

Pirahã – in need of recursive syntax? ⁱ

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1. Introduction

Since the publication of the article ‘The faculty of language: what is it, who has it and how did it evolve?’ by Hauser, Chomsky, and Fitch (2002) recursion has assumed a prominent place in the discussion of what aspects of our communication system are unique to humans and human language. The hypothesis put forward in that article is that recursion is the only property unique to human language. The entailments of this hypothesis are that recursion would be found in all languages spoken by humans and that a human language that does not use recursive structures would not exist.

This claim has provoked a number of reactions, most noticeably Everett (2005), who argues that Pirahã, the last surviving member of the Muran language family, does not exhibit recursive structures in its syntax, even though it undoubtedly is a language spoken by humans. Pirahã is spoken by approximately 450 people in the Brazilian state of Amazonas, in small settlements along the river Maici. The Pirahã live a largely traditional life as hunter-gatherers and rarely seek contact with the outside world.

Since the publication of Everett’s (2005) article, there has been an ongoing, mainly web-based, discussion as to whether Pirahã exhibits recursive structures, e.g., on *LingBuzz* by Nevins, Pesetsky, and Rodrigues (2007) and a reply by Everett (2007a), on *Language Log* by Liberman (2006), Everett (2007b), Sakel’s (2007a) and Slobin’s (2007) *Letters to the editor* of the journal *Human Development* and Everett’s reply (2008). The issues brought up are far from being resolved. Some of the ambiguity in the present discussion is based on contradictory analyses of Pirahã data in two publications by Everett (1986, 2005). Everett’s earlier work (1986) contains an extensive description of embedded clauses in Pirahã, whereas he rejects the existence of these structures in his more recent work (2005). Due to this discrepancy, researchers who support the hypothesis that Pirahã has recursive syntax usually cite data presented by Everett (1986), discarding the new analysis (2005). While the discussion is very focussed, few people so far have looked at Pirahã language facts other than those given in the two publications by Everett (1986, 2005), comparing them to other indicators as to whether recursion is necessary in a human language.

The present article sets out to add new data to the discussion. It is based on our field research among the Pirahã and brings together research data from experiments and elicitation, as well as analysis of spontaneous speech.ⁱⁱ

We look at first-hand language data in three areas of Pirahã grammar which we would expect to be expressed by recursive structures if these existed, and then address our findings in the light of a number of recent findings in linguistics.

The article is divided up in the following way: first we will discuss the suffix *-sai*, which Everett (1986) reported to be an indicator of embedding, and which features prominently in the recent discussions. We will then look at the other side of the coin and investigate what alternative strategies can be used to express complex situations. Following this, we will address the question whether recursive structures could enter the language through language contact with Portuguese. Finally we will examine our results in the light of recent publications to gain insights into whether recursion is really a necessary notion in human language. This article is a collection of several arguments related to the question whether recursion is necessary in Pirahã.

2. The suffix *-sai*

The suffix *-sai* figures prominently in recent discussions of recursion. Everett (1986: 277) classified it as a nominaliser and an obligatory indicator of embedding in conditional clauses (1986: 264). In his later approach (2005: 21), however, he argues that *-sai* does not mark syntactic subordination.ⁱⁱⁱ We have studied this marker's functions, in particular with respect to whether it is an obligatory marker of embedding. We will here look at two very different constructions in which *-sai* is used.

The first part of our discussion is based on findings by Stapert (2007) and Stapert et al. (in preparation). They tested the functions of *-sai* experimentally in a sentence repetition task.

In this experiment, two clauses representing semantically connected propositions, such as *it is raining* and *I don't go to the forest* were combined. The suffix *-sai* was added to either the verb of the first or that of the second clause, cf. (1a) and (1b) and the informants were asked to merely repeat the sentence.

- (1) a. *Piiboi-bai-sai* *ti* *kahápi-hiaba.*
rain-INTENS-SAI 1 go-NEG
'If it is raining I won't go.'
- b. *Piiboi-bai* *ti* *kahápi-hiabi-sai.*
rain-INTERS 1 go-NEG-SAI
'If it is raining I won't go.'

A total of nine speakers of Pirahã – 7 women and 2 men – participated in this language task. In their response, informants attached *-sai* to the first clause, the second clause, both clauses, or neither of the clauses (cf. 2) independent of the

input and with no reported change in meaning or judgement of (un)grammaticality.

- (2) *Piiboi-bai ti kahápi-hiaba.*
 Rain-INTENS 1 go-NEG
 ‘If it is raining I won’t go.’

Out of a total of 39 relevant responses *-sai* was attached to both clauses in 9 cases, to none in 6, and to one clause – either the *rain* part or the *forest* part – in 24 instances^{iv}.

The alternative in which *-sai* does not occur in either clause (2) was not part of the input of the experiment. Hence a simple repetition of an ungrammatical sentence from the input is ruled out. This means that the concept can be expressed without the presence of *-sai*; thus this marker can not be an obligatory marker of embedding. Still unclear, however, is the exact function of *-sai* in these constructions, but it does not appear to be a marker of subordination, as originally claimed by Everett (1986).^v

A related investigation carried out by Sakel and Stapert for the present paper was the analysis of various other constructions with *-sai*, both in spontaneous speech and elicitation. The results show that *-sai* occurs most frequently in constructions expressing quotation of the type *hi gai-sai* (3 say *-sai*) ‘he said’ or *ti gai-sai* (1 say *-sai*) ‘I said’. This construction is always followed by direct speech and occurs with great frequency, and indeed in certain discourse contexts in every utterance. While functioning as a quotative in many of these cases, it sometimes appears in contexts that are not directly reportative, cf. (3).

- (3) *Ai hi gai-sai xigihí hi xaisigíaihi xaitáhoihí*
 well 3 say-SAI man 3 same sleep
xoó.
 forest
 ‘Well, the same man went to sleep in the forest.’

This example (3) was uttered in the context of elicitation – the story was played out with dolls – where no conversation was directly referred to. Rather than being a quotative, *hi gaisai* seems to express impersonal reference in this case, such as ‘the Pirahã in general do/say this’, detaching the speaker and his responsibility from what is said. The meaning would be ‘one would say it in the following way’. This could point to a possible development away from the mere quotative use of the construction towards a more abstract meaning.

Altogether, we can say that *hi gaisai* and similar constructions function as discourse markers and elements detached from the main content of

the clause. Similar claims have been made for constructions in many other languages, including English, cf. Thompson and Mulac (1991) and Thompson (2002) for arguments that *I think* and *I guess* have grammaticalised into evidential markers and Hopper (2000) for English pseudo-clefts functioning as discourse markers.

3. Alternative strategies to express complex cognitive structures: Mental verb constructions

Similar to *-sai* above, Pirahã employs various other strategies to express cognitively complex concepts without making use of syntactic complexity. A striking example is mental verb constructions, such as sentences containing *I think* or *I doubt* in English. These are relevant since they always reflect two perspectives: either from two different people, or between reality and personal experience of one person. Regardless of whether these are two separate propositions or not, which in itself is a much debated issue, we have to do with a cognitively complex situation and many languages choose to encode this in syntactically complex sentences. Still, non-complex ways of coding mental verb constructions are likewise well-attested, e.g., marking for evidentiality by suffixes.

When looking at the data in Pirahã, we find that there are no separate verbs expressing mental states. Rather, suffixes corresponding functionally to English mental verbs or adverbs indicating mental attitudes are used. Table 1 brings together some of the mental attitude suffixes and their functions, as well as their equivalent translations as complex structures or adverbs in English (for a detailed argument on why mental verb constructions and evidential suffixes are comparable cf. Diessel and Tomasello 2001; Stapert 2009).

Table 1: attitude suffixes in Pirahã

Verbal suffix	Function, meaning	Equivalent in English	
		Mental verb	Adverb
-áti	Uncertainty	I doubt, I'm not sure	maybe, perhaps
-haí	relative certainty	I think, I guess	probably
-há	complete certainty	I know, I bet, I'm sure	definitely, certainly
-sog	Desiderative	I wish, I want, I hope	hopefully
-híai	Hearsay	I heard	apparently, allegedly
-sibiga	deductive	I understand, I suspect I get the impression	apparently, seemingly
-xáagahá	observation, matter of fact	I notice, I see, I'm certain (lit. use)	clearly
-bai / -koí	emphasis, intensifier	I bet, I mean (clarification)	obviously, certainly, for sure

Example (4) shows the markers *-hai* ‘relative uncertainty’ and *-hiai* ‘hearsay’ added to the verb *bog-ai* ‘he came’ to express ‘doubt’ and ‘hearsay’ respectively. In examples (5) and (6) the meanings of ‘complete certainty’ and ‘observation’ are added in the same way:

- (4) *Garippíiru bog-ai-hai-hiai.*
 Brazilian.worker come-ATELIC-DOUBT-HEARSAY
 ‘(I heard that) the Brazilian worker has probably not come here.’
- (5) *Hi kagáihiai koabái-p-á-há*
 3 jaguar kill-PERF-REM-COMP_CERT
 ‘(I’m sure) he shot the jaguar’
- (6) *Piboi-bai hi kahápi-hiab-áagahá*
 Rain-EMPH 3 go-NEG-OBSERV
 ‘It is raining; (I see) he is not going (to the forest)’

In English the concept of uncertainty can be expressed by the adverb *probably*, as in the translation of (4), or the entire sentence could alternatively be expressed in a double embedded structure such as ‘someone said that he doubts that the Brazilian worker came here.’ These elements function like evidentials, rather than verbs in expressing probability and source of information without having a separate subject themselves. In this way recursive embeddings in English are very different from constructions with evidentials in Pirahã. Compare the recursive sentence in (7a) with the non-recursive equivalent using adverbs with similar functions to the Pirahã evidentials in (7b):

- (7) a. *He said that I suspected that the students were hung over.*
 b. *Hearsay perhaps the students are hung over.*

Summarising, markers of attitude in Pirahã can be analysed as expressing semantically complex structures without syntactic embedding.

4. Language contact

The examples we have looked at so far were native Pirahã language data. Now, we will turn to elements and morphemes outside of the Pirahã system that could be introduced by language contact and that could subsequently introduce recursion into Pirahã syntax. The hypothesis is that through intensive language contact with Portuguese, markers and structures of embedding, which are common in Portuguese, could be borrowed into Pirahã. Our reasoning for this is as follows:

Firstly, elements that mark structures of embedding are frequently borrowed in other contact situations. A typological study of grammatical contact phenomena (Matras and Sakel 2007; Sakel 2007b) concludes that function words such as discourse markers, coordinators and subordinating conjunctions are almost always borrowed in situations where a minority language is in contact with a highly dominant language and with prevailing bilingualism. Indeed, in most of these cases subordinating conjunctions were among the borrowed elements, being taken over wholesale with their form and function.

Secondly, the Pirahã use many Portuguese lexical elements in their language, even though the community as a whole is predominantly monolingual with only a few older men having rudimentary knowledge of Portuguese. This is surprising as the Pirahã have been in contact with outsiders for over 200 years. The loanwords from Portuguese include new concepts such as *gahiáo* ‘plane’ (from Portuguese *avião*) and *kapiiga* ‘paper’ (from Portuguese *papel*), as well as a number of elements that already exist in Pirahã, but that are frequently used when speaking with outsiders, such as *bii* ‘good’ (from Portuguese *bem*) or *ambora* ‘away, let’s go’ (from Portuguese *embora*). When looking at the syntactic structures, however, there is no evidence that Portuguese has had any influence on the grammar of Pirahã, as there are no apparent grammatical calques. In a number of cases speakers of Pirahã incorporate Portuguese grammatical elements into their language, but this is only the case when making conscious efforts to speak Portuguese to foreigners, as in (8).

- (8) *Ai ai aki his-o keeche*
 DM DM here sun-LOC^{vi} hot
kwaadoaki his-o *friio*
 when here sun-LOC cold
ai kaba keema ai
 DM NEG burn DM
ai muito braako.
 DM very white

‘It is hot here in the sun. When it is cold here in the sun, you do not burn. (You are) very white.’ (Portuguese elements in bold)

In (8) the speaker makes use of the Portuguese adverbial clause marker *quando* ‘when’ (integrated into Pirahã as *kwaado*). Instead of functioning as an adverbial clause marker, however, it appears to be used similar to the Pirahã distance marker *-so*, which expresses that an event is not happening in the immediate context of the utterance.^{vii} In this case, the speaker expresses that it

is not cold at the moment of speech. Comparing this example to typical Pirahã sentences, the structure is very similar: relations between clauses are established by simple juxtaposition, combined with distance marking when appropriate. Example (8) is thus an instance of insertion of Portuguese material into a grammatical frame that is purely Pirahã. This is suggestive of the fact that Pirahã has not borrowed recursive structures from Portuguese. Increased contact with the outside world in recent years, and hence increased bilingualism could change this, however.

5. Recursion in Pirahã? Toward an alternative analysis

Let us sum up our findings and discuss to what degree we can expect recursion in Pirahã. Firstly, does Pirahã have recursion? Most structures we have looked at so far have given no evidence of being outright syntactically recursive structures. In most cases clauses are linked by simple juxtaposition and relations between them become clear in the discourse context. However, conclusive support of this negative finding would require more evidence than we presently possess. Thus, our conclusions are necessarily tentative.

There are a number of markers, such as *-sai* and *-so*, that seem to appear in structures parallel to ‘recursive’ structures in other languages, but these are not outright markers of subordination or recursion in the syntactic sense: more often, these markers are expressing semantic cohesion between parts of the discourse. These markers also indicate relations between what is said and the reality of the speech situation, such as the distance marker *-so*, which expresses a distance to the current reality. Concepts that are expressed recursively in many other languages are marked by affixes in Pirahã, as in the case of mental verb construction. Language contact has likewise failed so far to introduce recursive structures from Portuguese. Hence, we can not say with any confidence that there is – or for that matter is not – recursion in Pirahã.

Instead of saying that recursion is a core characteristic of human syntax, we believe that it is an important feature of human language which is most likely to be present in languages and language varieties that are used to express complex concepts. Let us discuss a number of recent publications in the field to clarify what we mean.

5.1. Spoken language

Recursive structures appear to be far less frequent in spoken language than in written language. Mark Liberman discusses this for English in his entry on Language Log in May 2006, citing the following example from Elmore Leonard’s *La Brava*:

- (9) *What’re you having, conch? You ever see it they take it out of the shell? You wouldn’t eat it.*

This is a typical example of a variant of spoken language, though paradoxically in this case it is written language imitating spoken language. Nonetheless, it shows that complex and recursive constructions such as ‘if you had ever seen it being taken out of the shell you would not eat it’ can be replaced by paratactic, non-recursive structures in spoken language.

That spoken language makes less use of recursion has also been shown for Finnish and Japanese: Laury and Ono (This Volume) present evidence that when recursive structures appear in spoken language they are generally less complicated than in written language. There is often only one degree of recursion in spoken language, while written language can show many different layers of subordination (cf. also Karlsson 2007). Similar evidence comes from the analysis of informal talk, where clause chains are preferred to embedding (Pawley and Syder 1983).

Comparing these findings with our Pirahã data, we can argue that since Pirahã is a spoken language exclusively, recursion may be unnecessary or at least far rarer than in written language.

5.2. *that-omission in relative clauses*

On top of the decrease in recursive structures we find in spoken language we can also argue for a parallel case that extends to written language. Two recent approaches to *that*-omission in English restrictive relative clauses claim that the resulting construction is non-recursive. Fox and Thompson (2007: 293) argue that pragmatic-prosodic factors, as well as frequency, can lead to a “monoclausal” nature of the combination of relative clause and main clause. These monoclausal combinations are highly formulaic and processed as one, rather than two clauses, and in these cases *that* is omitted. In a different approach, Jaeger and Wasow (2007) argue that the more accessible the relativised element is in English non-subject extracted relative clauses, the more likely it is for the relativiser to be omitted. *That*-omission usually takes place when the relativised element is given or definite. Hence *that* is often absent when the content of what is said is predictable. Another parallel case has been reported by Progovac (This Volume), who argues that certain small clauses do not allow for recursion.

In this way, English has constructions that have a non-recursive expression and that appear both in spoken and written language. What if such constructions were the default or indeed the only option in another language, such as Pirahã? Since English relative clauses work equally well in cases with or without overt syntactic marking for recursion, it is possible to imagine a human language that does not need to have recursive structures.

5.3. *Esoteric language use*

More evidence comes from studies of how human language developed. Wray and Grace (2007) distinguish between esoteric vs. exoteric communication, based on Thurston's (1987) terminology. Esoteric communication is inward-facing, which means that it is used within a well-defined group. In this type of communication comprehension is facilitated as hearers are likely to know what the speaker is going to say in a given situation. This still means that the language can express novel ideas, but the expression of predictable thoughts is a default. Exoteric communication, on the other hand, is outward-facing. Hence, exoteric communication in the definition of Wray and Grace (2007) would range from using a lingua franca to employing one's local dialect to communicate with somebody unknown. Speakers have to be clear, since hearers are unlikely to predict what the speaker will talk about. This is possible in a language with simple, unambiguous elements that can be combined by unambiguous rules.

Hence it is not surprising that the type of linguistic features found in varieties used for esoteric and exoteric communication are very different: Wray and Grace (2007) discuss how in esoteric communication suppletion and complex semantic structures are frequent, while language varieties used for exoteric communication often show logical and transparent rules that are also learnable by adult speakers and that are semantically transparent. They argue that human language probably started as a means for esoteric communication and that rule-based grammar is a cultural add-on that evolved with increased necessity for complex negotiations. Many types of communication are exoteric in the complex and globalised world of today. This is most likely to one reason for recursion being very frequent in the world's languages. The Pirahã, on the other hand, are an inward-facing group, and their language is only rarely used with outsiders.^{viii} Explicit recursive syntax may thus not be necessary.

6. Conclusion

In conclusion, the Pirahã structures we have looked at in this paper have shown no evidence of being syntactically recursive. Instead, Pirahã appears to make use of juxtaposition and morphological complexity to express complex concepts. Our conclusion is hence very similar to Everett's analysis (2005). We have discussed a number of constructions in which even syntactically complex languages prefer non-recursive structures to recursive ones. It is possible that what other languages have as an option is the default in Pirahã. Further support comes from the fact that Pirahã is an exclusively oral language. Spoken language and predictable content are exactly the instances in which non-recursive structures are preferred in other languages such as English. Hence, there is no apparent functional need for recursion in Pirahã syntax.

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Abbreviations

1	first person
3	third person
ATELIC	atelic action/event
COMP_CERT	complete certainty
DM	discourse marker
DOUBT	expression of doubt
EMPH	emphasis
HEARSAY	hearsay evidential
INTENS	intensifier
LOC	locative
NEG	negation
OBSERV	observation
PERF	perfect
REM	remote
SAI	- <i>sai</i> marker

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took great care to carry out all experiments as scientifically and objectively as possible.

ⁱⁱⁱ Everett, p.c., argues that *-sai* is an old information marker.

^{iv} For a detailed description and analysis of the results of this task see Stapert (2007).

^v In the same way as English *that*, *-sai* is optional and can be left out. While one could argue that when *that* is left out in English it is still present in the form of a null complementiser. In Pirahã the argument against *-sai* as a subordination marker is considerably stronger because of the combination of *-sai* being optional and appearing in different positions within the clause.

^{vi} *Hiso* is Pirahã for ‘in the sun’ or ‘on the day’, but it is phonologically similar to local Portuguese constructions with *fazer* ‘to be (in relation to weather)’. It may hence be a blend of both languages, accommodated by a similar construction in Pirahã.

^{vii} We do not yet fully understand the exact functions of *-so* or its distribution. In the same way as *-sai*, however, it appears to be optional and is not an obligatory marker for embedding.

^{viii} These outsiders are a handful of linguists and missionaries who speak the language to a degree.