

Clinical Validation of the Hebrew Voice Symptom Scale (VoiSS-Heb)

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SUMMARY: Objective. To translate, culturally adapt, and validate the Voice Symptom Scale (VoiSS) into Hebrew (VoiSS-Heb) for use in the clinical assessment of Hebrew-speaking adults with dysphonia, and to evaluate its psychometric properties, including associations with perceptual voice quality (GRBAS [grade, roughness, breathiness, asthenia, strain]) and anxiety (Generalized Anxiety Disorder 7-item scale [GAD-7]).

Methods. A cross-sectional validation study was conducted at a tertiary multidisciplinary Voice Clinic between January 2020 and December 2021. Seventy-eight dysphonic patients and 140 vocally healthy controls completed the VoiSS-Heb, the Hebrew Voice Handicap Index (VHI-Heb), and the GAD-7. Clinicians provided GRBAS perceptual ratings. Internal consistency, convergent and construct validity, and discriminative ability (receiver operating characteristic [ROC] analysis) were examined.

Results. The VoiSS-Heb demonstrated excellent internal consistency (Cronbach's $\alpha = 0.932$) and effectively distinguished dysphonic from nondysphonic individuals (median: 58 vs. 7; $P < 0.001$). Strong correlations with the VHI-Heb ($r = 0.946$, $P < 0.001$) confirmed convergent validity. Moderate subscale-level correlations indicated that the Physical subscale captures symptom dimensions not fully represented in the VHI. VoiSS-Heb scores correlated with GRBAS ratings ($P < 0.001$) and GAD-7 scores ($r = 0.347$, $P < 0.001$), reflecting sensitivity to both perceptual and emotional aspects of dysphonia. ROC analysis identified a clinically useful cutoff of 32.5 points (sensitivity = 87.2%, specificity = 92.9%).

Conclusions. The VoiSS-Heb is a valid, reliable, and clinically meaningful tool for evaluating the multidimensional impact of dysphonia among Hebrew-speaking adults. Its availability supports more precise assessment, more patient-centered treatment planning, and improved access to culturally appropriate voice care.

Key Words: Voice Symptom Scale–VoiSS–Dysphonia–Validation–VHI–GAD-7.

INTRODUCTION

Voice disorders can significantly affect communication, social interactions, an individual's occupational competencies, and overall emotional well-being.¹ Clinical assessment of people diagnosed with voice disorders is multidimensional, incorporating both professional perspectives of the ENT (Ear, Nose, and Throat) physician and speech-language pathologist (SLP), and the patient's perspective, integrating perceptual ratings, objective acoustic and aerodynamic analyses, and patient-reported outcome measures (PROMs) that capture the patient's perspective on voice-related handicap and quality of life.² In Israel, the Hebrew version of the Voice Handicap Index (VHI-Heb)³ and its shortened version (VHI-10-Heb)⁴ have been validated and are widely used as a standard tool.

However, additional PROMs may complement the VHI by addressing broader or related aspects of vocal symptoms.

The Voice Symptom Scale (VoiSS), developed by Deary et al. in 2003, is a 30-item questionnaire encompassing three subscales—Impairment, Emotional, and Physical—that assess how the patient evaluates symptom severity and the psychosocial impact of dysphonia.⁵ Unlike other commonly used tools, such as the VHI, the VoiSS provides a broader insight into the psychosocial aspects of dysphonia and captures subtle variations in patients' symptom perception. The VoiSS has demonstrated strong psychometric properties and has been cross-culturally adapted into several languages.^{6–13} However, a validated Hebrew version has not yet been available. In addition to its convergence with PROMs, the VoiSS has shown correspondence with clinician-rated perceptual severity, with studies reporting positive associations between VoiSS scores and GRBAS ratings.¹⁴ Establishing this linkage in Hebrew is important for clinical interpretability and for integrating the VoiSS-Heb within routine voice evaluations. Emotional and psychological factors, particularly anxiety, may also influence patients' perceptions of vocal limitations.

Emotional and psychological factors, particularly anxiety, may substantially influence patients' perceptions of their vocal quality and the extent of their perceived vocal limitations.¹⁵ Higher anxiety levels may amplify symptom reporting and reduce voice-related quality of life, even when objective voice assessments show mild impairment.

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The Generalized Anxiety Disorder 7-item scale (GAD-7) is a widely accepted, brief, and reliable instrument commonly used in clinical and psychological research.¹⁶ Incorporating it into the validation process enables examination of the contribution of anxiety to self-reported vocal functioning, thereby enhancing understanding of the psychological dimensions associated with voice disorders, symptom severity, and the psychosocial impact of dysphonia. Therefore, examining the relationship between VoiSS scores and anxiety tendencies can enhance understanding of the emotional components underlying dysphonia and strengthen the clinical value of the Hebrew VoiSS as a holistic assessment tool.

There is a clear need for clinically validated voice assessment instruments available in Hebrew, as many Hebrew-speaking patients rely on translations or shortened screening tools that may not adequately capture the full range of their symptoms. The VoiSS-Heb directly addresses this need by providing a comprehensive, culturally appropriate, and clinically sensitive measure that reflects how patients describe and experience their voice difficulties in everyday life.

Our objective in this study was to translate and culturally adapt the VoiSS into Hebrew and evaluate its psychometric properties among Hebrew-speaking adults. We also provide VoiSS data for healthy nondysphonic Hebrew-speaking adults to facilitate clinical application. A secondary aim of this study was to explore the relationship between VoiSS scores and perceptual assessments of voice quality using the GRBAS scale, and to examine the association between VoiSS scores and anxiety tendencies, as measured by the GAD-7.

METHODS

Study design

A cross-sectional validation study was conducted at the Multi-Disciplinary Voice Clinic of Sheba Medical Center, Tel Hashomer (January 2020–December 2021) following consensus-based standards for the selection of health measurement instruments (COSMIN) recommendations and the Declaration of Helsinki. Institutional Review Board approval was obtained (6550-19-SMC).

Participants

Two groups were recruited: the Voice Disorder group, comprising 78 adults presenting with voice complaints to our clinic, and the nondysphonic group, consisting of 140 vocally healthy adults (hospital staff, students, companions) with no reported voice complaints, history of dysphonia, or prior voice therapy. Participants in the nondysphonic group were matched to those in the voice disorder group on sex and age at the group level, rather than on an individual one-to-one basis.

All participants identified themselves as native speakers of Hebrew. All participants had the capacity to complete

the questionnaires independently. Exclusion criteria were prior head-and-neck malignancy or surgery within six months of the clinical visit, and/or reported neurological or cognitive impairment.

Data collection

Demographic (age, gender, height, and weight) and clinical data (medical diagnosis and GRBAS perceptual ratings) were recorded. Auditory perceptual ratings, using the GRBAS, were conducted by a certified and highly experienced SLP, with more than 30 years of clinical expertise in the assessment and management of voice disorders. The perceptual evaluation, including the GRBAS rating, was completed before the stroboscopic examination to avoid potential bias. All participants completed:

1. **Hebrew VoiSS (VoiSS-Heb)** – translated version.
2. **Hebrew VHI (VHI-Heb)** – for convergent validity.
3. **GAD-7** – to assess anxiety tendencies.

The order of administration of the three questionnaires (VoiSS-Heb, VHI-Heb, and GAD-7) was randomized across participants to minimize the potential order effect.

Translation and cross-cultural adaptation

The VoiSS was translated and culturally adapted into Hebrew in accordance with established guidelines from the World Health Organization (WHO) and the COSMIN framework for PROMs, and similarly to the procedure applied in the past for the translation and adaptation to Hebrew of the VHI-Heb and VHI-10-Heb. Two SLPs who specialize in voice disorders, each a native Hebrew speaker fluent in English, independently translated the original English VoiSS into Hebrew. The two resulting versions were synthesized by an expert committee composed of an otolaryngologist, an SLP, and a research methodologist, who reviewed semantic, idiomatic, and experiential differences to reach a consensus draft. This draft was then back-translated into English by two native English speakers fluent in Hebrew who were blinded to the original questionnaire. The back-translations were compared with the source VoiSS to ensure fidelity of meaning and to detect any discrepancies. Following committee discussion and refinement, a pre-final Hebrew version was produced. All translators involved in the adaptation process were highly proficient in both Hebrew and English. To ensure linguistic accuracy and naturalness, at each stage of the translation process, the translator responsible for the target language was a native speaker of that language (eg, the translator producing the English version was a native English speaker). To evaluate clarity and cultural appropriateness, this version was pilot-tested among a small group of Hebrew-speaking adults not included in the study cohort. The final version of the questionnaire is presented in [Appendix 1](#). The final Hebrew version of the questionnaire is presented from right to left, as is standard in written Hebrew.

Validation procedures

Psychometric evaluation of the VoiSS-Heb involved multiple complementary analyses. Internal consistency was assessed for the total score and each subscale using Cronbach's alpha and McDonald's omega, with values between 0.70 and 0.95 considered acceptable. Normality of distributions was assessed using the Kolmogorov–Smirnov test, and homogeneity of variances with Levene's test. Construct validity was examined by comparing VoiSS-Heb scores between patients with voice disorders and vocally healthy controls using independent-samples Mann–Whitney *U* tests; effect sizes (Hedges' *g*) and 95% confidence intervals were reported. Convergent validity was explored through Spearman correlations between VoiSS-Heb and the validated VHI-Heb. In contrast, divergent validity was examined by correlating VoiSS-Heb scores with unrelated variables such as height and weight, where near-zero associations were hypothesized. Associations between VoiSS-Heb scores and anxiety tendencies measured by the GAD-7 questionnaire, as well as with GRBAS perceptual ratings, were also calculated to investigate secondary hypotheses. Finally, receiver operating characteristic (ROC) curve analysis was performed to determine the optimal VoiSS-Heb cutoff score for discriminating patients with voice disorders from healthy controls, using the area under the curve and Youden's *J* statistic to balance sensitivity and specificity.

RESULTS

Participant characteristics

A total of 218 participants were included: 78 with voice disorders (37 males, 41 females; mean age, 44.89 ± 15.96 years) and 140 healthy controls (66 males, 74 females; mean age, 44.63 ± 15.46 years).

Diagnoses among patients included 17 (21.8%) functional dysphonia, 11 (14.1%) cysts, 10 (12.8%) edema, 9 (11.5%) vocal fold paralysis or paresis, 7 (8.9%) Muscle Tension Dysphonia (MTD), 6 (7.7%) vocal fold scars, 5 (6.4%) polyps, 5 (6.4%) warts, 4 (5.1%) spasmodic dysphonia, 4 (5.1%) presbyphonia, 3 (3.8%) sulcus, 2 (2.5%) nodules, and 3 (3.8%) other.

The VoiSS total score, as well as its three sub-scales scores for the nondysphonic group, are reported in Table 1.

TABLE 2.
Mean $\pm$ Standard Deviation of the VoiSS-Heb Subscale Scores in Dysphonic Patients and in Vocally Healthy Participants

VoiSS	Vocally Healthy Participants (n = 140)	Dysphonic Patients (n = 78)	<i>P</i> Value
Impairment	6.76 ± 7.31	35.0 ± 13.46	< 0.001
Emotional	1.03 ± 2.26	12.15 ± 8.64	< 0.001
Physical	4.11 ± 3.83	9.50 ± 5.38	< 0.001
VoiSS-Heb total score	11.91 ± 11.92	56.65 ± 22.59	< 0.001

Abbreviations: VoiSS, Voice Symptom Scale; VoiSS-Heb, Voice Symptom Scale – Hebrew version.

Internal consistency and reliability

The VoiSS-Heb demonstrated excellent internal consistency (Cronbach's $\alpha = 0.932$ for the total scale; $\alpha = 0.917, 0.898, 0.736$ for the Impairment, Emotional, and Physical subscales, respectively).

Construct and convergent validity

Patients scored significantly higher on the VoiSS-Heb (median = 58, IQR = 43.75–70) than controls (median = 7, IQR = 3–20; $P < 0.001$). The scores obtained by dysphonic patients were compared to those of vocally healthy participants using the Mann–Whitney *U* test. The results of this comparison are reported in Table 2. VoiSS-Heb total scores correlated strongly with VHI scores (Spearman $r = 0.946, P < 0.001$). The results of the correlations are reported in Table 3.

Associations of VoiSS-Heb

VoiSS-Heb scores were positively correlated with all GRBAS scores (G: $r = 0.669$; R: $r = 0.573$; B: $r = 0.482$; A: $r = 0.340$; S: $r = 0.580$; all $P < 0.001$). In addition, VoiSS-Heb scores were positively correlated with GAD-7 scores ($r = 0.347, P < 0.001$). VoiSS-Heb scores were not significantly correlated with the weight or height of the patients ($r = -0.122, P = 0.091$; $r = -0.065, P = 0.345$ for weight and height, respectively).

TABLE 1.
Mean $\pm$ Standard Deviation (SD) and Standard Error (SE) of the VoiSS-Heb Total Score, as well as of Its Three Subscales in Vocally Healthy Participants

VoiSS	Mean $\pm$ SD	10th Percentile	25th Percentile	50th Percentile	75th Percentile	90th Percentile	SE
Impairment	6.76 ± 7.31	0	1	4	11	18.9	0.6
Emotional	1.03 ± 2.26	0	0	0	1	3	0.2
Physical	4.11 ± 3.83	0	1	3	6	10	0.3
VoiSS-Heb total score	11.91 ± 11.93	0.1	3	7	20	30.9	1

Abbreviations: VoiSS, Voice Symptom Scale.

TABLE 3.
Results of the Correlation Between the VoiSS-Heb and the VHI-Heb Scores Obtained in a Group of 78 Patients With Dysphonia

		VHI-Heb			
		Functional	Emotional	Physical	Total Score
VoiSS-Heb	Impairment	0.713***	0.659***	0.833***	0.830***
	Emotional	0.755***	0.891***	0.620***	0.854***
	Physical	0.286*	0.251	0.378***	0.344**
	Total score	0.782***	0.793***	0.824***	0.903***

Note: * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$.

Abbreviations: VoiSS-Heb, Voice Symptom Scale – Hebrew version; VHI-Heb, Voice Handicap Index – Hebrew version.

Factor analysis and cutoff

Using ROC analysis, the optimal cutoff score was 32.5 points on the VoiSS-Heb, which yielded a sensitivity of 87.2% and a specificity of 92.9%, maximizing Youden's index ($J = 0.8$). Patients scoring 32.5 or higher were classified as having a voice disorder.

DISCUSSION

This study is the first to translate, culturally adapt, and validate the VoiSS for use among Hebrew-speaking adults. The VoiSS-Heb demonstrated the requisite psychometric properties, confirming that it is a reliable and valid self-assessment instrument for measuring the multidimensional impact of dysphonia from the patient's perspective.

The VoiSS-Heb total scale showed a Cronbach's α of 0.932, with subscale values ranging from 0.736 (Physical) to 0.917 (Impairment), exceeding the recommended 0.70 threshold for internal consistency. These results align with findings from other adaptations (eg, Korean,⁶ Brazilian,⁷ Chilean,⁸ Italian,⁹ Spanish,¹⁰ Iranian,¹¹ Kannada,¹² Azerbaijani-Turkish¹³), which reported α values ranging from 0.87 to 0.99. High internal consistency indicates that items within each subscale coherently measure the underlying constructs of communication impairment, emotional distress, and physical symptoms.

The VoiSS-Heb effectively distinguished patients with dysphonia from nondysphonic participants, with median scores of 58 versus 7 ($P < 0.001$). This large, statistically significant difference confirms the questionnaire's ability to detect clinically meaningful vocal impairment, consistent with findings from the Italian VoiSS validation, which also reported significantly higher scores among dysphonic patients compared with controls. The strong correlation between total VoiSS-Heb and Hebrew VHI scores ($r = 0.946$) demonstrates excellent convergent validity. However, when examining correlations between corresponding subscales of the two instruments, only moderate associations were observed, particularly within the physical domain. This suggests that, despite their overlap, the VoiSS captures additional dimensions of voice-related symptoms that are not fully represented in the VHI.

Specifically, the Physical subscale of the VoiSS includes items such as throat tightness, soreness, effortful speaking, and sensations of fatigue or dryness, symptoms commonly reported by dysphonic patients but underrepresented in the VHI's more general items. By addressing these bodily and sensory aspects of voice use, the VoiSS provides a more detailed reflection of the patient's physical experience of dysphonia. Thus, even when administered alongside the VHI, the VoiSS-Heb contributes unique and clinically relevant information, enriching the assessment of voice-related quality of life and supporting its complementary use in both clinical and research settings.

Positive correlation observed between VoiSS-Heb scores and GRBAS ratings ($P < 0.001$), which reflect perceptual evaluations of voice quality conducted by SLPs. The significant association suggests that the questionnaire captures symptom experiences that are consistent with clinician-based assessments of vocal dysfunction. Notably, the correlation supports the clinical validity of the VoiSS-Heb by demonstrating alignment between the patient's subjective perception and the clinician's auditory-perceptual judgment of their voice quality.

Significant positive correlations were observed between VoiSS-Heb scores and GAD-7 anxiety scores ($r = 0.347$). These findings highlight the interplay between psychological and perceptual aspects of dysphonia. The association with GAD-7 suggests that anxiety may heighten patients' awareness of vocal symptoms, leading to higher self-reported handicap scores. In contrast, the correlation with GRBAS, which reflects professional auditory-perceptual ratings, indicates that the VoiSS-Heb also aligns well with objective clinical impressions of voice quality.

Together, these relationships demonstrate that the VoiSS-Heb captures both the emotional burden and the subjective experience of the patients with their dysphonia, reinforcing its multidimensional nature. Integrating anxiety assessment with self-evaluation of voice handicap may therefore provide a more comprehensive understanding of the patient's voice disorder and improve individualized management strategies. Similar psychosocial associations have been emphasized in previous cross-cultural adaptations, where emotional subscales showed strong correlations with perceived voice handicap and quality of life.

ROC analysis identified an optimal VoiSS-Heb cutoff of 32.5 points (sensitivity = 87.2%, specificity = 92.9%). This threshold provides clinicians with an empirically derived benchmark for differentiating between pathological and non-pathological voice states in Hebrew-speaking populations. Comparable studies have reported slightly lower cutoffs (eg, 15.5 for VoiSS-I); however, these differences likely reflect variations in sample characteristics and linguistic contexts. Our higher threshold may be partly attributable to variations in dysphonia severity and normative scores among Israeli adults. Nonetheless, it should be noted that although our data provide a valid clinical cutoff point, this interpretation should be done with caution, because the VoiSS-Heb, like all other voice handicap questionnaires, is not intended to differentiate between dysphonic and healthy speakers. Instead, it reflects a subjective self-evaluation of the patient's experience, rather than an absolute or objective diagnosis.¹⁷

The rigorous forward-backward translation process and pilot testing used in this study adhered to WHO and COSMIN guidelines, ensuring semantic and cultural equivalence. This methodology reinforces the robustness of our adaptation and enhances confidence in the linguistic and conceptual validity of the VoiSS-Heb. Although the present study did not directly assess structural validity, the strong internal consistency of the subscales and the high convergent validity with established instruments support its reliability as a patient-centered self-assessment tool. The VoiSS-Heb, therefore, appears suitable and valuable for use in both clinical practice and research involving Hebrew-speaking individuals with voice disorders.

Strengths and limitations

Key strengths include a large control cohort, the use of multiple external validity anchors (VHI, GRBAS, GAD-7), and comprehensive statistical testing aligned with best practices. Limitations include the single-center design and potential sampling bias toward patients presenting to a tertiary care voice clinic. Responsiveness to treatment, surgical intervention, or voice therapy by an SLP was not assessed; future longitudinal studies should examine VoiSS-Heb's sensitivity to clinical change, as demonstrated for other language versions. Additionally, while anxiety was explored, other psychosocial factors, such as depression, stress, or overall personality, were not evaluated and could further inform construct validity.

CONCLUSIONS

The VoiSS-Heb is a reliable, valid, and culturally appropriate tool for assessing self-reported voice symptoms among Hebrew-speaking adults. Its strong psychometric performance, convergence with established measures, and robust discrimination between dysphonic and healthy speakers position it as an essential addition to voice outcome assessment in Israel. Incorporating VoiSS-Heb into routine clinical practice and future outcome studies will facilitate more nuanced

evaluation of dysphonia's physical, emotional, and functional impacts. It will also enable cross-cultural comparisons with other VoiSS adaptations worldwide.

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None.

Data availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at [doi:10.1016/j.jvoice.2025.11.024](https://doi.org/10.1016/j.jvoice.2025.11.024).

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