Syllable Weight, Sloppy Phonemes, and Channels in Pirahã Discourse
Author(s): Daniel L. Everett
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CHANNELS IN PIRAHÃ DISCOURSE
Daniel L. Everett
M.I.T./S.I.L./UNICAMP

0 Introduction
        The purpose of this paper is to document the importance
of prosodies in establishing distinct channels (cf., interalia,
Hymes (1977)) of discourse in Pirahã, an Amazon language
isolate. We argue that the notion of discourse channel partially
explains certain sui generis features of Pirahã syllable (o)
weight and phonemic variation, namely, the relevance of the
syllable onset to stress placement and sloppy_phoneme_effect
(described below).
        Our discussion is organized as follows. First, we state
the basic rule of stress placement in Pirahã, showing its
interaction with syllable weight and foot construction. The
uniqueness of this system is underscored and addressed by
additional evidence that stress placement is in fact   a
phonological rule rather than more phonetic prominence. Next,
examples of "free" variation among voiceless consonants are
given (sloppy phonemes). This is followed by a description of
the types, use, and importance of distinct channels of Pirahã
discourse and speculation as to the possible influence of these
channels on Pirahã low level phonology.
1 Syllable weight and stress placement
        Piraha syllable weight, as shown in (1) (where C=
voiceless consonant and G= voiced consonant):
(1) CVV > GVV > VV > CV GV (> = 'is heavier than')
        The rule of stress placement is stated as in (2):
(2)   Primary__stress_placement: Stress the rightmost token of
the heaviest syllable type within the final three syllables of
the word.
        The interesting features of (1) and (2) are the number
of syllable types recognized and the contribution of the onset
to determining syllable weight (cf. Everett and Everett (1984a,
1984b) for further discussion). Both components of the Pirahã
stress rule are unique in being undocumented in any other
language and predicted to be nonexistent by current multi-linear
models of phonology. Examples of rule (2) are found in (3) -
(14) (cf. also Everett and Everett (1984)):
Last three syllables only (́ = stress)
(3) pòò 'gáí hì àí   'banana'
     CVV GVV CV VV
      4   3   2   1
Rightmost token
(4) pàó hòà 'hàì   'anaconda'
     CVV CVV CVV
      3   2   1
CVV_vs_GVV
(5)a. bìí 'sàì   'red'
   b. 'kàí bàì   'species of monkey'
CVV_vs_VV
(6)a. ʔí 'sìì hò áì   'liquid fuel'

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              CV  CVV  CV  VV
               4    3   2   1
     b.  kò  sò  ll  gàl 'tàl  'eyebrow'
         CV  CV  VV  GVV  CVV
          5   4   3    2    1
```

CVV_vs_CV
```
(7)a.  'ʔòò  gì  áì  'proper name'
       CVV   GV  VV
              3   2   1
     b.  ʔò  gì  'áì    'big'
         CV  GV   VV
          3   2    1
```

CVV_vs_GV
```
(8)a.  'ʔàà  gí  'coati mundi'
       CVV   GV
              2   1
     b.  gà  'hlò  'airplane'
         GV   CVV
              2    1
```

GVV_vs_VV
```
(9)a.  'gàò  ll  'proper name'
       GVV   VV
              2   1
     b.  hò  àà  'gàl  'kind of fruit'
         CV  VV  GVV
          3   2    1
```

GVV_vs_CV
```
(10)a.  ʔì  'gàó  'back'
        CV   GVV
              2    1
     b.  'gàl  hí  'that'
         GVV   CV
              2   1
```

GVV_vs_GV
```
(11)a.  bó  'gàl  'breast'
        GV   GVV
              2    1
```

VV_vs_CV
```
(12)a.  pí  'àl  'also
        CV   VV
              2   1
     b.  hò  'àí  pl  'species of fish'
         CV  VV   CV
          3   2   1
```

VV_vs_GV
```
(13)a.  ʔà  'àí  bl  'thin'
        CV   VV  GV
              3   2   1
     b.  sl  gà  'll    'fuls'
         CV  GV   VV
          3   2    1
(14)a.  'ʔà  bà  gl  'toucan'
        CV   GV  GV
          3   2   1
```

b. ?à bà 'pà   'proper name'
   CV GV CV
      3 2 1

(15) supports the claim that tone is irrelevant to stress placement:

(15)a. '?aò ól   'foreigner'
       CVV VV
          2 1

b. '?aò ól   'ear'
   CVV VV
      2 1

c. '?aò ól   'skin'
   CVV VV
      2 1

d. '?aò òí   'kind of fruit'
   CVV VV
      2 1

e. '?aò ól   'Brazil nut shell'
   CVV VV
      2 1

Further evidence that Pirahã stress is a rule governed phenomenon rather than mere phonetic prominence comes from certain extrametrical morphemes, tone shifts produced by resyllabification and stress movement, and native speaker corrections. Consider first the examples of extrametricality in (16) and (17):

(16)a. kohòlbìí   - hàl 'proper name'
       species of fish - nominalizer

b.* kò hòl bìí 'hàl
    CV CVV GVV CVV
       4   3   2   1

c. kò'holbìíhàl

According to rule (2), we expect (16a) to be stressed as in (16b) when in fact it is stressed as in (16c). Moreover, were stress merely relative prominence, it would seem more likely to hear bìí as the "stressed" syllable due to its distinctive voicing and tonal pattern. Another apparently puzzling example is found in (17):

(17)a. ?òlbòlbìí   - sàl 'species of fish'
       species of fish - nominalizer

b.* ?òl bòl bìí 'sàl
    CVV GVV GVV CVV
       4   3   2   1

c. ?òlbòl'bìísàl

Again, rule (2) apparently makes the wrong prediction. As the rightmost token of the heaviest syllable type in (17), CVV, should be stresed. In fact, the stress is perceived on bìí. The relative prominence hypothesis is likewise called into question since there is no obvious reason why the sequence bìí should be more prominent here and less prominent in (16) where it is also in penultimate position.

Our understanding of (16) and (17) is that the nominalizers -hal and -sal are extrametrical (or alternatively, that their affixation follows rule (2)) and thus not subject to

rule (2). In spite of their inability to bear stress, however, these syllables nevertheless are relevant to the constraint on rule (2) prohibiting stress assignment more than three syllables leftward from the end of the word. Thus, the heaviest of the final three syllables in (16) turns out to be hoi. In (17), the heaviest of the last three syllables excepting -sai is -bii. In both cases rule (2) and not relative prominence makes the correct prediction.

As further evidence that Pirahã stress is rule governed consider the phenomenon of <u>high</u> <u>tone</u> <u>shift</u>, as in (18)(cf. Everett (to appear) for more examples):

(18)a. sì'tòí + 'hòí   →   sìtò'hóí
        'egg'   'two'   'a few eggs'
     b. sì'tòí + ?ògàbà'gàí →   sì'tòógàbà'gàí
        'egg'   'want'   '(someone) wants a few eggs'

After certain morphophonological processes, (18a) and (18b) are resyllabified as shown to the right of the arrows. Rule (2) correctly predicts the stress of both examples ((18b) has two occurrences of primary stress due to its morphological composition). Interestingly, high tone on a (lexically) stressed syllable shifts, following resyllabification, to the new stresed syllable in (18a). In (18b), however, high tone continues in the original syllable even though this results in a three tone sequence on two vowels, since stress continues on that syllable. Although we have no idea why high tone should follow stress in this way, the fact that (2) correctly predicts stress placement in these examples suggests that the tone shift is produced by a rule governed phenomenon and that tone itself is not relevant to stress placement (cf. also (15) above), contrary to what a relative prominence hypothesis would seem to predict. <1>

A final evidence that Pirahã's unique stress pattern is rule governed comes from native speaker corrections. In many of the above examples (and others), the present author was corrected on various occasions by a number of speakers, as in (19):

(19) Author: 'pàóhòàhàì 'anaconda'
      Piraha: 'pàóhòàhàì hìàbà,   pàóhòà'hàì
                           negative   (very strong
stress)

      'Not <u>a</u>naconda, ana<u>co</u>nda.'

Such facts then lead us to conclude that stress in Pirahã is indeed rule governed, a <u>learned</u> feature of Pirahã phonology. We now consider a second sui generis aspect of Pirahã phonology, the sloppy phoneme effect.

2 Sloppy Phonemes

Consider the following alternations:

(20)a. tì pìàì ~ kì pìàì ~ kì kìàì ~ pì pìàì ~ ?ì ?ìàì, etc.
        I also
        'Me too'
     b. ?àpàpàí ~ kàpàpàí ~ pàpàpàí ~ ?à?à?àí , etc.
        'head'
     c. ?ísìlhòáì ~ kìhìlhòáì ~ pìhìlhòáì , etc.

'liquid fuel'

Although subject to idiolectical variation, examples such as in (20) are observed frquently. (2) Due to the fact that the first example in each series of (20a-c) is more frequent intra- and inter-idiolectically, we consider these to be the basic forms. The fact that there are such basic forms leads us to conclude that this effect results from weak (rather than non) specification of point of articulation features at the segment level, as in (21) (where ( ) indicates weak specification):

(21)   ⌈ +cons   ⌉
        │ -cont   │
        ⌊ (point of articulation) ⌋

Interestingly, this segmental variation exists in spite of the fact that Pirahã's segmental inventory is the smallest yet documented: /p/, /t/, /h/, /s/, /b/, /g/, /i/, /a/, /o/ (with k appearing as variant of other segments, cf. above). In what follows, we suggest that the notion of channels in Pirahã may offer some insight into the relationship between contrast at the segmental and prosodic levels.

3 Channels

By channel we mean (roughly) the medium used to ʼarry the message from the source (speaker) to the receiver (heʼ,ʼ·ʼ\ (cf. Bell (1976); Hymes (1977)).

Thus, consonants and vowels, orthographic symbols, gestures, color coded plastic figures, etc. may serve as channels to carry all or a portion of the message (e.g., different intonations often communicate different emotional states while sequences of consonants and vowels carry propositional content (cf. Ladd (1978) for a survey of proposals on this subject).

What we want to begin with here then is the unoriginal, uncontroversial claim that the greater the communicative dependence on a particular channel, the greater the number of contrastive features needed for that channel. Of course, contrast may be attained at any level either paradigmatically or syntagmatically. So, for example, by making its words longer (greater syntagmatic contrast) Pirahã can partially compensate for its small phonemic inventory (reduced paradigmatic contrast). A logical correlate of this is that the less the communicative dependence placed on a particular channel, the fewer the number of contrastive features needed by that channel. Note, however, that this is a much weaker type of implication than the previous one. So a reduction in need of contrast does not require a reduction in number of contrastive features in the same way that increased need of contrast requires an increase in number of contrastive features (whether positions or position fillers). We return to this directly. First, however, we need to describe certain channels of Pirahã discourse (actually, it might be more appropriate to consider the individual "channels" described below as distinct manifestations of the single prosodic channel, each manifestation's use determined by context.

3.1 Hum Speech

Consider first the phenomenon of hum speech. This channel (or manifestation) is used primarily in home and village situations, e.g. mother-child conversation, communal eating, etc. In general, wherever close, emotional and physical proximity is recognized by the interlocutors the speaker commonly hums although (s)he may also produce a nasalized, slightly laryngealized low vowel, /a/. The humming or low vowel is then used as a carrier for the tone, intonation, timing, syllable patterns, and stress of a particular utterance (paragraph, sentence, phrase, word or entire discourse). Such humming is used by all members of the community although it is much more frequent between mothers and children. In fact, mothers hum to their children (to approximately six-nine years of age) much more than they "talk" to them. It should not be supposed, however, that hum speech is a truncated, lexically simplified type of "baby talk." We have observed mothers explain such things as our kitchen utensils, medical items, and National Geographic photos in great detail to their children. Also, hum speech is the most common channel used for scolding (infants or adults). Hum speech, like other channels is commonly used for making parenthetical comments or joking (especially when they wish to exclude the present author from the conversation!) When asked to "translate" what they said, these individuals provide detailed paraphrases of their utterances which are in no way restricted as to meaning, mood, etc. Perhaps correlated with the high frequency of hum speech between mother and child is the fact that the sloppy phoneme effect is even greater in children's speech, involving voiced as well as voiceless consonants. Moreover, it is clear that Pirahã children control the prosodic features of a given lexical item or utterance before its (basic) segmental manifestation.

3.2 Yell Speech

Yell speech is used to communicate between households during rainstorms, with hunters or fishers departing or arriving via the river or jungle (covering distances of up to a mile), and on other occasions when the speaker wishes to communicate at a distance. Like hum speech, yell speech is used by both men and women. Yell speech, unsurprisingly, is not generally used to communicate sensitive or personal information. A woman might yell, for example, to her husband to hurry back with some food but not to say that she is afraid for him or wishes he would not go (messages which are frequently communicated via hum speech). In yell speech, a vowel quality such as /a/ (lightly nasalized, not laryngealized) is used, often beginning at a pitch several steps above normal speech and rising to a falsetto. Once again, though, this channel is fully productive. A concrete example is found in (22) (translated from an actual text):

(22) Speaker A (villager on river bank): 'Hey, ko (abbreviated personal name), what did you kill today?'

Speaker B (returning hunter in canoe, approximately one mile out, barely visible): 'I killed a whole tapir. It's so heavy my canoe's about to sink.'

(Speaker A jumps up and down happily, calling for the village women to get firewood for cooking.)

Speaker B (again): 'I was just lying. I only have two pirana in here.'

Speaker A and other villagers start laughing. Speaker A turns to openmouthed, confounded linguist to explain what has just transpired.

3.3 Whistle Speech

<u>Whistle_speech</u>, unlike hum speech and yell speech is only used by men. In this respect and others it is very similar to the phenomenon of the same name described for Mazateco by Cowan (1948).   Boys frequently whistle to each other in the village when they are pretending to be hunting or warring. Men generally whistle in the jungle, (often varying whistling with an extremely high falsetto vowel quality). Phonetically, Pirahã whistling is interesting in that it is <u>ingressive</u>. Men often whistle when many of them are together.   We suspect that in these cases there are some modifications of the syntax and lexicon as well, and that whistle speech may also serve as a private masculine code. Thus, men at times are reluctant to translate whistle speech utterances for me, grinning or ignoring our requests that they do so (requests which we drop immediately, depending on the reaction).

As with other channels, there are no apparent limits as to the quantity, complexity, or kind of information transmitted via whistling.

3.4 Discussion

The question we come to then is what, if any, relationship exists betwen the existence and frequency of nonsegmental prosodic channels in Pirahã, the large number of syllable types or weights, and the unique amount of free variation at the segment level? Perhaps the only relationship between these phenomena is their occurrence in a single language. Yet, this seems unlikely.   For example, consider the sentence in (23) and its (rough) prosodic representation in (24):

(23) káplìgà baáxáí xísìgíhíí xàhòl-sàl
      money   good   meat   buy -nominalizer
      'Money's good for buying food.'

(24) *[prosodic representation]*

The very crude representation in (24) is adequate to show the high number of prosodic contrastive features in Pirahã. This would seem to meet the requirement noted earlier that the greater the communicative dependence placed on a particular channel, the greater the need for contrastive features in that channel. Of course, we cannot claim that such contrast renders the prosodic channels as unambiguous as "normal" speech but certainly Pirahã prosodies are rich enough to eliminate much of the ambiguity that would arise in many languages.

Although it is too early to attempt to draw any sort of causal connection between the importance and use of prosodic channels, weak specificatalon of features at the segmental level, and syllable weight, the facts are nonetheless quite suggestive.

It is worth comparing these facts about Pirahã channels with apparently similar systems in other languages. In such cases, e.g. Mazateco (Cowan (ibid)), in which whistle speech or some other channel is fully as productive as the Pirahã prosodic channel(s), it is common to encounter a very complex segmental system as well. Note, however, that this does not conflict with our claim that a relationship exists between communicative dependence placed on a particular channel and contrastive features of that channel. In these languages, syllabic contrasts are often as great or greater than Pirahã (cf. Rensch (1978) on ballistic vs. controlled sylables in Chinantec). That they also maintain a complex segmental channel is not therefore a problem for a functional explanation of the prosodic contrasts.

On the other hand, it might be asserted that the role of channels or the emphasis placed on them is a question entirely separate from their existence. So simply because languages A and B possess channels (1) - (3) does not therefore imply that both accord each channel an equal role. A may empasize channel (2) and B channel (1). Determining such things as which channel a culture emphasizes (or in fact the very position of language itself in the cultural hierarchy) is a question for the anthropologist - but one whose answer may very well have implications for the linguist. In this sense, one might reasonably investigate the hypothesis that prosodic channels in Pirahã play a more central role in the culture relative to the segmental channel than in languages/cultures such as Mazateco, Chinantec, etc., thus accounting perhaps for the existence of sloppy phoneme effect in Pirahã and its absence in these other groups.

Conclusion

In this paper, we documented two unique aspects of Pirahã phonology, namely, five way contrast in syllable types relevant to stress placement based on the contribution of the onset to syllable weight and the sloppy phoneme effect, an interesting type of segmental variation resulting from weakly specified values of point of articulation features. We suggested that these phenomena may have a functional explanation based on the role of prosodic channels (hum speech, yell speech, and whistle speech) in Pirahã discourse. We also noted that any attempt at a functional understanding of these phenomena implies a rigorous study of Pirahã culture.

Some caution must be taken of course to guard against confusing an association of mere coexistence in the same system with a causal relationship. It may well turn out that channels in Pirahã discourse have no relationship to complexity or variation at the segmental level at all. It might even be that establishing such a relationship is beyond the scope of science.

In such a case, we will be brought back to studying individual systems without relating them via any notion as grand as communicative function, viewing languages as biologists view the distinction between deciduous and evergreen trees: two genetically determined ways of dealing with winter, the same function, via radically different forms.

1. This evidence is clearly suggestive rather than conclusive.
It becomes significant in adding to the cumulative effect of
stronger evidence such as (16) and (17).
2.   There are individuals such as k̃ohõíbííhãì, my primary
language teacher and the village headman, who rarely produce
such alternations and, when they do, generally use k̲ as the
neutral form for all voiceless noncontinuants, allowing s̲ and h̲
to vary only preceding /i/. There are others, however, such as
k̲óx̲óí and x̲àhòàòglí who produce such variations in almost every
utterance.   In all idiolects k̲ tends to vary with other
voiceless noncontinuants much more frequently in singing.

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