Cross-Linguistic Prosodic Tendencies: A Review and Some New Proposals

J. Vaissière
Goal of the talk?

1) to illustrate the same prosodic tendencies observed in a large number of genetically non related languages in
   - tone language,
   - pitch accent language
   - stress languages
   - boundary languages

2) to summarize a number of plausible, non linguistic sources underlying these universal tendencies

3) counterexamples taken from African languages.
Plan of the talk

I) Introductory remarks on the functions of an human language

II) The sources of commonalties?

1. Psychoacoustics
2. Ethology
3. Production
4. Perception
5. Cognitive capabilities
It is reasonable to assume to all languages fulfill the same functions

• a) **Information**
  chunking into meanings units, old/new, focus
• b) **Modality**
  statements/questions/commands/ and exclamations
• c) **Attitudes, affect**
  doubt/certainty, disgust/pleasure
  - attitude about what he said
    - like doubt, uncertainty or disgust)
  - attitude toward the receiver,
    - like dominancy or subordination, or politeness
• d) **Emotions**
Humans fulfill these functions with the same means

• **1) linguistic means:**
  - such as lexical, morphological, syntactical means
    (present in written form)

• **2) and/or prosodic means**
  (present in spoken language)

- word order
- inflections
- discourse particles
1) linguistic means:
2) and/or prosodic means
3) gestures, postures

picture from
Ranka BIJELJAC-BABIC’s book
The share of prosodic means in fulfilling one function is language-dependent and style dependent.

Inside of a language, one prosodic parameter may take more or less its share with the other linguistic means:

- be obligatory or optional
  - if optional, it adds a nuance of meaning, like more politeness

There are compensatory phenomena between the different prosodic parameters.

There are no two languages the same.
The prosodic parameters?

<table>
<thead>
<tr>
<th>Pause</th>
<th>Intensity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fo</td>
<td>- initial tensening</td>
</tr>
<tr>
<td></td>
<td>- focus</td>
</tr>
<tr>
<td>Declination (., ?, !, focus)</td>
<td>Timber</td>
</tr>
<tr>
<td>rise-fall</td>
<td></td>
</tr>
<tr>
<td>height</td>
<td></td>
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<tr>
<td>resetting of the base-line</td>
<td></td>
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<tr>
<td>glottal stop</td>
<td></td>
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<tr>
<td>register</td>
<td></td>
</tr>
<tr>
<td>range (involvement)</td>
<td>Phonation</td>
</tr>
<tr>
<td>degree of voicing</td>
<td></td>
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<tr>
<td>Duration</td>
<td>Vocal setting</td>
</tr>
<tr>
<td>final lengthening</td>
<td></td>
</tr>
<tr>
<td>initial consonant strengthening</td>
<td></td>
</tr>
<tr>
<td></td>
<td>contrast consonant-vowel</td>
</tr>
</tbody>
</table>
What are the possible sources for the commun tendencies in using the prosodic parameters?

Explanations have to be found outside of the field linguistics...

1. Psychoacoustics
2. Ethology
3. Production
4. Perception
5. Cognitive capabilities
Perceiving is regrouping

- Rhythmic organization is inherent human activity (Lahsley, 1951).
- When a listener is presented with a sequence of equally spaced, isochronic tone bursts, the bursts appear to him to be regrouped into units of generally two, or three or four bursts. The number of units depends on the listener, and the speed.
- Very importantly the first unit in the group is perceived as more intense and the last unit in the group as longer (Woodrow, 1951, Fraise, 1956)
1) Two basic innate rhythms

intensive and temporal

initial strengthening

final lengthening

loudness: integration of intensity over time (Munson, 1947)

phonologization of IS:
intensive rhythm
English

phonologization of FL:
temporal rhythm
French
1- Each distinctive feature has a favored prosodic position and some combinations of features are favored ...

**Voicing** (glottis)
- initial: less voicing, glottalisation of V,
- aspiration of C
  - medial : more voicing
  - final : less voicing

**Nasality** (Velum)
- favored in final position
1- Each distinctive feature has a favored prosodic position and some combinations of features are favored ...

2- Strengthening/relaxing are directly responsible for sound changes (fortition/lenition)

**Sound changes** data indicate the fate of distinctive features composing the phoneme under the pression of their prosodic position
1- Each distinctive feature has a favored prosodic position and some combinations of features are favored ...

2- Strengthening/relaxing are directly responsible for sound changes (fortition/lenition)

3- the interaction between prosody and segments in spontaneous phenomena followed the same rules
1- Each distinctive feature has a favored prosodic position and some combinations of features are favored ...

2- Strengthening/relaxing are directly responsible for sound changes (fortition/lenition)

3- the interaction between prosody and segments in spontaneous phenomena followed the same rules

4) allophonic variations due to prosodic position are parts of prosodic means
3) final lengthenings

a) phrase-final lengthening

b) the end of a non final breath group

c) whole utterance lengthening in a paragraph
variable domains of phrase-final lengthening

- the final rhyme (nucleus and coda)
- the final lexically stressed syllable
- the last foot (including the final stressed syllable)
- the whole last word

The domain of lengthening depends on the language and dialect.

EN, FR, CN
Prepausal final lengthening/domains

Phrase-final lengthening

Both penultimate final

French in Roman Swiss French in Belgium French
Infants’s babbling is influenced by the dominant rhythmic pattern of the ambient language.
final syllable lengthening in French and shortening in Japanese

• French infants
  1. mostly rising F₀ contours
  2. 70% final syllable lengthening

• AE infants
  1. mostly falling F₀ contours
  2. <20% final syllable lengthening acquired later

• Japanese infants
  1. falling F₀ contours
  2. absence of final lengthening

Levitt, 1991

Hallé, 1991
Human fetuses are sensitive to the prosodic contours (and music)

- Newborns distinguish prosodically different languages
- Newborns' Cry Melody Is Shaped by Their Native Language

Fo, Int contours
FR: rising Fo, Intensity contours
GER: falling contours

Mampe et al, 1997
articulatory settings

early cg

late cg

English

French

devoicing
aspiration
voicing
liaison

FO fall
Intensity fall
V1 favors

FO rise
Intensity rise
V2 favors

attraction
rejection

P-center
To summarize

From psycho-acousticians

• 1) perceiving is regrouping
  - initial strengthening
  - final lengthening

• 2) cognitive associations:
  strengthening: initial
  lengthening: end
1. Psychoacoustics
2. Ethology
3. Production
4. Perception
5. Cognitive capabilities
1- the laws of physics.

the longer a cavity the lower its resonances vocal tract resonances are called formant

the more massive the vocal folds the lower the rate of vibration fundamental frequency
Ethology

1- the laws of physics.

2- in animal communications

the ancestral role of formant perception and Fo was to provide indexical cue about the size and age of the conspecifics
1) Fo as a correlate of subordination

Macaque’s Coo vocalizations

<table>
<thead>
<tr>
<th>Situation</th>
<th>Type of coo vocalization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Separated male</td>
<td></td>
</tr>
<tr>
<td>Female minus infant</td>
<td></td>
</tr>
<tr>
<td>Nonconsorting female</td>
<td></td>
</tr>
<tr>
<td>Female at young</td>
<td></td>
</tr>
<tr>
<td>Dominant at subordinate</td>
<td></td>
</tr>
<tr>
<td>Young alone</td>
<td></td>
</tr>
<tr>
<td>Dispersal</td>
<td></td>
</tr>
<tr>
<td>Young to mother</td>
<td></td>
</tr>
<tr>
<td>Subordinate to dominant</td>
<td></td>
</tr>
<tr>
<td>Estrus female</td>
<td></td>
</tr>
</tbody>
</table>

Green 1975a

Fitch

N = 226
2) resonances as a correlate of subordination

- Retraction of the mouth corners > used by animals to raise the resonances of the vocalization > to sound smaller > gives an appeasing impression

Ohala (1984), « An ethological perspective of common cross-language utilisation of F0 of voice », Phonetica 41
1) continuation
2) question
   (the question depends on the answer and the speaker depends on the good will of the listener)
3) politeness, uncertainty, doubt, submissive

high tone: feminity and smallness

1) finality
2) answer or order
3) certainty

• high Fo : dependency
• non-finality, subordination

• low Fo : independency
• finality, dominancy
• the smile

Smile:
Fo rise (due to rising the larynx untested > tension of the vf) > formant frequency rise (tested) (V. Tartter), due to front cavity
Frequency code in speech: formants

- the smile
- palatalisation
- feminity and smallness (high front vowels)
- velarization

disgust, aggressivness (guttural sounds)
To summarize

From psycho-acoustics

- cognitive associations of position:
  - strengthening: initial
  - lengthening: end

From ethology

- cognitive associations of dependancy
- Higher Fo, higher formants
  - (continuation, question, doubt, etc.)
- Lower Fo, lower formants
  - (answer, order, certainty, etc.)
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RESPIRATORY PAUSES: BG

- physiological necessity.
- the expiratory phase of the breathing cycle

All languages tend to insert a respiratory pause between two sentences

So pause is related to the cognitive notion of break
Declination tendency: one utterance in a single BG
unmarked BG = ASSERTION
Explanations for the DL?

• 1) Decline in subglottal pressure? no but quasi-constant sub-glottal pressure throughout a phrase (Draper, Ladefoged & Whitteridge 1959)

• 2) Tracheal pull may be (Maeda’s thesis)

• 3) the rises being more difficult to achieve than the falls interesting speculations (Ohala)
  - would also downstep HLH > HL!H (phonologization of this tendency)
Flat Fo and declining Ps!

Demolin, 2007, among other publications
BG+
continuation
Division of the sentence into (BG + BG+)

- When the sentence is long,
- the speaker needs to take a breath in the middle of the sentence.
- The utterance is then divided into two breath groups.
- **The first BG** may be marked by acoustic cues to indicate continuation (non finality)
  - the slope of the DL may be attenuated (Danish)
  - the final fall may be replaced by *sustain*, or a final rise
    - on the syllable (Arabic, French)
    - the final stressed syllable and the final syllable (German)
- There is a *Fo resetting* between the two groups
- *Fo peak* at the beginning of the second group is lower, marking dependency and subordination to the first BG
- **The last BG** keeps its shape
Comparison: finality versus continuation

no cue

more intensity

more intensity
higher last peak

almost no cue
Slope of the declination line

- syntactically unmarked
- question with word order inversion and or interrogative particle
- non-final clauses
- terminal declarative utterance
Comparison: finality versus continuation

final continuation rise
more intensity

final continuation rise
rise on the final stressed syllable
more intensity
unmarked BG = ASSERTION

+ final rise = NON FINALITY
(2+2) – (2+2) extraction

- pause
- lengthening
- resetting
- Fo rise

- Danish
- Chinese
- Japanese
- Vietnamese
- Arabic
- Chinese
- Portuguese
- German
- English AM1
BG+
question
unmarked BG = ASSERTION

- = NON FINALITY (QUESTION)

+ - suppression of the declinaison

+ - final fall
Demos

- **Final rise H%** *(Same register)*
  - Arabic
  - English
  - French
  - Japanese

- **Final rise H% + rise on the last stressed syllable**
  - Then H
  - Then final rise H%

- **Higher register**
  - German

- **Higher final peak**
  - Chinese
  - Danish
  - Russian
BG+
certainty
early and late Fo peak

- early: given
- late: new

Kohler, 2003

Er hat gelogen
He lied
Il a menti
In Moba (Togo), the question prosody involves lengthening and « breathy termination »:

The African lax question prosody: Its realisation and geographical distribution
Annie Rialland (2007)
In Wule Dagara (Burkina), yes/no question prosody involves:

A lengthening
A breathy termination

+noun base forms (without truncation and eventually with floating tone)

Lengthening
breathy termination

« You saw Kpo »
« Did you see Kpo? »

The African lax question prosody: Its realisation and geographical distribution
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In Kabiye, yes/no question intonation involves:

- falling intonation
- breathy termination
- lengthening

A. Rialland, R. Ridouane, B. Kassan 2009, A Physiological investigation of voice quality in Kabiye assertions and yes/no questions, World Congress on African Languages, Köln
Ncam (Togo)

Contraction of a word-final -u and -a

« a slave »
« a slave? »

- falling intonation
- breathy termination
- lengthening
- opening of V
The «lax» prosody as a typical feature of the Sudanic belt

- High-pitched markers are also overwhelmingly common in Africa outside the Sudanic belt.
- It is currently unknown whether such question prosodies occur elsewhere in the world.
BG+ focus
• same components
  Fo peak  pitch accent
  Higher intensity
  Higher register
  Extension of Fo range

Parsing

• but rare exceptions: no prosodic marking of focus (Wolof), but complex verbal system which indicates focus

(7)  a. Peer lekk na.¹¹ (N)  Peer ate  PFT3SG
    ‘Peer ate.’
  b. Peer moo lekk. (N)
    Peer SUBJEMPH3SG eat
    ‘It was Peer who ate.’
Language choices
Where to fluctuate?

• morpheme level (Cantonese)
• bound to lexical word stress (English)
• phrase (French)
• Low on the stressed syllable (Danish)
Cours de lecture de spectrogrammes 5

Spanish (LH*, H*L)

Japanese (HTL)

French (H*, L)

Danish (L*H)

English (H*L)

Fo/declarative
Regrouping words into phrases
A limited number of principles

- suppressing movements to give the two words the pattern of a single words Dutch hat pattern
- partial resetting of the base-line
- downstep
- phrasal final tone insertion
- phrasal final tone lengthening
- phonological processes (liaison, linking)
% IN NOVEMBER % THE REGION'S WEATHER WAS UNUSUALLY DRY

T1  T2  T3  T4  T5  T6
Regrouping two content words into a phrase

• suppressing movements to give the two words the pattern of a single words Dutch hat pattern)
• partial resetting of the base-line
• downstep
• phrasal final tone insertion
• phrasal final tone lengthening
• phonological processes (liaison, linking)
金将军，身高一八七，公猪阉割专家，兼精通机关枪。

Jin Jiangjun, shengao yibaqi, gong zhu yangge zhuangjia, jian jingtong jiguangqiang.

JIN Général taille 1m 87 porc castration expert simultanément doué mitrailleuse
Le général JIN, d’une taille de 1m87, expert en castration des porcs, en même temps, il est fin com
Yìdàlì dìmiàn bùduì chètuì guò kuài xiànrù kùnjìng

Italie fantassins se retirer trop vite se trouve dans l’embarras

Les fantassins italiens se sont retirés trop vite et ils se trouvaient dans une situation fâcheuse.
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Cognition

• 1) the magic number 7 (Miller)
  – when the number of syllables increases, the probability of dividing a phrase into two prosodic words increase

• 2) the influence of the native language

• 3) learning

• 4) etc
What to conclude?
1) The limited prosodic parameters

Pause

Intensity
- initial tensening
- focus

Fo

Timber
Tension
precision

- Declination (., ?, !, focus)
- rise-fall
- height
- resetting of the base-line
- glottal stop
- register
- range (involvement)
- degree of voicing

Phonation
regularities of vibrations
abruptness
breathy-creaky
open quotient

Duration

Vocal setting
palatization
pharyngelization
contrast consonant-vowel

- final lengthening
- initial consonant
  strengthening

Positive and negative means
2) Numerous functions where prosody plays a role

- demarcative
- culminative

Syntax-prosody mapping

Semantics-prosody mapping

Pragmatics; discourse structure-prosody mapping

Syntactic functions

Attitude/emotion
- Attitudinal

Pragmatic functions

Sociolinguistic
3) Tendency to associate the same »meaning« to a particular prosodic parameter or combination of prosodic parameters
motivated

Arbitrary

All speech organs

Not controlled

Archaic genetic code

Essentially the glottis

Plus supraglottal cavities + gestures (surprise: raised eyebrows)

Arbitrary

Controlled

Prosody, morphology, syntax

Emotions

Attitudes affects

Modalities
### 4) Where to find explanations or examples?

<table>
<thead>
<tr>
<th>Field</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerodynamics</td>
<td>Pathology</td>
</tr>
<tr>
<td>Production</td>
<td>Sound changes</td>
</tr>
<tr>
<td>Perception</td>
<td>Synchronic variations</td>
</tr>
<tr>
<td>Psychoacoustics</td>
<td>Statistics</td>
</tr>
<tr>
<td>Sociolinguistics</td>
<td>Baby’s cry and babbling</td>
</tr>
<tr>
<td>Ethology</td>
<td>IDS</td>
</tr>
</tbody>
</table>
5) Each language has make its own choices in the set of universal tendencies, which makes each language, dialect unique.

But the choice at one level often limits the number of possible choices at another level.
7) A convinced superpositionist: anticipation in production expectations in perception
montant

Groupe, syntagme

descendant

80
8) Future

- same speech material translated in different languages
- every thing equal
- all prosodic parameters observed
- litterature in different domains
- deep learning?
mmmerci !
Declination tendency: one utterance in a single BG
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