

CIVIL Corpus: Voice Quality for Forensic Speaker Comparison

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CIVIL Project

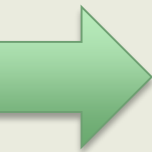
Cualidad Individual de la Voz en la Identificación de Locutores

- 2010
- Phonetics Lab CSIC



- Laryngeal settings modification

**FORENSIC
PHONETICS**



Types of Voice Transformation (non electronic)

1) Phonation disguise:

- whisper (Orchard y Yarmey 1995 & Yarmey et al. 2001, Evans & Foulkes 2009)
- *falsetto* (Endres, Bambach & Floss 1971, Wagner & Köster 1999, Künzel 2000, Alves et al. 2012)
- creak/creaky (Hirson & Duckworth 1993, Moosmüller 2001 Künzel 2000, Alves et al. 2012)

2) Prosody disguise:

pitch, intonation, speech rate (Dellwo, Ramyead & Dancovicova 2009 & Dellwo, Kolly & Leemann 2012)

Types of Voice Transformation (non electronic)

3) Supraglottal disguise:

- Through objects (Molina de Figueiredo & Souza Britto 2000; Horga, 2002)
- Techniques that interfere within the habitual speech transmission (Rose & Simmons 1996, Llamas et ál. 2008, Gil & San Segundo 2013)

4) Phonological system disguise:

foreign accent, dialectal or pathological features (Zhang & Tan 2008, Tate 1979, Markham 1999, Storey 1996, Moosmüller 2006, Simpson & Neuhauser 2009, 2010)

Disguise as a Challenge in Forensic Phonetics

Most criminals do not combine all these disguising techniques (Masthoff 1996).

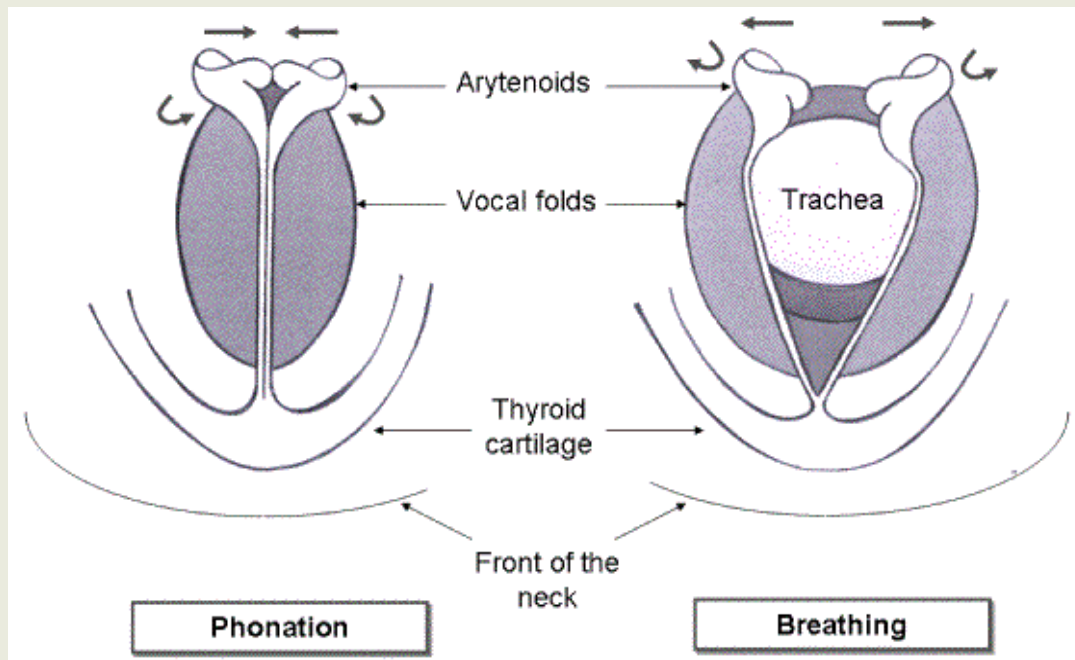
- ✓ The most frequently used is the voluntary modification of the **phonation types**.
- ✓ This kind of disguise is specially difficult to maintain for a long stretch of time (Künzel 2000).

CIVIL: hypotheses

- Changes in phonation = harmful for speaker recognition
- Idiosyncratic phonetic features (biometric traces):
 - Remain despite the disguise attempts
 - Some laryngeal characteristics cannot be disguised

Types of Phonation

- Phonation = vocal folds vibration



From: <http://www.phys.unsw.edu.au/jw/voice.html>

Types of Phonation

- Different states of the vocal folds produce different types of phonation

Falsetto	-adducted	+tense	elongated
Modal	adducted	tense	-----
Creak/y	+adducted	-tense	shortened



Corpus CIVIL

- 31 female speakers and 27 male speakers
- Standard European Spanish
- 20-35 years old → mean 25.6 years old
- Two recording sessions → mean 29.8 days

Why? → Forensically realistic

Non-contemporaneous speech samples

(-) Within-speaker variation

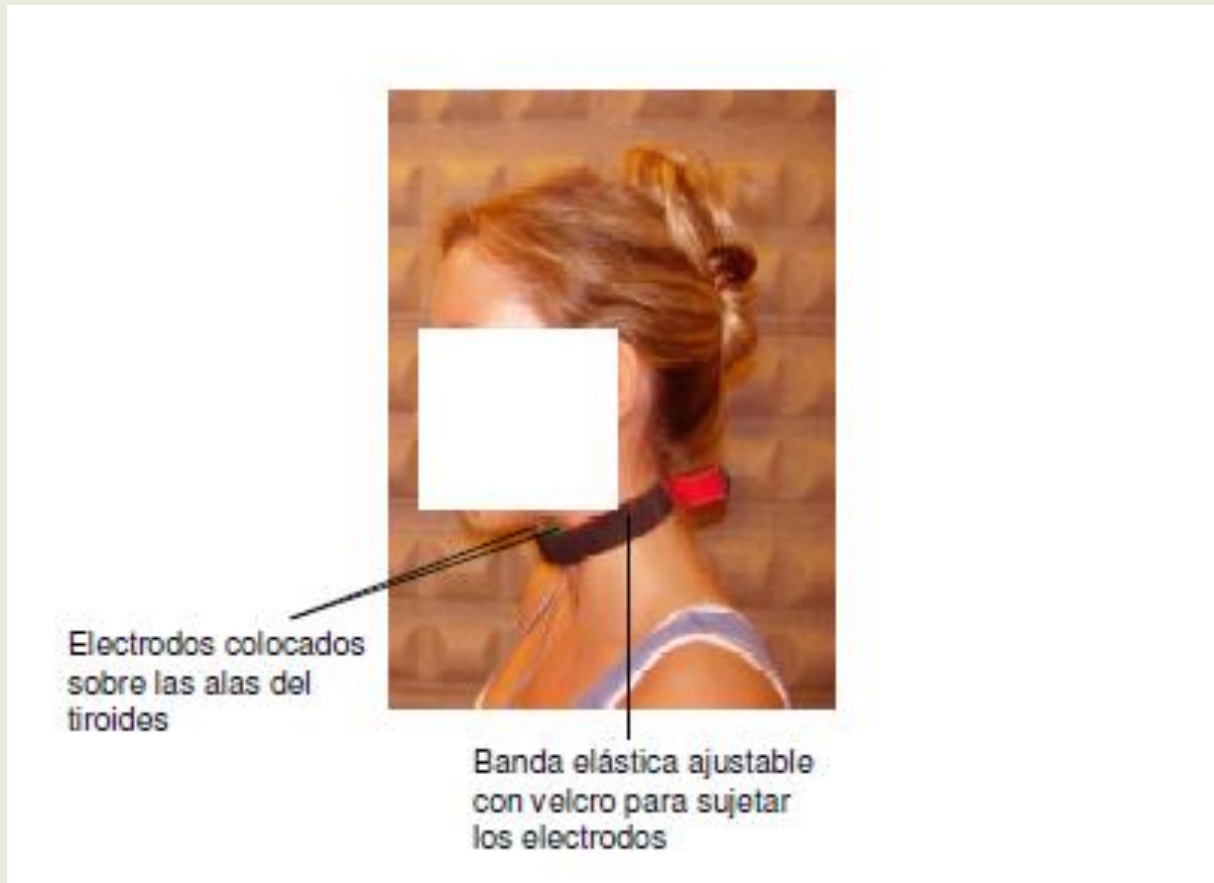
(+) Between-speaker variation

Corpus CIVIL

- Three tasks:
 - 3-4 minutes of conversation
 - 33 carrier sentences
 - 2 texts
- Voice Signal:
 - Microphone
 - Telephone
 - EGG
- Three Types of Phonation:
 - Modal
 - Falsetto
 - Creak/y

Electroglottograph

→ Measures the time variation of the degree of contact between the vibrating vocal folds



Recording Equipment & Settings

- **Equipment**

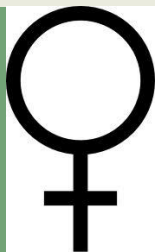
- Recording booth of the CCHS Phonetics Lab
- Condenser microphone → E6i Omnidirectional Earset Audio Interface → UA-25EX by Roland
- PC with the software Adobe Audition 1.0 for Windows
- Telephones → CISCO IP Phone as emitter & Samsung Galaxy as receiver
- Electroglossograph → Glottal Enterprises EG2-PCX2

- **Settings:**

- Sample Rate: 44100
- Resolution: 16-bits
- Channels for voice: Stereo (L-microphone & R-telephone)
- Channels for EGG: Stereo (L-microphone & R-EGG)

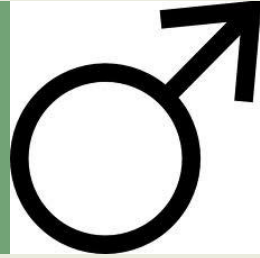
Results so far

- Alves et al. (2012) Disguised voices: a perceptual experiment, *3rd European Conference of the International Association of Forensic Linguistics*, Oporto.
 - Listeners' recognition of disguised voices is above chance ($p < 0.001$ ***)
 - Speakers are worse recognized when using **creak** than when using falsetto.
 - No performance differences between experts and naïve listeners in disguised voice recognition



FEMALE VOICES !!

Future directions...



MALE VOICES ?

-Hypothesis:

Worse recognition results when using **falsetto**

- Expectations not met:

- Creak less expected for female voice prototype
- Falsetto less expected for male voices prototype

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Thank you for your attention!

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