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Validation of the Acoustic Voice Quality Index Version 03.01 in Latvian

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INTRODUCTION

Acoustic analysis is an essential component of voice assessment, providing objective measures of voice quality.

Research indicates that combining sustained vowel phonation with connected speech enhances the reliability of the voice assessment (Maryn et al, 2010).

The Acoustic Voice Quality Index (AVQI) has gained recognition as a reliable tool for evaluating voice quality using multiple acoustic parameters (Batthyany et al, 2024).

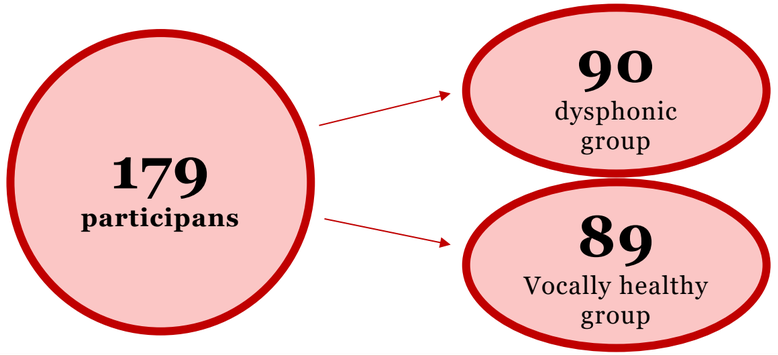
AVQI is the first tool to integrate both speech types in analysis, providing an objective and valuable measure for diagnosing voice disorders and monitoring therapy outcomes, and has been validated in the Latvian-speaking population.

OBJECTIVE AND METHODS

Objective

The aim of this study was to validate the Acoustic Voice Quality Index version 03.01 in the Latvian speaking population.

Participants



All participants:

- completed Voice Handicap Index (VHI-30);
- Performed voice tasks – sustained vowel /a/ phonation and connected speech passage

Study procedure:

1. The most appropriate number of syllables to use for analysis of the connected speech in Latvian was identified.
2. Auditory-perceptual voice evaluation was conducted using the “G” parameter of the GRBAS scale and made by three speech-language pathologists.
3. For acoustic analysis and calculation of the AVQI, sustained vowel and connected speech recordings were processed using the AVQIv3 script implemented in Praat software
4. An interrater reliability assessment, the criterion validity and diagnostic accuracy (sensitivity, specificity, and cut-off point between normophonic and dysphonic voice) of the AVQI were determined.

RESULTS

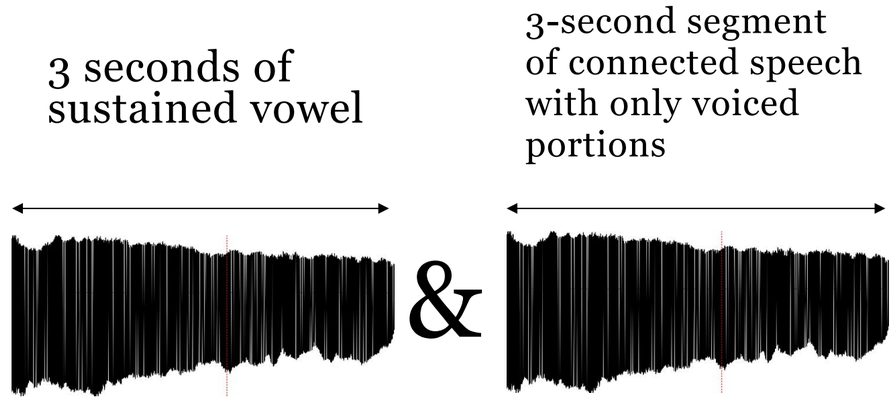
Standartized syllable count in the Latvian version of AVQIv3

For acurate computation of AVQI, sustained vowel phonation and connected speech passage recordings should be temporally balanced – 3 seconds of only-voiced segments.

To achieve this balance in connected speech, the number of syllables produced within three- second voiced segment must be determined for the target language.

It was found that in Latvian 25 syllables is the most appropriate number to ensure a balanced analysis.

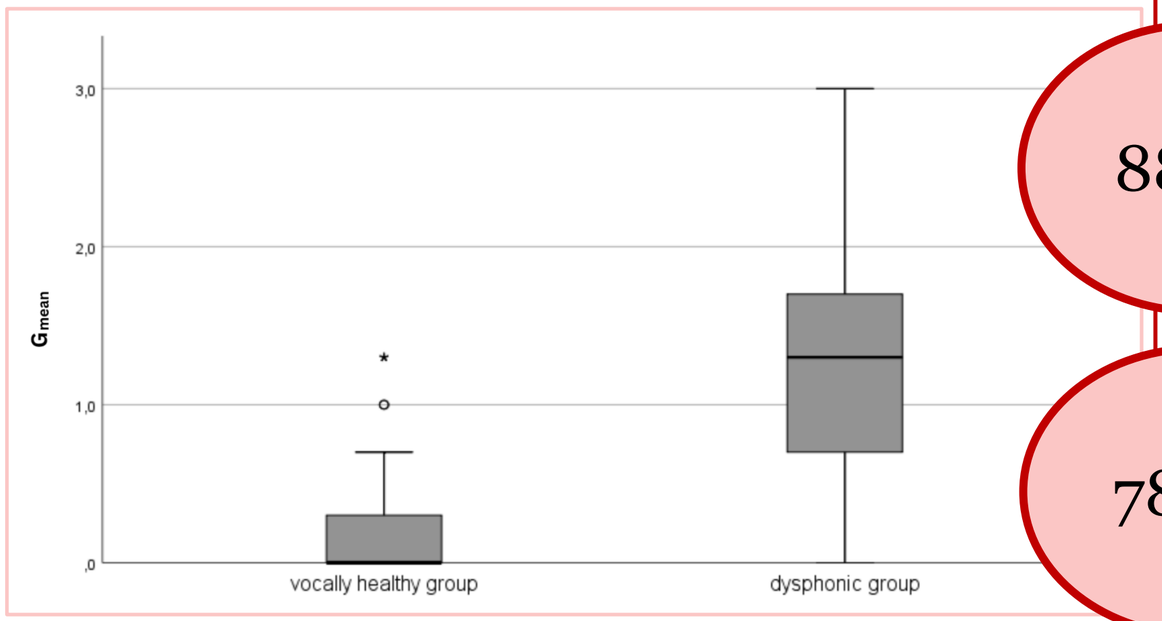
25
syllables



25-syllable point corresponds to the word "tas", located midway through the second sentence:

[ˈZiɛmelis un ˈsaule rɛiz ˈstri:dɛ:ja:s, kurʃ ˈstipra:ks. ˈViɲi ˈnɔsprieda, ka ˈuzvarɛta:js bu:s tas, | kurʃ liks ˈt͡sɛlinʲekam ˈizɟæ:rbties.]

RESULTS
Auditory-perceptual voice evaluation



Average perceptual ratings (G_{mean}) for vocally healthy voice and dysponic voice group participants

88,9% of participants in the dysphonic group were classified as having a voice disorder based on perceptual evaluation.

78,7% of participants in the vocally healthy group were classified as normophonic based on perceptual evaluation.

Interrater agreement among three independent raters for the G parameter was moderate ($\kappa = 0.414$; 95% CI, 0.412, 0.416; $P < 0.001$), indicating statistically significant, but only moderate consistency in the perceptual evaluation of overall voice quality.

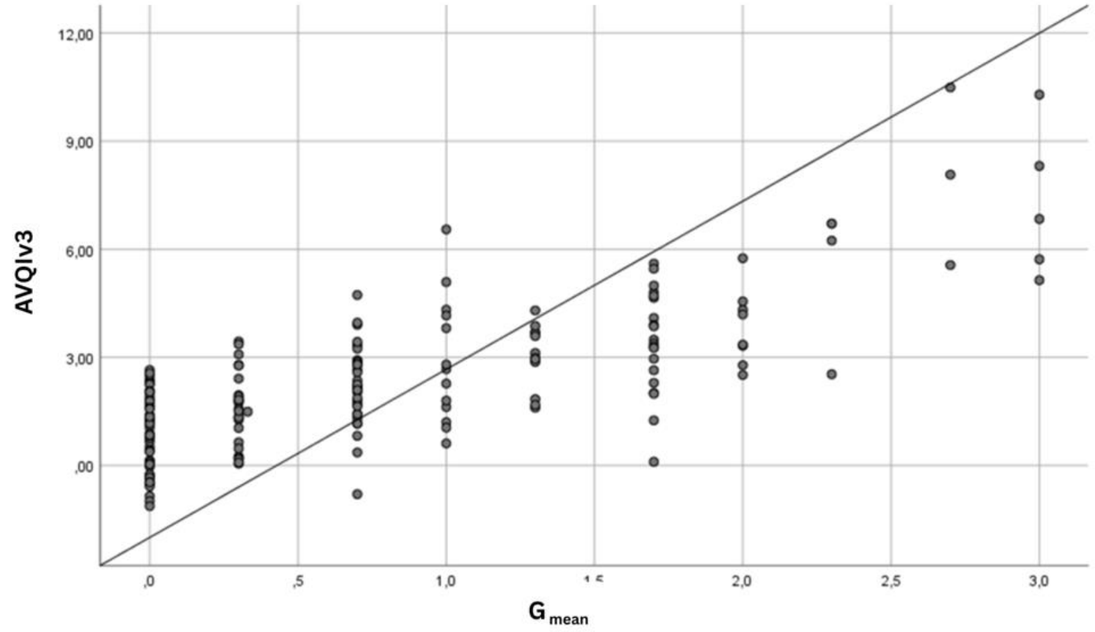
RESULTS
Concurrent validity

AVQIv3 was calculated for 179 participants

51,3%

of the variance was shared between the two measures, suggesting a substantial association between acoustic voice quality (AVQIv3) and perceptual ratings of overall voice quality.

Spearman's rank correlation analysis revealed a statistically significant, strong positive association between AVQIv3 and G_{mean} scores (Rs = 0.716, P < 0.001)



Relationship between AVQIv3 and G_{mean} ratings

RESULTS
Diagnostic accuracy

74,7%

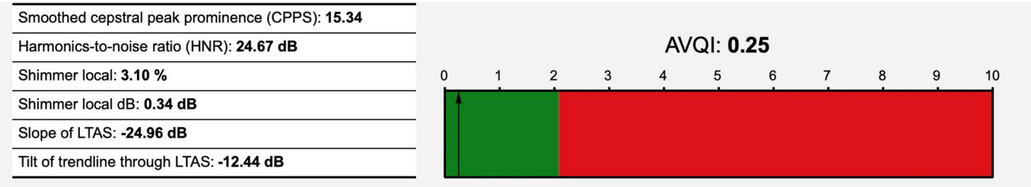
The sensitivity value indicates that almost 75% of dysphonic voices were correctly identified (true positives), suggesting that AVQI captures the majority of clinically relevant voice disorders, although mild or borderline dysphonia may occasionally remain undetected.

82,5%

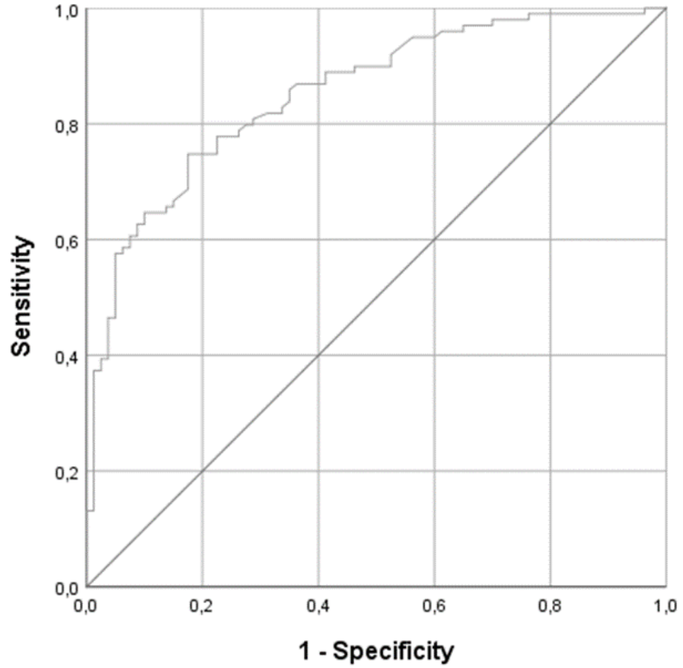
The specificity value indicates that 82,5% of normophonic voices were correctly classified as non-dysphonic (true negatives

2.08

- the threshold separating normophonic and dysphonic voices in this study



Example of AVQIv3 measurement output (in this case indicating normophonic voice)



Receiver operating characteristic (ROC) curve of AVQIv3 based on perceptual classification using G_{mean} ratings

CONCLUSIONS

1. The results of this study confirms the validity of AVQIv3 in Latvian, demonstrating good concurrent validity compared to perceptual voice assessment and overall ability to discriminate between normophonic and dysphonic voice which means good diagnostic accuracy.

2. Clinicians should be aware that some of mild dysphonic voices may not be detected by AVQIv3, therefore, results should be interpreted with caution

3. AVQIv3 can be a clinically useful objective tool to supplement perceptual and self-reported tools for voice quality evaluation. The result of voice evaluation should be based on a multidimensional voice assessment.

REFERENCES

Maryn Y, Corthals P, Van Cauwenberge P, Roy N, De Bodt M. Toward Improved Ecological Validity in the Acoustic Measurement of Overall Voice Quality: Combining Continuous Speech and Sustained Vowels. *Journal of Voice*. 2010;24(5):540-555. doi:10.1016/j.jvoice.2008.12.014

Batthyany C, Latoszek BB V., Maryn Y. Meta-Analysis on the Validity of the Acoustic Voice Quality Index. *Journal of Voice*. 2024;38(6):1527.e1-1527.e19. doi:10.1016/j.jvoice.2022.04.022