



Accuracy of Acoustic Voice Quality Index and its isolated Acoustic Measures to Discriminate the Severity of Voice Disorders

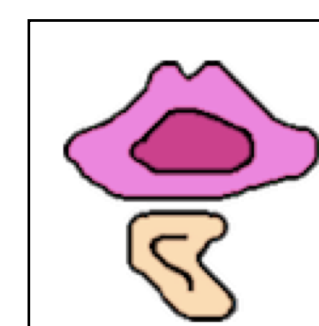
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INTRODUCTION

- Acoustic analysis with multiparametric approaches
 - World tendency¹⁻⁸
 - Higher reliability with the perceptual auditory analysis¹⁻³

AVQI – Acoustic Voice Quality Index



- Provides one score for the overall voice quality
- Good reliability among different languages³⁻⁸
- AVQI isolated acoustic measurements diagnostic accuracy among the different degree of vocal deviation is still unknown

Objective

- To evaluate the AVQI total score and its isolated acoustic measures accuracy in discriminating voices with different degrees of vocal deviation

METHODS

- Database – 258 individuals
 - 160 dysphonic and 98 non-dysphonic
 - Analysis of AVQI isolated acoustic measures, AVQI total score and G score
 - Smoothed cepstral peak prominence - CPPs
 - Harmonic-to-noise ratio - HNR
 - Shimmer local - Shim & Shimmer local dB -ShdB
 - General slope of the spectrum - Slope
 - Tilt of the regression line through the spectrum
- Perceptual auditory analysis
 - Median G score, previously rated by 5 voice specialist
 - Cohen Kappa > 0.605 ; Fleiss Kappa = 0.370

Statistical Analysis

Quadratic discriminant analysis and accuracy, sensitivity and specificity of performance measures were used to investigate discriminatory power of these measures, as well as cross-validation of random signals' combination with and without disturbance

RESULTS AND DISCUSSION

No deviation Vs With Deviation

- AVQI = 73.9%
- CPPs = 73.2%

AVQI & CPPs are reliable acoustic measures^{1,2,5-14}

Combined measures

- CPPs, HNR = 73.2%
- CPPs, HNR, Slope = 75.07%
- CPPs, HNR, Shim dB, Tilt = 73.9%
- CPPs, HNR, Shim dB, Slope, Tilt = 75.5%

The combination of 5 acoustic measures had the highest accuracy to differentiate between normal and deviated voice quality

- Weighing the acoustic measures in a multiparametric approach is essential¹

Degrees of Deviation

Acoustic Measures	Accuracy %
No deviation and Mild	
CPPs, ShdB	72.86 ± 3.26
Shimmer dB, LTAS slope, LTAS tilt	70.99 ± 3.70
CPPs, HNR, LTAS tilt	70.55 ± 5.47
CPPs, HNR, ShdB, LTAS tilt	74.29 ± 2.77
CPPs, HNR, LTAS slope, LTAS tilt	70.71 ± 3.90
CPPs, HNR, ShdB, LTAS slope, LTAS tilt	72.31 ± 2.80

Combined acoustic measures were better to discriminate among the degrees of deviation when compared to the AVQI total score

Acoustic Measures	Accuracy %
Mild and Moderate	
ShdB, LTAS slope	71.53 ± 5.70
Shim, ShdB, LTAS tilt	74.17 ± 4.64
HNR, LTAS slope, LTAS tilt	75.69 ± 2.73
Shim, ShdB, LTAS slope, LTAS tilt	76.11 ± 4.57
HNR, Shim, ShdB, LTAS slope, LTAS tilt	73.75 ± 4.90

Acoustic Measures	Accuracy %
Moderate and Severe	
Shim, LTAS tilt	93.00 ± 3.59
HNR, Shim, Ltas tilt	95.50 ± 3.02
Shim, ShdB, LTAS slope, LTAS tilt	93.50 ± 4.48
HNR, Shim, ShdB, LTAS slope, LTAS tilt	93.00 ± 3.59
All	86.00 ± 6.14

AVQI total score accuracy	
No deviation Vs Mild	70.79
Mild Vs Moderate	71.39
Moderate Vs Severe	87.5

No isolated acoustic measurement was consistent to differentiate the voice quality among all degrees of deviation

Superiority of the AVQI and multiparametric measures¹⁻⁸

CONCLUSION

- AVQI is a robust tool to discriminate among different degrees of deviation
 - More accurate between voices with moderate and severe deviations
- Isolated acoustic measures are more accurate to discriminate voices with more deviation
- AVQI acoustic measures with the same weight are more accurate to discriminate voices with different deviations

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