers a pragmatic account for the veridical inference of *before*-sentences. He claims that *before*-sentences give rise to an implicature that the *before*-clause event is highly likely because they “... are often used in cases in which the truth of the *before*-clause is already established in the common ground [...]”. Thus, “If [A before B] implicates that B is highly likely or even true, then this is tantamount to saying that [A before B] implicates that B became true after A became true (Krifka 2010: 920).”

In Karitiana the *before*-clause is truth-conditionally non-veridical, since it explicitly asserts that the event it denotes by the predicate has not occurred (see section 3.2). This is supposed to add a distinct pragmatic effect, that is, in Karitiana, it is not-B that is expected to hold by default, contrary to English *before*-clauses. The prediction that we should further check in future work is that, in Karitiana *before*-sentences, the implications are expected to go the other way around, and to strongly favour non-veridical interpretations: it is the non-occurrence of the *before*-clause event that is implicated by the whole sentence.

Vanrell & Vivanco (2023) offer an alternative explanation for the semantics of *before*-clauses in Karitiana. According to their analysis, *ki* is just a negative particle that is restricted to embedded clauses, i.e. a counterpart to *padni*, analyzed as the negative particle for matrix clauses by the authors, as illustrated in (48) by the contrast between the negative matrix clause, which uses *padni*, and the negative relative clause, which makes use of *ki*. According to the authors, the negation of the embedded clause (the *before*-clause) would raise an implicature that the event it denotes precedes that of the main clause. They add, without further arguments, that the adverbial marking suffix *-t*, which occurs in all adjunct clauses in Karitiana, strengthens its temporal implication and connects both clauses, suggesting a meaning similar to ‘when’.

- (48) 

<i>Jõnso</i>	<i>ti'y</i>	<i>'y</i>	<i>ki</i>	<i>i-engy</i>	<i>padni</i> .
woman	food	eat	NEG.PERF	3-vomit	NEG

(Storto, 2007)  
 ‘The woman who hadn’t eaten the food didn’t vomit.’

We, nevertheless, have evidence that *ki* is allowed in matrix clauses where it is inflected for tense and mood, as in sentence (23), repeated below as (49). We also argue that if *ki* were only subordinate clause negation, it should also be able to generate *while*, *when*, *after*, *because* and other possible negative adverbial clause readings, which it doesn’t. It consistently generates a *before*-meaning.

- (49) 

<i>Jonso</i>	<i>Ø-na-amangã</i>	<i>ki-t</i>	<i>gok</i>	<i>koot</i>
woman	3-DCL-plant	NEG.PERF-NFT	manioc	yesterday

 ‘Yesterday the woman had not (yet) planted (all) the manioc.’

## 5. Conclusions

We have compared the semantics of *before*- and *after*-clauses in Karitiana to what is known about their semantics in English and possibly in other like languages. According to the philosophical literature, *before*- and *after*-clauses have distinct quantificational force, and thus are expected to present some distinct empirical differences (Anscombe 1964). First,

English *before*-clauses but not *after*-clauses, support *transitivity inferences*. We have shown that this is not the case for Karitiana, where both clauses support transitivity inferences because of their similar aspectual semantics. Second, in English, the complement of *after* is veridical while that of *before* is not. This is also true for Karitiana, as *before*-clauses contain an explicit negative operator. Nevertheless, Karitiana *before*-clauses, as opposed to English *before*-clauses, trigger non-veridicality inferences.

As a tentative cross-linguistic generalization we may state that precedence and subsequence relations are realized across languages in different ways, but resort to a limited number of functional tools, such as connectives, relative tense, aspect, aspectual verbs, and context (Bohnenmeyer 1998). Thus, only a cognitive universal is possible here, which claims that all languages have a linguistic way of expressing *before*- and *after*-meanings. Nevertheless, it is worth stressing that the parameters involved are limited.

## 6. List of abbreviations

1S	First person singular	3	Third person
NOM	Nominative	OBL	Oblique
GEN	Genitive	SUBJ	Subject marker
POS	Postposition	DCL	Declarative
ADJ	Adjunct	COP	Copula
EV	Epenthetic vowel	NFUT	Non-future tense
NPAS	Non-past tense	FUT	Future tense
PAS	Past tense	PERF	Perfect aspect
NEG.PERF	Negative perfect aspect	PROG	Progressive aspect
PROSP	Prospective aspect	IMPF	Imperfective aspect
PFV	Perfective aspect	PART	Participle
CAUS	Causative	TopT	Topic time
UT	Utterance time	EvTime	Event time

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