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Transcultural Adaptation and Validation of the Voice Handicap Index-10 into the Serbian Language

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Voice disorders · Voice Handicap Index · Validity · Serbian version · Quality of life

Abstract
Background: The Voice Handicap Index-10 (VHI-10) is used in clinics because of its validity and ease of use by patients. ***Objectives:*** The aim of this paper was to evaluate the internal consistency, reliability, and clinical validity of the Serbian version of the VHI-10. ***Method:*** In this cross-sectional study, we translated the original English version of the VHI-10 into Serbian, after which it was back-translated into English. The Serbian version of the VHI-10 was completed by 161 patients with voice disorders, divided into 4 groups according disease etiology (structural, neurological, functional, and inflammatory) and 73 healthy control subjects. ***Results:*** The VHI-10 internal consistency was 0.88. Spearman's rank correlation coefficient for VHI-10 test-retest reliability was ρ = 0.991 ($p < 0.001$). Patients with voice disorders had higher median total VHI-10 scores compared with controls ($p < 0.001$). The patients' Grade, Instability, Roughness, Breathiness, Asthenia, and Strain (GIRBAS) scale scores were significantly correlated with the VHI-10 test scores (ρ = 0,682, $p < 0.001$) and VHI-10 retest scores (ρ = 0.716, $p < 0.001$). ***Conclusion:*** The Serbian version of the VHI-10 had good validity and reliability and can be used by Serbian patients with voice disorders.

Introduction

It has been widely accepted that voice disorder severity cannot be fully expressed by instrumental, aerodynamic, and perceptive measures, but only in combination with changes that are self-reported on voice handicap questionnaires [1]. There is no absolute positive correlation between voice disorder severity and its influence on everyday activities. Voice expectations are extremely individualized and depend on social and occupational conditions. Older individuals worry about loudness, teachers

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are often not satisfied with the strength of their voices, while professional singers are interested in whole-voice quality and range [2].

General (i.e., non-voice-specific) quality-of-life (QOL) questionnaires such as the Short Form Health Survey (SF-36) are insufficient for the clinical management of patients with dysphonia [3]. Consequently, researchers have developed several voice disorder-specific instruments to measure QOL in this patient population [3–6].

The Voice Handicap Index (VHI)-30 questionnaire is one such voice-specific QOL questionnaire [4]. In spite of its limitations [4], it is the most widely used voice-specific QOL instrument [5, 6]. The short form of the VHI-30 is the VHI-10 [2], and there is also a pediatric version [7]. Nawka et al. [8] even constructed an internationally applicable short scale. Their study included 1,052 patients from 8 different countries, with 5 different types of voice disorders. Various 9- and 12-item subsets were selected from the VHI-30, and country-specific subsets were compared to international subsets. The authors concluded that all important features of the VHI-30 were retained in the international 9-item subsets [8]. Following analysis of 9 contemporary voice-related self-assessment questionnaires (VHI-30 and VHI-10 were considered separate questionnaires), no single questionnaire has been found sufficiently robust, sensitive, comprehensive, disease-specific, and reflective of patients' health concerns [9]. Although some authors found no significant differences between the VHI-30 and the Voice-Related QOL questionnaire [10], others concluded that the VHI-30 is the gold-standard voice-specific QOL instrument [11].

The VHI-30 and VHI-10 have been validated translated into many languages [1, 12–15]. Considering problems arising from questionnaire translation, Verdonck-de Leeuw et al. [16] assessed the equivalence of the English language VHI-30 and translations from 8 European countries. They concluded that all versions of the VHI were equivalent, therefore enabling direct comparisons across the various versions of the questionnaire. In a prospective study, Forti et al. [13] found that the Italian versions of the VHI-10 featured high reliability and validity. In their study, the control group's scores were significantly lower with respect to all diagnostic subgroups; further, the ratio of the VHI-10 and VHI-30 scores was higher than expected in all subgroups [13]. Li et al. [17] investigated 2 simplified Chinese versions of the VHI-10 (10 items) and VHI-13 (13 items) in 3,825 patients with dysphonia and 120 controls. The resultant scores were compared with the original version of the VHI-30. They concluded that both simplified Chinese versions had good reliability and validity and could be used by patients with dysphonia. They found the VHI-10 to be more concise and widely applicable than the VHI-13. The Portuguese version of the VHI-10 [12] was also proven valid, reliable, and feasible for use with patients with dysphonia. The authors determined questionnaire validity by comparing the total score with vocal self-assessments and found statistical differences among the 5 self-assessment categories. Participants who classified their voices as *bad* had the highest total scores, whereas those who classified their voices as *excellent* had the lowest scores [12]. Additional confirmations of questionnaire validity and feasibility are available for the Hebrew [18] and Spanish versions of the VHI-10 [14].

The Serbian version of the VHI-30 has been validated [19] and has demonstrated excellent internal consistency and strong test-retest reliability for patients and controls. In patients with dysphonia, the mean scores of all 30 items were significantly higher than in controls. A good correlation was also obtained between the VHI-30 total scores and the patients' perceptions of the overall severity of their voices. The authors stressed the need to validate the Serbian version of VHI-10, as this shorter version is easier to use in clinical practice settings. The aims of the present study were therefore to (a) cross-culturally adapt the VHI-10 into Serbian and (b) validate the Serbian VHI-10.

Materials and Methods

Translation and Transcultural Adaptation of the VHI-10 Questionnaire

We used the Serbian version of the VHI-10 after receiving the permission from the author [2] of the original VHI-10. Using the Minimal Set of Translation Criteria [20], the first version of the Serbian VHI-10 was back-translated into English by another professional translator unfamiliar with the original English version. According to the Cognitive Debriefing Method, both phoniatricians and translators compared the original and translated English versions of the VHI-10 and then made adjustments to the Serbian version (Appendix).

The next step involved a pilot investigation of 20 patients who presented to our Phoniatric Department with voice complaints. All patients exhibited dysphonia and were native Serbian speakers. The meanings of each sentence were discussed by patients and phoniatric team members. Once consensus was established, corrections were incorporated into the questionnaire. Following additional analyses by both translators, the final version of the Serbian VHI-10 was created.

Assessment of VHI-10 Validity and Reliability

To assess the validity and reliability of the VHI-10, 2 groups of participants were recruited from October 2014 to March 2015. The first group consisted of patients presenting for an initial phoniatric

Table 1. Demographic characteristics of patients and their controls

Participants	*n*	Female	Male	Mean age ± SD	Range
Patient groups					
Space-occupying	74	57	17	45.54±11.68	(16–69)
Neurological	20	17	3	58.70±12.76	(31–78)
Functional	47	30	17	50.17±16.84	(25–80)
Inflammatory	20	13	7	51.70±15.44	(23–71)
Total	161	117	44	49.29±14.49	(19–80)
Control group	73	55	18	49.23±13.06	(30–81)

SD, standard deviation.

examination because of a voice complaint. Diagnosis was established following a clinical ENT examination and endoscopic videolaryngostroboscopy. The patients were further subdivided into 4 groups: (1) patients with space-occupying vocal fold lesions; (2) patients with neurological voice disorders; (3) patients with functional voice disorders; and (4) patients with inflammatory or vascular vocal fold lesions.

Sample size was defined on the basis of other similar studies [1, 13, 15, 18, 19]. Control subjects were individuals with no diagnosis of dysphonia.

All participants filled in the Serbian VHI-10 questionnaire on their first visits, following a short introduction and explanation, and acquisition of written informed consent. Questionnaire completion took no longer than 2 min, and the phoniatrician was present if any additional explanations were necessary. In addition, during this visit, every patient's voice was perceptually evaluated using the Grade, Instability, Roughness, Breathiness, Asthenia, and Strain (GIRBAS) scale by 2 experienced phoniatricians (with 20 years of working experience in the field of communication disorders). Phoniatricians calculated each GIRBAS scale score, ranging from 0 to 4, and total score, ranging from 0 to 24. Higher GIRBAS scores indicated more severe dysphonia [21].

After 2 weeks, each participant completed the Serbian VHI-10 a second time. Patients with worsening symptoms and/or clinical signs were excluded from further participation. No participants were allowed to access his/her previous answers, or the answers of others.

Statistical Analysis

Demographic characteristics and voice-related data were analyzed for patients with dysphonia, including the 4 subgroups and the control group. According to the Kolmogorov-Smirnov test, VHI-10 test, VHI-10 retest, and GIRBAS test scores were nonnormally distributed. We used medians and interquartile ranges in addition to mean ± standard deviation.

Cronbach's alpha coefficient was used to determine the internal consistency of the VHI-10. The maximum value of the coefficient is 1, with >0.9 considered excellent, >0.8 considered good, and >0.7 considered satisfactory [22]. Test-retest reliability was assessed by Spearman's correlation coefficient, which was also used to estimate correlations among VHI-10 scores, GIRBAS scores, and age. To compare VHI-10 test and retest median scores and GIRBAS median scores between males and females, the nonparametric Mann-Whitney test was used. For comparisons of the GIRBAS median scores in the voice disorder subgroups, we used the nonparametric Kruskal-Wallis test.

Results

Demographic characteristics of the study participants are presented in Table 1. There were initially 161 patients, divided among 4 subgroups. The dysphonia subgroups included (1) patients with space-occupying lesions such as vocal nodules, polyps and edema, vocal fold cysts, contact granulomas, and reactive lesions (n = 74); (2) patients with neurological voice disorders such as unilateral or bilateral paralysis, spasmodic dysphonia, and vocal tremor (n = 20); (3) patients with functional voice disorders such as muscle tension dysphonia, hypokinetic dysphonia, presbyphonia, and functional dysphonia (n = 47); and (4) patients with inflammatory or vascular vocal fold lesions such as acute and chronic laryngitis, monochorditis, reflux laryngitis, sulcus vocalis, hematoma, ectasiae, and varices (n = 20). Following readministration of the Serbian VHI-10, individuals with worsening symptoms and/or clinical signs were excluded, leaving 60 patients within the dysphonia group. The control group (n = 73) were healthy volunteers, mostly consisting of relatives and friends of patients, without histories of dysphonia. The oldest participants were patients in the group with neurological voice disorders. The mean age was nearly the same between patients and controls.

Total and item-related internal consistency measures of the Serbian VHI-10 in patients, expressed by Cron-

Table 2. Internal consistency of the VHI-10 in patients, total and item related[a]

VHI-10	Q-1	Q-2	Q-3	Q-4	Q-5	Q-6	Q-7	Q-8	Q-9	Q-10
0.88	0.87	0.87	0.87	0.87	0.89	0.87	0.88	0.87	0.87	0.86

VHI, Voice Handicap Index. [a] According to Cronbach's alpha.

Table 3. Mean, SD, median, range, and IQR of the VHI-10 test and retest scores

Participants	Mean ± SD	Median	Range	IQR	*p* value
A *In patients and controls*					
Patient groups					
Space-occupying	17.76±7.35	17.5	(4–38)	11	
Neurological	22.50±8.53	20.5	(10–36)	17	
Functional	17.13±7.73	16.0	(5–38)	13	
Inflammatory	21.50±8.97	23.0	(6–36)	15	<0.001*
Total	18.85±7.93	13.0	(4–38)	20	
Control group	1.10±1.81	0.0	(0–7)	2.0	<0.001**
B *In the group of 60 patients*					
Patient groups					
Space-occupying	18.85±7.31	19.0	(6–36)	8	
Neurological	23.70±8.39	21.5	(11–36)	14	
Functional	16.35±7.87	15.0	(6–40)	11	
Inflammatory	19.90±8.58	22.0	(8–31)	18	0.119*
Total	19.0±8.09	18.5	(6–40)	10	

SD, standard deviation; IQR, interquartile range. * For differences between diagnostic subgroups of patients. ** For differences between all patients and controls.

bach's alpha test, are presented in Table 2. The total VHI-10 internal consistency was 0.88, and item-related internal consistency ranged from 0.86 (question 10) to 0.89 (question 5).

Total VHI-10 test scores for both dysphonia and healthy control groups, including the 4 dysphonia subgroups, are presented in Table 3.

For the dysphonia group, the median total VHI-10 scores were significantly greater compared with those of the controls ($p < 0.001$). By group, the inflammatory and vascular lesion dysphonia subgroup exhibited the highest median VHI-10 score, and the functional dysphonia subgroup exhibited the lowest median score. With regard to individual scores, the lowest VHI score was 4 and was obtained by a patient within the space-occupying lesion subgroup. The highest score was 38, obtained by the space-occupying lesion and functional dysphonia subgroups. Differences in VHI-10 scores between voice disorder subgroups were significant ($p < 0.001$).

The VHI-10 retest scores of 60 patients are presented in Table 3. Retest scores were identically distributed among subgroups, from the highest to the lowest score, as they were in the test groups. Differences among the dysphonia subgroups were nonsignificant ($p = 0.119$). Spearman's rank correlation coefficient indicated that the test-retest reliability of the VHI-10 was $\rho = 0.991$ ($p < 0.001$).

GIRBAS scores in a group of 161 patients (Table 4) significantly differed between the various dysphonia subgroups ($p = 0.007$). The neurological voice disorder subgroup exhibited the highest median VHI-10 score, and the functional dysphonia subgroup had the lowest median score. With regard to individual GIRBAS scores, the highest was 21 and linked to a member of the inflammatory and vascular lesion subgroup. The lowest GIRBAS score was 4, produced by individual members of the other 3 dysphonia subgroups. The GIRBAS median scores were significantly correlated with VHI-10

Table 4. Mean, SD, median, range, and IQR of GIRBAS scores in the four subgroups of patients

Patient groups	Mean ± SD	Median	Range	IQR	*p* value*
Space-occupying	13.39±2.86	14.0	(4–20)	3	
Neurological	15.25±3.35	16.5	(9–20)	6	
Functional	12.47±3.58	12.0	(4–20)	5	
Inflammatory	14.65±4.50	15.0	(4–21)	7	0.007
Total	13.51±3.47	14.0	(4–21)	5	

SD, standard deviation; IQR, interquartile range. * For differences between diagnostic subgroups of patients.

test scores ($\rho = 0.682$, $p < 0.001$) and VHI-10 retest scores ($\rho = 0.716$, $p < 0.001$). Sex and age were not correlated with VHI-10 scores ($p = 0.269$ and $p = 0.822$, respectively) or GIRBAS scores ($p = 0.151$ and $p = 0.349$, respectively).

Discussion/Conclusion

The internal consistency of the Serbian VHI-10 was good, with an overall Cronbach alpha coefficient of 0.88. This value was lower in comparison with the Cronbach alpha coefficient for the English VHI-30 [1, 19, 23, 24] and Hebrew [18], Chinese [17] and Italian [13] versions of the VHI-10, but similar to the Spanish version [25]. The Serbian VHI-10 had excellent test-retest reliability, which is in agreement with findings of other authors for both the VHI-30 and VHI-10 [1, 13, 15, 19, 23, 24].

Similar to past studies involving the VHI-30 [13, 23], VHI-10 scores in this and other investigations [15, 17, 18] were significantly higher for patients with dysphonia in comparison with controls. The VHI-10 is therefore a valid, sensitive tool for identifying voice-specific impairments of QOL. The Serbian VHI-10 scores significantly correlated with GIRBAS scores, which additionally supports the validity of its use in clinical practice.

VHI scores are affected by the type of dysphonia [15, 18, 23, 24], and Lam et al. [15] concluded that the Chinese VHI-10 could be used to distinguish different *types* of dysphonia. The only consistent finding across studies was that the neurological voice disorder subgroup had the highest VHI score (mean or median, depending on the study). In the studies by Lam et al. [15], Amir et al. [18], Helidoni et al. [24], and Schindler et al. [23], the neurological voice disorder subgroup had the highest VHI scores, and the lowest scores were associated with the inflammatory and vascular lesion subgroup. A study that used the Croatian VHI-30 [1] found no significant differences among the various dysphonia subgroups; however, the authors found that scores were highest in the neurological voice disorder subgroup and lowest in the inflammatory and vascular lesion subgroup. Sotirović et al. [19] found no significant between-group differences in the total VHI-30 scores; however, the highest scores were found in the functional dysphonia subgroup, and the lowest scores in the inflammatory and vascular lesion subgroup.

In the present study, when patients were grouped according to dysphonia type, the highest median VHI-10 score was found in the inflammatory and vascular lesion subgroup, followed by the neurological, space-occupying, and functional dysphonia subgroups. Further, between-group differences were significant. GIRBAS score also significantly differed between the various dysphonia subgroups, but the median score was the highest in the neurological voice disorder subgroup, followed by the inflammatory and vascular lesion, space-occupying lesion, and functional dysphonia subgroups. Further investigations are needed to prove that the VHI could be used to differentiate different types of dysphonia. As with other VHI validation studies, the Serbian VHI-10 test and retest [1, 18, 19, 23] did not significantly vary according to age or sex.

Besides being valid and reliable, the Serbian VHI-10 was easy to complete over a short time (typically 2 min). The Serbian version of VHI-10 is easy to self-administer and features adequate validity and reliability. It is a useful tool for use during voice disorder assessments, or prior to commencing therapy. The VHI-10 can be used for clinical tracking of voice disorder-related impairments of QOL. QOL measures are recommended for inclusion in clinical assessments of patients with dysphonia.

The main limitation of this study was group heterogeneity, and our study cohorts were small. According to Anthoine et al. [26], there is a lack of clear, scientifically sound recommendations for sample size determination in psychometric validation studies. Their review of articles published in PubMed from January 2009 to September 2011 found that out of over 114 published studies, approximately 92% reported a subject-to-item ratio ≥2, whereas 25% had a ratio ≥20. This study produced a subject-to-item ratio of 16 for the initial test, and 6 for VHI-10 retest scores, although these scores were lower for the dysphonia subgroups.

Statement of Ethics

The study was given ethical approval by the Ethics Committee at the School of Medicine in Belgrade. All patients gave their written, informed consent.

Disclosure Statement

The authors have no conflicts of interest to declare.

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Author Contributions

Jadranka Maksimovic – designed the study, interpreted the study results, and wrote the article; Milan Vukasinovic, Vojko Djukic – directed study implementation including quality assurance and control; Hristina Vlajinac – interpreted the study results and wrote the article; Ana Jotic, Sanja Krejovic-Trivic – prepared data for statistical analysis; Jelena Marinkovic – performed statistical analysis; Jovica Milovanovic – supervised field activities. All authors critically reviewed the article for important intellectual content and approved the final manuscript.

Appendix

Serbian Version of the VHI-10

F1	Ljudi me slabo čuju zbog moje promuklosti.	0	1	2	3	4
F2	Ljudi me teško razumeju kada smo u bučnoj sredini.	0	1	2	3	4
F8	Problemi sa glasom ograničavaju moje lične i društvene aktivnosti.	0	1	2	3	4
F9	Zbog promuklosti mi se čini mi se da sam potpuno nesposoban / nesposobna za razgovor	0	1	2	3	4
F10	Preti mi gubitak posla zbog poremećaja glasa.	0	1	2	3	4
P5	Osećam napor kada hoću nešto da kažem.	0	1	2	3	4
P6	Ne mogu da predvidim kakav će mi biti glas.	0	1	2	3	4
E4	Problem sa mojim glasom me uznemirava.	0	1	2	3	4
E6	Osećam se hendikepiranim/hendikepiranom zbog moga glasa.	0	1	2	3	4
P3	Ljudi me pitaju: "Šta je to sa tvojim glasom?"	0	1	2	3	4

0, nikad; 1, skoro nikad; 2, ponekad; 3, skoro uvek; 4, uvek.

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