

Article

Factive Entailments and Clausal Complementation in Karitiana

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Abstract: Attitude verbs describe mental states of their subject in relation to a proposition codified by their clausal complement. In this paper, we describe the behavior of such verbs in Karitiana, a Tupian language spoken in Brazil. Recently, it has been noted in the literature that embedded clauses with nominal features seem to lead to a factive reading of these verbs. In Karitiana, all embedded clauses are nominalized since they lack many clausal features, and conversely exhibit nominal distribution and behavior. We propose a structure with an N head for embedded clauses in Karitiana, which accounts for their morphological behavior and also explains why these constructions behave as strong islands. Judgments of contradiction with attitude verbs of Karitiana were collected and the results show that they fall into two categories: one that obligatorily entails the truth of the embedded clause and another that favors it, but that does not require it obligatorily. This shows that nominalization of embedded clauses seems to be tied to the presence of factive entailments, but this alone is not a sufficient condition to force a factive reading of the matrix attitude verb.

Keywords: attitude verbs; factive verbs; factivity; entailment; embedded clauses; nominalization; Karitiana; Tupian; gradience



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1. Introduction

This paper explores the interpretation of attitude verbs such as ‘believe’, ‘know’, ‘think’, ‘forget’, etc. These verbs, which select for a complement clause, denote a mental stance of the subject in relation to the proposition expressed by the embedded clause. In (1), for example, the verb ‘believes’ expresses the belief relation between the subject ‘John’ and the proposition [the Earth is flat] in the subordinate clause:

(1) John believes that the Earth is flat.

Attitude verbs can be broken down into two categories depending on the status of the proposition denoted by the embedded clause. These verb classes are illustrated below with ‘forget’ and ‘think’. In (2), the proposition that Francis died can be false (as stated in the second clause), but the whole sentence will still be true. This is because verbs like ‘think’ denote the internal beliefs of the subject, which may be wrong. On the other hand, verbs like ‘forget’ in (3) require that the event denoted by the embedded clause be true. If one tries to negate it (by saying ‘but Francis didn’t die’ as a follow-up clause), the whole sentence becomes contradictory.

(2) John thought [that Francis died], but Francis didn’t die.

(3) John forgot [that Francis died], # but Francis didn’t die.

Verbs like ‘forget’, which impose this truth requirement on the complement clause, are called ‘factive’. At first sight, factivity seems to come from the matrix attitude verb,

as the structure of the embedded clause in English seems to be the same in both cases. Nonetheless, cross-linguistic evidence has been brought to attention in the past years to show that the embedded clause could have some sort of impact on the interpretation of the matrix verb. The leading question of this paper is then the following: to what extent could the structure of the selected clausal complement constrain the interpretation of their matrix attitude verb? We address this question with novel data from Karitiana, an indigenous language of the Tupian family spoken in the Brazilian western Amazon. A noteworthy feature of Karitiana is that all embedded clauses exhibit a very similar structure, which is arguably nominalized. Thus, we check whether this feature affects the factivity of embedded clauses as observed cross-linguistically.

This paper is divided as follows. In Section 2, the behavior of attitude verbs is discussed with special attention to the impact that the nature of their clausal complements have on their interpretation. The syntax of embedding in Karitiana is the topic of Section 3. As will be seen in this section, subordinate clauses in Karitiana exhibit many nominal features, which lead us to analyze them as clausal nominalizations. In Section 4.1, the previous literature on factivity is briefly presented, and we discuss that the factive inference under discussion is an entailment. Section 4.2 presents the materials and the elicitation method used to collect judgments of contradiction with attitude verbs. The results of the elicitation are reported in Section 4.3, where the two patterns of behavior found in the elicitation process will be presented and exemplified. In Section 4.4, we discuss how these findings can be related to the structure of embedded clauses in Karitiana. Finally, Section 5 summarizes the main findings of the paper and points to topics for future research.

2. The Problem

As mentioned in the introduction, attitude verbs describe mental states of their subject regarding a proposition expressed by the embedded clause. Nonetheless, it was observed by Kiparsky and Kiparsky (1971) (and see also Catell 1978) that these verbs can also be broken down into two different classes, whose behavior is illustrated below:

- (4) John knows/regrets/remembers [that Peter told the secret].
 (5) John thinks/believes [that Peter told the secret].

Verbs like ‘know’/‘regret’/‘remember’ select an embedded clause depicting a true proposition. They are called factive, because the event described has to be a consolidated fact in the discursive background. On the other hand, a non-factive verb such as ‘think’/‘believe’ does not have the same requirement. In (5), the whole sentence can be true even if Peter did not tell any secret—in this case, only John’s assumption about the world is wrong.¹

Since attitude verbs can be listed with respect to their meaning (see Catell 1978 for a list of verbal classes), it is reasonable to think of factivity as lexically encoded in the verb. Nonetheless, it has been noted in the literature that the interpretation of certain verbs may be influenced by the type of embedded clause they select. The following paradigm, taken from Moulton (2009), illustrates this observation with the perception verb ‘see’. One can see that the type of embedded clause in column A impacts the interpretation of the matrix verb (column B): Depending on the clausal type, the same verb can be interpreted as one act of (a/b) seeing, (c) imagining, (d) believing, or (e) acknowledging an established fact:

- (6) English (Moulton 2009)

A. Sentence	B. Clausal type	C. Interpretation
a. John saw [Fred leave early].	bare infinitive	direct perception
b. John saw [Fred leaving early].	gerundive	direct perception
c. John saw [Fred owning a house].	gerundive	imaginative
d. John saw [Fred to be a party-pooper].	infinitive	belief

- (12) Turkish (Özyildiz 2017, adapted)
- a. *Tunç [Hillary kazan-dı diye] biliyor.*
 Tunç Hillary win-PST DIYE knows
 “Tunç believes that Hillary won.” → Hillary won. (non-factive)
- b. *Ama kazan-ma-dı.*
 but win-NEG-PST.3S
 “But she didn’t win.”

The same behavior can be seen in Hebrew, in which the proximal demonstrative *ze* in the embedded clause induces a factive reading:

- (13) Hebrew (Kastner 2015)
- a. *hu hisbir et [ze še-ha-binyan karas] (#aval hu lo be’emet karas)*
 he explained ACC this COMP-the-building collapsed but he NEG really collapsed
 “He explained the fact that the building collapsed (# but it didn’t).” (factive)
- b. *hu hisbir [še-ha-binyan karas] (aval hu lo be’emet karas)*
 he explained COMP-the-building collapsed but he NEG really collapsed
 “He explained that the building collapsed (but it didn’t).” (non-factive)

According to Özyildiz (2017), these facts can be interpreted by either of the following alternatives: (1) factivity is entirely encoded in the embedded clause selected by an attitude verb; or (2) the factive meaning emerges in the semantic composition of an attitude verb in conjunction with the embedded clause. The author argues that Turkish facts support the second alternative, and we return to this question in Section 4.3.

While it is natural to think that factivity is built into the attitude verb, the configuration of subordinate clauses constrains the interpretation of these verbs in some way. More specifically, nominal structure induces factive readings. In this paper, we engage in this debate from a different starting point. In Karitiana, all embedded clauses show nominal morphosyntactic traits, and hence, we assume that they are nominalized. Since nominalized clausal complements tend to induce factivity in many languages, we investigate the impact that the structure of complement clauses may have in the attitude verbs in Karitiana. Particularly, we check whether the omnipresent nominalization of embedded clauses precludes non-factive readings of attitude verbs, especially for those such as ‘believe’ or ‘want’ (which are typically non-factive in other languages).

Before moving to attitude verbs, the properties of embedding in Karitiana are described in the next section.

3. Syntax of Embedded Clauses

The goal of this section is both to provide an overall picture of Karitiana and to argue that embedded clauses in Karitiana are indeed nominalized. We review the evidence put forth by Vivanco (2018, 2022) in favor of a nominal status of embedded clauses, which includes two blocks of arguments: (1) the lack of clausal structure in embedded clauses; (2) the nominal morphosyntactic behavior of embedded clauses. These arguments are presented in Sections 3.2 and 3.3, respectively.

3.1. Karitiana

Karitiana (ISO 639: ktn) is a Tupian language spoken in Rondônia, a northwestern State of Brazil. It is still spoken by 369 people who live in an indigenous reservation (Terra Indígena Karitiana) and in the urban areas of Porto Velho, the capital of Rondônia (Storto and Rocha 2018). Even though the Karitiana language is currently being transmitted to

younger generations, it faces several challenges such as the vicinity of urban areas, where Portuguese is heavily spoken.

Regarding its morphosyntactic features, the structure of noun phrases in Karitiana is noteworthy. The language only has bare nouns, as can be seen with the direct complement *gooj* ('canoo') in the example below (Müller 2011; Müller et al. 2006):

- (14) *Maria Ø-naka-m-'a-t gooj*
 Maria 3-DECL-CAUS-make-NFUT canoe
 "Maria built canoe(s)." (Müller et al. 2006)

These elements may receive a singular or plural reading, and they can also be indefinite or definite (examples (15) and (16), respectively):

- (15) *Yn Ø-naka-sadna-j ðwa hadna hyk*
 I 3-DECL-report-FUT child story about
 "I will tell the story of a child." Müller (2011)

- (16) *Ø-py-pyn-a andyk-y-n ðwa*
 ASS-know-EPEN IMPF.PASS-EPEN-NFUT child
 "The child was smart." (Müller 2011, adapted)

Moreover, quantificational indefinites also arise without any determiner. This is the case of 'boar' (*sojxa*) in the example below:

- (17) *An i-oky-t sojxa hỹ?*
 2s 3-kill-NFUT boar INTERR
 "Did you kill boars/any boar?" (Landin 1984, adapted)

Therefore, we adopt the structure of noun phrases in Karitiana as follows, with no DP layer:

- (18) NP
 |
 N

Karitiana is an ergative language, and this case alignment is mostly detected in main clauses (Storto 1999, 2005 but see also Landin 1984). As can be seen in examples (19) and (20), intransitive verbs agree with their subjects, but transitive verbs agree with their objects.

- (19) Karitiana (Storto 1999)
A-ta-opiso-t an
 2-DECL-listen-NFUT you
 "You listened."

- (20) Karitiana² (Storto 1999, adapted)
Yn a-ta-oky-j an
 I 2-DECL-kill/hurt-FUT you
 "I will hurt you."

Another important feature of Karitiana is a complementary distribution between matrix and embedded clauses regarding word order and verbal morphology (Storto 1999). Matrix clauses are mainly V2 and display full verbal morphology, whereas embedded clauses are obligatorily verb-final and do not show agreement, tense, and mood morphemes: in (21), the verb 'oky' occupies the second position of the matrix and fully inflected clause, while the same verb sits bare in the final position in the embedded clause of (22):

- (21) Karitiana (Storto 1999)
Yn a-ta-oky-j an
 I 2s-DECL-kill-FUT you
 "I will kill you."
- (22) Karitiana (Vivanco 2018)
Ivan Ø-naka-sadn-Ø [Ana ombaky oky]
 Ivan 3-DECL-report-NFUT Ana jaguar kill
 "Ivan reported that Ana killed a jaguar"

These features shed light onto the structure of clauses in Karitiana, a topic that we address in the following sections.

3.2. Lack of Clausal Structure in Embedded Clauses

As first noticed by Storto (1999), embedded clauses in Karitiana do not exhibit full clausal structure. They lack CP, and agreement, mood, and tense morphemes are also obligatorily absent.

As far as complementizers are concerned, Storto (1999) claims that embedded clauses in Karitiana lack the syntactic projection CP, which is, on the other hand, present in matrix clauses. Three pieces of data support this conclusion:

- (23) Arguments for the lack of C in embedded clauses
- i There are no lexical items that could be classified as complementizers;
 - ii The complementary distribution in word order (examples (21) and (22)) can only be explained by the lack of C;
 - iii There are no indirect questions in the language.

We begin the discussion of the lack of C in embedded clauses (but not matrix clauses) with the property (i). Embedded clauses are introduced without any complementizer-like lexical item, as examples (24)–(26) show.³ These sentences illustrate three types of subordinate clauses: a direct complement clause, an indirect complement clause (marked with the oblique marker *-ty*), and a relative clause:⁴

- (24) Karitiana (Vivanco 2018) (=22)
Ivan Ø-naka-sadn-Ø [Ana ombaky oky]
 Ivan 3-DECL-report-NFUT Ana jaguar kill
 "Ivan reported that Ana killed a jaguar."
- (25) Karitiana (Vivanco 2018)
Karin Ø-na-aka-t i-koro'op kāra-t [Ana médico mĩ]-ty.
 Karin 3-DECL-COP-NFUT NMZ-suspect/think-COP.AGR. Ana doctor hit-OBL
 "Karin thinks that Ana hit a doctor."
- (26) Karitiana (Vivanco 2014)
Yn Ø-na-aka-t i-pyting-Ø [boet Luciana ti-m-'a]-ty
 1s 3-DECL-COP-NFUT NMZ-want-COP.AGR necklace Luciana INV-CAUS-make-OBL
 "I want the necklace that Luciana made."
 (Context: The speaker had two choose between two necklaces)

Since there is no overt counterpart of C, the simplest analysis would be to consider that the language has no C altogether. This analysis can be further supported by observations (ii) and (iii). Regarding (ii), the word order facts presented by examples (21) and (22) can easily be captured if embedded clauses lack C. If one assumes that C is absent in

embedded clauses, this contrast is readily comprehensible. Storto (1999) claims that the verb raises to C and acquires agreement, tense, and mood in matrix clauses, similarly to Germanic V2. Since there would be no C in subordinate clauses, the verb stays in situ and the verb-final order emerges.⁵ This is also tied to the other non-clausal property of embedded clauses: the lack of agreement, tense, and mood morphology. As seen in example (22), the embedded verb *oky* emerges bare, without prefixes or suffixes related to agreement, tense, or mood.⁶ According to Storto, C would host agreement, tense, or mood morphology, and since C would be missing in embedded clauses, these morphemes are consequently absent in subordinate environments.

Finally, the last argument pointing to the lack of C in embedded clauses was presented by Vivanco (2018). This is the property (23iii), namely, the absence of “real” indirect questions in the language. One can see in the examples below that the interrogative locative pronoun *tihoori* (‘where’) is absent in embedded clauses of (28) and (29):

(27) Karitiana (Vivanco 2018)

Tihoori i-pytim'adna Ivan?
 where 3-work Ivan
 “Where does Ivan work?”

(28) Karitiana (Storto 2022)

A-so'oot-o mini an [ʔrom heredni-pa-ty], y-syp'et?
 2s-see-EPEN NEG 2s black.monkey live-LOC-OBL 1s-uncle
 “Do you know where the black monkeys live, my uncle?”
 (Literally: “Didn’t you know (the place) of the black monkeys, my uncle?”)

(29) Karitiana (Vivanco 2018)

Ana i-sondyp-y-wak-Ø [Ivan pytim'adn-i-pa]-ty.
 Ana NMZ-know-EPEN-DES-COP.AGR Ivan work-EPEN-NMZ-OBL
 “Ana wants to know where Ivan works.”
 (Literally: “Ana wants to know about Ivan working.”)

The reason why interrogative pronouns are absent in embedded clauses is that there would be no place to host them.⁷ Without C, there is no projection CP to make room for interrogative pronouns in its specifier position.⁸

In sum, all the observations in (23i-iii) are easily captured by a structure without C (and its projection CP).

3.3. Presence of Nominal Morphology

The last section showed that embedded clauses do not exhibit full clausal status, since C and its projection CP are absent in subordinate environments. In this section, we show that embedded clauses exhibit nominal morphology and behavior, which brings them closer to noun phrases. The nominal features to be described are the following:

(30) Nominal features of embedded clauses

- i Presence of the oblique marker *-ty*
- ii Presence of the postposition *-p*
- iii Presence of the overt nominalizer *-pa*
- iv Pied-piping in WH- questions

Regarding (30i), Karitiana allows the oblique marker *-ty* both on noun phrases and on embedded clauses whenever the matrix verb requires it. The verb *pyting*, for example, takes an argument marked with *-ty*, as can be seen in the simple sentence (31) (Rocha 2011). Crucially, when the complement of *pyting* is a clause as in (32), *-ty* must also be present.

- (31) Karitiana (Rocha 2011)
 Ø-py-pyting-yn ãonso opi-ty
 3-ASS-want-NFUT woman earring-OBL
 “The woman wants the earring.”
- (32) Karitiana (Vivanco 2018)
 Yn Ø-na-aka-t i-pyting-Ø [gijo Luciana ti-tak]-a-ty.
 I 3-DECL-COP-NFUT NMZ-want-COP.AGR corn Luciana INV-grind-EPEN-OBL
 “I want the corn that Luciana ground.”
 (Context: the speaker had to choose between two types of corn)

Another suffix occurring both in noun phrases and embedded clauses is the locative postposition *-p* (the nominal feature (30ii)):

- (33) Karitiana (Everett 2006, adapted)
 Yn Ø-naka-m-tat-Ø him pisyp ambi-p
 I 3-DECL-CAUS-go-NFUT meat house-LOC
 “I sent meat to the house.”
- (34) Karitiana (Rocha 2016)
 Inacio ø-na-aka-t i-tat-ø akan pip [‘irip Inácio oky]-p
 Inacio 3-DECL-COP-NFUT NMZ-go-COP.AGR village in tapir Inácio kill-LOC
 “Inácio went to the village to kill tapirs.”
- (35) Karitiana (Ferreira 2017)
 Antonio, [carro-tyyt y-aki-p] yn a-ãy-atot-Ø
 Antonio car-with 1s-COP-LOC I 2s-COND-take-NFUT
 “Antônio, if I had a car, I would take you.”

When present in embedded clauses, the suffix *-p* gives rise to different (but related) interpretations when compared to noun phrases. In (34), it is a purpose clause ‘to kill tapirs’, whereas it marks the clause expressing the condition of a conditional construction in (35). On the basis of examples such as (34), Rocha (2016) calls this morpheme ‘infinitival’, but we prefer to see it as the same postposition found in noun phrases.

Overt nominalizers may also be present in embedded clauses (the property (30iii)). This is the case of the suffix *-pa*, which attaches to a base to create a locative or an instrumental noun:

- (36) Karitiana (Storto 1999)
 Kookot-o-pa
 pass-EPEN-NMZ
 “bridge”

This suffix is found in locative relative clauses as in (37) and (38):⁹

- (37) Karitiana
 Y-pyr-amynt-yn [cama taso kat-a-pa]-ty
 1s-ASS-buy-NFUT bed man sleep-EPEN-NMZ-OBL
 “I bought the bed where the man slept.”
 (Literally: “I bought the man-sleeping bed.”)

- (38) Karitiana (Vivanco 2018)
Ana i-sondy-p-y-wak-Ø Ivan pytim'adn-i-pa-ty.
 Ana NMZ-know-EPEN-DES-COP.AGR Ivan work-EPEN-NMZ-OBL
 "Ana wants to know where Ivan works."
 (Literally: "Ana wants to know about Ivan working.")

The fact that *-pa* is also found in noun phrases constitutes evidence that it is not a complementizer, but truly a nominalizer.

Finally, another similarity between noun phrases and embedded clauses is that both are opaque domains for extraction and require pied-piping (property (30iv)). It is ungrammatical to move a possessor out of an NP, as well as extracting an argument out of an embedded clause. In the example (40), one can see that the genitive WH-word *morã* cannot be fronted alone. It has to pied-pipe the whole noun phrase 'whose manioc' as in (40):

- (39) Karitiana (Vivanco 2018)
 **Morã_i-mon Ivan ti-'y-t [t_i gok]?*
 WH-INT.COP. Ivan INV-eat-COP.AGR manioc
- (40) Karitiana (Vivanco 2018)
 [*Morã gok*]_i-o-mon Ivan ti-'y-t?
 WH manioc-EPEN-INT.COP Ivan INV-eat-COP.AGR.
 "Whose manioc did Ivan eat?"

The data below show that the very same pattern is found with embedded clauses. *Morã* cannot undergo WH-movement without pied-piping the whole clause [*morã Karin tiko*] (Vivanco 2018):

- (41) Karitiana
 **Morã i-kāra Karin [t_i Ana mĩ]-ty?*
 WH 3-suspect/think Karin Ana hit-OBL
 "(Intended) What does Karin think that Ana killed?"
- (42) Karitiana (Vivanco 2018)
 [*Morã pop 'it*]-i-ty i-kāra Karin?
 WH die make-EPEN-OBL 3-suspect/think Karin
 "Who does Karin think fainted?"

All in all, just like noun phrases, embedded clauses are islands for WH-movement and require pied-piping. In the next section, the proposed structure for embedded clauses in Karitiana is presented, and we discuss how it precludes movement while capturing all the morphosyntactic facts described in (23) and (30).

3.4. Structure of Embedded Clauses

In the previous sections, several features of embedded clauses were presented and discussed. We saw that they exhibit two types of features: one that distinguishes them from full clauses (properties in (23)) and another that brings them closer to noun phrases (properties (30)). Therefore, the structure of embedded clauses in Karitiana must be somewhat different from full clauses, while exhibiting some sort of nominal structure at the same time.

In Section 3.2, we saw that embedded clauses do not contain a CP projection. The lack of tense and mood also led Storto (1999) to propose that the embedded Infl is much poorer than its matrix counterpart. Based on that, Storto proposed the following structure for all embedded clauses:¹⁰



Due to the lack of IP, the structure in (43) is non-finite (see also Rocha 2016). This cannot be the whole story, though. Traditionally, non-finite clauses usually tend to make extraction out of them easier because there are fewer projections to interfere between the target and the source positions of movement (see, for example, the phenomenon of raising). This is not what is found in Karitiana. As seen in Section 3.3, extraction out of embedded clauses is ruled out, requiring pied-piping of the whole embedded clause containing the WH-word. Therefore, there must be something in the structure of embedding that interferes with WH-movement, and crucially, this is probably the very same thing that bans extraction out of noun phrases.

We then follow Vivanco’s (2018, 2022) proposal that embedded clauses in Karitiana are actually derived nouns, which include a nominal head N:



In most cases, N would be null in embedded clauses. Nonetheless, there is at least one possibility for the overt realization of N: subordinate clauses with *-pa*, as examples (37) and (38) show. In these cases, we propose that the derivational suffix *-pa* is the overt realization of N.

This N head would turn an embedded clause in Karitiana into a strong island. As proposed by Vivanco (2018), extraction out of embedded clauses can be understood as a violation of the Complex NP Constraint, which was proposed by Ross (1967) to account for data such as (46):¹¹

(45) *Complex NP Constraint*¹²
 No element contained in a sentence dominated by a noun phrase with a lexical head noun may be moved out of that noun phrase (Ross 1967)

(46) English (Ross 1967)
 *The hat_i which I believed [the claim that Otto was wearing t_i] is red.

Summing up, embedded clauses in Karitiana display a nominal structure due to the presence of a nominal head N. In the next sections, we investigate whether clausal complements of attitude verbs, which would be nominal as any other embedded clause in Karitiana, impact the interpretation of matrix verbs.

4. Semantic Interpretation of Complement Clauses in Karitiana

4.1. The Nature of the Factive Inference Tested

The defining characteristic of factive verbs remains a matter of debate.¹³ Kiparsky and Kiparsky (1971) and Karttunen (1971) assume that presupposition projection is the only defining property shared by factive predicates. Projection in this context is the ability of the truth of the complement surviving negation of the main clause (among other tests). For example, Karttunen (1971) shows that both the sentence in (47a) and its negated counterpart in (47b) still presuppose (47c):

- (47) a. John realized that he had no money.
- b. John didn't realize that he had no money.
- c. John had no money. (Karttunen 1971)

Nonetheless, other authors (such as Anand and Hacquard 2014) point out that what defines a factive verb is both presupposition and entailment of their complement. A statement *A* semantically entails a statement *B* here if the truth of *A* (as in (48a)) consequently implicates the truth of *B* (as in (48b)) and the truth of *B* cannot be negated.

- (48) a. Lee kissed Kirn passionately.
- b. Lee kissed Kirn. (Chierchia and McConnell-Ginet 1990)

More notably, more recent experimental studies show a diverse spectrum of judgments of presupposition projection, even for canonical factive verbs (e.g., see Degen and Tonhauser 2022), which, as a consequence, casts doubt on how crucial presupposition is for this class of verbs.

In this study, we circumvent this debate and test the factive inference of these types of verbs in terms of entailment only¹⁴ and we follow a definition of entailment *à la* Chierchia and McConnell-Ginet (1990), wherein the truth of the complement clause of a factive verb is indefeasible because the whole sentence cannot be followed up with another sentence contradicting its truth value. In other words, an utterance of the sentence containing the factive verb followed by another utterance that negates the truth of the proposition of the factive complement should result in contradiction. For the purposes of this study, we are thus using the definition of factive verbs that assumes that the content of their clausal complement must be both entailed and presupposed (e.g., Anand and Hacquard 2014).

4.2. Methodology

As described in Section 2, factive attitude verbs in many languages select for clausal complements with nominal traits. Section 3 defended the position that all embedded clauses in Karitiana are nominalized, and one may wonder how this nominal status could impact the interpretation of attitude verbs.

In order to address this question, fieldwork was conducted with two Karitiana consultants through online elicitation sessions. Both speakers are fluent both in Karitiana and Portuguese, and their ages range between 30–50 years old. Throughout this section, they are referred to as Consultants 1 and 2 to assure their anonymity.

Table 1 shows the attitude verbs tested in this study with the most common translations provided by our consultants.¹⁵

Table 1. Verbs tested.

Verb	Possible Translations
<i>dıwyt</i>	forget
<i>sodyp</i>	know
<i>sikina</i>	remember
<i>koro'op 'yra</i>	lament
<i>kybawa</i>	doubt, not believe
<i>kywytit</i>	thinks “for sure”, believe
<i>pyting</i>	want
<i>(koro'op) k̄ara</i>	suspect, think

All verbs in Table 1 can take an embedded clause as its complement.

In order to assess entailment, the method used was elicitation, which can be defined as “the collection of responses to linguistic or non-linguistic *stimuli* designed to study the respondents’ linguistic competence and/or their practices of language use” (Bohnenmeyer

2015). The response in this case was judgments of contradiction. Specifically, two sentences were presented to the consultants, who had to verify whether uttering both would be contradictory or not. More specifically, a second sentence following the primary sentence under evaluation could deny or not the content of the first, as exemplified by the filler context below (background information: the city of Rio de Janeiro belongs to the Rio de Janeiro state. Rondônia is another state, whose capital is called Porto Velho):

- (49) *Karitiana* \emptyset -*na-aka-t* *i-ki-t* *Rondônia* *pip.* *Karitiana*
 Karitiana 3-DECL-COP-NFUT PART-live.PL-COP.AGR Rondônia in Karitiana
 \emptyset -*na-aka-t* *i-ki-t* *Rio de Janeiro* *pip.*
 3-DECL-COP-NFUT PART-live.PL-COP.AGR Rio de Janeiro in
 “The Karitiana live in Rondônia. The Karitiana live in Rio de Janeiro.”

It is important here to draw a distinction between **contradiction** and **judgments of contradiction**. **Contradiction** is a theoretical concept: a (manufactured) status of truth-value clash between two sentences. **Judgments of contradiction** are a speaker’s stance in relation to this possible clash of truth-values. Judgments of contradiction are therefore an indirect way to access contradiction, and as such, they are subject to many other intervening factors and must be taken into account carefully.

Simple sentences were added as fillers, and these were presented both at the beginning of the session as a training or interspersed with the target contexts throughout the elicitation session. All fillers were affirmative sentences. Both speakers succeeded in all fillers in the sense that they both rightly classified the fillers as contradictory or non-contradictory when that was actually the case.

For target contexts, two types of two-sentence sequences were presented to the speakers, the difference between them being the nature of the second sentence (either negative or affirmative). These types are named here as Test 1 and Test 2. Test 1 is the most paradigmatic method to detect entailment and has frequently been used in the literature to assess factivity. Test 2 was also added because the follow-up sentence does not contain an explicit negation that could induce speakers to offer more negative judgments. An example of each test is depicted below in English:

1. TEST 1: João remembered that Luciana killed the jaguar, **but Luciana didn’t kill the jaguar.**
2. TEST 2: João remembered that Francisco was born in [the city of] Porto Velho, **but Francisco was born in [the city of] São Paulo.**

The Karitiana equivalents of these sentences are as follows:

1. TEST 1: João remembered that Luciana killed the jaguar, **but Luciana didn’t kill the jaguar.**
- (50) *João* \emptyset -*na-aka-t* *i-sikina-t* [*Luciana ombaky oky*]-*ty.* *I-oky*
 João 3-DECL-COP-NFUT PART-remember-COP.AGR Luciana jaguar kill-OBL 3-kill
padni ombaky Luciana.
 NEG jaguar Luciana
 “João remembered that Luciana killed the jaguar, **(but) Luciana didn’t kill the jaguar.**”
2. TEST 2: João remembered that Francisco was born in Porto Velho, **but Francisco was born in São Paulo.**

- (51) *João* Ø-*na-aka-t* *i-sikina-t* [*Porto Velho pip Francisco*
 João 3-DECL-COP-NFUT PART-remember-COP.AGR *Porto Velho in Francisco*
yt]-y-ty. *Francisco* Ø-*na-aka-t* *i-yt-Ø* *São*
 be.born-EPEN-OBL *Francisco* 3-DECL-COP-NFUT PART-be.born-COP.AGR *São*
Paulo pip.
 Paulo in
 “João remembered that Francisco was born in Porto Velho, **but Francisco was born in São Paulo.**”

In the next section, we discuss some challenges that arose when eliciting the judgments for the aforementioned types of sequences. On the one hand, we found that Test 1 was especially challenging, that is, when the first sentence under evaluation is expressively followed by the negation of the proposition of the complement of the factive verb. On the other hand, Test 2, which also denies the truth of the complement clause yet without directly using negation in front of the content of the embedded proposition, might have been, to some extent, easier to grasp by our consultants. As a consequence, the results had to be interpreted as a whole, taking into account both the results from Test 1 and Test 2 in conjunction.

4.3. Results

In the last section, a distinction was drawn between contradiction and judgments of contradiction. Contradiction is a binary concept: a sequence of sentences is either a contradiction or not. Judgments, on the other hand, are a little more complicated. As pointed out by [Bohnenmeyer \(2015\)](#): “Judgments are almost always of a graded nature. That is, even if a speaker gives a categorical response to a simple polar question, this response can be ranked in relative strength with respect to the same speaker’s responses to other *stimuli*.” Therefore, even though contradiction is binary, judgments of contradiction do not necessarily have to be—and in our study, they were not in some cases.

Generally speaking, the main result is that the tested verbs can be divided into two subcategories as in in Table 2: one class of verbs that yields a very consistent response (Group 1) and another whose judgments are much more complex to interpret (Group 2). The latter will require us to take a closer look at them as their behavior cannot be categorically classified:

Table 2. Two subcategories of verbs tested.

Group 1	Group 2
<i>diwyt</i> (forget)	<i>kybawa</i> (not believe)
<i>sodyp</i> (know)	<i>kywytit</i> (think “for sure”/believe)
<i>sikina</i> (remember)	<i>pyting</i> (want)
<i>koro’op ’yra</i> (lament)	<i>(koro’op) kāra</i> (suspect/think)

The *criteria* for inclusion in each group will be justified in detail. We start with verbs of Group 1:

- (52) **Criterion for inclusion in Group 1**
 The sequence of sentences was consistently labeled as a contradiction in Test 1 and Test 2 by both speakers and the clarification given by our consultants was compatible with the use of such a label.

The results for Group 1 verbs are depicted in Tables 3 and 4:

Table 3. Responses of Group 1 for Test 1: "...but Luciana didn't kill a jaguar".

Verb	Consultant 1	Consultant 2
<i>diwyt</i> (forget)	contradiction	contradiction
<i>sodyp</i> (know)	contradiction	contradiction
<i>sikina</i> (remember)	contradiction	contradiction
<i>koro'op 'yra</i> (lament)	contradiction	contradiction

Table 4. Responses of Group 1 for Test 2: "...but Francisco was born in São Paulo".

Verb	Consultant 1	Consultant 2
<i>diwyt</i> (forget)	contradiction	contradiction
<i>sodyp</i> (know)	contradiction	contradiction
<i>sikina</i> (remember)	contradiction	contradiction
<i>koro'op 'yra</i> (lament)	contradiction	contradiction

The second group, on the other hand, comprises verbs whose judgments were not consistent across speakers and/or tests. In some cases, the sequences of sentences with Group 2 verbs were judged as pure contradictions, but in other cases, a variety of responses was obtained. Therefore, the criterion for inclusion in Group 2 is the occurrence of at least one of these different responses, as described below:

(53) **Criterion for inclusion in Group 2**

A verb will belong to Group 2 if at least one of the following responses was obtained:

- A The judgment given by at least one consultant was "it is not a contradiction";
- B The judgment given by at least one consultant was "it can be a contradiction or not";
- C The judgment given by at least one consultant was "it is a contradiction" but the justification for this response was not in line with a linguistic contradiction. For example, the justification given was "because the second sentence contradicts the [subject of the previously stated matrix clause's] opinions/beliefs." In this case, the explanation does not necessarily justify a situation that would contradict the occurrence of the entailed event.¹⁶

Example (54) shows a verb classified into Group 2 by Criterion (53A): Consultant 2 stated that the two sentences are not contradictory and presented a justification.

(54) *João* Ø-*na-aka-t* *i-koro'op kãra-t* [*Luciana ombaky oky*]-*ty*.
 João 3-DECL-COP-NFUT PART-suspect/think-COP.AGR Luciana jaguar kill-OBL
I-oky padni ombaky Luciana.
 3-kill NEG jaguar Luciana

Possible translation: "João thought that Luciana killed a jaguar, (but) Luciana didn't kill a jaguar."

Judgment and justification of Consultant 2: "It is not a contradiction, because João was afraid that the jaguar would kill Luciana, but the jaguar didn't kill her."

Next, 55 illustrates a response (53B) given by Consultant 1:

- (55) *João* Ø-*na-aka-t* *i-kywytit*-Ø [Porto Velho *pip* Francisco
 João 3-DECL-COP-NFUT PART-believe-COP.AGR Porto Velho in Francisco
yt]-*y-ty*. Francisco Ø-*na-aka-t* *i-yt*-Ø São
 be.born-EPEN-OBL Francisco 3-DECL-COP-NFU PART-be.born-COP.AGR São
Paulo pip.
 Paulo in

Possible translation: “João thought that Francisco was born in [the city of] Porto Velho, (but) Francisco was born in [the city of] São Paulo.”

Judgment and justification of Consultant 1: “It can be a contradiction or not.”

Below, an example fitting Criterion (53C) is provided:

- (56) *João* Ø-*na-aka-t* *i-kāra* [Porto Velho *pip* Francisco
 João 3-DECL-COP-NFUT PART-suspect/think-COP.AGR Porto Velho in Francisco
yt]-*y-ty*. Francisco Ø-*na-aka-t* *i-yt*-Ø São
 be.born-EPEN-OBL Francisco 3-DECL-COP-NFU PART-be.born-COP.AGR São
Paulo pip.
 Paulo in

Possible translation: “João thought that Francisco was born in [the city of] Porto Velho, (but) Francisco was born in [the city of] São Paulo.”

Judgment and justification of Consultant 2: “It is a contradiction, because it contradicts John’s expectation, but it is a possible situation.”

Finally, in example (57), the Consultant 2’s response also fits into Criterion (53C).

- (57) *João* Ø-*na-aka-t* *i-koro’op kāra-t* [Porto Velho *pip* Francisco
 João 3-DECL-COP-NFUT PART-suspect/think-COP.AGR Porto Velho in Francisco
yt]-*y-ty*. Francisco Ø-*na-aka-t* *i-yt*-Ø São
 be.bornEPEN-OBL Francisco 3-DECL-COP-NFUT PART-be.born-COP.AGR São
Paulo pip.
 Paulo in

Possible translation: “João thought that Francisco was born in [the city of] Porto Velho, (but) Francisco was born in [the city of] São Paulo.”

Judgment and justification of Consultant 2: “It is a contradiction, because João was feeling that Francisco would be born in Porto Velho, but then Francisco was born in São Paulo.”

Summing up, the key difference between Group 2 in relation to Group 1 is that the use of the same verbs in non-factive contexts are not consistently judged as contradictory like with Group 1. The variation of results can be seen in the tables below for Test 1 (Table 5) and for Test 2 (Table 6):

Table 5. Responses of Group 2 for Test 1: “... but Luciana didn’t kill a jaguar”.

Verb	Consultant 1	Consultant 2
<i>kybawa</i> (not believe)	contradiction	not contradiction (53A)
<i>kywytit</i> (believe)	contradiction	contradiction
<i>pyting</i> (want)	contradiction	contradiction
<i>(koro’op) kāra</i> (suspect/think)	contradiction	not contradiction (53A)

Table 6. Responses of Group 2 for Test 2: "...but Francisco was born in São Paulo".

Verb	Consultant 1	Consultant 2
<i>kybawa</i> (not believe)	not contradiction (53A)	not contradiction (53A)
<i>kywytit</i> (believe)	it can be a contradiction (53B)	contradiction
<i>pyting</i> (want)	contradiction (53C)	contradiction (53C)
<i>(koro'op) kāra</i> (suspect/think)	contradiction (53C)	contradiction (53C)

When mixed results across speakers and/or tests are obtained as in Group 2, we cannot conclude that the complement of the factive verb is entailed in the same way as it is for the factive group (Group 1).¹⁷ However, it is also important to stress that even though judgments of non-contradiction are found with these verbs (or something along the lines like *it could be contradictory and non-contradictory*), there are a certain number of judgments that are labeled as truly contradictions by the consultants, even for the verbs listed in Group 2. This will be important for our classification and understanding of these Group 2 verbs, which is the topic of the next section.

4.4. Discussion

Whenever a sequence of sentences with a certain verb is consistently judged as a contradiction as in Group 1, then we consider this a very strong indication of true contradiction. If a contradiction arises, then we can conclude that there is indeed a factive entailment. Therefore, we conclude that verbs in Group 1 are truly obligatorily factive.

The picture with verbs of Group 2 is less clear, though. The judgments were less consistent in comparison with Group 1, so they do not seem to be obligatorily factive. Nonetheless, the tests containing these verbs were not constantly judged as non-contradictions either, as it would be the case if they were obligatorily or truly non-factive. One possible interpretation of the results in Tables 5 and 6 is that they can have a factive reading, but this is not obligatory and depends on several factors. In other words, factivity is, for verbs of Group 2, optional to some extent.

Importantly, it has been observed that a binary distinction opposing factive and non-factive predicates may not be universal. For instance, [Degen and Tonhauser \(2022\)](#) conducted an empirical study where they compare twenty canonically and non-canonically factive verbs in English and concluded that there is no evidence for a categorical distinction; rather, a more fine-grained scale might be necessary. Along these lines, in another recent empirical study, [Dahlman and van de Weijer \(2022\)](#) observe different degrees of cross-linguistic acceptance of canonically factive verbs like *know* used in non-factive contexts across nine different languages. Therefore, variability in judgments is found in other languages as well, and in Karitiana specifically, this would be the situation with verbs of Group 2, which may have a factive reading—or even a high tendency/strong preference to be interpreted factively—but do not require it as verbs of Group 1.

Turning now to the research questions discussed in Section 2, we are now in a position to evaluate the impact that the structure of the embedded clauses in Karitiana has on the interpretation of attitude verbs. The judgments of sentences with verbs of Group 2 prove that nominalization alone is not sufficient to force a factive reading of the matrix attitude verb, as there are cases in which a non-factive reading was possible, i.e., when the two-sentence sequence was not judged as contradiction (Criteria (53A) and (53B)).

What we would like to suggest at this point is that nominalized embedded clauses do have an important contribution to factive readings, but that they alone may be insufficient to generate them. This is what has been proposed by [Özyildiz \(2017\)](#). According to the author, the factive meaning emerges in the composition between certain verbs and a specific type of clause (a nominalized one).¹⁸ This view is supported by the fact that in many languages, nominal structure is a necessity, but not a sufficient condition to the presuppositional/factive reading of an attitude verb. In Turkish, for example, certain verbs such as *bil-* 'know' are interpreted as factive if their clausal complement is nominalized (see

examples (58a) and (58b), repeated below). However, other verbs such as *düşün* ‘think’ may take a nominalized clause (as in (59a)) without having any kind of factive interpretation.

(58) Turkish (Özyildiz 2017)

- a. *Tunç* [*Hillary'nin kazan-dığın-ı*] *biliyor*
 Tunç Hillary win-NMZ-ACC knows
 “Tunç knows that Hillary won.” → Hillary won.” (factive)
- b. *Tunç* [*Hillary kazan-dı diye*] *biliyor*.
 Tunç Hillary win-PST DIYE knows
 “Tunç believes that Hillary won.” → Hillary won. (non-factive)

(59) Turkish (Özyildiz 2017)

- a. *Tunç* [*Hillary'nin kazan-dığın-ı*] *düşünüyor*.
 Tunç Hillary win-NMZ-ACC thinks
 “Tunç thinks that Hillary won.” (non-factive)
- b. *Tunç* [*Hilari kazan-dı diye*] *düşünüyor*.
 Tunç Hillary win-PST.PFV DIYE thinks
 “Tunç thinks that Hillary won.” (non-factive)

The same has been observed for Buryat. The verb *hanaxa* can receive a factive reading when complemented by a nominalized clause (example (60a)) or a non-factive reading when it selects for a CP (60b). Nonetheless, this is not the case for all verbs: as example (61) shows, the verb *ətigəxə* (‘believe’) has a non-factive reading regardless of the structure of the complement:

(60) Buryat (Bondarenko 2019)

- a. *Dugar* [_{NMN}*mi:sgəi-n zagaha ədj-ə:f-i:jə-n'*] *han-a:*
 Dugar.NOM cat-GEN fish eat-PART-ACC-3SG think-PST
 “Dugar remembered a cat’s eating fish.”
- b. *Dugar* [_{CP}*mi:sgəi zagaha ədj-ə: gəžə*] *han-a:*
 Dugar.NOM cat.NOM fish eat-PST COMP think-PST
 “Dugar thought that a cat ate fish.”

(61) Buryat (Bondarenko 2019)

- Sajana badm-i:n tərgə əmdəl-ə:f-tə-n'* *ətig-ə:, xarin badma tərgə*
 Sajana Badma-GEN cart break-PART-DAT-3 believe-PST but Badma cart
əmdəl-ə:güi
 break-PST-NEG

“Sajana believes that Badma broke the cart (lit. ‘in Badma’s breaking the cart’), but Badma didn’t break the cart.”

Finally, the factive interpretation of verbs in Group 2 is not fully understood. It could be that these verbs are optionally factive (or say *semifactive*), in the sense that they strongly implicate the factive reading but still leave open the possibility of finding the right context that would allow for a non-factive interpretation. Nonetheless, even then, there seems to be a strong preference for factive readings of these verbs (specially in Test 1, as can be seen in Table 5). We hypothesize that this could be due to the nominalization of the embedded clause, because nominalized complements do exhibit a factive entailment in other languages. This can be seen in the Portuguese examples below, in which the nominalized complement in (62) has a strong preference for a factive reading (i.e., it strongly implies that John cheated), as opposed to the non-nominalized version in (63):

- (62) *Maria suspeita da traição do João.*
 Maria suspects of cheating of João
 “Maria suspected of João’s cheating.”
 (strongly implies that the cheating occurred)
- (63) *Maria suspeita que o João traiu a namorada.*
 Maria suspects that the João cheated the girlfriend
 “Maria suspected that João cheated on (his) girlfriend.”

The same contrast in judgments on factivity for nominalized vs. non-nominalized complements of some attitude verbs like *suspect* also applies to other Romance languages such as Catalan and Spanish.

All in all, moving from a categorical dichotomy of factive vs. non-factive verbs towards a more gradient scale in terms of factivity might be a more adequate approach in order to capture all the fine-grained intermediate interpretations that appear to occur not only in Karitiana but also cross-linguistically. It is, however, complex to pinpoint the reason behind this, as it appears to be multi-factored: at least both syntactic- (e.g., nominalized vs. non-nominalized clauses) and lexico/context-dependent (e.g., to which degree the factive implication gets accommodated in the discourse, which, in turn, might be influenced by the semantics of the verb). Regarding the latter, our results slightly suggest that the verbs in Group 2 could be further categorized along a scalar degree of factivity depending on how much their use is accepted in non-factive contexts. For instance, on the basis of the consultants’ clarifications to their answers, a three-tier scale of attitude verbs with a denotation similar to ‘know’ could be posited. Under such an approach, the verbs would be placed along a scale of factivity—*sodyp* (know) » *kyvytit* (think “for sure”, believe) » *koro’op kãra* (think/suspect)—from exhibiting a stronger factive behavior (left) to a weaker one (right). If this idea holds water, something along those lines seems to be the right direction for moving forward. A deeper understanding of how such a scalar reasoning of attitude verbs works remains for future research.

5. Final Remarks

This paper presents an exploratory description of attitude verbs and their clausal complements in Karitiana. Starting from the literature on these verbs—and specifically, on the impact of the clausal structure on factive readings—we proceeded to investigate whether the structure of subordinate clauses impacts the interpretation of these verbs.

Embedded clauses are not full clauses in Karitiana, lacking many clausal features. Moreover, they exhibit a morphological and syntactic behavior that brings them closer to noun phrases. A nominalized structure with an N layer was proposed to account for these facts. We also claimed that this nominalized structure is tied to the status of embedded clauses as strong islands. Lastly, this syntactic structure of the embedded clauses, in which an N head is present, would be similar to factive sentences with “... the fact that...” in English and Hebrew (see [Kastner 2015](#)). These constructions, as in Karitiana, behave as strong islands.

Nominalization of embedded clauses does seem to impact the interpretation of attitude verbs: in this language, verbs that are read as non-factive in other languages (e.g., ‘believe’, ‘think’, ‘want’) are what we could categorize as *optionally factive* or *semifactive* since by default they are interpreted factively, similarly to nominalized embedded clauses of these verbs in other languages like in Portuguese.

It remains to be answered to what extent the matrix attitude verb contributes to this factive or semifactive interpretation. Up to this point, what we can answer now is that obligatory nominalization of the embedded clause is not enough and the lexical meaning of the verb must contribute to a certain degree for its complement to be taken factively. Nevertheless, how the structure of the clausal complement and the lexical meaning of the verb combine is a matter for future research.

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Abbreviations

3	third person
ACC	accusative
ASS	assertive
COND	conditional
DECL	declarative
DEP	dependent marker
DES	desiderative
DS	different subject
COMP	complementizer
COP.AGR	copula agreement
CAUS	causative
COP	copula
GEN	genitive
IND	independent mood marker
INT	interrogative
LOC	locative
NEG	negation
NFUT	non-future
NM.ACC	accusative nominalizer
NMZ	nominalizer
OBL	oblique
PST	past
PL	plural

Notes

- ¹ For [Kastner \(2015\)](#), factive verbs are part of a bigger class of presuppositional verbs, i.e., verbs that require the existence of the proposition expressed by the embedded clause in the conversational background. One example of a non-factive presuppositional verb is [Catell’s \(1978\)](#) response-stance category, which includes verbs like ‘confirm’, ‘accept’, ‘agree’, ‘deny’. Here, for the purposes of the present study, we opt to focus only on factive verbs.
- ² The verb *oky* is always ambiguous between the interpretations ‘kill’ or ‘hurt’. In the following glosses, we omit this information, as the most salient interpretation of *oky* in our examples is ‘kill’.
- ³ Aspectual markers are also possible in embedded clauses. These are not complementizers though, because they are also allowed in matrix clauses (see [Rocha 2016](#); [Storto 1999, 2012](#)).

4 Relative clauses in Karitiana are internally-headed (see [Storto 1999](#) and [Vivanco 2014](#)). When the matrix verb requires the oblique marking *-ty*, such as *koro'op kāra* ('suspect/think') in (26), this suffix attaches to the whole relative clause.

5 Karitiana is head-final ([Storto 1999](#)).

6 Even though agreement morphemes are not possible, cliticized pronouns can be present in embedded clauses ([Storto 1999](#)).

7 It still remains to be explained how a WH-word is licensed (e.g., in long-distance questions) if CPs are absent in embedded clauses.

8 There are no relative pronouns as well, as the relative clause in (26) shows.

9 It is worth mentioning that the embedded clause with *-pa* as in (38) covers the meaning of an indirect question. As already discussed in Section 3.2, Karitiana does not have real indirect questions.

10 Evidentials can also be present and in this case, an EvidP layer will be added into the structure ([Vivanco 2018](#)).

11 An alternative analysis, pointed out by an anonymous reviewer, would derive strong islandhood of both NPs and embedded clauses from a restriction on Left Branch Extraction such as the one found in English ("*Whose_i did you buy [_{t_i} car]). At this point, both analyses cover all empirical facts described here, and we leave this matter to future research. Nonetheless, the reasoning still holds in both cases: in Left Branch Extraction in English, for example, the left periphery of embedded clauses does not induce island effects which trigger pied-piping; in Karitiana, on the other hand, both noun phrases and embedded clauses behave alike in this respect, showing that they both share similar properties.

12 In Ross' original formulation, the head noun was of lexical nature lexical. We mentioned in Section 3.4 that the head N would be null in most cases, but that it could also be the nominalizer *-pa*. The question of whether this N head could be considered lexical exceeds the scope of this work, as it would require a detailed syntactic investigation of it. Moreover, it has been proposed by [Vivanco \(2018\)](#) that this nominal head is actually tied to the ancient Tupian suffix *-a/∅*, whose behavior is quite complex.

13 It is worth mentioning that factivity can be present in a larger class of predicates, not only whenever attitude verbs are involved. Nonetheless, we focus only in attitude verb-related factivity in this paper for a limited list of attitude verbs.

14 We tried to address presupposition projection in negated sentences using the following task:

1. "Someone says the following sentence to you: *Ikybawa padni João Porto Velho pip Francisco 'ytyty* ("João doesn't doubt that Francisco was born in Porto Velho"). Based on that, where would Francisco be born?"

- (A) Porto Velho
- (B) São Paulo
- (C) It is not possible to know.

This configuration was tested with several verbs (see Table 2) with one speaker (Consultant 1):

A. *I-diwyt/sondyyp/sikin-i/kybawa/koro'op yri/kywytit/pyting/kār-ĩ* padni João
 3-forget/know/remember-EPEN/doubt/lament/believe/want/think-EPEN NEG João
 Porto Velho pip Francisco 'yt-y-ty.
 Porto Velho in Francisco be.born-EPEN-OBL

"João does not forget/know/remember/doubt/lament/believe/want/think that Francisco was born in Porto Velho."

If the speaker chose item A (the city of Porto Velho), it meant that the content of the embedded clause was presupposed. The speaker chose letter A only for the verbs *diwyt* ('forget') and *koro'op yri* ('lament'). For other verbs, the responses were less clear: the verb *sondyyp* ('know'), for example, did not score the item A according to the speaker because "if João does not know that, I do not know it either". This explanation could either be that the sentence does not presuppose [João was born in Porto Velho] or maybe that the speaker was following João's beliefs to determine the answers. Since we were unable to check it with more than one consultant, we leave the matter of presupposition projection left for future work.

15 The verb *pyting* (translated here as 'want') was included here even though its equivalent in English is a desiderative verb and consequently not factive. This was done precisely to test whether nominalization of embedded clauses impacts the interpretation of a matrix verb usually not considered potentially factive in other languages.

16 We also included in this item C responses in which the speaker presented a scenario as a justification that would go against the subject of the first sentence's opinions/beliefs without explicitly stating that.

17 One may wonder whether sentences were incorrectly judged as contradictions because the concept of contradiction was not fully understood by the consultants. We do not think that this is the case due to the result of the fillers: these were correctly and consistently judged by the speakers.

18 There is an important difference between many authors who studied the interaction between nominal features and factivity: for some of these, factivity may be encoded or triggered by D ([Bochnak and Hanink 2022](#); [Kastner 2015](#)). As Karitiana lacks D altogether (see Section 3.1), it seems that only N and its projection would be responsible for that.

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