



The relevance of future vs. non-future languages for the understanding of the role of tense in counterfactuals sentences

A relevância de línguas do sistema futuro vs. não-futuro para se entender o papel do tempo gramatical em sentenças contrafactuais

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Abstract: A sentence is counterfactual when it implicates that the proposition it denotes is false (IATRIDOU, 2000). It has been noted that the past tense behaves non-canonically in counterfactual constructions in several unrelated languages, since it does not seem to convey pastness. A similar behavior is found in Karitiana, a Tupian language that belongs to the future vs. non-future system. It is the non-future that is used non-canonically in counterfactuals in Karitiana. Some authors posit that the past tense has a modal interpretation in counterfactual environments (JAMES, 1982; FLEISCHMAN, 1989; IATRIDOU, 2000; PALMER, 2001; van LINDEN; VERSTRAETE; 2008). Others posit that tense is just tense in these environments (IPPOLITO, 2002, 2003; ARREGUI, 2005). The goal of this paper is to describe the semantics of counterfactual sentences in Karitiana, and show that the language supports the Tense as Tense approach to counterfactuals. Thus, bringing data from Karitiana becomes relevant because, besides giving a description of counterfactuality in the language, it brings data from a typologically distinct language to bear on the choice between two important theoretical approaches.

Keywords: counterfactuality; tense; past; indigenous languages.

Resumo: Uma sentença é contrafactual quando implica que a proposição que ela denota é falsa (IATRIDOU, 2000). Tem sido observado, em diversas línguas de famílias não relacionadas, que a morfologia de passado usada em sentenças contrafactuais possui um comportamento inesperado. Ela parece não expressar a noção de tempo passado. Observamos um comportamento semelhante em uma língua que não têm morfologia de passado, mas cujo sistema temporal expressa a distinção futuro *vs.* não-futuro – o Karitiana, língua Tupi. Nessa língua, a morfologia de não-futuro, quando usada em sentenças contrafactuais, não expressa ausência de futuridade. Alguns autores consideram que em contrafactuais o tempo gramatical tem uma interpretação modal (JAMES, 1982; FLEISCHMAN, 1989; IATRIDOU, 2000; PALMER, 2001; van LINDEN; VERSTRAETE; 2008). Outros consideram que o tempo mantém sua interpretação temporal (IPPOLITO, 2002, 2003; ARREGUI, 2005). O objetivo deste artigo é avaliar essas duas teorias frente ao comportamento das construções contrafactuais em Karitiana. O artigo mostra que os dados de uma língua do sistema temporal futuro *vs.* não-futuro contribuem para a avaliação de qual das duas abordagens mencionadas acima oferece a proposta mais plausível para o papel da flexão temporal em sentenças contrafactuais. A primeira abordagem funciona exclusivamente para línguas que possuem a morfologia de passado. Por outro lado, a segunda abordagem é capaz de fornecer uma explicação para o comportamento distinto da flexão temporal tanto em línguas do sistema futuro *vs.* não-futuro, como em línguas do sistema passado *vs.* presente *vs.* futuro. Assim, a discussão da língua Karitiana é relevante porque, além de aprofundar a descrição das sentenças contrafactuais nessa língua, traz dados de uma língua tipologicamente distinta das línguas mais discutidas pela literatura para dentro da discussão teórica sobre a contrafactualidade. Esses dados desafiam o poder explanatório das principais abordagens teóricas e apoiam uma delas.

Palavras-chave: contrafactualidade; tempo; passado; línguas indígenas.

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1 Introduction

This paper focuses on the role of tense in counterfactual sentences. More specifically, it investigates the semantics of tense in counterfactual sentences of a future *vs.* non-future oriented language – Karitiana (Tupi stock). This language is spoken by around 400 people in Northwestern Amazonia. It is considered an endangered language due to the small number of its speakers. The paper has two goals: (i) understand how

counterfactuality works in Karitiana; and (ii) show how data from this language contributes to the debate of which is the best approach to the role of tense in counterfactuals.

A sentence is considered counterfactual (henceforth CF) when the proposition it expresses goes against actual facts (IATRIDOU, 2000, p. 231). For instance, sentence (1) conveys that the speaker does not have a car, and sentence (2) conveys that the situations of ‘John be smart’ and of ‘he be rich’ don’t hold. This article does not tackle all counterfactual structures in Karitiana, but focuses on counterfactual conditionals such as (2).

(1) I wish I had a car. (IATRIDOU, 2000, p. 231)

(2) If John were smart, he would be rich. (IATRIDOU, 2000, p. 232)

A cross-linguistic investigation by van Linden and Verstraete (2008) shows that few languages have a morpheme that is restricted to counterfactuality. Most languages they investigated (22 out of 32) use the past tense to express counterfactuality. This is observed in languages from distinct language families such as English, French, Modern Greek, Papago (Uto-Aztecan), Proto-Uto-Aztecan, Cree (Algoquian), Tonga and Haya (Bantu), Chipewyan (Athabaskan), Garo (Tibeto-Burman), Japanese and Korean, among others. In all such languages, the past tense does not show its usual behavior when in counterfactual environments. English illustrates this fact. Its past tense is canonically used with past oriented adverbials, as illustrated in (3a), but it cannot co-occur with them in counterfactuals (see (3b)). On the other hand, past tense morphology cannot co-occur with future oriented adverbials, as in (4a), but it can in CFs, as in (4b). This unexpected interaction with adverbials shows that the past tense does not seem convey pastness in counterfactual environments. For this reason, Iatridou (2000) calls the occurrence of the past in these environments *fake*.

(3) a. John smoked **yesterday**.

b. *I wish John smoked **yesterday**. (IATRIDOU, 2000, p. 248)

(4) a. *John **left** tomorrow.

b. If he **left tomorrow**, he **would** get there **next week**. (IATRIDOU, 2000, p. 248)

Iatridou (2000) also points out that in languages that mark the distinction between perfective *vs.* imperfective aspect; it is the imperfective aspect that is used in counterfactual constructions, as illustrated by the Portuguese (5) and the Hindi (6) sentences below. We will only deal with imperfective aspect tangentially, since it is not the focus of this paper.

(5) Se Maria fosse inteligente, ela seria rica.
 if Maria were-IMPF intelligent she would.be rich
 ‘If John were smart, he would be rich.’

(6) agar Ram phal khaa-taa ho-taa
 if Ram fruit ate-HAB/IPFV be-HAB/IPFV
 ‘If Ram had if been eating fruit habitually,...’ (BHATT, 1999, p. 2)

The literature on CFs is based on the study of languages that belong to past *vs.* non-past or past *vs.* present *vs.* future tense systems (JAMES, 1982; FLEISCHMANN, 1989; IATRIDOU, 2000; PALMER, 2001; IPPOLITO, 2002, 2003; ARREGUI, 2005, van LINDEN; VERSTRAETE, 2008). Such languages, make a distinction between the past (7) and the present (8). Depending on the theoretical account, these languages may or may not distinguish between the present (8) and the future (9), since the future may be treated as modality.

(7) Brazil played France last year.

(8) Brazil plays France every year/tomorrow.

(9) Brazil will play France tomorrow.

This paper brings data from a future *vs.* non-future oriented language to contribute to this debate. Karitiana is such language. The inclusion of a future *vs.* non-future language is relevant, It brings data from a typologically distinct tense oriented language that challenges the explanatory power of the existing theoretical approaches. In future *vs.* non-future systems, non-future tense may refer to both the present and the past (see (10a)); whereas the future tense refers only to the future (see (10b)). We show that the non-canonical behavior of tense in CFs also occurs in Karitiana. This is illustrated by (10c) below. Notice that

the non-future morphology *-t* co-occurs with the future oriented adverb *dibm* ('tomorrow') in this construction.

- (10) a. Sara Ø-na-aka-t akan i-aka-t koot/ka'abm.¹
 Sara 3-DECL-COP-NFUT village NMLZ-COP-ABS today/yesterday²
 'Sara is/was in the village today/yesterday.'³
- b. Sara Ø-na-aka-j akan i-aka-t dibm.
 Sara 3-DECL-COP-FUT village NMLZ-COP-ABS tomorrow
 'Sara will be in the village tomorrow.'
- c. [dinheiro tyyt y-akiip] [**dibm** yjxa-jyt-ahy-t yjxa cerveja-ty]
 [money have 1SG-COP] [**tomorrow** 1PL.INCL-CF-drink-NFUT 1PL.INCL beer-OBL]
 '[If I had money], [we would drink beer tomorrow]'

There are two main approaches to the non-canonical behavior of tense and its contribution in CF environments. The **Past as Modal Approach** claims that tense in counterfactuals does not have a temporal interpretation, but a modal one (JAMES, 1982; FLEISCHMAN, 1989; IATRIDOU, 2000; PALMER, 2001; van LINDEN; VERSTRAETE, 2008). The other approach – the **Past as Tense Approach** – claims that tense does have a temporal interpretation in counterfactual environments (IPPOLITO, 2002, 2003; ARREGUI, 2005). None of the **Past as Modal** approaches yield a satisfactory analysis of tense in counterfactual environments for future *vs.* non-future languages. These proposals end up being too narrow and work exclusively for past *vs.* non-past languages. The **Past as Tense** proposals, on the other hand, seem capable of also accounting for the distinguished behavior of tense in future *vs.* non-future languages. We show that this approach works for the non-future tense in Karitiana CFs. Thus, the behavior of tense in Karitiana supports the **Past as Tense** approach.

¹ For simplicity, we will only present sentences in the declarative mood (see STORTO, 2002 and FERREIRA, 2017a, b for mood in Karitiana).

² Glosses for the Karitiana examples follow *The Leipzig Glossing Rules*. Other conventions used: ANA = anaphoric; CF = counterfactual; EV.REP = reportive evidential; HAB = habitual; POS = postposition; PROSP = prospective and YNQ = yes/no question.

³ The translations presented are our translations of the Portuguese ones given to or by the consultant. Other interpretations may very well be available.

The *corpus* analyzed for this research contains sixty-six conditional Karitiana sentences. Six of these sentences come from the literature. Forty of them are counterfactual conditionals collected by one of the authors (L. F. Ferreira). The other twenty sentences are non-counterfactual sentences also collected by the same author. The methodology used was contextualized data elicitation.⁴

This paper is organized as follows. Section 2 describes the basics of Karitiana grammar. Section 3 presents the adopted framework for the analysis of tense (3.1), and applies it to Kartiana (3.2). In section 4, we discuss the semantics of counterfactual conditionals (4.1) and their behavior in Karitiana (4.2). Section 5 deals with the behavior of tense in counterfactuals (5.1) and argues that Karitiana counterfactuals behave in a similarly to other better known languages (5.2). In section 6, we show that Karitiana challenges the **Past as Modal** approach (6.1) and supports the **Past as Tense** approach (6.2). Finally, section 7 summarizes our conclusions.

2 The Karitiana language

In this section, we lay down the basic facts about Karitiana grammar. They will be relevant for the understanding of the data and of its analysis. Karitiana is a partially described Amazonian language. The Karitiana people have their reservation in Rondônia, western Amazonia, around 100 kilometers from the city of Porto Velho. Research on Karitiana was first pursued by David and Rachel Landin, who worked out the basics of the syntax and of the phonology of the language.⁵ Luciana Storto has been working on it since 1992.⁶ Other works on Karitiana worth mentioning are Everett (2006), Coutinho-Silva (2008), Silva (2011) and Vivanco (2014) on aspects of the syntax and semantics of the language.

⁴ This method developed by Matthewson (2004) especially for fieldwork on semantics of indigenous languages and was developed by Sanchez-Mendes (2014).

⁵ Landin, D. (1983, 1984, 1988); Landin, R. (1982, 1987, 1989); Landin and Landin (1973).

⁶ Storto (1994, 1996, 2001, 2002, 2003, 2008, 2010, 2011, 2012a,b, 2013, 2014), Storto and Demolin (2005), Storto and Thomas (2012).

Work within the framework of Formal Semantics has been pursued by Müller, Sanchez-Mendes, Carvalho, Alexandre and Ferreira.⁷

Karitiana is a complement-head order language. Complements precede postpositions, as illustrated by the Prepositional Phrase *2020 pip* ('to the hotel') in (11). Subordinate clauses normally precede main clauses, as illustrated in (12). And, within subordinate clauses, arguments precede the verb (12).

- (11) [2020 pip] yn Ø-naka-m-'a-j ambi.
 [2020 POS] 1SG 3-DECL-CAUS-to.do-FUT house.
 'In 2020, I will build a house.' (CARVALHO, 2010, p. 36)

- (12) [Ti'y Marcelo 'y tykiri] Ø-na-pa'ira-t João
 [food Marcelo eat when] 3-DECL-get.angry-NFUT João
 'When Marcelo ate the food, João got angry.' (STORTO, 2012, p. 4)

As we have seen, Karitiana is verb final in subordinate clauses. In matrix clauses the word order is mostly verb second (see STORTO, 1999, 2003). This pattern may be observed in sentences (11) and (12) above and (13) below. Matrix clauses are inflected for person agreement, tense and mood, whereas subordinate clauses lack these inflections. Note that in sentence (12) the verb 'y 'eat' is bare and occupies the final position of the clause; whereas in sentence (13), the same verb shows up in the second position with the presence of inflectional morphemes.

- (13) Õwã Ø-naka-'y tyka-t kinda'o
 child 3-DECL-eat IPFV-NFUT fruit
 'The child is eating fruit.' (CARVALHO, 2009, p. 15)

Karitiana is an ergative language: intransitive verbs agree with their only argument (see (14)); transitive verbs agree with their theme arguments (see (15)).

⁷ Müller (2009, 2012), Müller and Negrão (2012), Sanchez-Mendes (2006, 2008, 2012a,b, 2014a, b, 2015, 2016), Müller and Sanchez-Mendes (2008, 2010), Sanchez-Mendes and Müller (2007), Carvalho (2009, 2010), Alexandre (2016), Ferreira (2017a, b).

- (14) Y-ta-opiso-t yn.
 1SG-DECL-listen-NFUT 1SG
 ‘I listened.’
- (15) An y-ta-oky-j yn.
 2SG 1SG-DECL-kill-FUT 1SG
 ‘You will kill me.’ (STORTO, 1999, p. 157)

Intransitive verbs occur in copula constructions in most contexts, as illustrated by sentence (16).

- (16) i Ø-na-aka-t i-kysep-Ø.
 3 3-DECL-COP-NFUT NMLZ-jump-ABS
 ‘He is jumps.’ (EVERETT, 2006, p. 240)

Karitiana Noun Phrases (NPs) always occur bare. They have number-neutral denotations, i.e., they denote both singular and plural entities. Singular *vs.* plural and definite *vs.* indefinite distinctions are not morphologically marked. Sentence (17) illustrates the inexistence of a singular *vs.* plural and of a definite *vs.* indefinite contrast. Because of the absence of (in)definiteness marking and of the absence of number marking in the language, a sentence may be truly uttered in a vast array of situations, as the ones listed below sentence (18).

- (17) Taso Ø-naka-ʔy-t myhin-t/sypom-t boroja.
 man 3-DECL-eat-NFUT one-ADV /two-ADV snake
 ‘A/the man/men ate one/two snake(s).’
- (18) Taso Ø-naka-ot-Ø ese.
 man 3-DECL-bring-NFUT water
 ‘Men brought water.’

True in the following situations:

- ✓ One (definite or indefinite) man brought some (definite or indefinite) quantity of water.
- ✓ Some (definite or indefinite) men brought some (definite or indefinite) quantity of water.
- ✓ It is usually the men who carry water.

The most productive sentential types or moods in Karitiana are the following: declarative, assertive, interrogative and negative.⁸ We only describe the so called declarative mood, which is the one that occurs in conditional sentences, besides occurring in affirmative declarative sentences. It is marked by the morpheme *-na(ka)-* and its variants, as illustrated in (19).

- (19) taso Ø-**na**-oky-t boroja.
 man 3-DECL-to.kill-NFUT snake
 ‘The man killed the snake.’ (STORTO, 1999, p. 153)

In this section, we have presented the core grammatical properties of Karitiana. The next section will present the theoretical background on tense and aspect adopted in this paper.

3 Tense and aspect

This section presents the concepts of **tense** and **aspect** adopted by this article. It also describes how these categories work in Karitiana. The section is organized in two subsections. The first subsection presents the background adopted for dealing with tense and aspect. For the treatment of tense in counterfactuals, we adopt the **Tense as Deixis Approach** (PARTEE, 1973, KRATZER, 1998). We do not deal formally with aspect in counterfactuals, but only comment on its behavior briefly. Further work is needed in order to make any stronger claims about the behavior of aspect in Karitiana counterfactuals. The second subsection presents the morphology and semantics of tense and aspect in Karitiana. As already mentioned, Karitiana is a future *vs.* non-future language. We follow Matthewson (2005) and Jóhannsdóttir and Mathewson (2007) and analyze its non-future tense – the tense used in Karitiana counterfactuals - not as being ambiguous, but as having a semantics that is not specified for the distinction between past and present.

⁸ See Storto (2002) and Ferreira (2017a) for a better picture of the phenomena.

3.1 The theoretical approach to tense and aspect

According to Klein (1994), **time** is a notional category. Eventualities are described by human languages as occurring before, after or concomitantly to the Utterance Time. These notions are referred to as **past, present** and **future**. Languages may mark them on their verbs through morphological means. Tense, on the other hand, is a linguistic category. It is anchored to the Utterance Time. Klein (1994) defines tense as a relation between two time intervals: the moment the sentence is uttered and the moment or interval referred to by the topic of the conversation (KLEIN, 1994). The first one is called Utterance Time (henceforth UttT) and the latter is called Topic Time (henceforth TopT). Within this framework, the past tense conveys that TopT is located before UT ($TopT < UttT$). Sentence (20) below illustrates this. Its TopT (*in the 90's*) is located before its UttT. The present tense conveys that UttT is included in or equal to TopT ($TopT \geq UttT$). Sentence (21) is marked for present tense, and has its TopT (*now*) equal to UttT. English has no future tense inflection. Nevertheless, sentence (22) shows that the modal *will* combined to the main verb – conveys that its TopT (*when she grows up*) is located after UttT ($TopT > UttT$).

(20) This actor **was** handsome in the 90's.

(21) Joan **is** tired now.

(22) This girl **will be** beautiful when she grows up.

The semantics of the future is controversial. Prior (1957, 1967), Dowty (1982) and Klein (1994), among others, analyze it as tense. On the other hand, Partee (1973), Kratzer (1998), and Abusch (1998) claim that English, for instance, has no future tense. For them, the future is conveyed through a combination of the present tense and the modal *will*. Enç (1987) specifically claims that the future is a modal operator and scopes over possible worlds.

Klein's framework also allows a precise treatment of grammatical aspect. According to it, grammatical aspect expresses a relation between the Topic Time and the Situation Time (SitT). The SitT refers to the internal duration of the eventuality. This way, **perfective** aspect is defined as expressing that the Topic Time includes the Situation Time ($TopT \supseteq SitT$). Sentence (23) is marked for perfective aspect and its

TopT (*this morning*) includes the event time of ‘Mary brush her teeth’. **Imperfective** aspect, on the other hand, is defined as expressing that the Situation Time fully includes the Topic Time SitTTopT. Sentence (24) illustrates imperfectivity – its SitT (*Mary brush her teeth*) fully includes its TopT (*when Joan come in*).

(23) Mary brushed her teeth this morning⁹

(24) Mary was brushing her teeth when Joan came in.

In this section, we are specifically interested in the semantics of the past, since this is the tense that is related to counterfactuality in many languages. Within Formal Semantics, there are two main proposals that compositionally account for the semantics of tense. The first proposal claims that tense denotes an **existential quantifier** over time intervals (PRIOR, 1957; 1967). The other proposal claims that tense is **referential** and behaves like a **pronoun** (PARTEE, 1973; KRATZER, 1998). We will adopt the latter proposal.

The tense as pronoun analysis for the past is traditionally presented as in (25a) below. The formula in (25a) states that the denotation of the past tense operator will only be defined if there is a time interval - $g(i)$ - before a contextually given time – tc . If this condition is met, the operator PAST has the value $g(i)$, which is contextually established. Within Klein’s (1994) framework, $g(i)$ corresponds to the Topic Time and tc corresponds to the Utterance Time. We translate (25a) to Klein’s framework in (25b). In order to illustrate this analysis, we apply it to sentence (20), repeated below as (26).

- (25) a. $[[\text{PAST}]]_{g,c}$ = defined only if $g(i) < tc$; if defined, then $[[\text{PAST}]]_{g,c} = g(i)$.¹⁰
 b. $[[\text{PAST}]]_{g,c}$ = defined only if Topic Time < Utterance Time; if defined, then $[[\text{PAST}]]_{g,c} = \text{Topic Time}$.

⁹ $A \supset B = A$ contains B.

¹⁰ g : an assignment function, which attributes a salient contextual value to i ;

c : context. g is applied to different indexes because there may be more than one value to be attributed by g .

(26) This actor **was** handsome in the 90's.

[[PAST]]_{g,c} = defined only if *in the 90's* < *Utterance Time*; if defined, then
[[PAST]]_{g,c} = *in the 90's*.

In words: The operator [[PAST]]_{g,c} is defined only if *in the 90's* is located before the Utterance Time; if so, then the operator gets the value *in the 90's*

This section presented a theoretical framework that assumes tense and aspect express relations between two time intervals (REICHENBACH, 1947; KLEIN, 1994). Within this framework, we have adopted an approach which claims that tense behaves like a pronoun (PARTEE, 1973; KRATZER, 1998). The next section makes use of Klein's framework to describe the behavior of tense and aspect in Karitiana.

3.2 Tense and aspect in Karitiana

3.2.1 Tense

As mentioned before Karitiana is a future vs. non-future language. This language marks only two tenses, which occur as suffixes to the verbal root: future and non-future (STORTO, 1999; 2002). The future tense morphemes are *-i* and *-j*. The first occurs when the verbal root ends in a consonant, as in (27a) and the latter when it ends in a vowel, as in (27b).

- (27) a. Aj-taka-tar-i ajxa
 2SG-DECL-leave-FUT 2SG
 'You (plural) will leave.'
- b. João Ø-na-oky-j boroja
 João 3-DECL-kill-FUT snake
 'João will kill the snake'

The non-future tense morphemes are *-* or *-t*. The first one occurs when the verbal root ends in a consonant, as in (28a), and the second one when it ends in a vowel, as in (28b). When inflected for the non-future tense, the sentence conveys both past and present as in (28a-b).

- (28) a. Gokyp Ø-naka-hyr̃j-Ø omenda
 Gokyp 3-DECL-sing-NFUT noon
 ‘Gokyp sang at noon.’
 ‘Gokyp sings at noon.’
- b. João Ø-na-oky-t boroja
 João 3-DECL-kill-NFUT snake
 ‘João kills snakes.’
 ‘João killed the snake.’

How should the semantic contribution of non-future tense be accounted for? One could posit that the non-future tense is ambiguous. This analysis is stated in (29) below. According to it, there would be two identical non-future morphemes, call them non-future-1 and non-future-2. One of them would carry the semantics of the present tense and the other one would carry the semantics of the past tense. Context would force the selection of one or the other morpheme.

- (29) NFUT-1 : TopT < UttT PAST
 NFUT-2 : TopT ⊆ UttT PRESENT

Optionally, one could posit that the non-future tense is not ambiguous, but that its meaning encompasses both the present and the past, as stated in (30). Which proposal is more adequate: the ambiguity analysis or the analysis in which the non-future morpheme is vague between the present and the past?

- (30) NFUT : TopT ≤ UttT PAST + PRESENT

Matthewson (2005) analyzes tense in St’át’imcets (Lillooet Salish – a British Columbian native language of the Salish family). According to her, this language has an overt tense morpheme that means future and a covert tense morpheme that means both past and present. Thus, the author faces the same problem we do. Based on data such as that of sentences (31a-b), she concludes that the semantics of the non-future tense is not ambiguous, but covers both the present and the past. The fact that the non-future morpheme is simultaneously compatible with both a past-time and a present-time event supports her claim. If the non-

future tense were ambiguous, the event of vomiting described in (31b) should be interpreted either as past or as present. Since they are not, the author concludes that the semantics of the non-future tense is unspecified between past and present. Jóhannsdóttir and Mathewson (2007) analyze the same fact in Gitxsan and come to the same conclusion.

- (31) a. Wat'k' ha i snek'wnuk'wa7-lhkálh-a
 vomit YNQ DET.PL friend.PL-1PL.POSS-DET
 'Our friends thow up?'
- b. wat'k' kw s-Theresa múta7 s-Charlie
 vomit DET NMLZ -Theresaand NMLZ- Charlie
 'Theresa and Charlie threw up/ are throwing up.'

CONTEXT: Your white friends Theresa, Charlie and Marie got drunk at the bar. You are looking after them because you don't drink. Theresa threw up at 10pm; Marie hasn't thrown up at all. Just as Charlie is in the process of throwing up, another friend calls and asks you (a). You can answer with (b).

(MATTHEWSON, 2005, p. 21)

We will follow these authors and assume that the non-future tense in Karitiana is also unspecified and covers both the present and the past.¹¹ Following Partee's (1973) approach - the 'Tense as Pronoun' approach - we propose that the semantics of the non-future tense is the one in (32). The definition in (32a) states that the *NFUT*-operator will only be defined if there is a time interval $g(i)$ (the Topic Time) before or equal to tc (the Utterance Time). If this condition is met, *NFUT* is defined and gets the value of $g(i)$. This definition is restated within Klein's (1994) framework in (32b).

- (32) a. $[[NFUT]]_{g,c}$ = defined only if $g(2) \leq tc$; if defined, then $[[NFUT]]_{g,c} = g(2)$.
 b. $[[NFUT]]_{TT,context}$ = defined only if Topic Time \leq Utterance Time; if defined, then $[[NFUT]]_{TT,context} =$ Topic Time.

In this section, we have described how tense works in Karitiana. Then, we have argued, following Matthewson (2005) and Mathewson and Jóhannsdóttir (2007), that the non-future tense has a semantics

¹¹ Müller and Bertucci (2012) argue for the indeterminacy of the non-future in Karitiana.

that encompasses both the present and the past. We have formalized its semantics within the tense as pronoun approach. The next section presents the main aspectual categories in Karitiana

3.2.2 Aspect

The semantics of the category of aspect in Karitiana is still in need of further investigation. It was first studied by Storto (2002). The basic aspectual distinctions, such as imperfective, perfect and prospective are marked by auxiliaries. Perfective aspect is expressed by the absence of overt marking. The most frequent and better understood aspectual morphemes are listed on the table 1 below, based on Storto (2002), Carvalho (2009), Müller (2018) and Rocha (2018).

TABLE 1 – Aspectual morphemes in Karitiana

	ASPECTUAL MORPHEMES
Imperfective	ty-ka/ ty-syp/ ty-so
	(an)dyk
perfective	
prospective	pasagng<ã>
perfect	byyk
Karitiana aspectual morphemes.	

Based on: Storto (2002), Carvalho (2009), Müller (2018) and Rocha (2018)

The auxiliaries *tyka/tysyp/tyso* mark imperfective/progressive aspect (CARVALHO, 2009). Rocha (2018) claims that the auxiliaries *byyk* e *pasagngã* are perfect and prospective markers respectively. Examples of imperfective markers are given in (33)-(34); whereas examples of the perfect and of the prospective are given in (35-36).

- (33) Maria Ø-naka-'y **tyka-t** kinda'o.
 Maria 3-DECL-comer **IPFV-NFUT** fruta
 'Maria está comendo fruta (em movimento).' (CARVALHO, 2009)

- (34) y-ta-oty **andyk-i yn.**
 1SG-DECL-banhar IPFV-FUT 1SG
 ‘Estou indo me banhar.’ (STORTO, 2002)
- (35) jonso Ø-na-amang **byyk-i** gok.
 woman 3- DECL-plant PRF-FUT manioc
 ‘The woman will have planted manioc.’ (ROCHA, 2018)
- (36) jonso Ø-na-amang<a> **pasangng<a>-t** gok.
 mulher 3-DECL-plant PROSP-NFUT manioc
 ‘The woman was going to plant manioc’. (ROCHA, 2018)

The expression of perfectivity is achieved by the absence of any overt marking, as illustrated in (37) (MÜLLER, 2018). Nevertheless, we still do not know whether the absence of overt marking can also mean imperfectivity. If so, this might be a case of neutral aspect. The aspectual semantics of the bare future marker hasn't been investigated yet. An example is given in (38).

- (37) Cláudio Ø-na-aka-t i-pykyn<a>t ko'ot.
 Claudio 3-DECL-COP-NFUT NMLZ-correr-ABS ontem
 ‘Cláudio correu ontem.’
- (38) Cláudio Ø-na-aka-t i-pykyn<a>j dibm.
 Claudio 3-DECL-COP-FUT NMLZ-correr-ABS ontem
 ‘Cláudio vai correr amanhã.’

In this section, we have summarized the essentials of tense and aspect in Karitiana. As mentioned before, no formal account will be given for aspect. Next, we turn to the discussion of counterfactual conditionals.

4 Counterfactual conditionals

The purpose of this section is to describe counterfactual conditionals. According to von Stechow (2011, p. 1515), conditional sentences talk about a possible scenario that may or may not be the case and describe what else is the case in that scenario. Although there are

many ways to convey conditional meanings, the *if... (then)...* construction is the canonical one. This construction is made up of two clauses, an *if-clause* and a *(then)-clause*. The *if-clause* sets up the possible scenario; whereas the *(then)-clause* asserts what is the case in that scenario. For instance, sentence (39) asserts that it is the case that Mary lets the dog out in the scenarios that the dog barks. Sentence (40) exemplifies a non-CF conditional in Karitiana. Similarly, it states that it is the case that I drink in the scenarios that I eat. The *if-clause* is traditionally called the *antecedent*, *premise* or *protasis*, and the *then-clause* is called the *consequent* or *apodosis*. We will adopt the terms *antecedent* and *consequent* to refer to the *if-clause* and the *then-(clause)* respectively.

(39) If the dog barks, Mary lets him out.

(40) Y-ta-ahy-t yn, y-pyt'y tykiri
 1SG-DECL-drink-NFUT 1SG, 1SG-eat if/when
 'I drink, if/when I eat'

There are two main types of conditionals: indicative conditionals and subjunctive or counterfactual conditionals. An *indicative conditional*, such as (41a), conveys that the truth of the antecedent is an open issue. Therefore, it is not possible to know whether Grijpstra played or not his drums. On the other hand, *subjunctive/counterfactual conditionals*, such as (41b), convey that the antecedent is false. As a consequence, we understand that Grijpstra has not played his drums when we hear (41b). Example (42) illustrates these two kinds of conditionals in Karitiana. (42a) is an *indicative conditional* since its antecedent is an open issue. Thus, it is not possible to guess whether the hearer fishes or not. On the other hand, (42b) illustrates a *subjunctive/counterfactual conditional* since it implies that the antecedent is false. Thus, we understand that the hearer did not arrive.

- (41) a. If Grijpstra played his drums, de Gier played his flute. INDICATIVE
 b. If Grijpstra had played his drums, de Gier would have played his flute.
 subjunctive/counterfactual (von FINTEL, 2011, p. 1518)

- (42) a. A-ohit tykiri, a-ta-aka-j pongyp
 2_{SG}-fish if/when, 2-DECL-COP-FUT quiet
 ‘If/when you fish, you be quiet’
- b. yn jy-soko’i-t eremby, a-otam-am
 1_{SG} CF -tie-NEUT hammock 2_{SG}-arrive-PFV
 ‘I would tie the hammock if you had arrived.’ (STORTO, 2002)

The terminology indicative/subjunctive conditional is misleading. Depending on the language, there is no need for a conditional to be in the indicative mood in order to convey that the truth of its antecedent is to be taken as an open issue. Similarly, there may be no need for a conditional to be in the subjunctive mood to convey that its antecedent is to be taken as false. Besides, many languages have no indicative/subjunctive mood distinction. For this reason, we will use the terms ‘non-counterfactual’ (non-CF) to refer to conditionals like (42a) and ‘counterfactual’ (CF) to refer to conditionals like (42b). Note that *if... then...* constructions are not the only kind of CF construction. Wishes, for instance, also convey counterfactuality and implicate that the proposition expressed by the subordinate clauses is false, as in (01) repeated below as (43). Sentence (43) implicates that the speaker does not have a car. This paper focuses only on CF conditionals, such as (41b) and (42b).

- (43) I wish I had a car. (IATRIDOU, 2000, p. 231)

Formal Semantics traditionally assumes that counterfactuality is a pragmatic implicature (ANDERSON, 1951; STALNAKER, 1975; JAMES, 1982; IATRIDOU, 2000; van LINDEN; VERSTRAETE, 2008). As shown by Anderson (1951), the counterfactual implication can be cancelled, as in (44) below. If the falsity of the proposition expressed by the antecedent were an entailment or a presupposition, sentence (44) would be contradictory. Since it is not, the literature concludes that counterfactuality is a pragmatic implicature.

- (44) If Jones had taken arsenic, he would have shown just exactly those symptoms which he does in fact show. So, it is likely that he took arsenic.

A second argument that supports the claim that counterfactuality is a pragmatic implicature comes from Stalnaker (1975). If counterfactuality were a presupposition or an entailment, stating the falsity of p should sound redundant. So the possibility of asserting the falsity of p , as in in (45), without sounding redundant, supports the claim that counterfactuality is an implicature.

- (45) If the butler had done it, we would have found blood on the kitchen knife. The knife was clean; therefore, the butler did not do it.

Up to this point, we have described in general terms what conditionals and counterfactuals are. The remaining of this section has two subsections. The first one discusses how to formalize the semantics of conditionals. The second section explores the behavior of counterfactual conditionals in Karitiana.

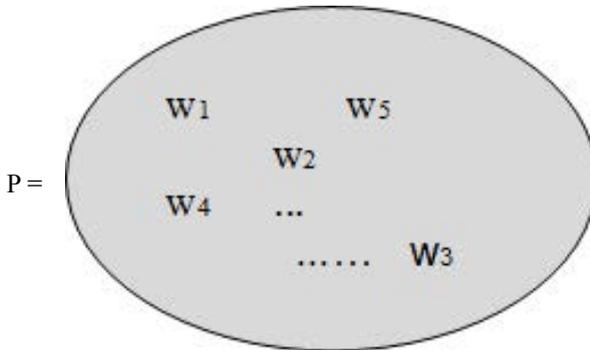
4.1 A formal approach to counterfactual conditionals

This section focuses on the meaning of counterfactual conditional sentences. Within Formal Semantics, sentences denote propositions, which may be conceived as their meanings (CHIERCHIA, 2000). Within possible worlds semantics, each proposition may be identified with the set of possible worlds in which it is true (KRATZER, 2012). We illustrate these concepts by discussing the meaning of sentence (46a) below. Its meaning can be identified with the set of possible worlds P , which encompasses all possible worlds (w_1, w_2, w_3, \dots) in which *John be in Rio* is true. There are many of such worlds: w_1 may be a possible world in which John is in Rio, loves Tess and his mother is Carla; w_2 may be a possible world in which John is in Rio, loves Tess, and his mother is Mary; and w_3 may be a possible world in which John is in Rio, loves Mark, and his mother is Mary.

- (46) a. John is in Rio.
 b. $P = \{w: \text{John be in Rio in } w\}$

In words: P is the set that includes all worlds w such that John is in Rio in w .

c.

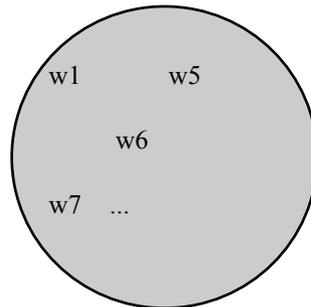
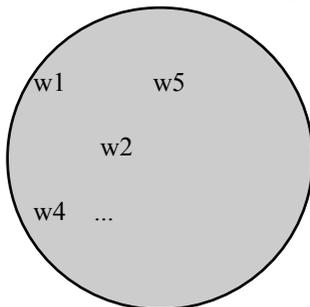


The two clauses of a conditional sentence correspond to two propositions that can each be identified with a set of possible worlds. In the CF conditional in (47a) below, the antecedent expresses the proposition *John be in Rio* and the consequent expresses the proposition *John be visiting Copacabana Beach*. The first proposition can be identified with the set P, as in (46) above, repeated below in (47b,c). The second proposition can be identified with the set Q that includes all the possible worlds in which *John be visiting Copacabana Beach* is true (see 47b-c). In (47b-c), the meanings of the antecedent (*p*) and of its consequent (*q*) are described separately. How should the meaning of conditionals like *If p then q* be accounted for?

(47) a. [If John were in Rio], [he would be visiting Copacabana Beach].

b. $P = \{w: \text{John be in Rio in } w\}$ $Q = \{w: \text{John be visiting Copacabana beach in } w\}$

c. $P =$ $Q =$



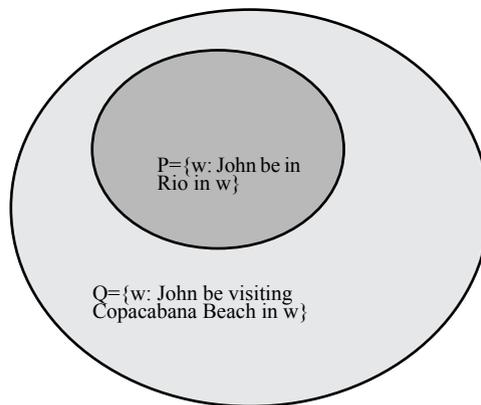
For Kratzer (2012), a conditional sentence such as (47a) is true if every possible world in which its antecedent - *John be in Rio* - is true, is also a possible world in which its consequent - *John be visiting Copacabana Beach* - is true. In other words, every world in set P is also a world in set Q. In set theory, this means that set Q includes or is equal to set P, as stated in (48a-b) and illustrated in (48c) for sentence (47a).

(48) a $P \subseteq Q$

b. $\{w: \text{John be in Rio in } w\} \subseteq \{w: \text{John be visiting Copacabana Beach in } w\}$

In words: The set of worlds P, in which John be in Rio, is included in the set of worlds Q, in which John be visiting Copacabana Beach.

c.

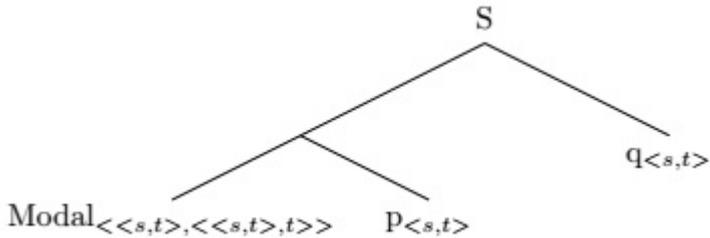


An interesting question arises of what in CF-sentences is responsible for compositionally combining the meaning of the antecedent with the meaning of the consequent in order to yield the meaning of the whole conditional. The literature on counterfactuals posits the existence of a (covert) modal operator responsible for relating the two propositions (or their corresponding sets of possible set of worlds). This operator is defined in (49). The general semantic structure of the operation that derives CF sentence meanings is represented in (50).

(49) $[[\text{Modal}_{CF}]] = \lambda p_{\langle s,t \rangle} . \lambda q_{\langle s,t \rangle} . \{w \mid p(w) = 1\} \subseteq \{w \mid q(w) = 1\}$

In words: The modal counterfactual operator takes both the set P denoted by the antecedent p and the set Q denoted by the consequent q as its arguments and yields the set of worlds such that P is included in Q.

(50)

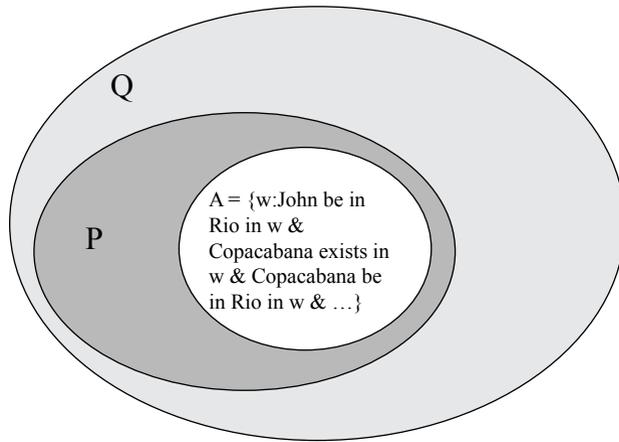


This analysis is still in need of some adjustments. Take sentence (47a) repeated below as (51). Note that there will be possible worlds in which John is in Rio, but Copacabana Beach does not exist; possible worlds in which John is in Rio, but Copacabana Beach is in another state or country; and so on. Therefore, not all possible worlds are worlds in which John is in Rio are possible worlds in which he is visiting Copacabana Beach.

(51) If John were in Rio, he would be visiting Copacabana Beach.

What we need then is to take into account is only the subset of the set of worlds in which John is in Rio - the possible worlds that are very similar to the one the speaker is in (so that Copacabana Beach exists, Copacabana Beach is in RJ, etc.). Thus, for a conditional sentence like (51) to be true, the set of possible worlds denoted by the antecedent must be very similar to the world in which the speaker utters the sentence. Besides this, we just want the similar worlds in which John is in Rio. We will label this set *A* and illustrate it in (52) below. For reasons of simplicity, we will leave this restriction aside in our formalizations.

(52)



This subsection presented how Formal Semantics analyzes counterfactual conditionals. We have seen that the meaning of a conditional sentence in possible worlds semantics is that the set of worlds in which the antecedent is true is a subset of the set of worlds in which the consequent is true. CFs have a modal operator that is responsible for taking the antecedent and the consequent propositions and yielding the meaning of the whole conditional sentence. The next subsection will discuss counterfactuals in Karitiana.

4.2 Counterfactual conditionals in Karitiana

Subordinate clauses in Karitiana bear no tense or mood morphology (STORTO, 2012). Since the antecedent of the counterfactual is a subordinate clause, its verb will never bear tense or mood morphology in this language. As a pilot study, we first analyzed a small *corpus* composed of six counterfactual conditionals obtained from previous works by other authors. All those counterfactual conditionals had something in common: the verb in the consequent clause always bore the prefix *jỹ-* and non-future tense, as illustrated in (53-55).

- (53) [yn Ø-**jỹ**-sokoĩ-t eremby] [a-otam-am]
 [1SG 3-CF-tie-NFUT hammock] [2SG-arrive-PFV]
 [‘I would tie the hammock] [if you had arrived’] (STORTO, 2002, p. 158)

- (54) [João Ø-**jỹ**-so'oot saryt-Ø pikom-ty] [haka i-kokotop]
 [João 3-CF-see EV.REP -NFUT monkey-OBL] [here 3-pass]
 ['João would see the monkey] [if it passed through here']
 (ALEXANDRE, 2016, p. 57)
- (55) [João Ø-**jỹ**-pykynñn saryt-Ø ombaky-ty] [gopip ta-'akip]
 [joão 3-CF-run EV.REP -NFUT jaguar-OBL] [forest 3.ANA-COP]
 ['João would run from the jaguar] [if it were in the forest']
 (ALEXANDRE, 2016, p. 58)

Through the analysis of these CF conditionals, Ferreira (2017a, b) raised the hypothesis that, for this type of conditional, the use of the prefix *jỹ-* and of non-future tense was mandatory. In order to test this hypothesis, sixty conditionals were collected with native speakers through contextualized data elicitation. From those sixty, twenty were non-CF conditionals and forty were CF conditionals. All twenty non-CF conditionals had their consequent verbs marked for the future tense and did not bear the modal prefix *jỹ-* as illustrated below (56-58). They always bore the declarative mood.

- (56) [kinda sypo a-namang tykiri] [Ø-naka-tat-**i** 'ep]
 [thing seed 2SG-plant when] [3-DECL-go-FUT tree]
 ['If you plant a seed,] [it turns into a tree']
- (57) [a-ohit tykiri] [a-taka-**j** pongyp]
 [2SG-fish when] [2SG-DECL-FUT quiet]
 ['When you fish,] [you remain quiet']
- (58) ['e yryt tykiri] [Ø-naka-kerep-**i** ese]
 [rain arrive when] [3-DECL-grow-FUT river]
 ['When it rains] [the river floods.']

On the other hand, all forty CF conditionals had the verbs on their consequent clauses marked for the non-future tense, and bore the prefix *jỹ-*, as illustrated below in (59-60).

- (59) [carro tyyt y-aki-p] [yn a-jy-atot-Ø]
 [car have 1SG-COP-ALL] [1SG 2SG-CF-take-NFUT]
 [‘If I had a car,] [I would take you’]

CONTEXT: The speaker does not have a car and will not give the hearer a ride.

- (60) [a-taktagi-p a-pypyn-p] [y-jy-pyhit-Ø se-pip a-pomã-ty]
 [2SG-swim-ALL 2SG-know-ALL] [1SG-CF-let-NFUT river-POS 2SG-play-OBL]
 [‘If you knew how to swim,] [I would let you play in the river’]

CONTEXT: The son does not know how to swim, therefore, his father (the speaker) does not let him play in the river.

Storto (2002) analyzes *jỹ-* as a conditional mood prefix. Ferreira (2017a, b) argues that it cannot be a conditional prefix because it does not occur in all conditional sentences. The prefix *jỹ-* is restricted to CF conditionals. Thus, one could account for a CF sentence such as (53) in two ways. One way would be to assume that *jỹ-* is an overt realization of the modal operator present in conditional sentences (see section 4.1). Its semantics would then be the one formalized in (61) below. Its semantic structure within this analysis would be the one in (62) below.

- (61) $[[j\tilde{y}]] = \lambda p \langle s, t \rangle . \lambda q \langle s, t \rangle . \text{for each } P, P \subseteq Q$

Such that:

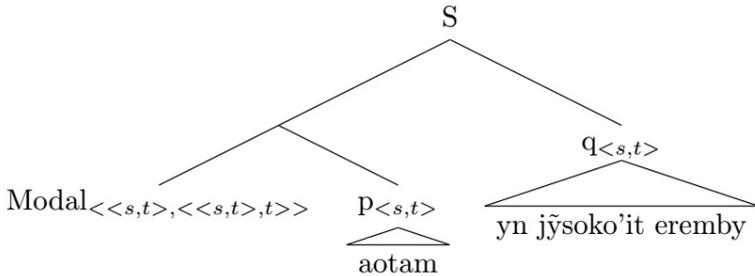
$$P = \{w \mid p(w) = 1\}^{12}$$

$$Q = \{w \mid q(w) = 1\}$$

In words: the prefix *jy* takes the propositions *p* and *q* as its arguments and yields a proposition that denotes a set of worlds such that all worlds in *P* are included in the set *Q*.

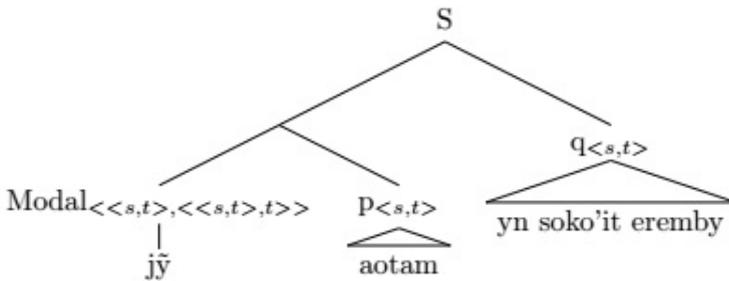
¹² The set *P* includes all worlds *w* such that the proposition *p* is true in *w*.

(62)



A second possible analysis could posit that the modal operator is not *jỹ-*, but some covert operator. The semantic structure of the sentence under this analysis would then be the one in (63). Since *jỹ-* prefixes the verbal root in the same morphological position of other modal operators in this language, Ferreira (2017a, b) analyzes it as a modal operator as well. We follow his work and adopt the first analysis here.

(63)



Remember that verbs are inflected for non-future tense in all CF consequents. The main focus of this paper is not on the role of *jỹ-*, but on the role of the non-future tense in CF conditionals. To our knowledge, the behavior of the non-future tense and its semantic contribution in CF environments has not been investigated yet. The next section discusses the role of tense in CFs. Then it shows how the Karitiana data contribute to the debate.

5 Tense (and aspect) in counterfactual environments

The purpose of this section is to show that tense in CFs does not have its ordinary behavior and that the same happens in Karitiana. We also comment on the behavior of aspect in Karitiana CFs. Nevertheless, we do not make definite claim about it. We still need more thorough data in order to get the full picture of the behavior of aspect in Karitiana CFs. This section is divided into two subsections. The first subsection focuses on the non-canonic behavior of the past tense in CF environments, and shows that its usual semantics seems to be missing. The second section discusses the Karitiana data and concludes that something similar occurs in the language.

5.1 The behavior of tense (and aspect) in CF environments

This section discusses the relation between the past tense and counterfactuality and tangentially comments on the relation between imperfective aspect and counterfactuality. It presents two different approaches to the analysis of tense in CF environments.

In English, and in many other languages, CF sentences occur in the past tense, as illustrated in (64a) below. If some other tense is used, the sentence loses its CF interpretation as in (64b) below. The use of past tense forms calls attention because CF sentences such as (64a) do not seem to convey pastness. The occurrence of the past tense with the adverb *now* in (65) yields ungrammaticality. This is the reason why Iatridou (2000) calls the use of the past tense in CF environments *fake past*.

- (64) a. If John **had** his car now, he **would give** us a ride (now). CF
 b. If John **has** his car now, he **will give** us a ride. NON-CF

- (65) ??#John **was** tired **now**.

As mentioned in the introduction, the use of the past tense in CF sentences does not only occur in English, but in several other languages (JAMES, 1982; van LINDEN; VERSTRAETE, 2008). One could think that the languages that have this in common inherited it from a common ancestor. This is not the case since many of these languages are not related. In their comparative study, van Linden and Verstraete (2008) examine a sample of 43 languages from different families. They find a

strong correlation between past tense morphology and counterfactuality (70% of the cases).

Iatridou (2000) analyzes counterfactuals in English, French and Modern Greek and concludes that the past tense is its main ingredient. This is true even for languages that have subjunctive mood morphology. French, for example, made use of the past subjunctive in CF environments. However, the language has now lost its past subjunctive, but kept its present subjunctive. According to Iatridou (2000), if the subjunctive were responsible for conveying counterfactual meaning, the present subjunctive should be the tense used in CFs after the disappearance of the past subjunctive. But this was not so, French makes now use of the past indicative, as illustrated in (66). The present subjunctive in these environments is not grammatical (see (67)). According to Iatridou (2000), this shows that the past is more important than the subjunctive for the expression of counterfactuality.

(66) Si Marie **avait** un parapluie rouge,...
 if Marie **have.PST.IND** an umbrella red,...
 ‘If Marie had a red umbrella,...’

(67) *Si Marie **ait** un parapluie rouge,...
 if Marie **have.PRS.SBJV** an umbrella red,...
 ‘If Marie had a red umbrella,...’

Iatridou (2000) also points out that counterfactual constructions are commonly marked for imperfective aspect. Similarly to the use of the past tense, imperfective aspect in CFs behaves non-canonically, and does not get its usual habitual or progressive interpretation. As exemplified in (68) from French and (69) from Hindi, the event denoted by the sentence is interpreted perfectly. Thus, Iatridou (2000) also calls the imperfective marking on CFs *fake*. Nevertheless, the author claims that imperfective aspect does not contribute to counterfactuality. Other authors, like Arregui (2005) and Ferreira (2016), disagree with this position and think that imperfectivity plays a role in generating counterfactual meaning. We won't deal with the role of imperfectivity in CFs in this paper and leave it for further work.

- (68) Si l'oeuvre avait été connue, elle aurait provoqué ...
 If the.work be.PST.IPFV been known, it be.COND.IPFV cause
 'If the work had been known, it would have caused...'.
 (69) An pandrevotan mia prigipisa, θa esoze tin eteria tu.
 if marry.PST.IPFV a princess, FUT save.PST.IPFV the company his.
 'If he married a princess, he would save his company'. (IATRIDOU 2000, p. 236)

Since the relation between the past and the imperfective aspect with counterfactuality is widespread among the languages of the world; there must be something about their semantics that favors the expression of counterfactuality. The next subsection will argue that a parallel phenomenon occurs in Karitiana as far as tense is concerned.

5.2 The behavior of tense (and aspect) in Karitiana CFs

The goal of this section is to show that an interaction between tense and CFs similar to the one discussed in the previous section is also found in Karitiana. In order to do that, we will examine the interaction between tense and temporal adverbs in CF environments. As we saw in section 3.2, all counterfactual sentences in Karitiana bear non-future tense. In this language, a future-oriented adverb such as *dibm* ('tomorrow') must co-occur with future tense as illustrated in (70). Future oriented adverbs like *dibm* cannot normally co-occur with non-future tense, as illustrated in (71).

- (70) Yn a-taka-hit-i celula-ty **dibm**
 1SG 2SG-DECL-give-FUT cell.phone-OBL **tomorrow**
 'I will give you the cellphone tomorrow'.
 (71) *Yn a-taka-hit-Ø celula-ty **dibm**
 1SG 2SG-DECL-give-NFUT cell.phone-OBL **amanhã**
 'I gave you the cell phone tomorrow'
 'I give you the cell phone tomorrow'.

The reason why sentence (71) is not grammatical is that there is a clash between the semantics of the non-future morphology and the

semantics of the future-oriented adverb. Note that this does not happen in CFs. In CF sentences, the non-future tense can occur with future oriented adverbs as illustrated in (72). The occurrence of the non-future tense with a future oriented adverb in CFs seems to indicate that we get a *fake non-future* in these environments just like the *fake past* described in the previous section.

- (72) [dinheiro tyyt y-akiip] [**dibm** yjxa-jyt-ahy-t yjxa cerveja-ty]
 [money have 1SG-COP] [**tomorrow** 1PL.INCL-CF-drink-NFUT 1PL.INCL beer-
 OBL]
 ['If I had money,] [we would drink beer tomorrow']

As mentioned in section 3.2.2, the absence of overt aspectual marking in Karitiana normally expresses perfectivity. Imperfectivity is usually expressed by the use of overt auxiliaries. None of the CF sentences in our *corpora* was overtly marked for imperfectivity. Nevertheless, we need more data in order to be sure that the absence of overt marking cannot also mark imperfectivity.

But what is the role of fake tense in CFs? What is its semantic contribution? These questions will be investigated in the next section.

6. Analysis

The purpose of this section is to explore the two main approaches for the semantics of tense in counterfactuals relative to the Karitiana data. The first approach claims that the past tense has a modal interpretation in CFs (JAMES, 1982; FLEISCHMAN, 1989; IATRIDOU, 2000; PALMER, 2001). The second approach claims that it bears its canonical temporal interpretation (IPPOLITO, 2002, 2003; ARREGUI, 2005). We will show that both approaches are able to explain the phenomenon in past vs. non-past languages. Nevertheless, the Tense as Modal approach cannot account for the phenomenon in languages of the future vs. non-future system, such as Karitiana. For these languages, the only approach that offers a plausible account is the one that claims that tense makes a temporal contribution.

6.1 Past as Modal

In his typological study, Palmer (2001) notes that it is common for languages to make use of the past tense in CF environments. The author analyzes these instances of the past tense as *irrealis* markers. Thus, according to Palmer, the past tense in CFs does not have a temporal interpretation, but a modal one. He does not try to give any kind of explanation for why CF environments favor the use of past tense.

James (1982) and Fleischman (1989) also claim that the past tense morphology is not really being interpreted as past in CF-environments. They call attention to the fact that the past tense usually conveys distance from the moment the sentence is uttered – the Utterance Time. According to them, this distance in time may be metaphorically used to convey distance from reality. This metaphorical use is their explanation for why past tense semantics may change from temporal to modal. One problem for this approach is that, as far as distance from the Utterance Time goes, both *past* and *future* fare alike. So, why would languages only use the past tense as a metaphor? Besides that, this proposal only accounts for past *vs.* non-past languages that have a *fake past* in CF-constructions, but not for languages with a *fake non-future*. Recall that it is the future tense that expresses distance from Utterance Time in Karitiana (see section 3.2). Note that the non-future tense includes the Utterance Time. So, if distance from the Utterance Time were a relevant factor, one would expect the future tense to be employed in counterfactual environments in Karitiana. But this is not so. Thus James (1982) and Fleischmann (1989) proposal faces two problems. The first one is that it fails to explain why the future is not selected in counterfactual constructions. The second one is that it is not able to give a unified account of the phenomenon in both past *vs.* non-past and future *vs.* non-future languages.

Iatridou (2000) also proposes that the use of the past tense in CF-constructions is modal. She solves the first problem we pointed out by claiming that languages like English, which superficially have a past *vs.* present *vs.* future tense system, actually belong to a past *vs.* non-past tense system. Future markers are not considered tense markers, but are treated as modals. According to this analysis, the past tense means that the Utterance Time is not a part of the Topic Time, as stated in (73b). On the other hand, the non-past (present) tense means that UtT is part of TT as stated in (73a).

- (73) a. PRESENT/NON-PAST: $UT \subseteq TT$
 b. PAST: $UT \not\subseteq TT$

Thus, according to Iatridou (2000), what differentiates past from present/non-past is that the first has an exclusion feature, which the latter does not. This exclusion feature will be used in CF environments. In these environments, instead of excluding time intervals, it excludes possible worlds. This is formally presented in (74), which asserts that the contribution of the past tense in CFs is to exclude the possible world in which the sentence is uttered ($Uttw$) from the set of possible worlds that are the Topic Worlds ($Topw$). The author posits that the semantics of the past is underspecified and encompasses both time intervals and possible worlds. When used in a non-CF environment, its denotation ranges over time intervals and the interpretation is that of pastness. When used in CF environments, its interpretation that of counterfactuality.

- (74) PAST (in CF environments) = $Uttw \not\subseteq Topw$

Iatridou's proposal gives a satisfactory account of the first problem - why languages do not use the future in CFs. But it still does not explain the Karitiana data. If one assumes her proposal that some tenses bear an exclusion feature, Karitiana future tense would be the tense to bear this feature; whereas its non-future tense would bear no exclusion feature, as asserted in (75) below. But this is not what happens: it is the non-future tense occurs in CF environments. Therefore, this exclusion feature is probably not the reason why a certain tense is employed when counterfactual meanings are expressed.

- (75) a. NON-FUTURE: $UttT \subseteq TopT$
 b. FUTURE: $UttT \not\subseteq TopT$

Van Linden and Verstraete (2008) also follow the Past as Modal approach. According to them, in order to hypothesize about what would be the case, one must know what has actually happened. The past is the only tense that refers to what has actually happened, and this is the reason we use it to imagine how things would have been. For them, the past may be either modal or non-modal. The modal past is weaker than the non-modal past. They claim that counterfactuality in CF-constructions

from reality. Nevertheless, we saw that this approach cannot explain the use of the non-future tense in Karitiana. It also does not explain why the future is not used in CFs. Iatridou (2000)'s analysis claims that the difference between the past and the present/non-future tense is that the past has an exclusion feature and present does not. This exclusion feature, in CF-environments, excludes the Utterance World from the Topic Worlds. Her proposal explains why the future is not employed in counterfactuals, but it still does not explain the use of the non-future tense in these constructions. Finally, for van Linden and Verstraete (2008), the use of a modal past is weaker than the use of a temporal past tense. Thus the modal past raises a Gricean implicature that the event denoted by the CF does not hold. We rejected this proposal on the basis that the CF meaning is not the weakest on a scale.

We have shown that none of the proposals that claim that the past tense is modal in CFs gives a satisfactory account of the phenomena for both the past vs. non-past languages and Karitiana. The next section discusses approaches that claim that tense has its canonical temporal interpretation in CFs.

6.2 Past as Tense

We now turn to the Past as Tense approach as proposed by Ippolito (2002, 2003) and Arregui (2005). For these authors, the past tense in CF environments has its canonical semantics. Their claim raises the following question: If past morphology in those contexts is really a past tense, why doesn't it have its usual temporal interpretation and can occur with future-oriented adverbs? The answer given by them is that tense in CFs is dislocated from its canonical position. While temporal adverbs are interpreted inside their Tense Phrase (TP), tense in CFs is interpreted in a higher position with scope over the whole counterfactual sentence.

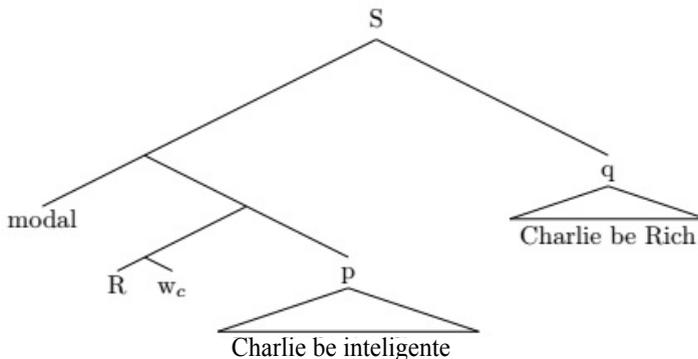
In Ippolito's (2002, 2003) proposal, modals scope over an accessibility relation R . This relation specifies the type of modality that is being used (e.g. epistemic, deontic, buletic, ...). The accessibility relation R in counterfactual sentences is defined in (78). First, it takes as its argument the Utterance World w_c . Next, it takes as its arguments the possible worlds w' , which belong to the set $P = \{w'_1, w'_2, w'_3, \dots\}$, denoted by the proposition p . As a result, it yields the set of worlds $W'' = \{w''_1, w''_2, w''_3, \dots\}$ that are accessed from w_c and are compatible with P .

Consider the CF conditional in (79). The proposition p delimits the set of possible worlds in which *Charlie be intelligent* is true. The accessibility relation R yields the set of worlds in which *Charlie be intelligent* is compatible with what the speaker knows in the Utterance World (w_c). The semantic structure of this sentence is illustrated in (80). Ippolito (2003) proposes that, besides the Utterance World, the accessibility relation is also able to use time intervals as a parameter, as formalized in (81). When one incorporates time as a parameter for R , the semantic structure of a counterfactual sentence becomes as in (82). The time parameter allows the accessibility relation to yield different sets of possible worlds for different time intervals. When the time parameter is not specified, UtT is used as *default*. But this need not always be the case. When the time parameter is set as past, the set of accessible worlds W will be made of worlds accessed from the past.

(78) $R = \lambda w_c. \lambda w'. w'$ is compatible with what the speaker knows in w_c .

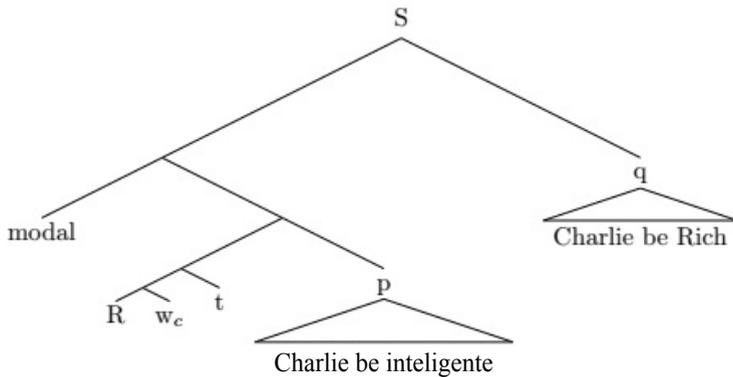
(79) If Charlie were intelligent, he would be rich.

(80)



(81) $R = \lambda w_c. \lambda t. \lambda w'. w'$ is compatible with what the speaker knows in w_c at t .

(82)



Note that, as time goes by, things happen and less possibilities become available. Imagine for instance that yesterday until 6 p.m. Maria hadn't had any ice cream. Since the day was not yet finished, there were possible worlds in which she has had ice cream yesterday (let's represent them with odd numbers as w_1, w_3, w_5, \dots), and possible worlds in which she has not had it (let's represent them with even numbers as w_2, w_4, w_6, \dots). Suppose she had some ice cream yesterday at 7 p.m. The only worlds accessed from this point on are the ones in which she had ice cream (w_2, w_4, w_6, \dots). Thus, the set of accessible worlds W got smaller after 7 p.m. This is summarized in (83a-b) below. If the time parameter under the scope of R is the Utterance Time, the set of possible worlds accessed is the one expressed in (83b).

- (83) a. Accessible possible worlds yesterday before 7pm: $W = \{w_1, w_2, w_3, w_4, w_5, \dots\}$
 b. Accessible possible worlds yesterday after 7pm: $W = \{w_2, w_4, w_6, \dots\}$

Ippolito (2002) argues that the ambiguity of sentences like (84) corroborates her hypothesis. According to her, this sentence has two readings, which stem from the possibility of the past tense being interpreted in different positions. If the past is interpreted in its original TP position, the sentence has an epistemic reading. If the past is interpreted under the scope of the relation R , the sentence has a metaphysical reading. What is important in Ippolito's proposal is that, not only does it work for the languages she is analyzing, but also for languages of the future vs. non-future system.

(84) Charlie could have left.

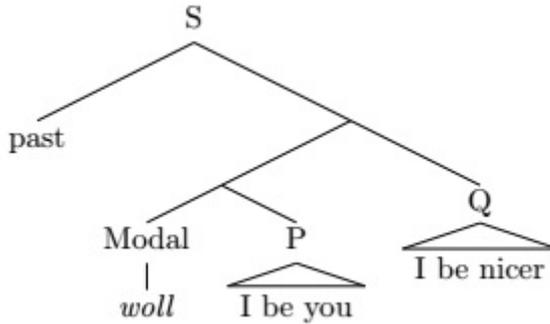
Epistemic reading: In view of what the speaker **knows** now, it **is** possible that Charlie **left**.

Metaphysical reading: In view of what the speaker **knew** then, it **was** possible for Charlie to **leave** (but he did not).

We now turn to the analysis of **counterfactual conditionals in Karitiana** within Ippolito's framework. Consider sentence (85) below. We analyze *jỹ-* as the modal that takes both the antecedent *p* and the consequent *q* as its arguments, as in (86). Superficially (see (85)) the non-future morphology *-t* co-occurs with the future oriented adverb *dibm* ('tomorrow') within the same clause. Nevertheless, what the structure (86) claims is that the non-future marking is actually interpreted under the scope of R. This explains why the past tense may co-occur with present and future oriented adverbs in the languages Ippolito analyzes. It also explains why non-future morphology may co-occur with future oriented adverbs in Karitiana. Within this framework, the obligatory use of the non-future in its CFs is explained. In order to convey a CF meaning, it is necessary to access possible worlds from the past. The only morpheme that can do this is the non-future morpheme.

(85) [dinheiro tyyt y-akiip] [**dibm** yjxa-jỹt-ahy-t yjxa cerveja-ty]
 [money have 1SG-COP] [**tomorrow** 1PL.INCL-CF-drink-**NFUT** 1PL.INCL beer-
 OBL]
 ['If I had money,] [we would drink beer tomorrow']

(88)



(89) $[[woll]]^s: \lambda P<i, <s, t>>. \lambda Q<i, <s, t>>. \lambda t. w [w \text{ similar to } w_c \text{ until } t \ \& \ P(g(ti))(w) \rightarrow Q(g(ti))(w)],$

where: *i*: is the type of times; *s* is the type of events; *t* is the type of propositions; *g* is an assignment function; *t_i* is the Utterance Time; *g(t_i)* is the Topic Time, restricted to non-past times.

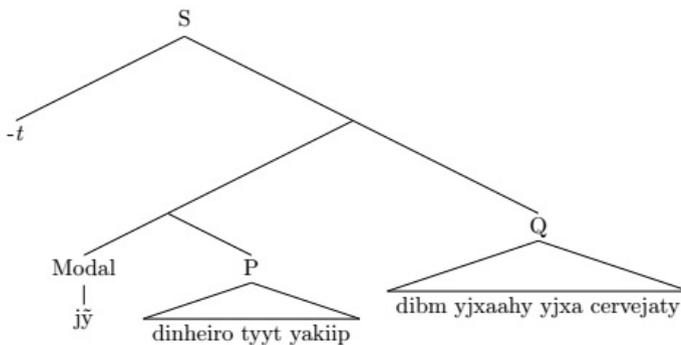
In words: *Woll* takes the properties *P* and *Q* and a time *t* as its arguments and yields a proposition that is true if in every world denoted by *P(t_i)* until *t* is a world denoted by *Q(t_i)* until *t*.

In section 4.1, we have seen that the possible worlds denoted by *p* need to be similar to the Utterance World. In a CF conditional, the possible worlds being quantified over must be similar to the world in which the sentence is uttered only until some past time. In (89) above, only worlds *w* that are similar to the Utterance World until some relevant past time *t* are to be taken into account. In taking the past as its argument, *woll* restricts the quantification to worlds that were similar to the Utterance World in the past. The most important in Arregui’s proposal is that not only does it work for the languages she is analyzing, but also for languages of the future vs. non-future system. Applying her proposal to Karitiana, we posit that the prefix *Jÿ-* is the realization of the modal operator with a semantics similar to that of *woll*, as defined in (90) below.

(90) $[[Jÿ-]]^s = \lambda P<i, <s, t>>. \lambda Q<i, <s, t>>. \lambda t w [w \text{ similar to } w_c \text{ until } t \ P(g(ti))(w) \rightarrow Q(g(ti))(w)].$

Within Arregui's (2005) framework, the past tense may co-occur with present and future oriented adverbs because the adverbs and the tense operator are not interpreted inside the same proposition. In future *vs.* non-future languages, the occurrence of the non-future tense with future oriented adverbs in CFs is possible because the non-future tense (-*t*) is dislocated from its canonical position and becomes an argument of the modal, as illustrated in (91) below. The non-future tense refers to some salient past time and restricts the possible worlds quantified over to the ones that are similar to the Utterance World until this past time reference. Arregui's proposal also explains another phenomenon observed in Karitiana. As mentioned in subsection 3.2, antecedent clauses of conditional sentences never bear tense morphology in this language. The lack of tense morphology in the antecedent has also been observed by James (1982) in other languages. Arregui's proposal that tense in the antecedent does not have any semantics, but is just some sort of agreement with the tense of the consequent clause is corroborated by these data. The fact that the antecedent clauses of Karitiana CFs do not bear tense morphology supports the claim that tense marking in these clauses is vacuous.

(91)



This section discussed two approaches that posit that tense in counterfactual environments has a temporal interpretation. In the case of Karitiana, this proposal amounts to the claim that its non-future tense in CFs has the same meaning as it does in non-CF environments. In order to explain that the past morphology is not interpreted as having scope

over the consequent and that it can occur with future oriented adverbs, the authors posit that it is dislocated to a higher position. In Ippolito (2002, 2003), the past tense is dislocated to the accessibility relation R. This results in that the CF proposition is evaluated in worlds that were accessible in the past, but are not accessible anymore. In Arregui (2005), the past morphology is dislocated to a position above the modal operator, which results in the selection of worlds that were similar to the Utterance World in the past.

Both proposals work for Karitiana since the non-future, according to the pronominal analysis of tense, refers to a salient time, which may be in past. The next section presents our final remarks.

7 Final remarks

The first conclusion we draw is that a similar interaction between tense and counterfactuality as the one observed in past *vs.* non past languages occurs in Karitiana, a future *vs.* non-future language. In this language it is not the past, but the non-future tense that is used in counterfactuals. Further typological work is necessary to determine whether the same pattern is to be found in other future *vs.* non-future languages.

Our second conclusion is that only proposals that consider that tense has a temporal interpretation in CFs is able to describe the phenomenon in languages of the future *vs.* non-future system, such as Karitiana. When comparing the Past as Modality to the Past as Tense approaches, Arregui (2005) mentions that the second approach, which includes Ippolito's (2002, 2003) proposal as well, is more appealing since it provides a unified account of the semantics of the past. This approach does not consider that the past inflexion is ambiguous. Within these frameworks, tense can get dislocated to either the accessibility relation R (IPPOLITO, 2002, 2003) or above the modal (ARREGUI, 2005). This explains why both the past and the non-future tenses may co-occur with future oriented adverbs.

We have claimed that both the modal prefix *jỹ-* and the non-future suffix contribute to the expression of counterfactuality. According to our analysis, *jỹ-* is an overt modal operator and the role of the non-future suffix is to allow the access to possibilities that were only available in

the past, or else to establish a time parameter that restricts the possible worlds being quantified over to past worlds.

Authorship statement

This article is the result of joint work of the two authors: Müller and Ferreira. While Müller collected data on tense with native speakers, Ferreira collected the data on countefactual and non-counterfactual conditionals with native speakers. Müller's main contribution was in the analysis of tense, mainly section 2. Ferreira's main contributions were in the analysis of conditionals in section 3 and 4. The analysis and conclusions (section 5 and 6) resulted from joint work of the two authors. Both authors revised the article.

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