Voice Evaluation of candidates for professional voice using by VRP & ELS protocoll measurements

Matthias Weikert (1,2), Andrea Orendi (1), Josef Schlömicher-Thier (2),

Austrian Voice Institute, Salzburg / Austria (2)
ENT - Phoniatrics- Group Practice Regensburg / Germany (1)
Im Gesundheitsforum / Arcaden D-93051 Regensburg
27.8.2009 PEVOC Dresden
www.austrianvoice.at / www.forumHNO.de

Evaluation candidates voice users

Design of the study: retrospective study
71 candidates mean 26 y (17-48 y), 49 F, 22 M starting in professional voice use 2007-2008 (intervall Feb-July)
ENT & Phoniatrician Examination for evaluatuion of voice function in speaking, singing and shouting
Concerning the 5 ELS Parameters LRO 84-2005 by Dejonkere & Friedrichs:
1. Perception - R-B-H
2. Stroboscopy (Video-Score)
3. Aerodynamics (MPT)
4. Acoustics (VRP, Jitter, DSI)
5. Subjective rating (VHI (12)) = SSI (Nawka)
Evaluation candidates voice users

71 candidates
ENT-Phoniatrician examination
for professional voice using
In acting, logopedics
speech communicator
music pedagogy(singing),

22 male  49 female
Average 26 y  17-48 years

Design of the study : retrospective study
71 candidates mean 26 y (17-48 y) , 49 F , 22 M starting in professional voice use
2007-2008 (intervall Feb-July)
ENT & Phoniatrician Examination for evaluatuion of voice function in
speaking, singing and shouting
Concerning the 5 ELS Parameters LRO 84-2005 by Dejonkere & Friedrichs:
1. Perception - R-B-H
2. Stroboskopy (Video-Score)
3. Aerodynamics (MPT)
4. Acoustics (VRP, Jitter, DSI)
5. Subjective rating (VHI (12)) = SSI (Nawka)
Methode of VRP Measurement:

**LingWaves / Phonetogramm Pro** (Windows programm XP)

Medical product class 1 (93/42/EEC), CE signed

- A standardized sound level meter (IEC 651 Typ2 / ANSI S 1.4 Type 2)
- for measuring intensity in the range between 40 - 120 dB(A), permitted tolerance +/- 1.5 dB,

Pitch measurement in the range between 50 - 1.560 Hz (G1-G6)

**Recommendation of UEP:**


---

Evaluation candidates starting in professional voice users

**Design of the study:** retrospective study

**Questions:** ELS - Protocol:

1. Parameters sufficient?
2. Evaluation acceptable (for ENT-Phon-Päd- studio / group-praxis by personal instrumental and timing equipment - practicable)?
3. Result significant? Informational value: clear statement of acceptance or exclusion to start in a professional voice?

1-3 answer: Reliability-Evaluation of VRP & ELS data

(spearman’s test, rho, p<0.01- 0.05 by Statistical Programme SPS 17)

The subjective rating by VHI (12 acc. Nawka) = SSI was not considered for evaluation (all candidates SSI < 8)

Spirometric and EEG measurements also not considered (incomplete data)
Arrangement and position in phonetography

VRP’s Comparison: restricted (left) ---- good shape (right)

1. BF - m, 36 y DSI 3.32 SpeechCom
2. NJ - m, 25 y DSI 4.2 Actor
3. WS - f, 20 y DSI 3.0 Logopedist
4. BB - f, 31 y DSI 6.3 Singer/MusicPed.
Voice assessment according to ELS

Guidelines of physiological voice output

- Indifferent pitch (ISL)
  F 200-250 Hz (G3-H3)
  M 100-150 Hz (G2-D3)
- Range singing > 24 ST
- Intensity – max. > 90 dB (A)
- Dynamics > 40 dB(A)

MPT > 15 s ( < 10 s patholog. )
Jitter < 1 % (PPQ)
DSI > +4.1 (mild dysphon. > +1.8 patholog. minus-field)

Shouting Intensity max. > 90 dB(A)*
ST-speaking-shouting > 12 ST*

Acc. voice-protocol of European Laryngological Society (ELS)
acc. Friedrich e.a. LRO 2005/84 (* not listed)

Parameter | Female N = 49 | Male N = 22
---|---|---
Dimension | Mean | Std-Deviat | Mean | Std-Deviat
Indifferent SL | Hz | | |
Singing Voice | SemiTones | | |
 Intensity max | dB | 99 | 5 | 99 | 4 |
 Intensity min | dB | 52 | 3 | 54 | 3 |
 Dynamics | dB | 47 | 7 | 45 | 5 |
 Max. Phon Time | sec | 15 | 5 | 20 | 6 |
 Jitter | % | 0,74 | 1,01 | 0,27 | 0,44 |
 DSI | | 4,6 | 2,2 | 4,1 | 1,87 |
 Shouting voice | dB | 95 | 8 | 98 | 7 |
Speaking-Shouting- ST | SemiTones | 12 | 2 | 17 | 4 |
Speaking-Shouting- Dyn | dB | 36 | 7 | 40 | 6 |
SemiTones pro dB, Speak-Shout | ST/dB | 0,34 | 0,08 | 0,43 | 0,12 |

Evaluation of candidates professional voice users

Comparison shouting - and singing voice - intensity dB(A)

- Detailscale: Delta 8 dB
- All: Difference of 3 dB

Singing - Shouting Intensity

<table>
<thead>
<tr>
<th></th>
<th>Shouting</th>
<th>Singing</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>M 95</td>
<td>F 99</td>
</tr>
<tr>
<td>Male</td>
<td>M 98</td>
<td>F 99</td>
</tr>
</tbody>
</table>

Comparison shouting - and singing voice - intensity dB(A)

Evaluation candidates starting in professional voice users

DSI (Dysphonia Severity Index) Mean 4.1 - 4.6

- The DSI based on a weighted combination of selected measured values from aerodynamic and acoustic (VRP) parameters.
  - highest frequency \( F_{\text{max}} \)
  - lowest intensity \( I_{\text{min}} \)
  - max. Phonationtime (MPT)
  - Jitter (%)

Norm: > 4.1 (Nawka)
Evaluation of candidates professional voice users

Laryngostroboscopy

4 Items - Evaluation of vocal folds vibration:
Closure, Regularity, Mucosal wave, Symmetry

Grading:
0 = normal
1 - mild, 2 - moderate, 3 - severe unnormal

Score:
Best 0  Cut off > 3  Worst 12

15 candidates (71) with unnormal stroboscopy findings (score > 3)

Evaluation of candidates professional voice users

Hoarseness

Females: Grd. 0, 1, 2, (3)

Males: (Grd. 0, 1, (2,3))
Evaluation of candidates professional voice users: H - more breathy than rough!

No significant coincidence between kind of hoarseness and gender

**Hoarseness male Grd. 0-1**

- 10 (45.5%)
- 2 (9.1%)
- 7 (31.8%)
- 3 (13.6%)

**Hoarseness female Grd. 0-2**

- 14 (29.8%)
- 6 (12.8%)
- 19 (40.4%)
- 8 (17.0%)

**DSI-Correlation to ELS Parameters: Plausibility**

- Positive coincidence of DSI with:
  - max. Frequency ($r=0.512, p<.01$)
  - SemiT ($r=0.601, p<.01$)
  - max. Intensity ($r=0.277, p<.05$)
  - Dynamik ($r=0.557, p<.01$)
  - MPT ($r=0.538, p<.01$)

- Negative coincidence:
  - minimal Intensität ($r=-0.609, p<.01$)
  - ISL-female ($r=-0.306, p<.05$)
  - Jitter ($r=-0.501, p<.01$)

The better the voice capacity the higher the DSI

The less the ability of piano-singing, and the higher/ “more tensed” the female ISL, the more decreasing DSI.

A slight negative coincidence with hoarseness ($p < 1.0$)?
Strobo-Score Correlation to ELS-acoustic Parameters:
(0-12, cut off >3)

There is no correlation anyway (neither positively, nor negatively) to
gender, ISL, min. Frequency, min. Intensity and Shouting
We have to emphasize a negative coincidence, to
max. Intensity  (Spearman's rho = -0.283, p<0.0.5 )
dynamics (Spearman's rho = -0.307, p<0.010)
DSI (Spearman's rho = -0.238; p<0.05 ) :
an higher = worse StroboScore has a significant coincidence with lower
DSI
a decreasing singing voice capacity (lower Intensity, dynamics and DSI)
goes along with conspicuous stroboscopical findings, showed by
increasing score (>3)

Evaluation of candidates professional voice users: Discussion

•The correlation of acoustic and aerodynamic results demonstrate the reliability
  in voice evaluation with ELS - protocol
•Particularly we have instable values of MPT and DSI :
  There is a greater dispersion of values, which has a negative consequence for DSI.
  One reason could be the 1 trial use of MPT
•We need guidelines, normal values of speaking and shouting voice - they are
  not listed in ELS- protocol (LRO 84-2005)
•We recognize the different data 0.3-0.4 ST/dBA only for speaking range, Nawka
  0.36- 0.39 ST/dBA only for speaking-shouting range trained choirsingers, Hacki
•Our study confirmed the “24-90-minimal-rule” for a gratifying voice constitution
  (acc. Schneider HNO 5-2004, Friedrich HNO 44 1996 (2 Octaves and 90 dBA shouting)
•Improvements:
  MPT 3- trial and GNE - measurement with new software VRP-VDC lingWAVES
Evaluation of candidates professional voice users: Discussion

• **2 candidates with negative answer (rejection)**
  
  females with Stroboscore 7 and 9 and hoarseness H 2.
  
  and other conspicuous parameters
  
  GS: 37y, Logopede: ST/Dyn/Shout :26/34/99; Strobo 9, MPT 10, DSI 3,4; H2
  
  RC: 28y, SpeechComunic.:ST/Dyn/Shout: 26 /44/83; Strobo 7, MPT 11, DSI 2,0; H2
  
  no certification, accompanying by profound consulting we have advised voice therapy.

• **6 candidates with mild restricted voice capacity, who otherwise would not have got rejection:** Recommendation of urgent voice therapy
  
  2 M Actor aspirant.: DSI < 3 (MPT < 15), Dyn. < 40, MPT < 15, Shout < 90, H1
  
  4 F 2 Actor aspirantes, 2 Speech-communication students: DSI <3 (MPT <15 ), Stroboscor :1x/ 6, 2x/ 5, 1x/ 4 , H1

Certification of candidates professional voice users:

**Conclusions**

1. **ELS-Protocol is sufficient**

2. **Calculation of correlations shows plausibility of data**

3. **The most reliability have**
   • Perception - RBH (0/1-3)
   • singing voice range ST
   • Shouting voice- intensity (dB A)
   • Stroboscopy (score < 3)
   • DSI (from VRP)

4. **Therefore VRP measurement is essential**

5. **A clear significance is only conditional**
Conclusions

7. Overall Impression of the candidate must be considered,
8. Certification of voice fitness is a sensitive mixture of
   ELS-Protocol and overall impression
9. 2 negative answers, 6 urgent logopedic-therapy (with
    „restricted“ certification) out of 71 candidates
10. The time after and independent of positive certification
    or negative answer is more important for consequences:
    voice-focused: - therapie, -councelling, -hygiene,
    -coaching, - education, ............ new orientation

ELS-Protocol featured Voice fitness evaluation with VRP, as presented here, takes charges of
minimum 150€, in our ENT-PHON-Studio, less money is without any rentability

Thank you for Attention.

Autoren:

Matthias Weikert, Regensburg,
FA Phoniatrie u. Pädaudiologie u. HNO

Andrea Orendi, Regensburg
Psychologist

Josef Schlömicher-Thier, Salzburg
FA HNO u. Occupational Medicine
www.austrianvoice.at
Grüss`Gott aus Regensburg

Weltkulturerbe an der Donau