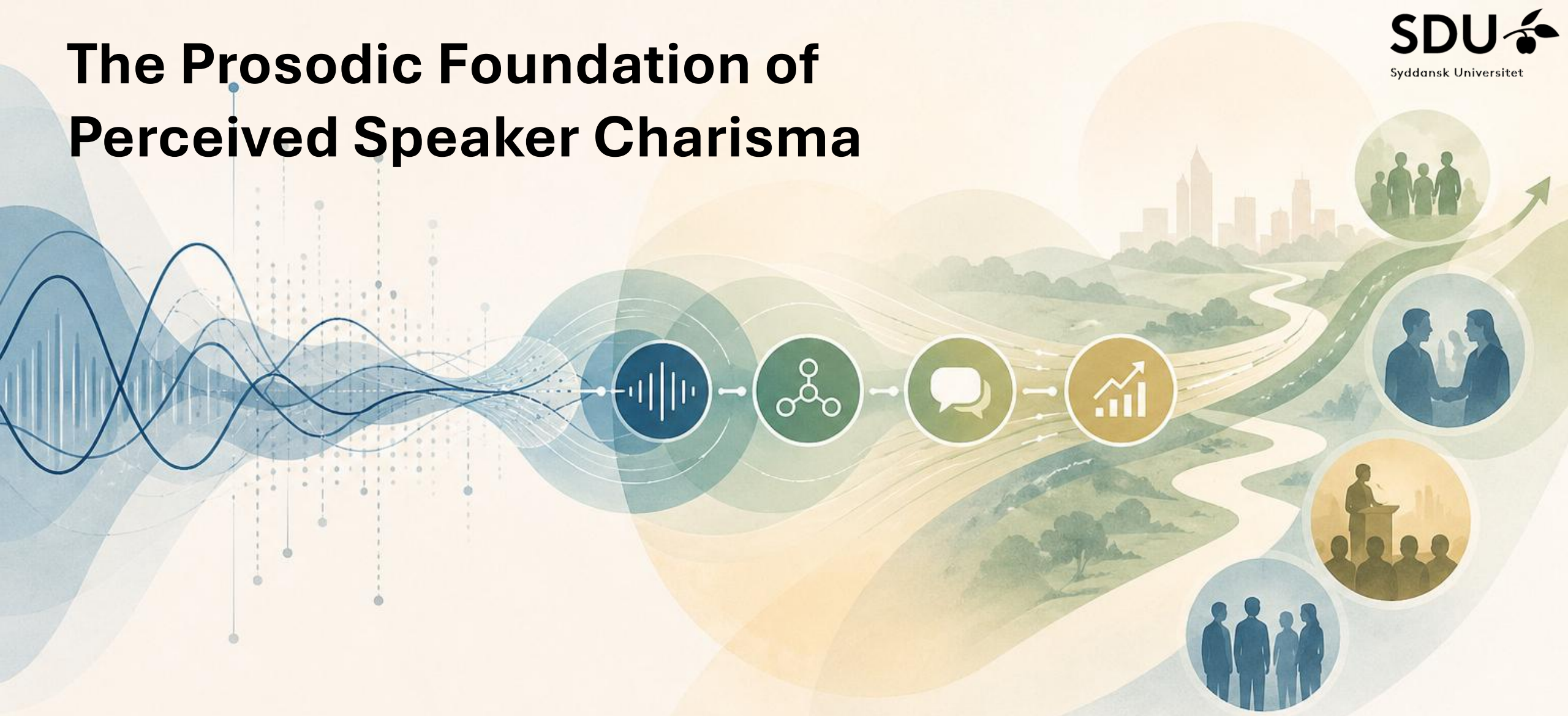
Stammen, stemmen - og karismatisk tale ☺

KUC, Kolding, 10 Nov 2026



Oliver Niebuhr
Associate Professor of Communication and Innovation
Director of the SDU Acoustics Lab
Centre for Industrial Electronics, University of Southern Denmark
Founder of the Speech-Technology Startup AllGoodSpeakers ApS

The Prosodic Foundation of Perceived Speaker Charisma



Part 1: How it all began...

Acoustic Voice Profiling®



8 weeks after I started at SDU in 2015 *„Olli, you know something about speech… can‘t you teach our engineers and entrepreneurs giving better presentations? Making them sound more charismatially ?“*



…And what do you say when you are the new guy? – *„Yes sure!“* ☺

Challenge: 12 weeks to prepare a new 5 ECTS course that should be mandatory for all business engineers and entrepreneurs

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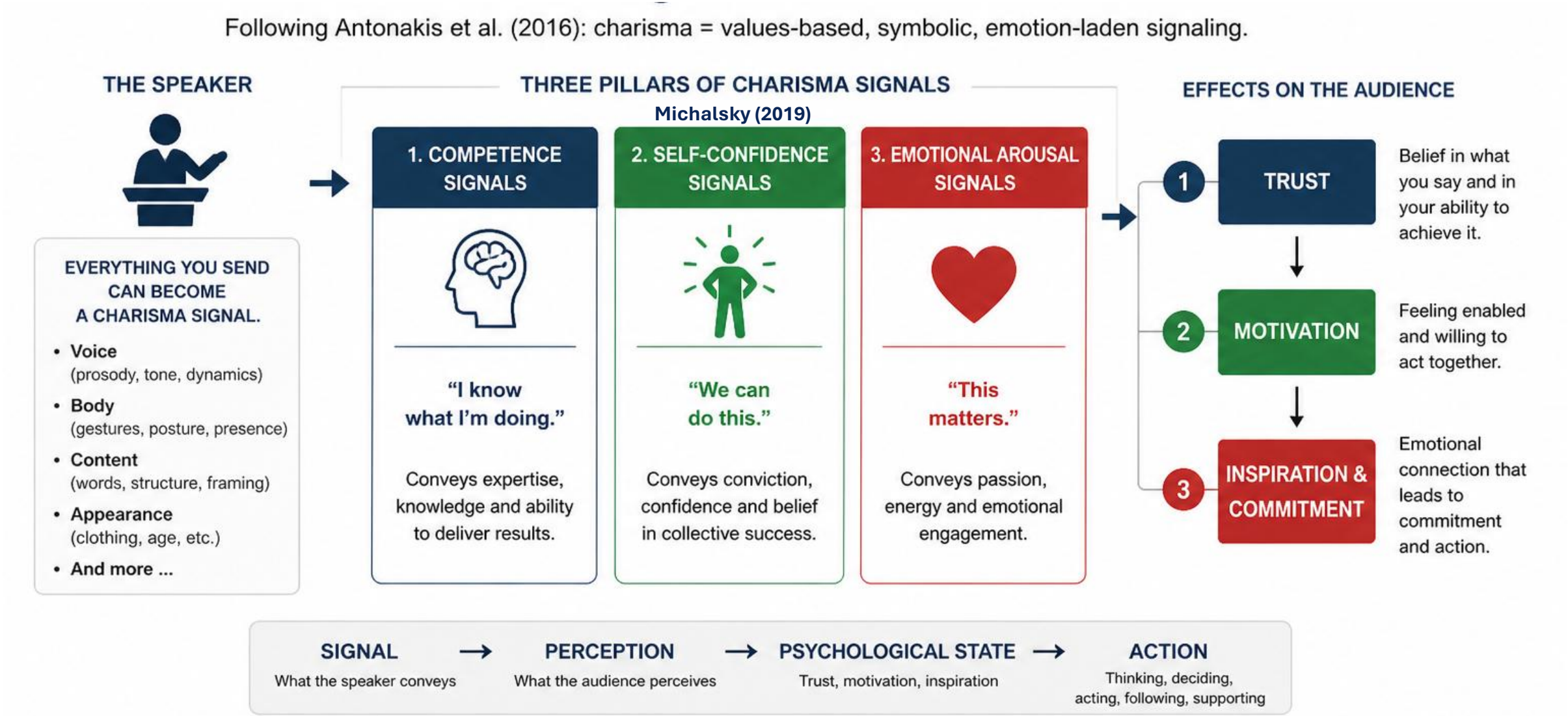
What is charisma? Charisma is not the effect⇔ Charisma is the multimodal signal that (can) create the effect



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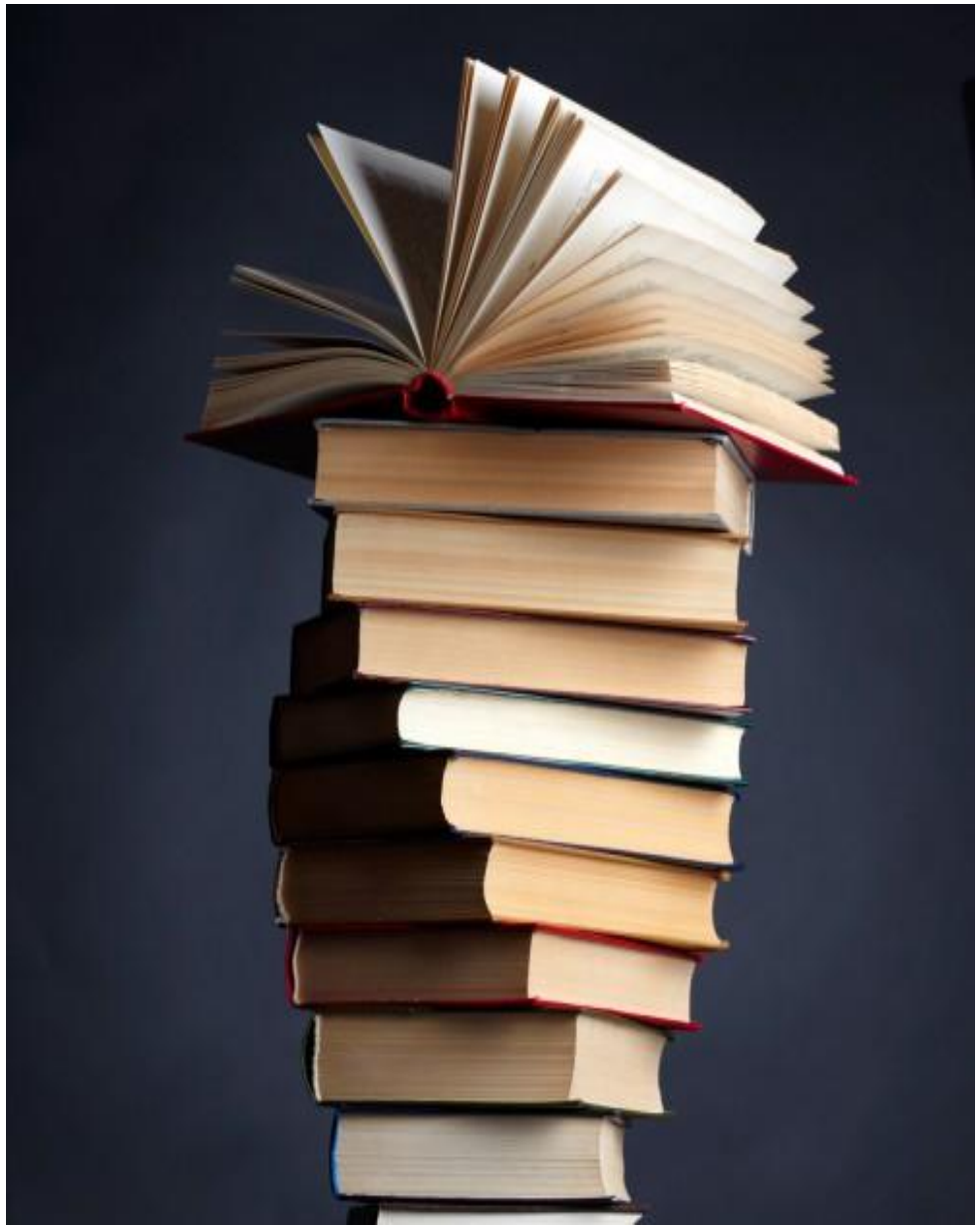
Fluent speech

Variable in Rhythm and Intonation

Clear & strong voice



Vivid tone of voice

Warm tone of voice

- Vague
- Entirely subjective

- Not quantifyable

- Arbitrary → Not defined by physiology of acoustics of a speaker‘s vocal tract

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S. Volkmann (2013): Pauses should be **long** (structuring); Breathing through **mouth** (less noisy); **Do not try** to change your pitch level; fluent speech = **get rid of fillers**.



K.W. Mortensen (2011): Pauses should be neither long nor short; **do try hard** to **raise** your pitch level; **occasional use of fillers** is good, speak **fast.**

„If you don‘t like how you sound, take a deep breath and find a solution“ (p.158)

Hardcover
from USD 23.44
prime

O. Fox Cabane (2012): Pauses should be **short** (more fluent); Breathing through **nose** (as this supports belly breathing); **Do try hard** to change and **lower** your voice pitch level, **speak slowly**

- Vague
- Entirely subjective
- Not quantifyable
- Arbitrary → Not defined by physiology of acoustics of a speaker‘s vocal tract

And now?



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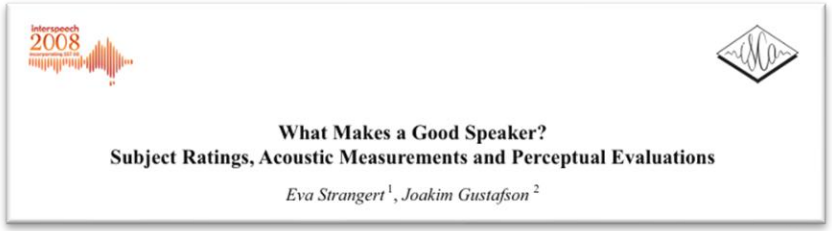

What Makes a Good Speaker?
Subject Ratings, Acoustic Measurements and Perceptual Evaluations

Eva Strangert [1], *Joakim Gustafson* [2]



Speech Communication
Volume 51, Issue 7, July 2009, Pages 640-655

Charisma perception from text and speech

Andrew Rosenberg, Julia Hirschberg



Charisma perception in political speech: a case study

Rosario SIGNORELLO[1,2], Francesca D'ERRICO[2], Isabella POGGI[2], Didier DEMOLIN[1], Paolo MAIRANO[1]

[1]GIPSA-Lab, UMR 5216 CNRS, Grenoble INP, UJF, U. Stendhal (Grenoble, France); [2]Dipartimento di Scienze dell'Educazione, Universita' degli Studi Roma Tre (Rome, Italy)

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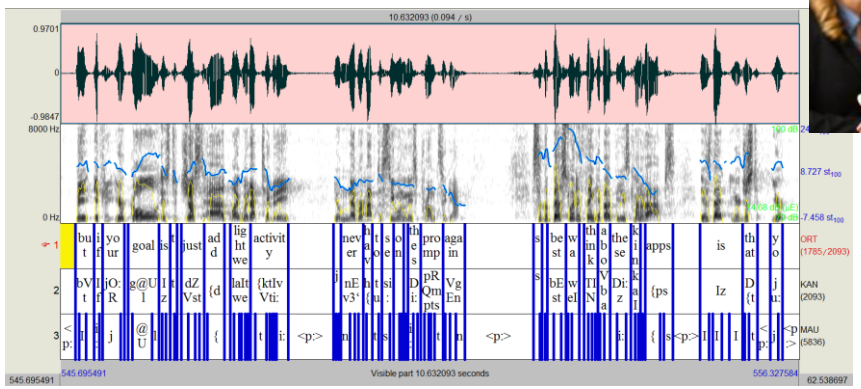
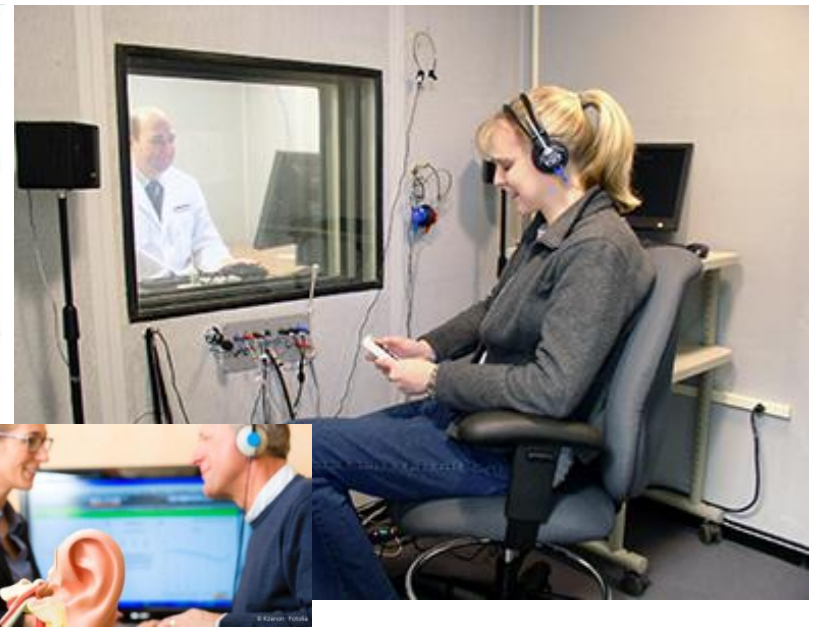
What does the existing prosodic literature say about charisma and related perceived speaker traits?





Online surveys in 16 countries
→ Overlaps between good/bad speakers?



Test and refinement of acoustic results in perception experiments with stimulus sets based on, e.g., PSOLA-manipulated prosodic parameter continua, 1.5yrs
(> 500.000 listener ratings)

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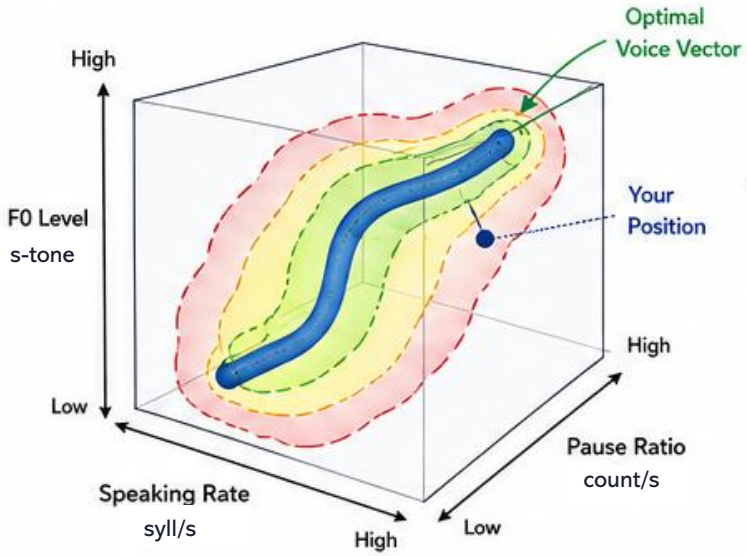
1 VOICE VECTOR ®

Where is the optimal combination?

A voice is the result of multiple prosodic parameters working together in harmony. The PICSA 2.0 model represents the optimal coordination as a "voice vector"® through a 3D parameter space.



- Optimal (close to vector)
- Suboptimal (moderate distance)
- Poor (far from vector)

PICSA 2.0 evaluates how well bundles of parameters are aligned with the optimal voice vector.
The smaller the distance to the vector, the better.

2 PARAMETER WEIGHTS

How important is each?

Empirically determined weights show the relative impact of each parameter on overall vocal performance.

Acoustic Parameter	Weight (Example)
F0 Level (Pitch)	0.142
Speaking Rate	0.098
F0 Variability	0.087
Pause Ratio	0.074
Spectral Tilt	0.061
…	
20+ Voice Vectors	$\Sigma\, w_i = 1.000$

Like a nutrition label: each parameter has a "caloric value" (weight) that determines how much it contributes to the overall result.

3 PICSA SCORE (PASCAL)

How do I compare?

The weighted sum of all parameter contributions is translated into a percentile-based score.

Algorithm

$$S = \sum_{k=1}^{m} w_k \cdot g_k\big(d(\mathbf{x}_k, \mathbf{v}_k)\big)$$

$f_i(x_i)$ = contribution of parameter i based on distance to the voice vector (0 to 1)
w_i = weight of parameter i
S = raw PICSA score (0 to 1)
n = number of parameters (20+)

PASCAL Score

Shows how you rank compared to your peers in your specific category.



You are better than 78% of your peers in your category.

Peer Group
(e.g., male founders, female academics, Western Germanic speakers, etc.)

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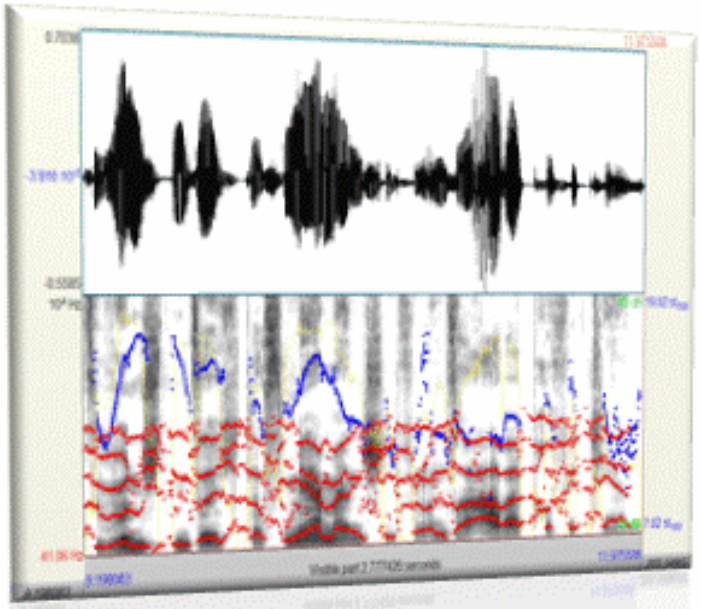
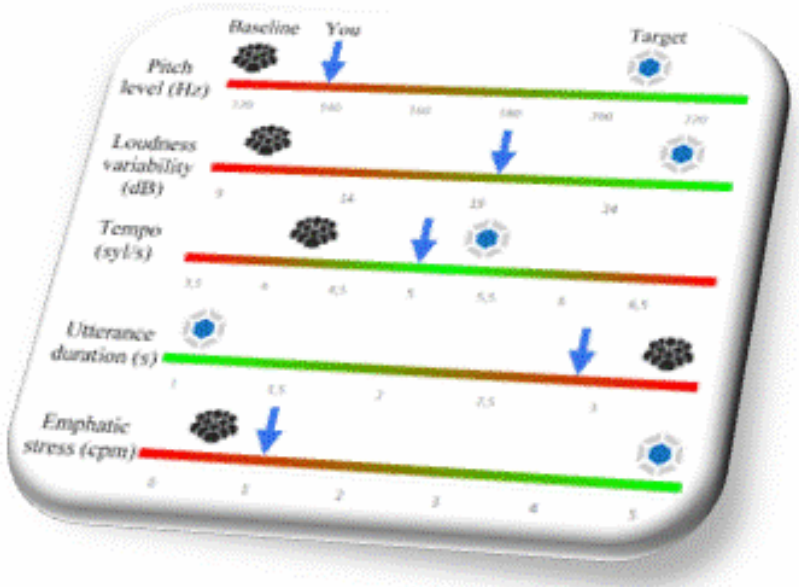
PICSA Algorithm: Perception-Integrated Charismatic Speech Analysis



Excerpt of a speech
(minimium 40 seconds)



Analysis & „Diagnosis“/Assessment
(21+ acoustic parameters)

Integrated total charisma score (0-100) PASCAL



Learning success
immediately visible

Precise, tailored, targeted training (of only those parameters that need and should be improved)

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HARDWARE INNOVATIONS

All components work together – powered by the **PICSA** Algorithm



VR Voice Gym
Immersive VR environment for realistic presentation practice and feedback.



MARRYS Helmet
Wearable sensor system for high-precision voice capture in any situation.



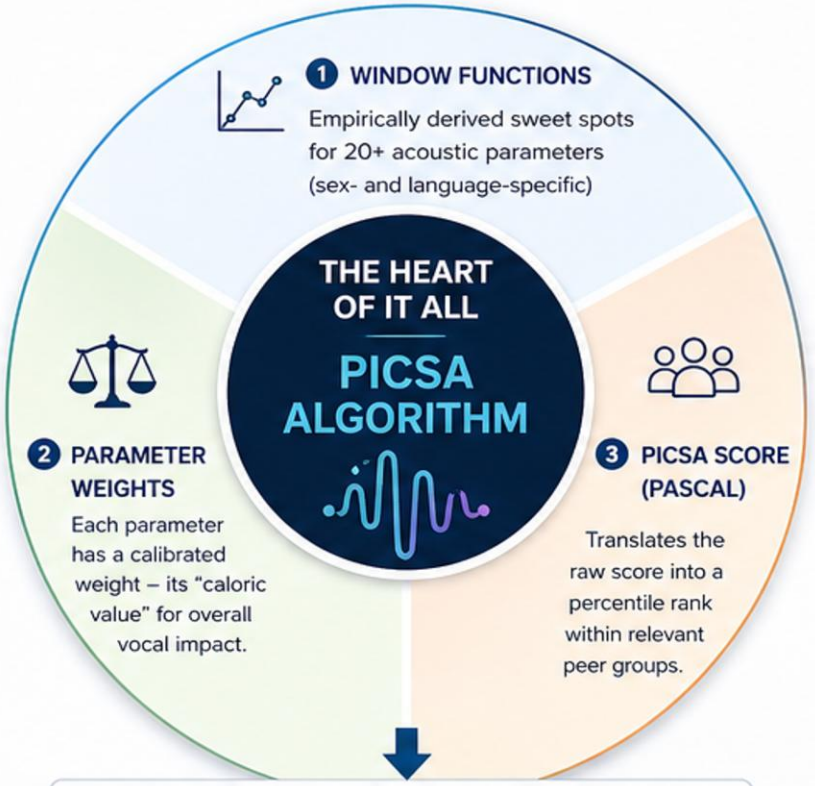
IN-POCO
(Interactive Posture Corrector)
Real-time posture monitoring and haptic feedback to build optimal posture.



The CHARLES
(Gesture Sensor Vest)
Tracks upper body gestures and movement dynamics for expressive delivery.



Audience Reactor
Educational robot that engages children, raises awareness for prosody and public speaking, and provides interactive feedback.



SCIENCE. TECHNOLOGY. IMPACT.
One integrated ecosystem.

SOFTWARE SOLUTIONS



Web PITCHER
AI-powered web platform for comprehensive presentation training and feedback.



Analytics Dashboard
Advanced visualizations for progress tracking, comparisons and insights.



Personalized Feedback
Detailed, actionable feedback on all key aspects of vocal and physical delivery.



Adaptive Training
AI-driven training paths that adapt to individual needs and goals.

Cloud Platform
Secure data storage and access anywhere, anytime, on any device.

FROM RESEARCH TO REAL-WORLD IMPACT

ALL GOOD SPEAKERS
Make waves that matter

Founded in 2019 as a spin-off to bring prosody science into practical, scalable solutions.

- International company
- Interdisciplinary team
- Continuous innovation
- Evidence-based impact

GLOBAL REACH – MAKING WAVES WORLDWIDE



- Dubai (UAE)
- Denmark
- Germany
- Austria
- Switzerland
- Brazil
- USA
- ...and growing

TRUSTED BY LEADING PARTNERS

sound hub denmark

CCV

BMTD BUNDESVERBAND FÜR MEDIENTRAINING IN DEUTSCHLAND

flo

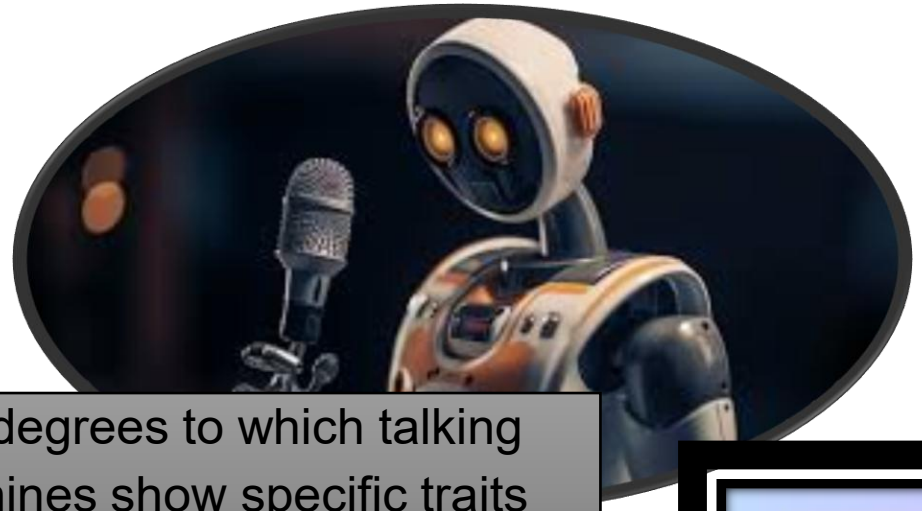
DR

SPEECH ACADEMY

unesco Learning Cities

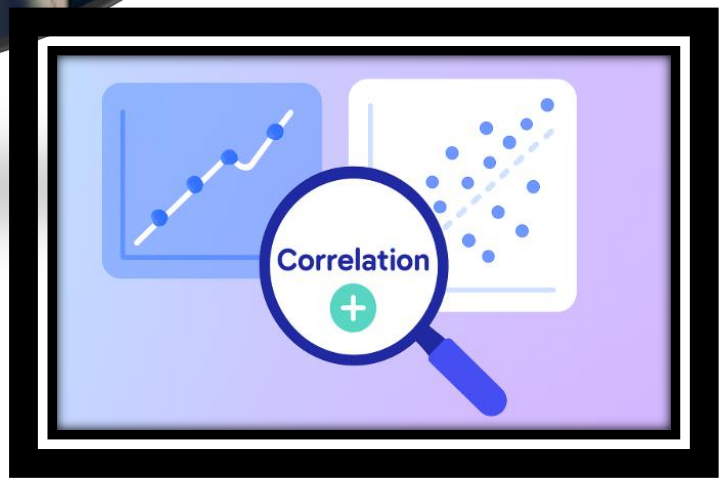
Sønderborg Learning City Denmark

PICSA & PASCAL in real life



The degrees to which talking machines show specific traits (Conle et al., 2026)

The degree of psychopathy at eye level with estiablished clinical questionnaire parts (Welsh, 2022)





The oral exam grades of Danish university students (Niebuhr, 2021)

Dividend distribution of companies, based on the vocal performance of the CEO at annual shareholder meetings (Taghva & Niebuhr 2023)

PICSA & PASCAL in real life



1. COMPETENCE SIGNALS

"I know what I'm doing."

Conveys expertise, knowledge and ability to deliver results.

Prosodic parameters (mainly) associated with this pillar

- Phrase duration (pause frequency)
- F0 variability
- Intensity variability
- F1 level ("Jaw Dancing")
- Rhythmicity
- Filled pause characteristics



2. SELF-CONFIDENCE SIGNALS

"We can do this."

Conveys conviction, confidence and belief in collective success.

Prosodic parameters (mainly) associated with this pillar

- Intensity level
- Spectral tilt/slope
- Final/terminal fall
- F2–F3 levels
- (Acoustically projected body size)
- Silent pause duration
- Jitter–Shimmer (breathiness)



3. EMOTIONAL AROUSAL SIGNALS

"This matters."

Conveys passion, energy and emotional engagement.

Prosodic parameters (mainly) associated with this pillar

- F0 level
- F0 range
- Speaking rate
- Emphasis
- Pitch-Accent frequency
- Breathing amplitude
- Cepstral Peak Prominence (CPP)

These associations are not exclusive.
Prosodic parameters can contribute to more than one pillar.

What are possible links to stuttering?



Part 2: What does science say....

Where might voice training help?

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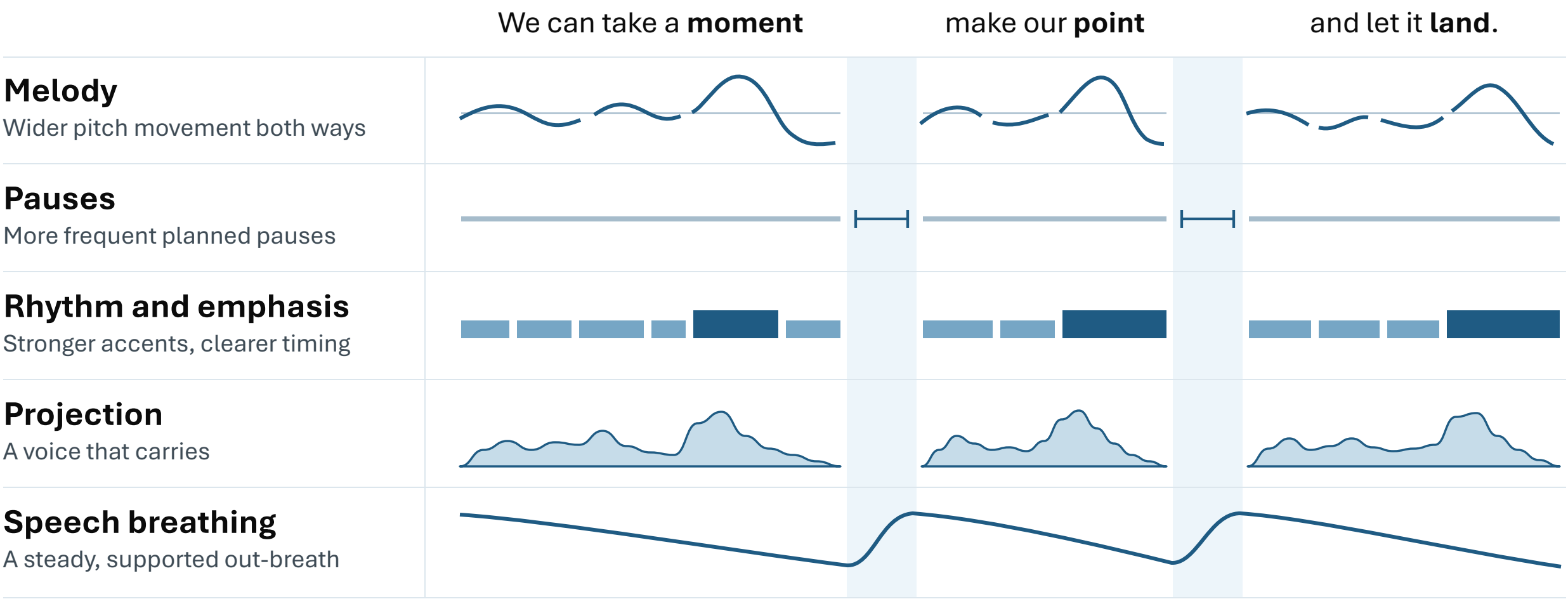
Five features of speech we can practise

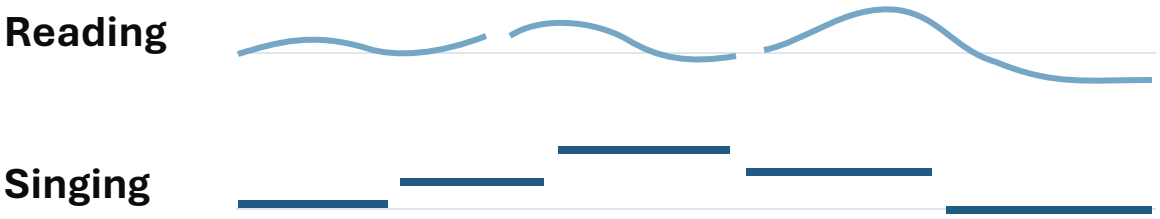


Schematic example

Melody and projection

What changes when we sing?

Pitch patterns, shown schematically



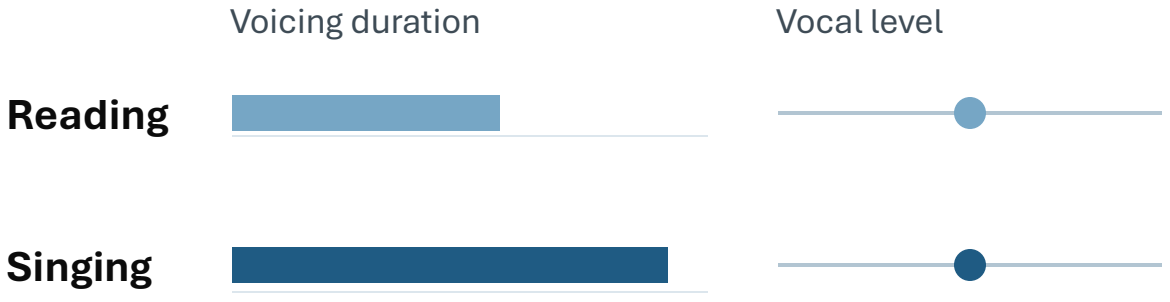
75% fewer disfluencies

Twelve people who stutter read or sang passages at normal and fast rates.

Singing changes pitch, timing and voicing together.

Glover et al. (1996)

Voicing and vocal level



Schematic comparison

Longer periods of voicing

A second study found longer voicing during singing and no significant change in vocal level.

Whether greater projection helps in conversation remains open.

Colcord & Adams (1979)

Could a more melodic or better-projected voice make everyday speech easier?

Pauses and rhythm

Alternating speech and silence

Reading task used in the experiment



One syllable per beat

Metronome



Speech aligned to an external beat

5.19% to 0.28%

Mean share of stuttered syllables in standard reading and in a task with regular pauses.

The pause task also imposed a rhythm and slowed speech.

Davidow et al. (2011) | ASHA Practice Portal

Stuttering fell at a matched rate

With a metronome, stuttering was near zero even at a comparable stutter-free speech rate.

Emphasis changes articulation. Its effect on stuttering is still open.

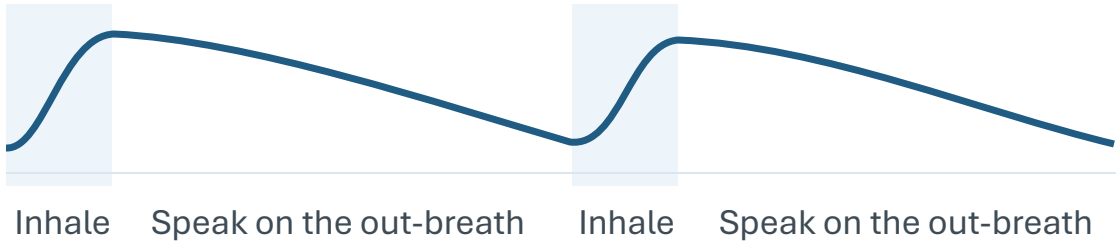
Davidow (2014) | Kopera & Grigos (2025)

Could planned pauses or clearer accents make a phrase easier to say?

Speech breathing and speaking anxiety

Breath and phrase coordination

Illustrative breath trace



When someone is listening

Mean percentage of syllables stuttered

0.04%

Speaking to oneself

8.42%

Same words to two listeners

Breathing patterns can differ

A lab study found different lung-volume patterns even during relatively fluent speech.

The effect of breathing exercises alone on stuttering remains uncertain.

Johnston et al. (1993) | Neumann et al. (2017)

A separate trial on speaking anxiety

Cognitive behavioural therapy eased social anxiety and avoidance, with no added fluency benefit.

How much fear of judgement explains the difference is open.

Jackson et al. (2021) | Menzies et al. (2008)

Could steadier breathing or less pressure about being heard make speaking feel easier?

What are possible links to stuttering?



Part 3: What we train and how it can possibly make a difference...

Making voice and speech tangible

The AllGoodSpeakers' training approach

We can see a gesture. Feedback lets us see or feel what our voice is doing.



Visual feedback Tactile feedback

Analytical listening

Example of a stronger pitch accent

See it or feel it

See a pitch contour or feel a speech movement.

Hear it more precisely

Learn to recognise specific patterns in your own speech.

Adjust it deliberately

Choose a change, practise it and check the result.

Hands-on exercises and tools we develop ourselves

MARRYS cap, Pitcher and the Virtual Voice Gym

Training by making voice and speech tangible

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Training by making voice and speech tangible



"Light & Loud"

- Objective To develop awareness of speaking with sufficient vocal energy to reach and engage the entire audience.

- The exercise is based on acoustic principles: To capture and maintain attention, at least ~45 dB is typically required at the listener's position.
As sound travels through the room, its energy decreases by about 3 dB with each doubling of distance. This means that effective projection is not intuitive, but must be actively controlled and trained.

VIRTUAL VOICE GYM

Training by making voice and speech tangible



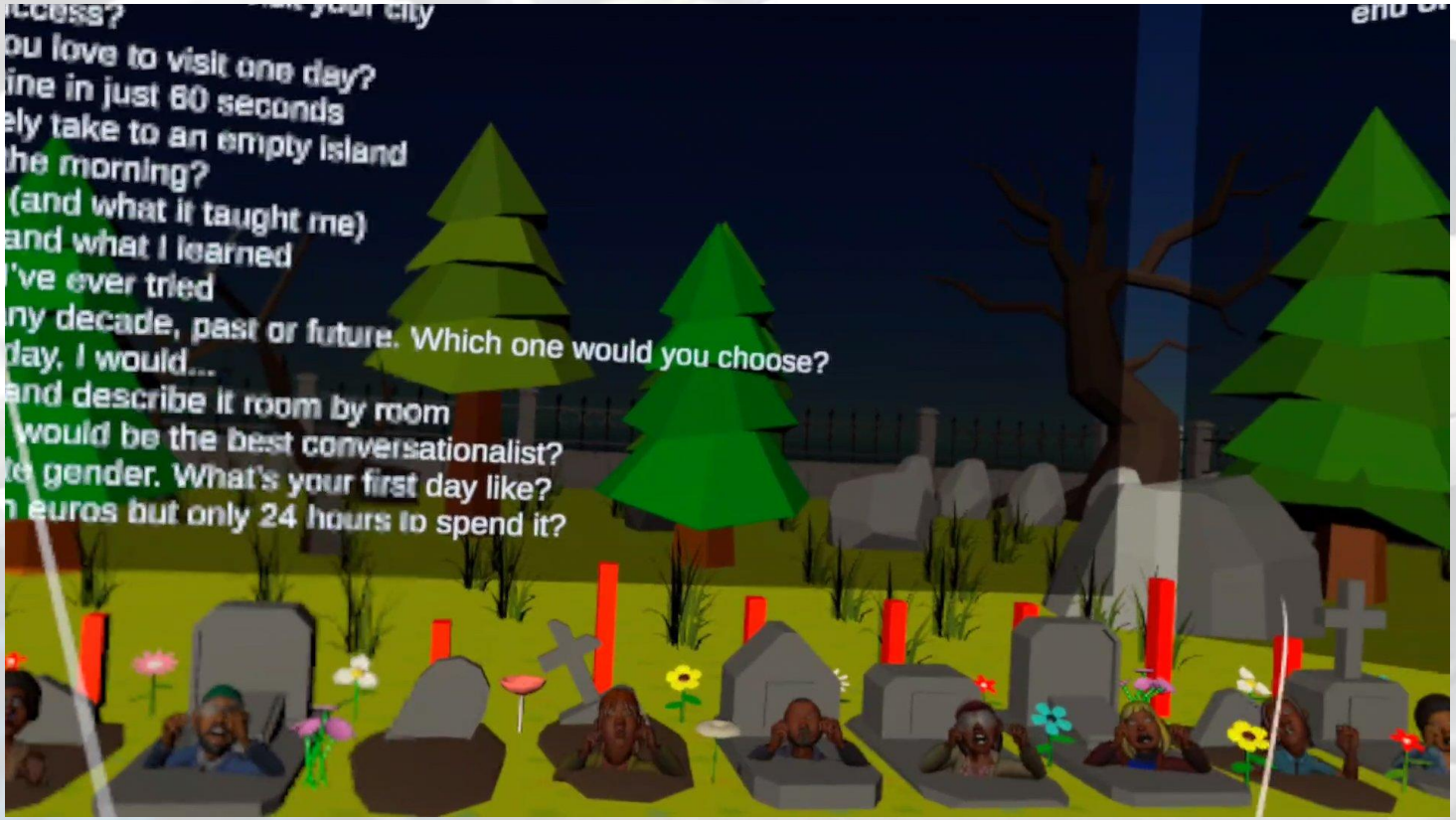
Pause & Applause

Focus Pausing behavior & silence control

Goal Develop awareness and control of intentional pauses as a key element of confident and effective speaking.

Principle You stand on a virtual theatre stage. Whenever you pause for at least one second, the audience starts to applaud. This simple but powerful feedback loop trains you to tolerate silence, use pauses strategically, and experience their positive impact on audience perception.

Training by making voice and speech tangible



"Melody or Eulogy"

- Focus on pitch control and pitch range extension

- Objective To develop a larger and more flexible tonal range in order to improve vocal expressiveness, rhythmic contrast and competence, as well as one's own emotional effect.

- Principle: to train both the upward and downward variation of pitch, with a special emphasis on activating higher pitches. This requires muscular effort and control, which can be strengthened through targeted training.

VIRTUAL VOICE GYM

Training by making voice and speech tangible



Training by making voice and speech tangible

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"Per-Breath Breathing Belt System"



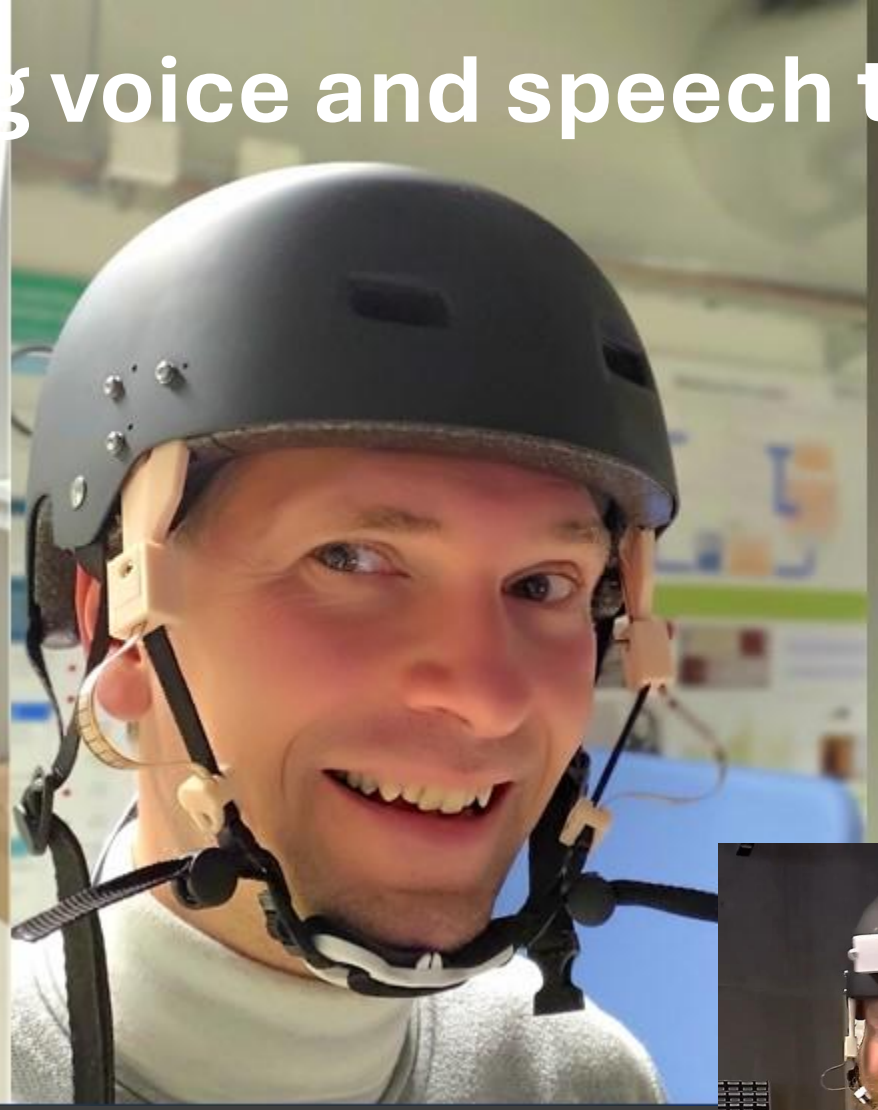
- Focus on understanding, strengthening and controlling one's own breathing
- Goal More constant, more asymmetrical breathing independently of posture
- Principle: Put on the breathing belts (blue = belly), press the reset button, and then get started, observe, try out, steer, learn, control.





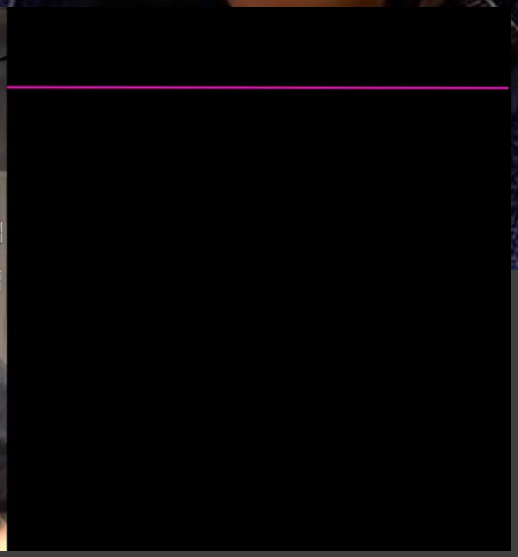
Training by making voice and speech tangible









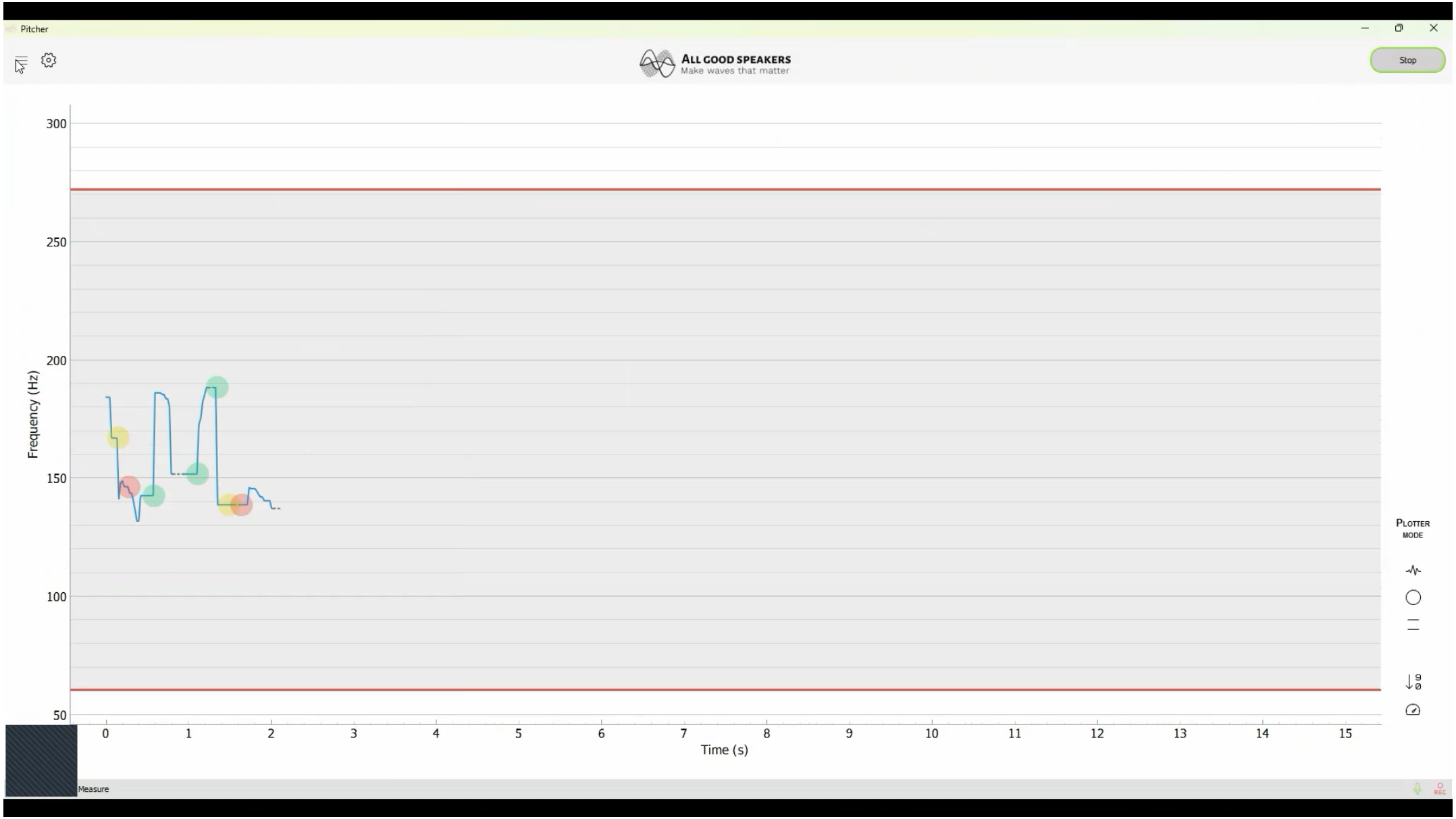


A new articulatory tool: Comparison of EMA and MARRYS

Malin Svensson Lundmark[1,2], Donna Erickson[3], Oliver Niebuhr[2], Mark Tiede[3] and Wei-Rong Chen[3]

[1]*Lund University,* [2]*University of Southern Denmark,* [3]*Yale University*

Training by making voice and speech tangible



Training by making voice and speech tangible

Speaking with a cork



Practise a slower pace, clearer rhythm and more frequent, stronger stresses.

Stretching an elastic band



Stretch the band sideways with both hands on the stressed syllable. Bring your hands back slowly. The resistance lets you feel the lengthening.

Lengthen one sound in the stressed syllable

Consonants	really, super, very
Vowels	amazing, wonderful

Thank you! Tak!

ALL GOOD SPEAKERS
Make waves that matter

Also to: Jan Michalsky, Jana Neitsch, Nina Bachsleitner, Kerstin Fischer, Radek Skarnitzl, Steffi Berger, Nina Schmidt, Alex Brem, Silke Tegtmeier, Plinio Barbosa, Tim Schweißfurth, Ingo Siegert, Oliver Jokisch, Francesca D'Errico, Isabells Poggi, Suza Wrzeczsz, Anna Gutnyk, Wentao Gu, Donna Erickson, Jana Voße, Emil Novák-Tót, Simon Gonzalez, Nafiseh Taghva, Lisa Tschinse Sina Voss, Katrin Prüfig, Elina Banzina, u.v.a.m... ☺!!



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