Phonation Profile Analysis

A novel VPA-based auditory-perceptual method for analysing phonation

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Voice quality and phonation

Voice quality

Characteristic auditory colouring of a speaker's voice

(Abercrombie 1967)

Phonation

How do we measure phonation?

Instrumental methods

Acoustic methods

Auditory-perceptual methods

Vocal Profile Analysis

(Laver 1980, Laver et al. 1981)

Auditory-perceptual approach

Speaker's **overall** voice quality

- Supralaryngeal + Phonation type
- Over a sample of at least 90 secs

Voice quality treated as **composed of different settings**

- Rated on **scalar degrees** where appropriate
- Can be **combined**
- Compared to **'neutral'** baseline, rather than 'normal' voice

Section I of the Vocal Profile Analysis Protocol from Laver et al. (1991[1981])

Vocal Profile Analysis Protocol

Judge: . . . . . **Tape:** . . . . . **Sex:** . . . . . .
Date of Analysis: . . . . . **Speaker:** . . . . . **Age:** . . . . . .

I. VOCAL QUALITY FEATURES

CATEGORY	FIRST PASS			SECOND PASS						
	Neutral	Non-neutral		SETTING	Scalar Degrees					
		Normal	Abnormal		Normal			Abnormal		
					1	2	3	4	5	6
A. Supralaryngeal Features										
1. Labial				Lip Rounding/Protrusion						
				Lip Spreading						
				Labiodentalisation						
				Extensive Range						
				Minimised Range						
2. Mandibular				Close Jaw						
				Open Jaw						
				Protruded Jaw						
				Extensive Range						
				Minimised Range						
3. Lingual Tip/Blade				Advanced						
				Retracted						
4. Lingual Body				Fronted Body						
				Backed Body						
				Raised Body						
				Lowered Body						
				Extensive Range						
				Minimised Range						
5. Velopharyngeal				Nasal						
				Audible Nasal Escape						
				Denasal						
6. Pharyngeal				Pharyngeal Constriction						
7. Supralaryngeal Tension				Tense						
				Lax						
B. Laryngeal Features										
8. Laryngeal Tension				Tense						
				Law						
9. Larynx Position				Raised						
				Lowered						
10. Phonation Type				Harshness						
				Whisper(y)						
				Breathiness						
				Creak(y)						
				Falsetto						
				Modal Voice						

What's not captured by Vocal Profile Analysis

Intra-speaker variation

Utterance position

Turn-taking

Style

Linguistic context

e.g. Sweet 2015, Podesva 2007, Podesva 2013, Henton 1988…

How can we consider intra-speaker variation, *and* maintain principles of VPA?

Phonation Profile Analysis - Principles

In line with VPA

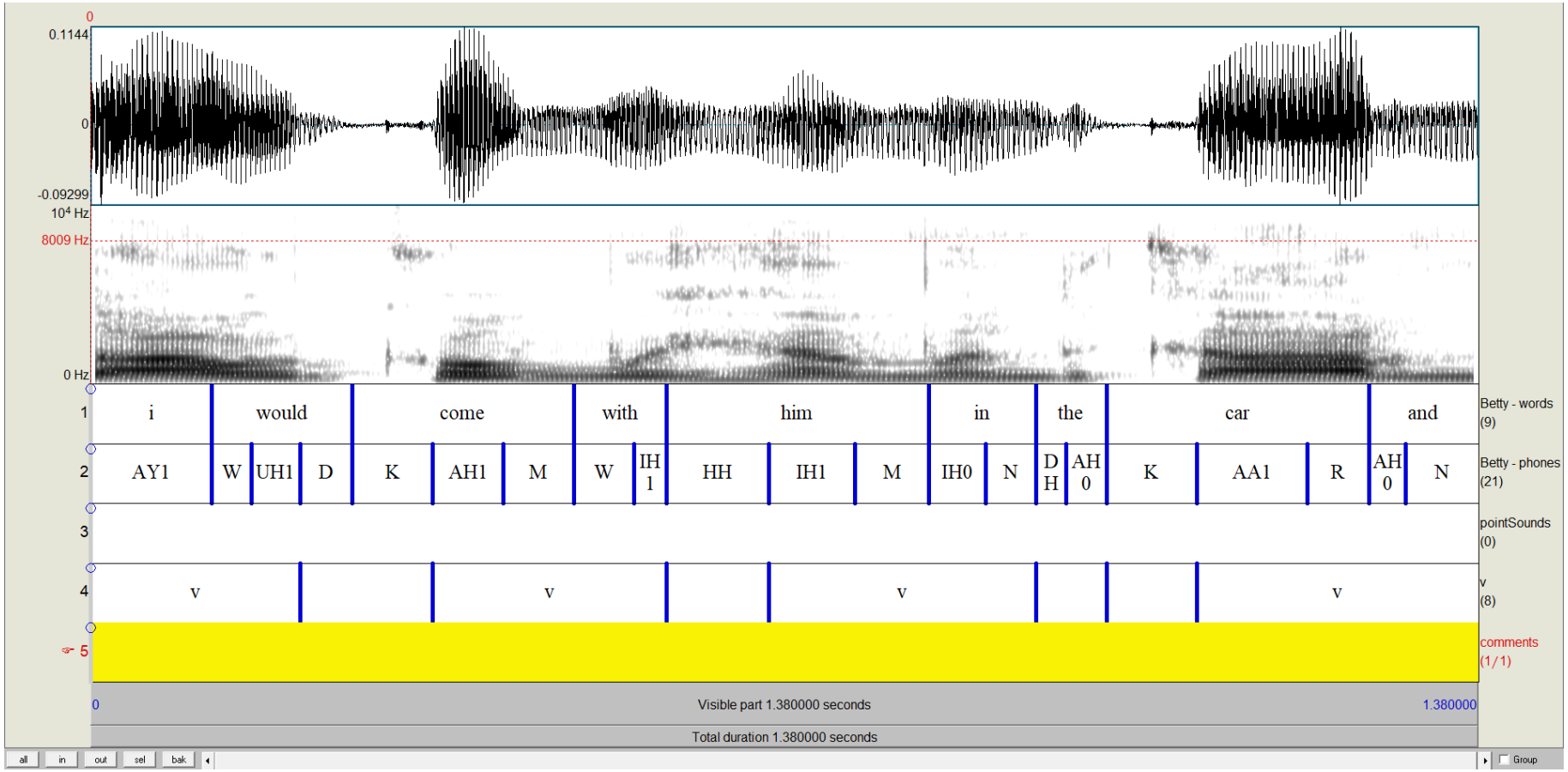
- ✓ Auditory-perceptual approach
- ✓ Voice quality as settings that can be combined
- ✓ Scalar degrees
- ✓ Neutral baseline

In contrast to VPA

- ≠ Voiced stretches
- ≠ Phonation only
- ≠ Differences in scales & permissible combinations

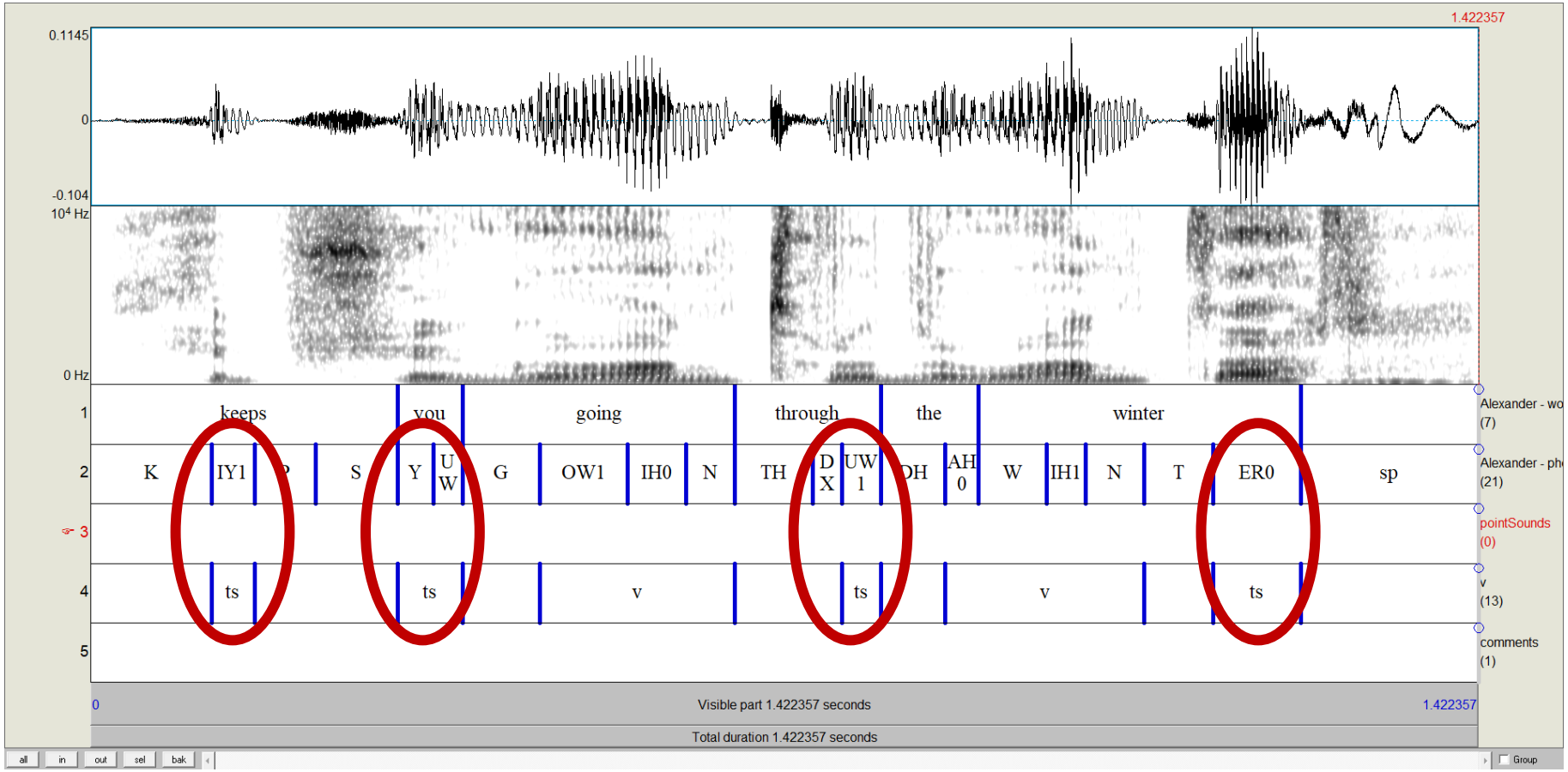
Unit of analysis – Voiced Stretch (VS)

- Stretches of voicing – mostly sonorants – no segmental frication



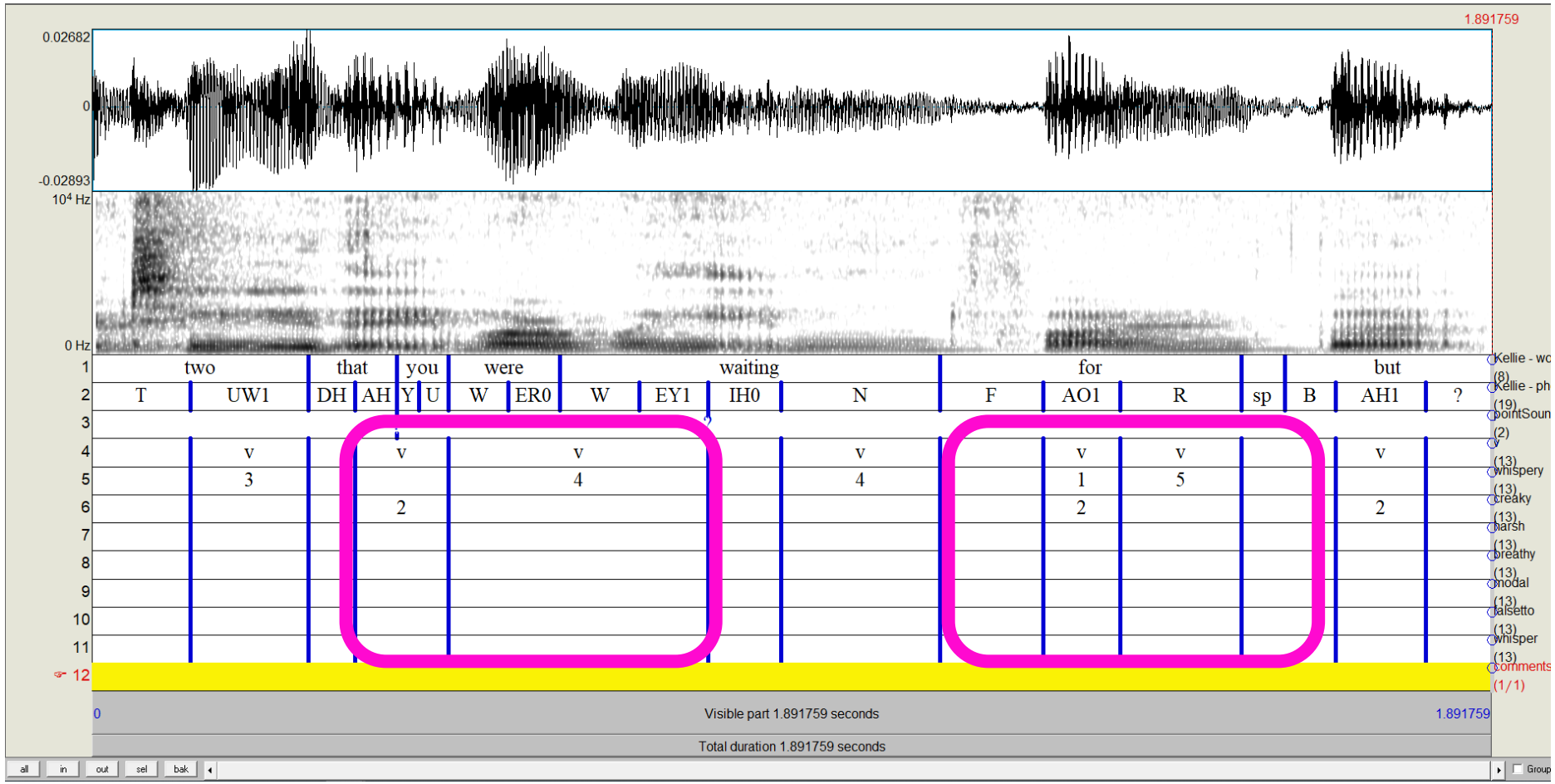
Unit of analysis – Voiced Stretch (VS)

- More than 100 ms



Unit of analysis – Voiced Stretch (VS)

- With a near-constant phonation type



Analysing a phonation profile

For each VS, code on scalar degrees:

- Whispery (1-5)
- Creaky (1-5), where 1 = tense and 5 = very creaky
- Breathy (1-5), where 1 = lax and 5 = very breathy

And the presence or absence of:

- Harsh voice
- Whisper
- Falsetto
- Modal (if no other phonation types are present)

Demonstration of PPA

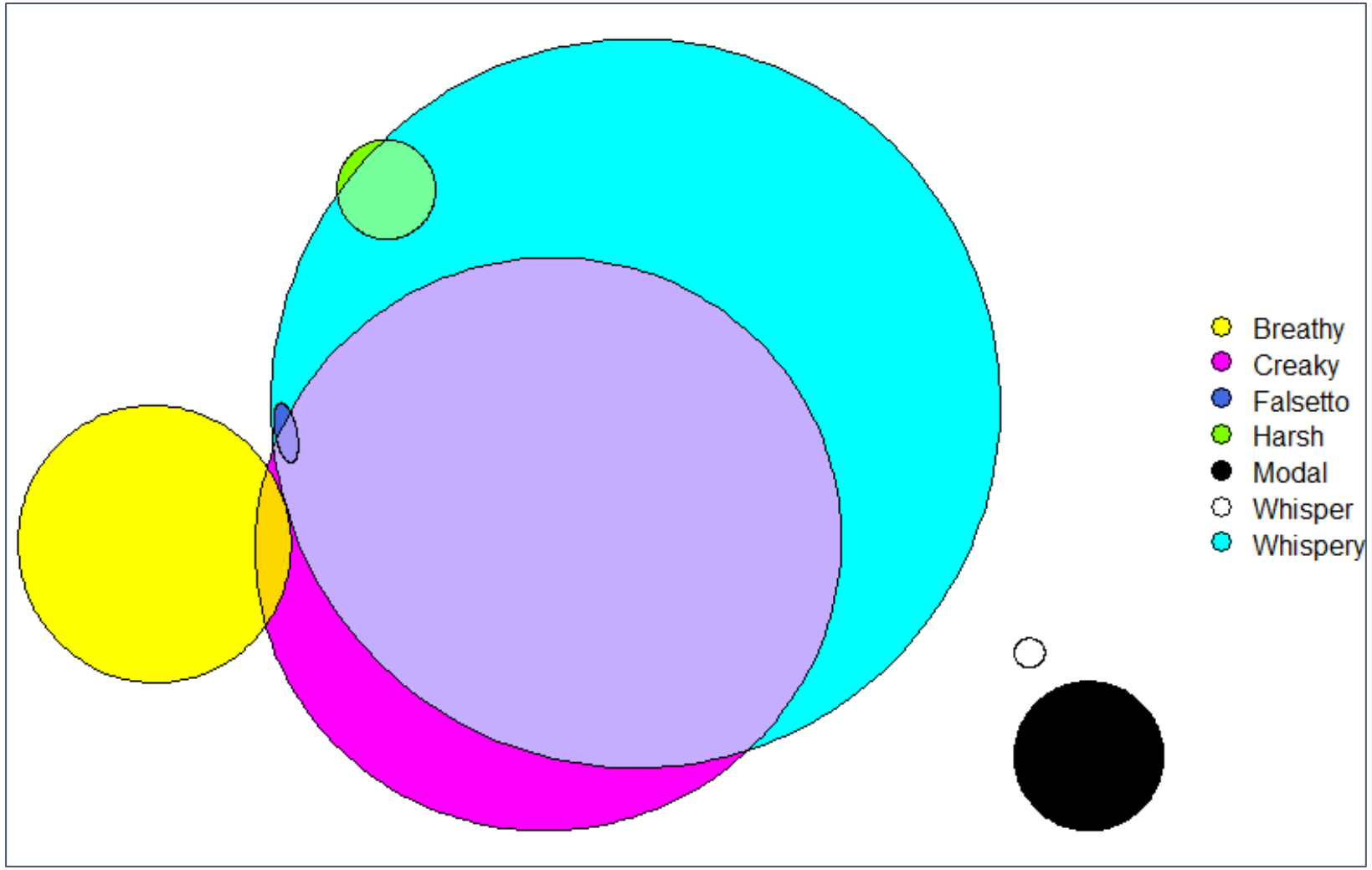
For each location:

	Male	Female
Younger speakers (~18-25)	2	2
Older speakers (~65+)	2	2

Smith et al. 2018

What does it tell us?

- **How often** a phonation type is used
- How different phonation types are **combined**



Euler diagram showing how phonation types are used across all speakers. The size of the ellipses represents the proportion of voiced stretches with that phonation type.

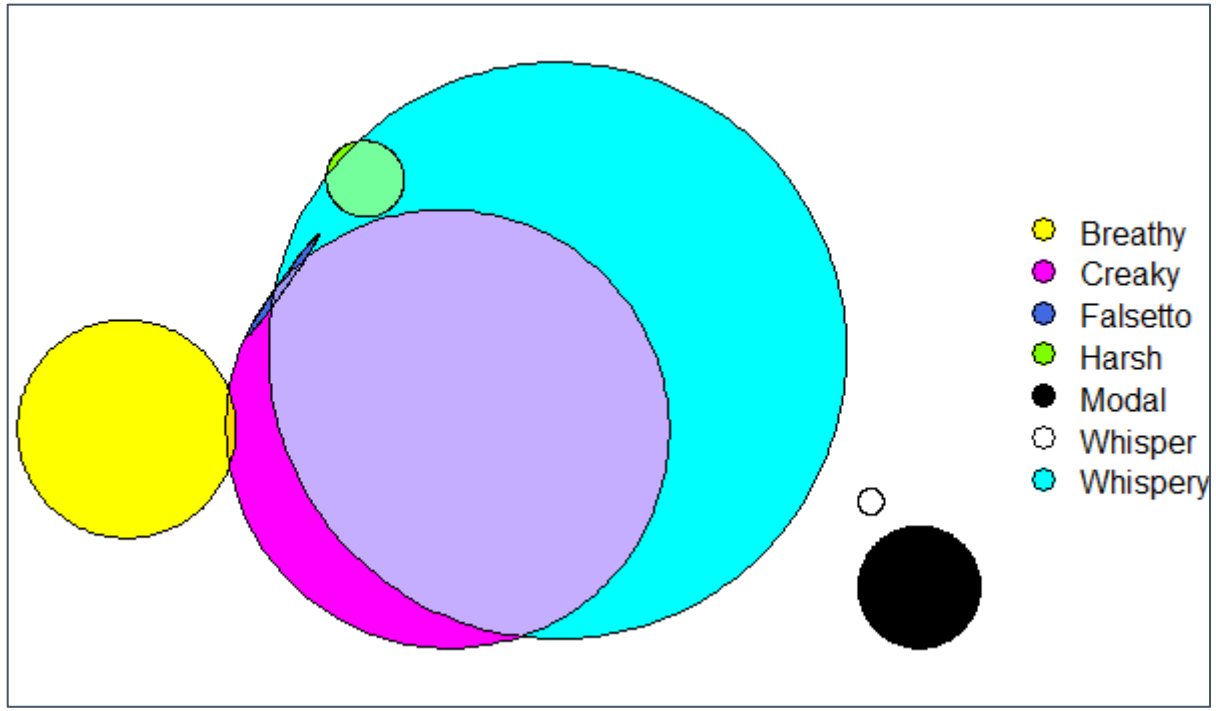
What does it tell us?

How often each scalar degree is used for:

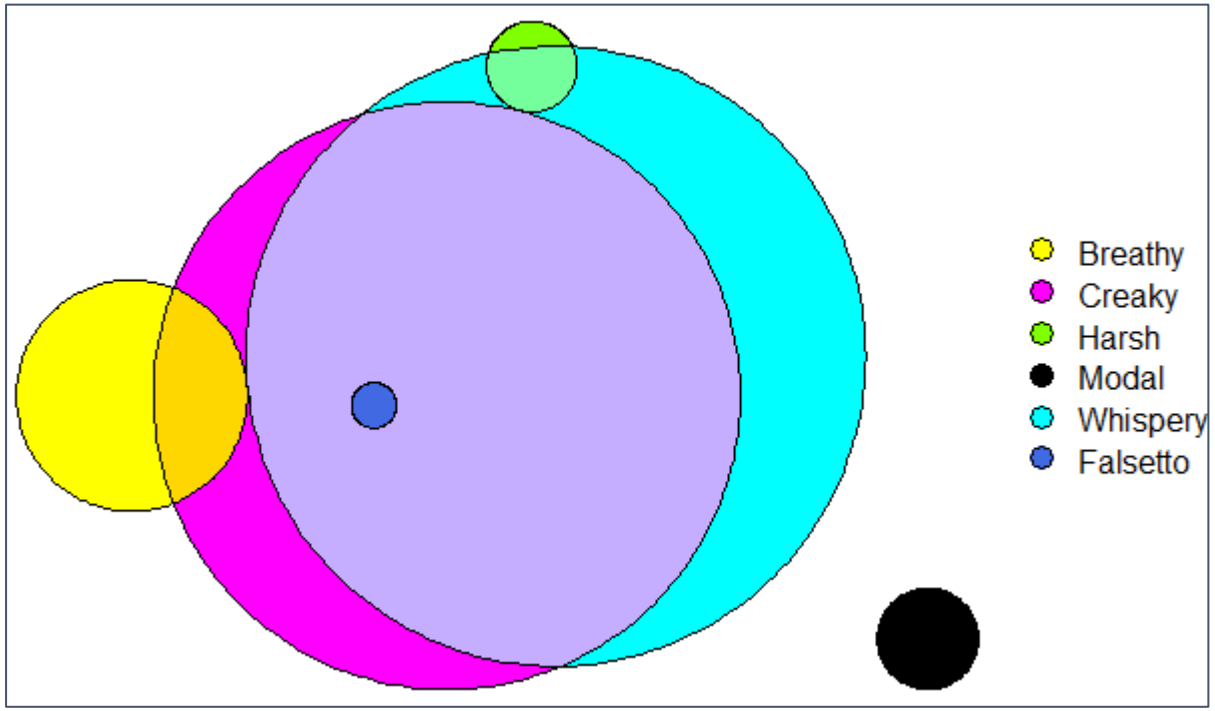
- Whispery
- Creaky
- Breathy voice

Advantages of this approach

- Can be used to look at impact of internal factors – here, by glottal context



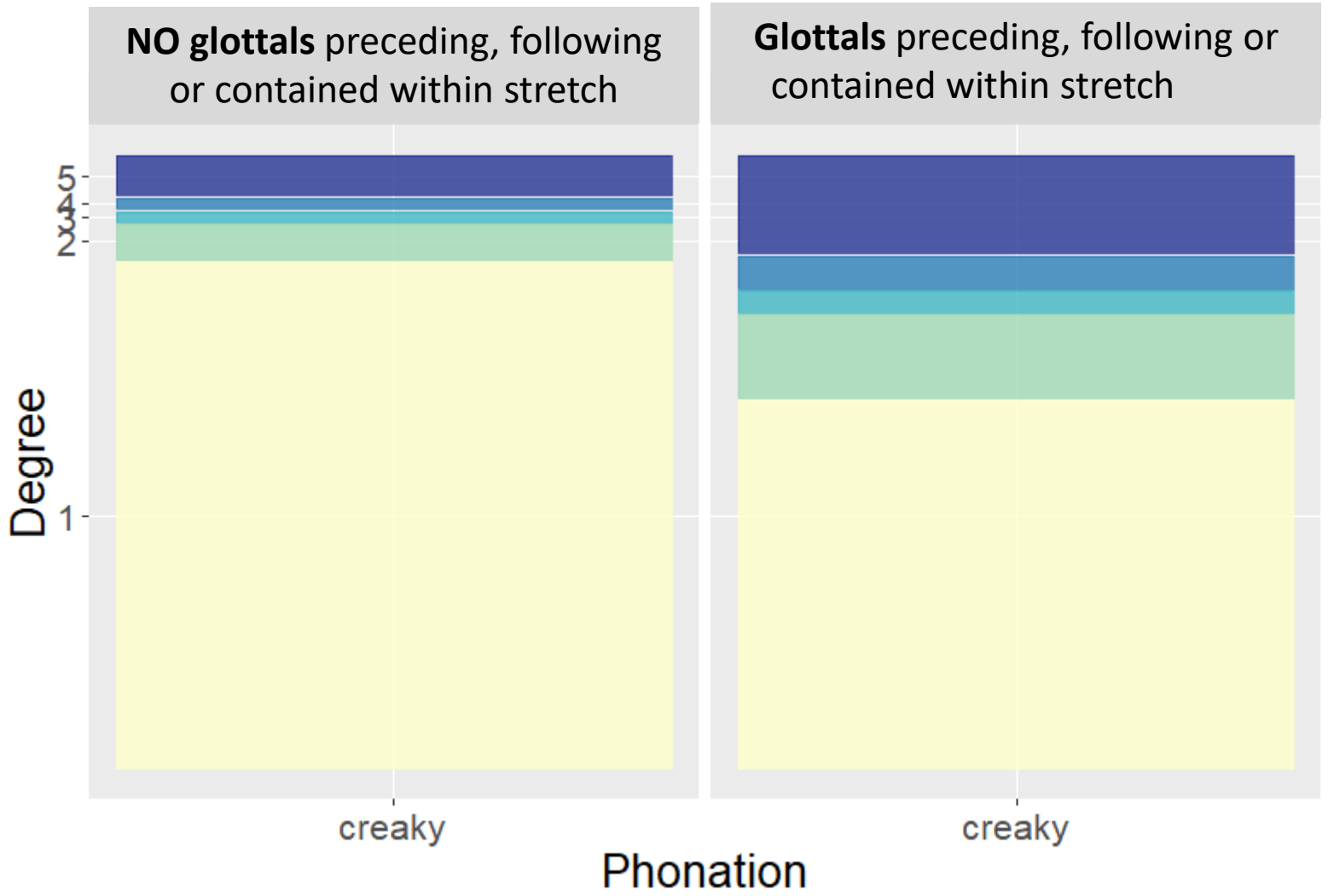
NO glottals preceding, following or contained within stretch



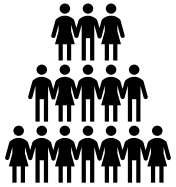
Glottals preceding, following or contained within stretch

Advantages of this approach

- Scalar degrees help to differentiate between
  - "***More*** creak"
  - "Creak***ier***"



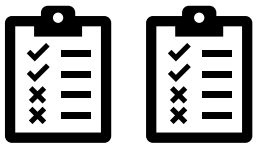
Next steps



Increasing number of speakers + locations

Other aspects of intra-speaker variation
- Constructed dialogue

Acoustic analysis



Intra- and inter-rater reliability

Thank you for listening!

- Questions?

Potential applications & directions

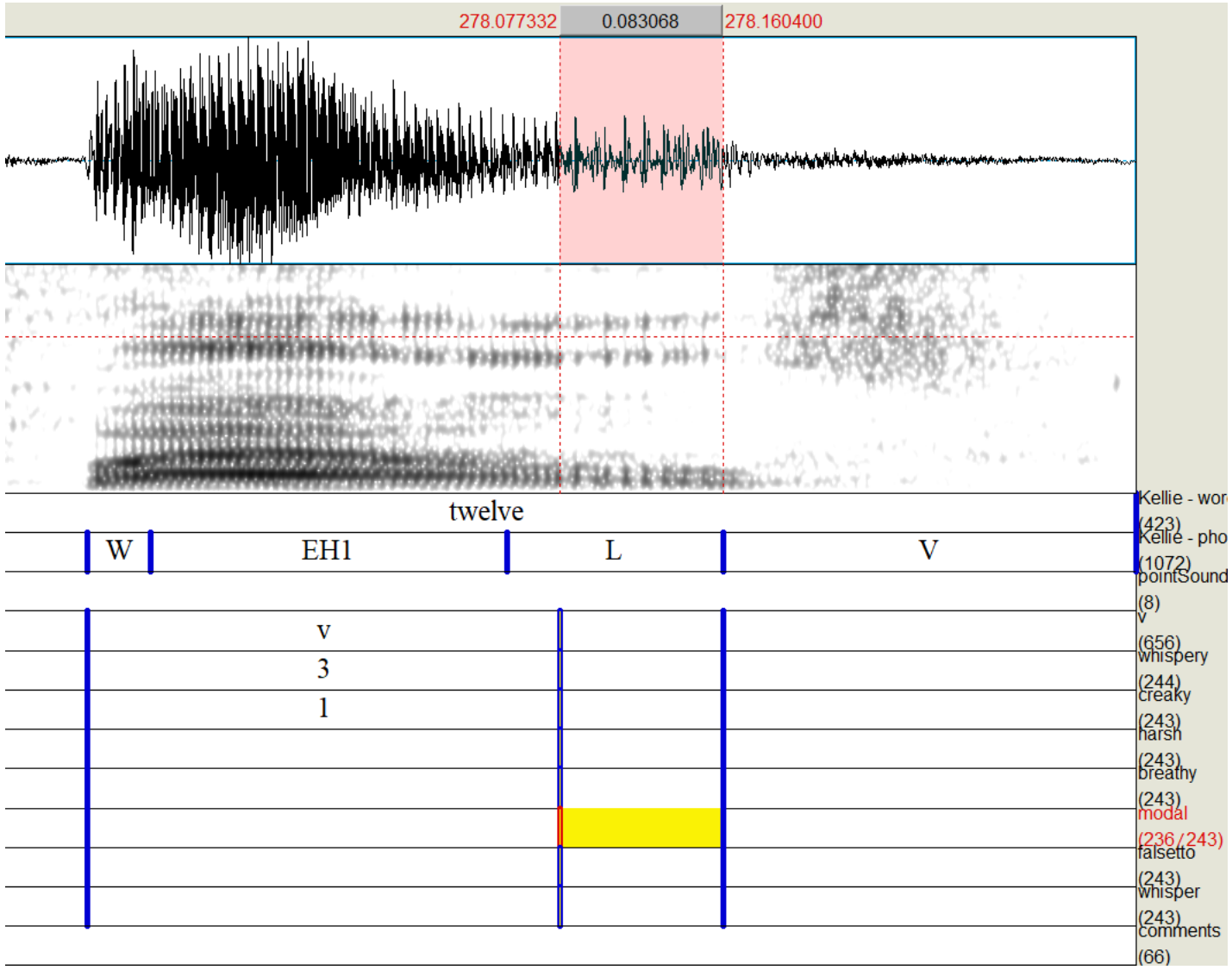
- Within sociolinguistics:

…comparison with VPA & other voice analysis methods

- Beyond:
  - Assessing speaker similarity
  - Assessing voice disorders

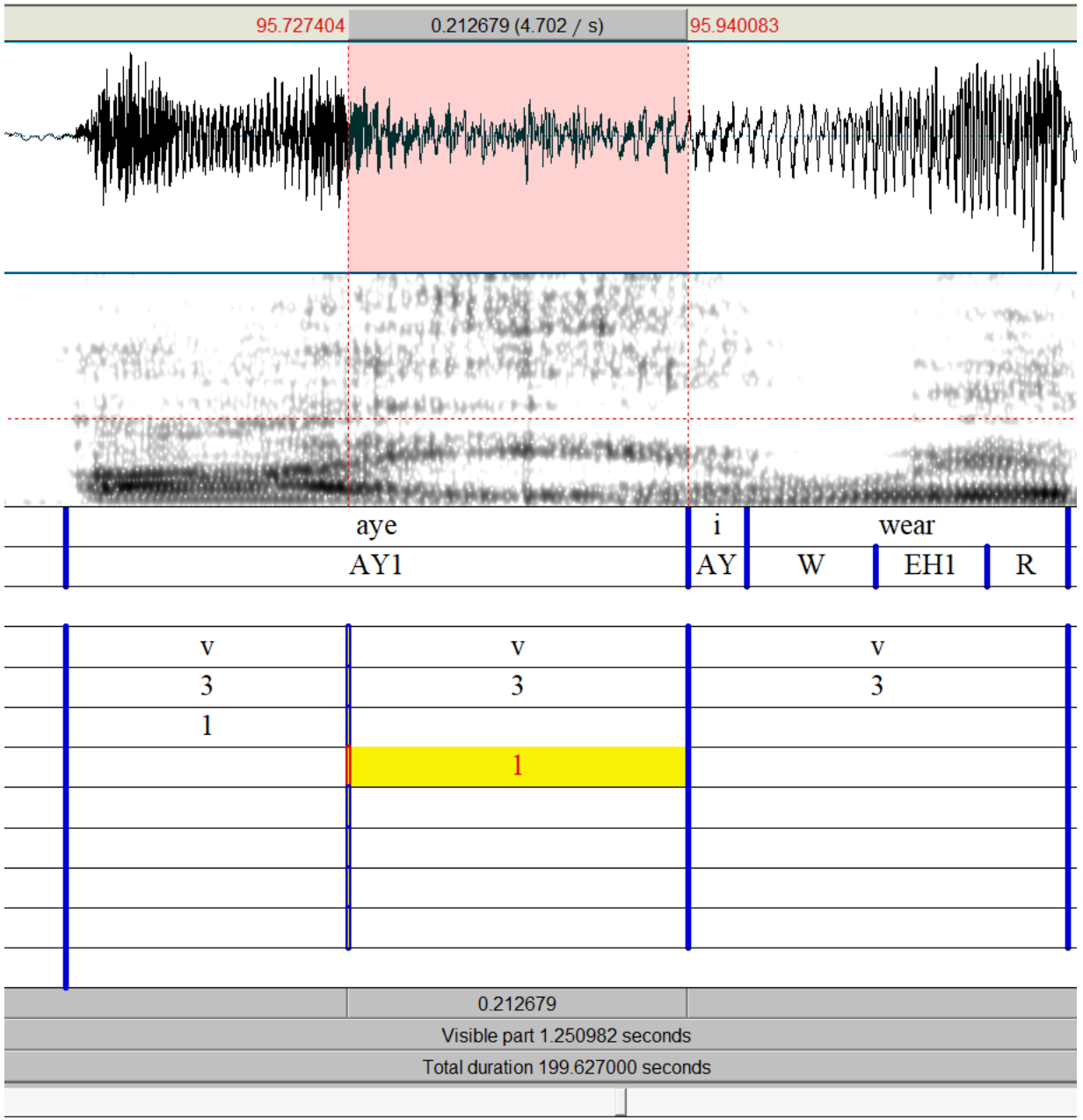
Challenges and limitations

- Small stretches of a different phonation type can occur at the beginning and end of VS
- Excluded if < 100ms



Challenges and limitations

- Scalar degrees for linear perception
- Change from one phonation type is gradual, but we have to decide on a point where the change occurs



Phonation Profile Analysis - Principles

In line with VPA

- ✓ Auditory-perceptual approach
- ✓ Voice quality as settings that can be combined
- ✓ Scalar degrees
- ✓ Neutral baseline
- ✓ Breathy and whispery treated as distinct

In contrast to VPA

- ≠ Voiced stretches
- ≠ Phonation only
- ≠ 1-5 scale
- ≠ Harsh voice not scalar
- ≠ Greater flexibility about what can be combined
  - E.g. breathy + creaky = lax creak

References

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