

Voiceless implosives: a comparison between American and African languages

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1. What are implosives? Distinction between voiced and voiceless.

- (a) Definition (Hayward 2000: 269):
 - sounds that are produced by moving the larynx down;
 - as air pressure inside the mouth lowers, it involves a glottalic airstream at the closure release.
- (b) Voiced implosives
 - Laver (1994: 179): the vocal folds are **only lightly closed** allowing for their vibration.
 - the larynx and the respiratory system are exercised momentarily **in opposite directions**.
- (c) What causes the vibration of the vocal folds?
 - Catford (1977: 75): vibration is the product of the downward movement of the larynx against the fixed pressure of the lungs.
 - Laver (1994: 179): considering the dynamics of continuous speech, voiced implosives would be performed with a more positive expiratory effort.
- (d) Voiceless implosives
 - the glottis is **fully closed**
 - by the lowering of the larynx **the pressure lowers** inside the vocal tract
 - + short **prevoicing** before the burst (much stronger than for the voiced implosives)

2. African languages

2.1. IGBO, a Benué Congo language of Nigeria

- (a) Ladefoged et al. (1976): Proof of the existence of voiceless implosives by **aerodynamic measurement** of intraoral pressure in Owerri Igbo.

- (b) What are their perceptual characteristics, since pressure and direction of airflow are not audible?
- Ladefoged & Maddieson (1996: 89):
 - movements of the larynx affect the formant frequencies at the onset of the vowel.
 - all bilabial implosives (voiced and voiceless) seem to be auditorily velarized, as they historically developed from the labial velars found in other dialects.

2.2. LENDU, a Central Sudanic language of Congo

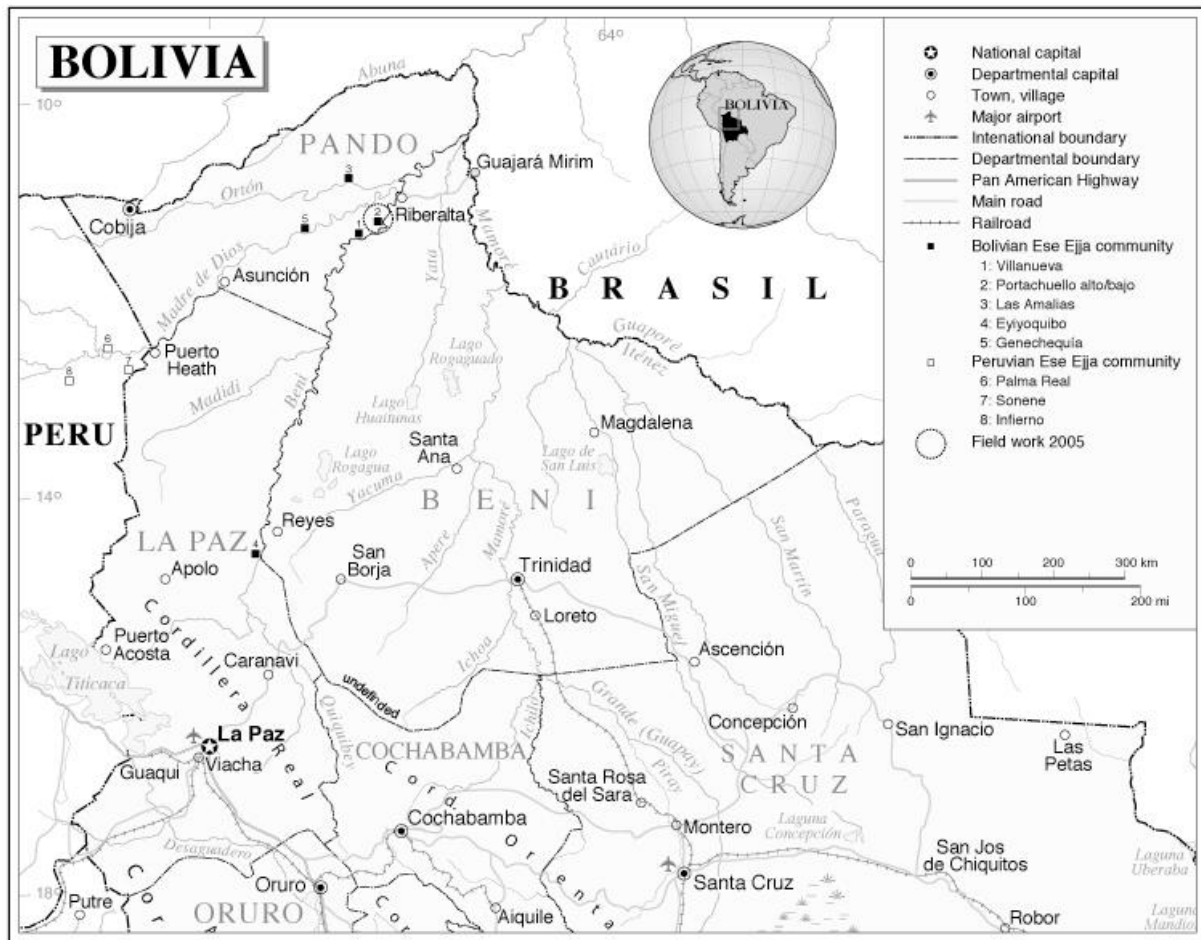
- (a) Numerous researchers, various inventories:
- Lendu linguists: Ngapka-Ndjali: 1977, Dhejju: 1977, Dirive: 1981, Dz've: 1982
 - other researchers: Trifkovic: 1977, Mertens: 1978, Dimmendaal: 1986, Goyvaerts: 1988, Kutsch Lojenga: 1991, Demolin: 1995, Ladefoged & Maddieson: 1996
- (b) Established phonemic inventory: bilabial, alveolar, palatal **voiced and voiceless implosives**, contrasting with **pulmonic stops**.
- (c) Ladefoged & Maddieson (1996): Voiceless implosives are similar to the **laryngealized stops** found in Hausa (described by Goyvaerts: 1988), then the prevoicing might be slightly creaky.
- (d) Demolin (1995): his acoustic data show **no traces of laryngealization**, but they show:
- a period of silence (like that for a glottal stop);
 - a following prevoicing;
 - a strong burst.

3. American languages

3.1. Mayan languages of Meso America (Mexico and Guatemala)

- (a) Pike (1963): the 1st one to document the voiceless implosives of Tojolobal of Mexico (Chuj language) and in Cakchiquel of Guatemala (Quichean language)
- (b) Campbell (1973): Quichean languages of Guatemala use at least a contrastive **voiceless uvular implosive**.
- (c) Pinkerton (1986) confirms the existence of voiceless implosives in the Quichean languages of Guatemala on the basis of **aerodynamic measurements**: uvular voiceless implosives in any dialect, 2 bilabial and 1 alveolar.

3.2. ESE EJJA, a Tacanana language of Bolivian Amazonia



Map 1: Location of Ese Ejja Communities in Peru and Bolivia

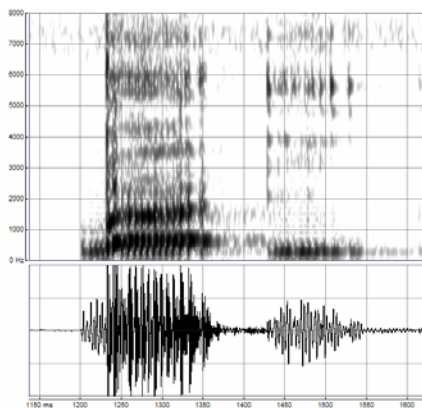
(a) Fieldwork **2005** (summer):

- 1200 Ese Ejjas live in the South West of Amazonia (Bolivia & Peru).
- Audio recordings were made in Bolivia (Portachuelo Bajo) by Vuillermet.

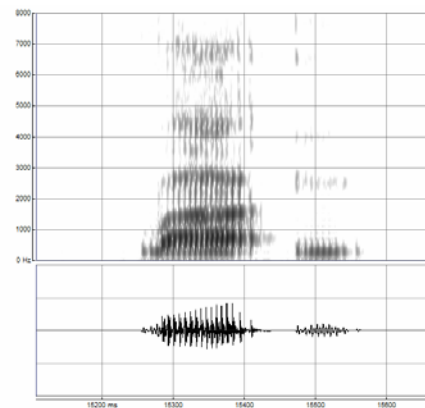
(b) Ese Ejja's voiceless implosives:

- No report of implosives **in any other Tacanan language** (Araona: Gonzales 1997; Cavineña: Guillaume 2004; Reyesano: Guillaume in prep;; Tacana: Key 1968, Girard: 1971).
- Previous work on Ese Ejja:
 - Firestone (1955: 52): mere voiced stops
 - Key (1968:32): laryngealised voiced implosives
 - Chavarría (2000): mere voiced stops in the Peruvian dialect?
- New evidence from fieldwork 2005: 2 voiceless implosives at the **bilabial** and **alveolar** points of articulation.

- (c) • Acoustical work in DDL: discussion on Ese Ejja recordings with Demolin on the basis of **spectrogram analysis**; the period of silence, the prevoicing, and the strong burst confirm the existence of bilabial and alveolar voiceless implosives.
- **Aerodynamic evidence** are yet to be measured.
- (d) Phonetic variations noted in Ese Ejja voiceless implosives:
- in intervocalic position, the **prevoicing** of the bilabial implosives may be **greater**.
 - the **quality of the prevoicing** varies when the sounds are produced with weak amplitude.
 - **traces of laryngealisation** are occasionally observed.
 - intervocalic bilabial may be almost **realised as a glottal closure**.



ɸaʔi by a female speaker



ɸaʔi, by a male speaker
(and by weaker amplitude)

4. Discussion

4.1. African languages

- (a) • Igbo's **voiceless** implosives are the same as in Lendu.
- **laryngealisation** is more likely to be a **possible feature** than a main one.
 - the **strong burst** and the implosive nature differentiate these sounds from the Hausa's glottalised stops.
- (b) • voiceless main features: **strong burst**, that is preceded by a **short prevoicing**.
- the strong burst is probably the result of an **ingressive** airstream, because the glottis is still in a constricted configuration at the release of the closure.
 - prevoicing is the result of the relaxation of the vocal tension when the larynx is rising after the initial lowering.

4.2. American languages

- (a) Interesting differences:
- some Mayan Quiché dialects have both **voiceless implosives** (bilabial and uvular) **and ejectives** (alveolar and velar) in their inventory.
 - Ese Ejja has **voiceless implosives** only in the front of the vocal part – bilabial and alveolar - and **no ejectives**.

- (b) Pinkerton (1986: 138): Quichean implosives might come from ejectives in some languages, due to variation in the timing of the articulatory gestures or by phonetic differences created by position within the word.
- (c) Possible origins of Ese Ejja's voiceless implosives:
- #1: from the **devoicing of a voiced implosive**, as observed in Mangbetu as a phonetic variation by Demolin (1995).
 - #2. from the combination between **a glottal closure and a voiced stop** (further evidence would be needed): the lowering of the glottis for the articulation of the voiced stop would be anticipated during the glottal stop.
- (d) The voiceless implosives found in Lendu could be explained by a similar mechanism (#2), all the more since Dimmendaal (1986) observed a set of preglottalised stops: the possible auditorily confusion gives some support that one could have developed from the other.

4.3. Universals?

Whereas the voiceless implosives found in Quichean languages seem to differ, the similarities observed in Igbo, Lendu and Ese Ejja about the way voiceless implosives are produced suggest that they might have the **same origin**, or that they might be produced with **similar mechanisms**.

More data are needed... we will work on this in the future!

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