

Culture and Language: Recursion

Ted Gibson

Pirahã research: Dan Everett

1977: started missionary work on Pirahã under Summer Institute in Linguistics (missionary group) with then wife Keren

7 full years in tribe between 1977 and 2007

Previous missionaries had failed to translate much into Pirahã

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Gave up missionary work along the way: only interested in learning the language / culture

Everett (2005):

- 1. &Pirahã has no numbers of any kind or a concept of counting**
- 2. &Everett hypothesizes a tight relationship between culture and the syntax of a language**

Everett (2005)

Pirahã has a number of very surprising features:

- **the absence of numbers of any kind or a concept of counting** and of any terms for quantification,
- the absence of color terms,
- **the absence of syntactic embedding in the language,**
- the simplest pronoun inventory known,
- the absence of relative tenses,
- the simplest kinship system yet documented,
- the absence of creation myths and fiction,
- the absence of any individual or collective memory of more than two generations past,
- the absence of drawing or other art,
- one of the simplest material cultures documented,
- the Pirahã are monolingual after more than 200 years of regular contact.

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Background: Recursion is proposed to be a core property of human language / Universal Grammar

- Hauser, Chomsky & Fitch (2002) argued that the grammars for all human languages are recursive, such that *"there is no longest sentence (any candidate sentence can be trumped by, for example, embedding it in 'Mary thinks that . . .'), and there is no nonarbitrary upper bound to sentence length."* (Hauser et al., 2002, p. 1571).

Background: Everett (2005)

- Everett (2005) argued that the grammar of Pirahã, an isolate language spoken by a small hunter-gatherer community in the Amazonian rain forest, is not recursive. (cf. Hale, 1976)
- Pirahã is proposed to have a regular grammar, generating a finite language (with no recursive rules)

Background: Everett (2005)

The Immediacy of Experience hypothesis

Everett (2005) makes two kinds of claims:

1. *Syntactic descriptive*: Pirahã lacks recursive syntactic structures
2. *Syntactic explanatory*: **Immediacy of Experience Principle**: “Pirahã culture constrains communication to non-abstract subjects which fall within the immediate experience of interlocutors. This constraint explains [the] very surprising features of Pirahã grammar and culture.”

Background: Everett (2005)

The Immediacy of Experience hypothesis

Immediacy of Experience Principle:

- ' Difficult to make concrete links between IEP and Everett' s empirical claims
 - Why would the IEP restrict syntactic embedding?
 - “the house of the brother of X” could be in your immediate experience but be syntactically embedded
 - Intuitively more likely to be lack of use (“toipo’s brother’s house” = “owehe’s house”)
- ' Other cultural factors could account for some of Everett’ s empirical claims
 - Number: Agricultural societies require number, collectivist hunter-gatherer societies might not
 - Monolingualism: Pirahã disapprove of outward displays of emotion, do not respect other cultures, hence don’t learn Portuguese

Background: The definition of recursion

- Syntactic recursion: a syntactic category embedded within another of the same category, e.g., an S within an S; an NP within an NP (“self-embedding” in Nevins et al., 2009)
 - Conjunction: $S \rightarrow S \text{ Conj } S$; $NP \rightarrow NP \text{ Conj } NP$; $VP \rightarrow VP \text{ Conj } VP$
 - [[John and Mary] and Bill]
 - Clausal complements: $S \rightarrow NP \text{ VP}$; $VP \rightarrow V \text{ CP}$; $CP \rightarrow \text{Comp } S$
 - [John thinks that [Mary said that [the girl cried]]]
 - Possessives: $NP \rightarrow NP \text{ 's } N$; $NP \rightarrow N$
 - [[[[John]’s mother]’s brother]’s house]
 - Possessives: $NP \rightarrow NP \text{ of } NP$
 - [the house of [the brother of [the mother of [John]]]]

Background: some terminological confusion

1. The term *Universal Grammar (UG)*:

(a) Chomsky (in more recent discussions of Everett's work) and Nevins et al. assume that UG is whatever is biologically necessary to learn human language.

(b) Everett uses the term to refer to a specific claim about the nature of human language from HCF: that it allows recursion (self-embedding) in the syntax

- It makes no sense to falsify UG in the sense of (a): this is just a descriptive term
- Everett intends (b)

Background: some terminological confusion

2. The definition of recursion:

(a) self-embedding of a syntactic category, thus allowing for an infinite number of sentences (Everett, 2005).

(b) “Merge”: effectively compositionality of any two syntactic elements (Nevins, Pesetsky & Rodrigues, 2009):

- ‘*“In a model with category-neutral Merge, however, a language that lacks recursion would be considerably more exotic. No sentence in such a language could contain more than two words. Pirahã is manifestly not such a language.”*
(p. 366)

- Using definition (b), there is no debate (as Nevins et al. observe)
- Everett is assuming definition (a).

An alternative response to Everett could have been: recursion is available to all languages, but not all languages use it. This is Jackendoff’s response. He accepts that self-embedding may not be part of many grammars.

Goal of current work (Futrell et al, 2016): To evaluate whether Pirahã grammar is recursive (allows self-embedding)

- Weakness of previous work:
 - No quantitative evaluations
 - Everett: Some structure looks to be non-recursive (finite language)
 - Nevins et al.: No, this structure looks recursive
- How to decide between the two?*

Goal of current work (Futrell et al 2016): To evaluate whether Pirahã grammar is recursive

- **Methods:**
 - Experimental elicitation: Trip to Pirahã winter, 2007
 - Analysis of corpus of stories collected by Steve Sheldon & Dan Everett
- Look for structures that are hallmarks of recursion (cf., Everett, 2010):
 - Relative clauses
 - Embedded clauses of saying / thinking
 - Embedded possessives
 - Conjunction, disjunction
- **Results:** No evidence of recursion, but minimal evidence
- **Conclusion:** The no-recursion hypothesis is still plausible, but not enough data yet to say one way or the other

Goal of current work (Futrell et al 2016): To evaluate whether Pirahã grammar is recursive

- General Caveat:
 - Everett's descriptive hypothesis is that Pirahã *lacks* recursion
 - In general, it is impossible to prove a negative claim: if recursive structures are rare, it may be hard to find evidence of them
 - See Piantadosi & Gibson (2013) for quantitative statistical approaches to similar questions within typology, exploring proposed linguistic universals

The Pirahã

- ' Indigenous people of the Amazon basin
- ' Hunter-gatherers, little agriculture
- ' Approximately 750 people in ~6 villages
- ' Minimal contact or trade with outsiders
- ' Generally uninterested in outside cultures

Working with Pirahã:

- ' Arlo Heinrichs: 1959-1966
- ' Steve Sheldon: 1967-1976
- ' Dan Everett: 1977-2007



Corpus analyses: Futrell et al., 2016

- Corpus was collected by Steve Sheldon & Dan Everett
- 15 stories (14 by Sheldon, 1 by Everett):
 - Approximately 1000 sentences
 - Stories were transcribed morpheme by morpheme by Sheldon, with overall glossed meaning
 - Words tagged for part of speech (nouns verbs, pronouns, adjectives, determiners, etc.)
 - Some glosses, and parses added by trained undergraduate (L.S.), using primarily Sheldon's glosses.

Examples

7.17.1: Hoagaixoxai said she is not giving birth.

Hoagaixoxai spoke.

```
(S (NPsubj hi/3/PRP )  
   (VP gA/speak/VB -sai/old_info )  
   (NPsubj hoagaIxOxaI/Hoagaixoxai/NNP )))
```

She spoke.

```
(S (NPsubj hi/3/PRP )  
   (VP gA/speak/VB -sai/old_info )))
```

She is not giving birth.

```
(S (NPsubj i/3/PRP )  
   (VP op/give_birth/VB -i/state -hiaba/neg -xaI/REL_CERT )))
```


Corpus analyses: Shallow parsing

- **Shallow parsing** by hand
 - Subject noun phrase; Object noun phrase; Verb phrase; Possessives; Embedded sentences (if any); etc.
 - Initially performed by co-author Laura Stearns, then others
 - Collaboration among all authors to evaluate potential recursive sentences (recently including Steve Sheldon).
- Examine parses for the presence or absence of certain hallmark structures of recursion (cf. Everett, 2010):
 - Relative clauses
 - Embedded sentences: complement clauses
 - Possessive structures
 - Conjunctions
 - Disjunctions

Corpus analyses: Shallow parsing

- Limitations:
 - Depends primarily on D.E. for linguistic judgments
 - The “no-recursion” claim is Dan’s hypothesis, and he may have unconscious cognitive biases in support of this hypothesis (cf. Gibson & Fedorenko, 2010, 2012)
 - Many key examples are ambiguous with respect to their syntactic analysis
 - Lack of examples may result from low frequency structures (rather than ungrammaticality)

Corpus analyses: Searching for structures that are hallmarks of recursion

- Relative clauses
- Embedded sentences: complement clauses
- Possessive structures
- Disjunctions
- Conjunctions

Corpus analyses: Searching for structures that are hallmarks of recursion

Embedded clauses: RCs, complement clauses

To find strong evidence for recursive syntax from embedded clauses it is best to find examples with two dependents of one clause on the outside of another clause:

E.g., [SUBJ [embedded clause] main-verb]

No instances like this in the corpus, so no strong evidence of recursion

Corpus analyses: Potential complement clauses

- 183 instances of “NP said / speaks” followed by a clause: e.g.,

2.3.1: I spoke. He is moving on the ground. TixohOI is crying.

“I said that TixohOI is crying on the ground.”

```
(S (NPsubj ti/1/PRP )
   (VP igA/speak/VB xai/do/VB -ai/INTENS ))
(S (NPsubj hi/3/PRP )
   (VP (NPobj big/ground/NN ) a/move_vertical/VB -I/proximate )))
(S (NPsubj * )
   (VP is/cry/VB -Aaga/be -haI/REL_CERT )
   (NPtopic-subj TixohOI/TixohOI/NNP )))
```

The analysis of these clauses as embedded or matrix clauses is underdetermined by the evidence: There is no convincing argument yet to analyze these clauses as embedded.

Note: Semantic dependency does not entail syntactic dependency: e.g.,

“You drink you drive you go to jail.” (Everett, 2010)

Corpus analyses: Relative clauses

- **'0 sentences transcribed by either Sheldon or Everett as relative clauses**
- ' Back of the envelope calculation:
 - Relative clauses occur in English about 6 per 1000 words (Reali, 2007).
 - With ~3600 words, we should expect to see around 20.

(Limitation of this comparison: Need comparisons with matched discourse topic, socio-economic status, education, etc.)

Corpus analyses: Searching for structures that are hallmarks of recursion

- Relative clauses
- Embedded sentences: complement clauses
- Possessive structures
- Disjunctions
- Conjunctions

Initial conclusion: *No strong evidence for recursion among these categories.*

Corpus analyses: Summary

The search for recursive structures

- Relative clauses: No examples
- Embedded sentences: complement clauses: No conclusive examples
- Possessive structures: No conclusive examples
- Conjunctions / disjunctions: No conclusive examples

Initial conclusion: *No strong evidence for recursion among these + categories.* +

But: small corpus; No control corpus from other languages (matching for + SES etc.) +

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