

Remarks on the Pirahã suffix –sai and
complex syntax

PRELIMINARY REPORT

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Introduction

- The purpose of this presentation is to put more Pirahã prosodic data into the hands of a wider audience.
- This is a very preliminary version of a large study on Pirahã intonation.
- The decision to publish this preliminary piece was taken in order to provide a response to Sauerland's recent post on LingBuzz.
- *All sound files in this report are available from the second author. They will be placed on the internet soon.*

Analyses of *-sai*

- Everett (1986) never questioned the existence of embedding in Pirahã.
- The analysis of *-sai* was premature because Everett failed to incorporate into his analysis *-sai*'s appearance outside of what seemed to be embedding environments.
- In the examples he used, the 'tone differences' turned out to be the result of intonation, rather than underlying tone.

- The analysis of Everett (2005) recognized the underlying tonal identity of -sai in its different manifestations and correctly analyzed it as having a single underlying form.
- The analysis of Everett (2009) is completely compatible with the analysis of Everett (2005) in terms of tone, though in the intervening years, as explained in Everett (2009) the analysis of its syntactic function had evolved and a more complete picture, that it marks old information, was available.

Sauerland's Paper

- Sauerland's recent short paper entitled "Experimental Evidence for Complex Syntax in Piraha" used material taken from an experiment designed by Ted Gibson, Evelina Fedorenko, Mike Frank, and Dan Everett.
- The experimental methodology that was employed to collect these data was later found to be problematic.

- In individual sessions, nine Pirahã speakers were instructed to repeat utterances that were presented to them by a Pirahã-English interpreter.
- Some of the utterances the interpreter presented were ungrammatical; specifically, the word order was incorrect.
- The Pirahã had been instructed to repeat the interpreter's utterances aloud but as they did so, make any corrections of the Pirahã that they deemed necessary.

- As pointed out by one of the authors of the experimental protocol (Ted Gibson and Mike Frank, personal communication), the data that was collected do not present enough sentence types in order to make useful conclusions:
 - “Interpretations based on syntax / intonation are confounded with simple lexical explanations, because there is only one (or occasionally two) sentence types per condition.”.

- Sauerland (2010) reports the analysis of two sentences in the data:

Hiaitfihi xobáaxái kafi kai-sai
 Pirahã good at house make-SAI

'The Pirahã are good at making houses.'

'The Pirahã are good. They make houses.'

Pi-boi-bai-sai ti kahápihiaba
 rain-MOVE:DOWN-INTNS-SAI 1 go-NEG

'If it rains, I'm not going.'

'It is raining. I'm not going.'

- According to his analysis, the first example represents what he calls the “nominalizer condition”; the second represents what he calls the “conditional condition”.

speaker	Cond	Nom
I	26	11
P1	6	2
P2	3	7
P4	4	2
P5	6	2
P7	3	5
P8	3	1
P9	3	4

- According to Sauerland (2010), 28 occurrences of *Pi-boi-bai-saiti kahápihiaba* (Cond) and 23 occurrences of *Hiaitíihi xobáaxái kaíikai-sai* (Nom) were found in the data (see table).
- The objective of the study was to find empirical evidence that Pirahã speakers pronounce ‘sai’ with different tones, what would – according to the author – suggest that there exists complex clauses in Pirahã.

Problems in Sauerland's Study

- The exact examples Sauerland claims to have taken from the Gibson, et. al. data set were not found in the data. However, many similar examples were found that illustrate what he refers to as the 'conditional' vs. the 'nominalizer' uses of *-sai*.
- No specific report of the F0 measurement was made. The paper only states that F0 maximum values were measured on the syllable *-sai*.

Some things to consider...

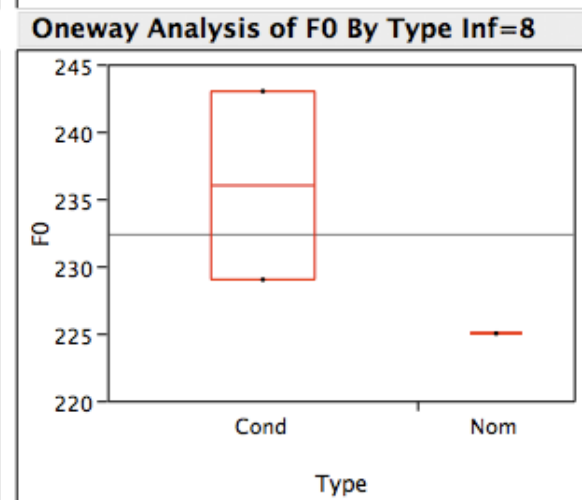
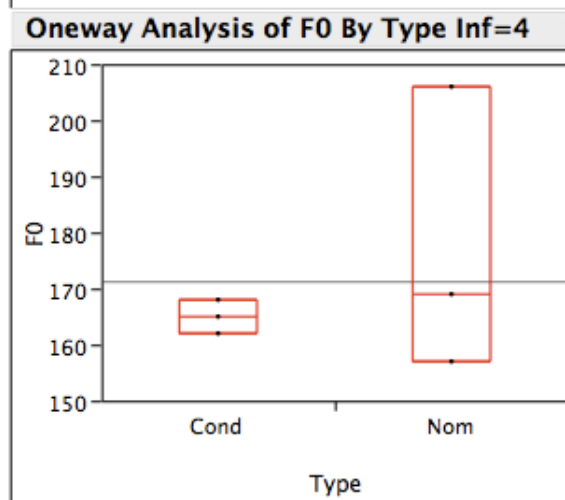
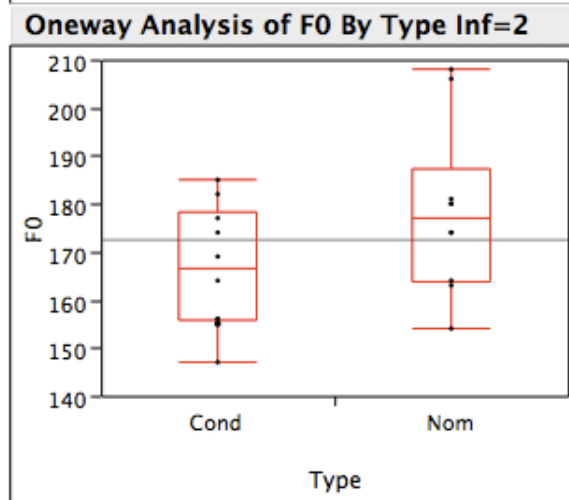
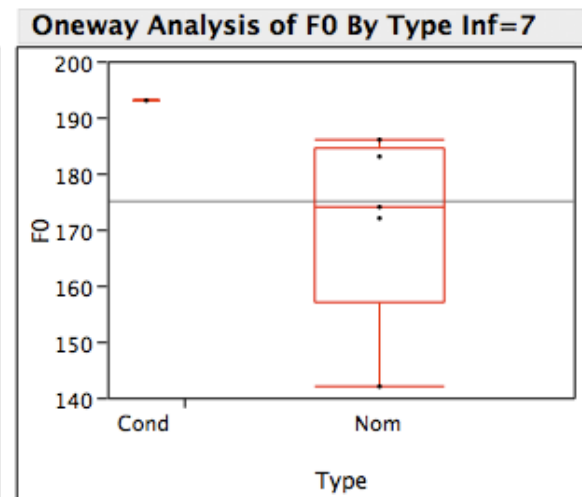
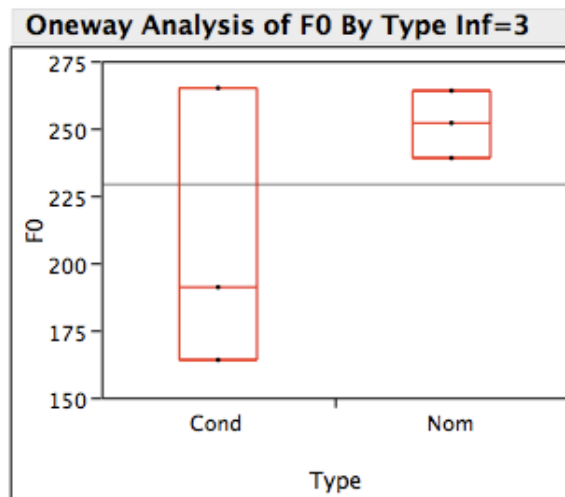
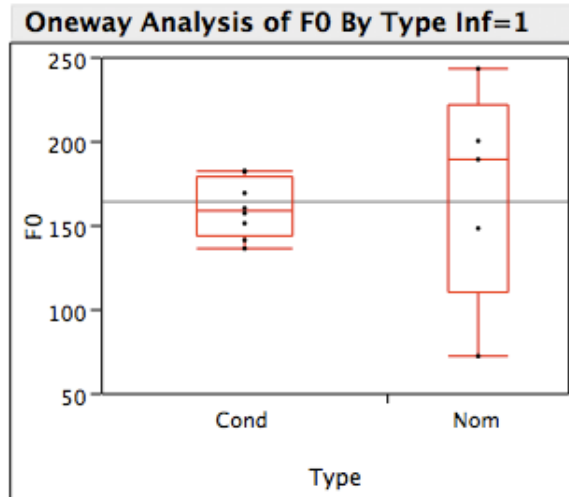
- The segment rather than the syllable is the smallest and most basic prosodic domain (Van Heuven 1994).
- *Intrinsic pitch* - the tendency of high vowels to be characterized by slightly higher fundamental frequency values than low vowels (Peterson & Barney 1952; Lehiste & Peterson 1961).

- According to di Cristo & Hirst (1986: 14), “the automatic nature of intrinsic and co-intrinsic effects could lead to a distortion of the intended fundamental frequency pattern if compensatory processes do not intervene either during the production or during the perceptual integration of the speech.”
- Interpretation of raw F0 data is not straightforward. In order to interpret the F0 curve in relation to the speech chain, stylization is required.

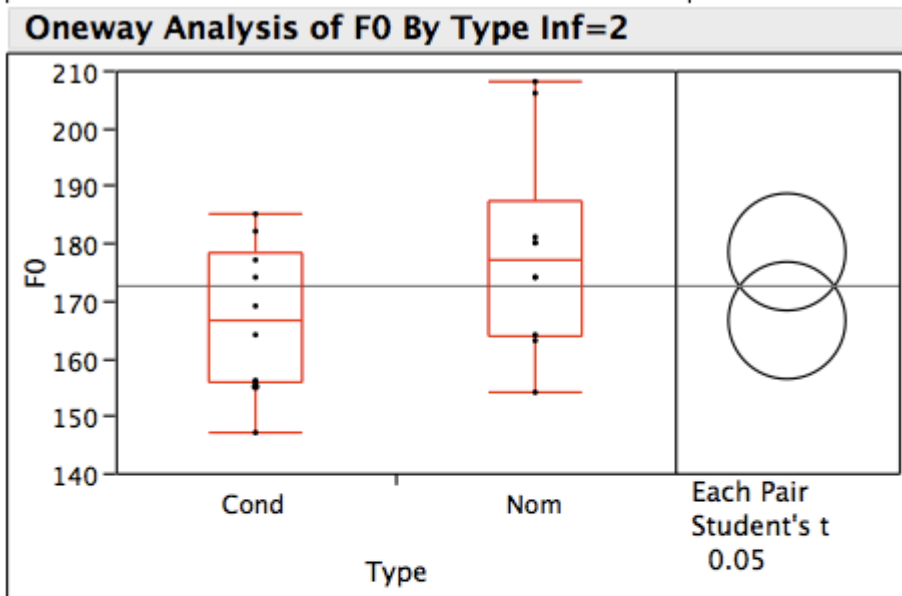
Methods

- 58 fragments with –sai with the ‘conditional’ use, and the ‘nominalizer’ use of -sai, produced by 7 speakers (5 men & 2 women), all from the relevant data set.
- F0 values were measured in HZ after a stylization of F0 curves done with the MOMEL algorithm (Hirst & Espesser 1993).
- This was done to avoid the interference of octave jumps and of intrinsic pitch values (Nootboom & Kruyt 1987; Sluijter & Terken 1993; di Cristo & Hirst 1986).

Results per Informant



Individual Results



Means Comparisons

Comparisons for each pair using Student's t

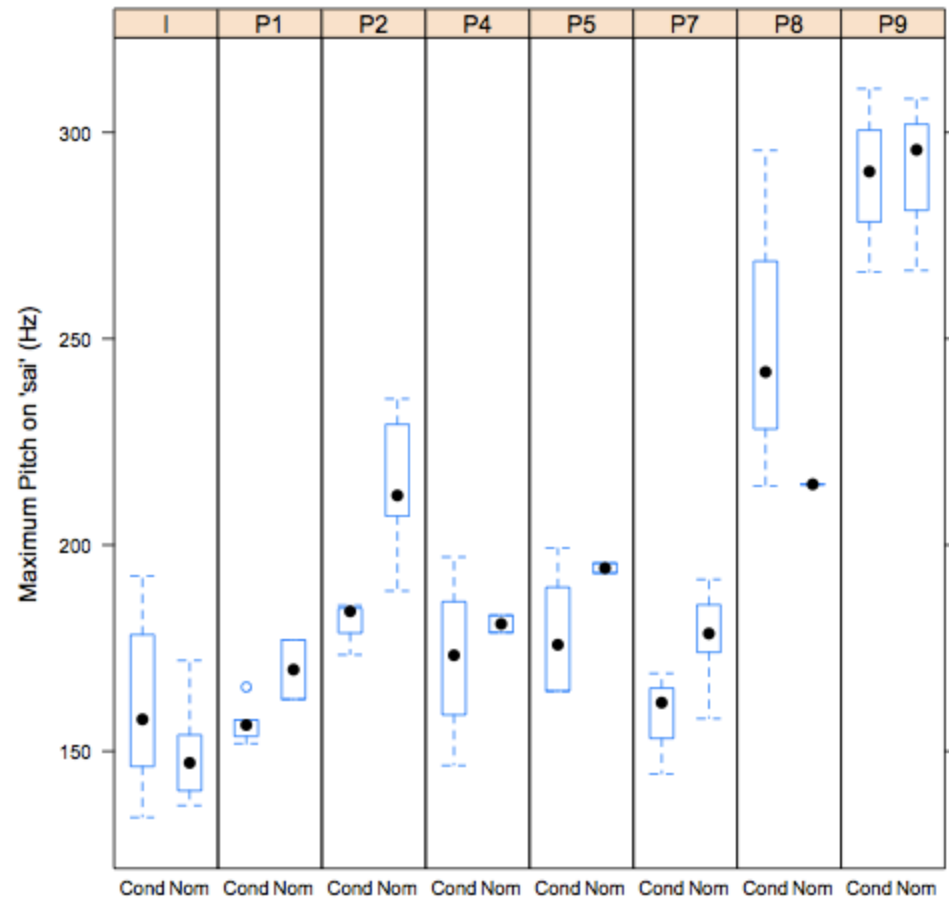
	t	Alpha
Abs(Dif)-LSD	2.10092	0.05
	Nom	Cond
Nom	-14.391	-2.491
Cond	-2.491	-14.391

Positive values show pairs of means that are significantly different.

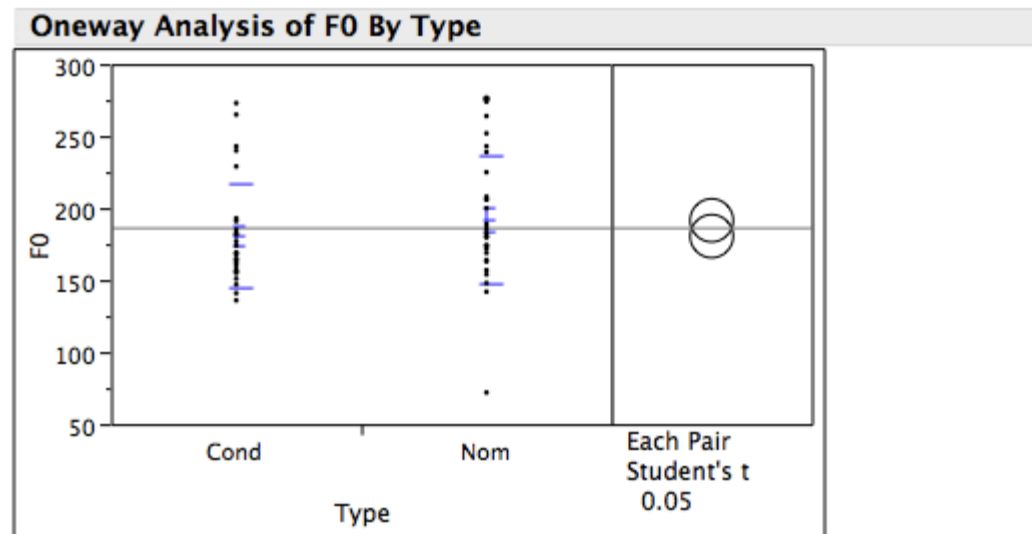
Statistical analyses show no significant difference between conditions for any of the participants in the experiment, as opposed to what Sauerland (2010) reports.

The figure aside shows that no statistically significant difference between conditions were found in the analysis, as opposed to what Sauerland (2010) reports for Informant 2.

Results in Sauerland (2010)



General Results of our analysis



Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
Cond	29	180.552	35.7307	6.6350	166.96	194.14
Nom	29	191.552	44.2134	8.2102	174.73	208.37

Means Comparisons

Comparisons for each pair using Student's t

	t	Alpha
	2.00324	0.05
Abs(Dif)-LSD		
	Nom	Cond
Nom	-21.146	-10.146
Cond	-10.146	-21.146

Positive values show pairs of means that are significantly different.

Concluding Remarks

- It is important to point out four problems with Sauerland's study:
 - intonation does not provide direct evidence for syntactic complexity as a matter of principle - intonational structures are not built on syntactic structures but on phonological structures, a basic tenet of most models of intonational theory, going back to the work of Kenneth Pike;
 - The differences in Hz between 'conditional' vs. 'nominalizer' are too small (10Hz or less) to be of significance, since it is well-known that speakers cannot perceive such differences in normal speech.

- Sauerland's analysis fails to distinguish tone from intonation (Pirahã has both);
- Everett's factual analysis of the tones and intonation range of Pirahã, especially in the -sai constructions, is correct.