

# Voice Symptoms and Risk Factors for Developing Voice Disorders in Future Musical Actors

*Evelien D'haeseleer, Sofie Claeys, Iris Meerschman, Kim Bettens, Sofie Degeest,  
Caroline Dijckmans, Joke De Smet, Anke Luyten, Kristiane Van Lierde*

# Vocal demands musical actors

- Unique performance genre
- Project the voice
- Express full range of emotions
- Combination of singing, dancing, acting
- Vocally violent behavior
- Role of the environment



## Bachelor program Musical



## Voice disorders in **future musical actors**

Vocal quality in future musical & stage actors (*Timmermans et al., 2002*)

- Abnormalities vocal folds
  - Organic lesions: 5,7%
  - Inflammatory lesions: 17%
- Increased VHI score (23/120)
- DSI: +2.3
- Poor vocal hygiene habits



Risk  
population



Vocal symptoms and habits in musical students (*Donahue et al., 2014*)

- Poor hydration habits
- Current vocal symptom: 50%

## Purpose

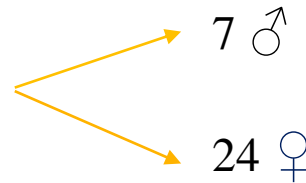
The purpose of this study was to determine the mean objective and subjective vocal quality, status and function of the vocal folds, voice symptoms and the risk factors for developing voice problems in a group of future musical theater performers.

→ Optimize prevention and care

# Methods

## Subjects

n = 31 (full-time) musical students



- Mean age: 20 years (SD: 1.89)
- 1<sup>st</sup> (n=23) and 2<sup>nd</sup> (n=8) Bachelor year
- Succeeded in the Entrance Test
- Normal hearing (PTA < 20 dB)
- Good physical and mental state of well-being
- Mean time singing per day: 1.6 hours
- Acting classes and rehearsals: 3.1 hours

## Questionnaires

- Voice Handicap Index (*Jacobson et al., 1997*)
  - Dutch version, (*De Bodt et al. 2000*)
- Voice Handicap Index adapted to the singing voice (*Morsomme et al., 2007*)
  - Dutch version (*D'haeseleer et al., 2011*)
- Checklist voice symptoms and risk factors for developing voice problems (*De Bodt et al., 2007*)

## Perceptual evaluation

- GRBASI scale (*Hirano, 1981; Dejonckere et al., 1996*)

## Maximum performance and aerodynamic measurements

- Maximal phonation time (s)
- Vital capacity (cc)

## Acoustic analysis /a/, MDVP, Speech Lab, Kay

- $F_0$ , Jitter (%), shimmer (%), NHR (%),  $vF_0$

## Voice Range Profile, VRP, Speech Lab, Kay

- $F_{low}$  (Hz),  $F_{high}$  (Hz),  $I_{low}$  (dB),  $I_{high}$  (dB)



## Perceptual evaluation

- GRBASI scale (*Hirano, 1981; Dejonckere et al., 1996*)

## Maximum performance and aerodynamic measurements

- Maximal phonation time (s)
- Vital capacity (cc)

## Acoustic analysis /a/, MDVP, Speech Lab, Kay

- $F_0$ , Jitter (%), shimmer (%), NHR (%),  $vF_0$

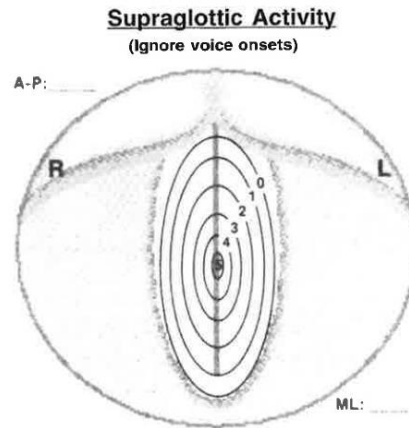
## Voice Range Profile, VRP, Speech Lab, Kay

- $F_{low}$  (Hz),  $F_{high}$  (Hz),  $I_{low}$  (dB),  $I_{high}$  (dB)

Dysphonia  
Severity  
Index  
(DSI)

## Flexibel videolaryngostroboscopy

- Function and status of the vocal folds (*Remacle, 1996*)
- Supraglottic constriction (*Poburka, 1999*)



SERF protocol (*Poburka, 1999*)

# Results

## VHI

	Men					Women				
	Mean	Median	Min.	Max.	SD	Mean	Median	Min.	Max.	SD
VHI	7.1	5.0	2.0	24.0	7.8	14.0	10.0	0.0	60.0	13.7
VHI singing voice	14.3	9.0	5.0	30.0	10.5	20.3	15.0	1.0	49.0	12.7

## Vocal complaints

- Vocal complaints: 80%
- Vocal fatigue: 80%
- Dryness of the throat: 80%
- Vocal tract discomfort: 73%

## Risk factors

- Screaming: 70%
- Habitual loud voice use: 47%
- Speaking with a tensed voice: 56,7%
- Frequently coughing: 43%
- Throat clearing: 53%
- Shouting above background noise: 67%
- Stress or anxiety: 87%

## Perceptual vocal quality

G 0 (range: 0-1, mean: 0.23, SD: 0.43)

R 0 (range: 0-1, mean: 0.13, SD: 0.34)

B 0 (range: 0-1, mean: 0.23, SD:0.43)

A 0 (range: 0-0, mean:0, SD:0)

S 0 (range: 0-0, mean:0, SD:0)

I 0 (range: 0-0, mean: 0, SD:0)

 Median values

## Objective vocal quality male musical students

	Mean	Median	Min.	Max.	SD
Aerodynamic measurements					
MPT	22.2	23.8	9.1	31.8	7.2
VC	3814.3	3700.0	3400.0	4600.0	414.0
PQ	194.0	164.6	113.1	373.6	85.3
Voice Range Profile					
llow	57.0	57.0	50.0	62.0	4.4
lhigh	109.9	109.0	104.0	118.0	5.1
Flow	75.6	77.8	65.7	87.3	7.0
Fhigh	781.8	830.6	523.3	1046.5	227.8
Acoustic analysis					
F0	126.3	126.4	108.2	153.0	14.0
jitter	0.64	0.52	0.26	1.46	0.40
shimmer	3.28	3.70	1.89	4.41	0.94
vF0	0.90	0.86	0.61	1.37	0.27
NHR	0.14	0.14	0.13	0.15	0.01
DSI	3.9	5.3	-1.0	6.2	2.7

## Objective vocal quality female musical students

	Mean	Median	Min.	Max.	SD
Aerodynamic measurements					
MPT	18.7	18.5	10.3	29.8	4.5
VC	2375.0	2275.0	1900.0	3200.0	333.0
PQ	132.8	128.9	73.9	204.7	32.5
Voice Range Profile					
l <sub>low</sub>	55.4	55.5	50.0	61.0	3.1
l <sub>high</sub>	109.1	109.0	95.0	118.0	6.4
Flow	138.3	138.6	71.0	164.8	18.3
F <sub>high</sub>	1208.9	1174.7	740.0	1661.8	266.2
Acoustic analysis					
F <sub>0</sub>	218.9	216.8	185.8	270.1	20.9
jitter	1.01	0.78	0.26	2.59	0.66
shimmer	3.54	3.42	2.27	5.91	0.84
vF <sub>0</sub>	1.06	0.97	0.43	2.15	0.49
NHR	0.12	0.12	0.10	0.17	0.02
DSI	5.6	5.7	0.6	10.4	2.4



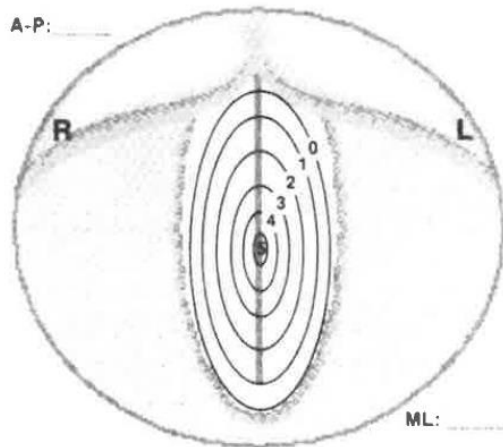
## Laryngoscopic findings

Evaluation of vocal folds		n	%
Regularity	regular	28	90.3%
	irregular/inconsistent	2	6.4%
Glottic closure	normal	19	61.3%
	longitudinal	0	0.0%
	posterior	7	22.6%
	anterior	1	3.2%
	hourglass	2	6.5%
	inconsistent	1	3.2%
Amplitude	normal	29	93.5%
Mucosal wave	normal	29	93.5%
Aspect of the vocal folds	normal	17	54.8%
	organic lesion	14	45.2%
Type of lesion	nodules	3	9.7%
	erythema	8	25.8%
	edema	2	6.5%
	polyp	1	3.2%

## Supraglottic activity

### Supraglottic Activity

(Ignore voice onsets)



Evaluation of M-L  
and A-P constriction

during phonation	mean	median	SD	min	max
M-L constriction	0.55	1	0.57	0	2
A-P constriction	1.1	1	1.01	0	4

M-L constriction: 52% (n=16/31) > 0

A-P constriction: 68% (n=21/31) > 0

## Discussion

- DSI male and female musical students
  - Median: 5.3 and 5.7 (> 100%)
  - Excellent vocal capacities
  - // perceptual normal vocal quality
- // literature
  - Better than SLP students (DSI 68%) (*Van Lierde et al. 2010*)
  - Better than acting students (DSI 73%) (*Timmermans et al. 2002*)
- // norm
  - Better than normative data (*De Bodt et al., 2008*)

- Contrast vocal capacities and vocal complaints
  - ↑ Vocal load
  - ↑ Vocal complaints
  - ↑ Vocal abuse
  - No psychosocial effect (VHI and VHI adapted to the singing voice)
- Literature
  - Poor vocal hygiene (*Timmermans et al., 2002*)
  - Need for a better guidance (*Donahue et al., 2014*)
  - Efficacy of a vocal hygiene program?? (*Timmermans et al., 2002*)

- Videolaryngostroboscopic findings
  - Organic lesions: 45%
  - Inflammatory lesions: 26%
    - alarming!
    - Need for a better screening, guiding musical students
  - Supraglottic constriction (grade 1)
    - Healthy singers: opera, pop, rock en jazz (*Guzman et al., 2013; Guzman et al., 2015; Mayerhoff et al., 2014*)
    - Hypothesis: normal activity ~ singing style
    - Normal activity in speaking voice of professional voice users?
    - Difference with MTD?



be.brussels 



Thank you for your attention

**45TH ANNUAL SYMPOSIUM:  
CARE OF THE PROFESSIONAL VOICE**

*vf*