

The Voice-Related Quality Of Life: A Study on the Reliability and Validity of the Tamil Version

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ABSTRACT:

OBJECTIVE: Voice serves as an identity and is one of the primary requisites of an individual, especially for singers who are extensive professional voice users with greater vulnerability to voice disorders. The aim of this study is to translate and validate the Tamil version of Voice-Related Quality of Life (T-VRQOL), a self-rating questionnaire that estimates the influence of voice disorders on quality of life. The study also intends to compare the T-VRQOL scores in singers (with and without voice complaint) and non-singers, and to correlate T-VRQOL and the Tamil Singing Voice Handicap Index-10 (TSVHI-10).

METHOD: In this cross-sectional study, 120 native Tamil speakers (40 classically trained Carnatic singers without voice complaints, 40 Carnatic singers with voice complaints and 40 normal non-singers) in the age range of 20 to 50 years, filled in the T-VRQOL and the TSVHI-10 rating scales, along with a demographic questionnaire.

RESULTS: Reliability of T-VRQOL was established with Cronbach α coefficient ($r=0.9$, $P<.001$) and good test-retest reliability ($r=0.98$). The validity of T-VRQOL was confirmed by examining convergent and discriminant validity. T-VRQOL also demonstrated a good correlation with the TSVHI-10 ($r=0.838$, $P<.001$). On comparing the T-VRQOL scores across the groups, singers (13.88 and 24.3) obtained higher values than the non-singers (11.63). Among the singers, those with voice complaints (24.3) scored higher than those without voice complaints (13.88) in the T-VRQOL.

CONCLUSIONS: The Tamil version of Voice-Related Quality of Life (VRQOL) questionnaire correlates well with TSVHI-10. It proves to be an effective clinical tool in effectively evaluating the VRQOL among the Tamil-speaking population.

KEYWORDS: quality of life, voice, larynx, singing, voice handicap, Carnatic singers

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Introduction

Singing, the vocal production of musical tones,¹ is a form of expressing one's feelings and emotions.¹ Being ancient and universal, singing has its origin predate the development of the spoken language.² Starting from the simple vocal imitation of the sounds heard in nature to the act of performing complex communication, voice is the most powerful basic instrument.¹ Singers practicing Carnatic music, the South Indian art music tradition, use this vital element in a sophisticated and ornamental fashion.³ Singers form the elite voice user category of Kouffman and Isaacson classification (1991), for whom a slight vocal disturbance could result in serious voice-related consequences. Although singing may positively influence several aspects of quality of life,⁴ singers, having such extensive and strenuous voice usage, seem to be more susceptible to factors that adversely affect voice, such as gastroesophageal reflux⁵ and allergies,⁵ voice fatigue,⁶ musculoskeletal tension disorder,⁶ submucosal hemorrhage,⁷ and edematous changes and symptoms.⁷ Such disorders, coupled with higher voice demand and/or use of inappropriate singing techniques, may result in dysphonia.⁸

Among several infirmities, dysphonia represents a difficulty or deviation in vocal production that impedes natural voicing. In a study with Carnatic singers, symptoms such as change in voice, difficulty in singing higher and lower pitches, dryness of throat, vocal fatigue, discomfort and pain while singing, difficulty in sustaining voice for long duration, throat tightness, and strain were reported by the trained participants.³

In ideal conditions, a dysphonic patient evaluation includes the patient's history and a complete diagnostic assessment including laryngostroboscopic, acoustic, and aerodynamic evaluations.⁹ Even though voice problems could be precisely quantified using these instruments, there is a growing focus toward the inclusion of subjective parameters in voice evaluation¹⁰ required to highlight the effect of a vocal disorder on an individual's life. Evaluation of quality of life is primarily conducted by means of questionnaires. The self-reported symptom-specific scale can provide valuable information not only about related quality-of-life issues but also on functional abilities, and social and emotional domains. The Voice-Related Quality of Life (VRQOL) by Hogikyan and Sethuraman¹¹ is a



10-item instrument that was designed and validated as a self-administered instrument for adult populations with voice disorders to measure both social-emotional and physical-functional aspects of voice problems.

To better measure the handicap and its influence on a person's quality of life, there is a need for self-rating questionnaires to be in one's native language. These translated instruments ensure reliable clinical outcomes. Hence, from its original version in English,¹¹ the VRQOL has been translated and validated in various languages, such as in Brazilian¹²; German¹³; Norwegian¹⁴; Polish¹⁵; and Turkish.¹⁶ For these instruments to be used in Indian languages, these questionnaires must be translated and adapted based on international guidelines. Their measuring properties must also be demonstrated in specific cultural contexts.

The vocal well-being of an individual greatly influences their quality of life and overall comfort, especially for singers. Hence, measuring the voice handicap and well-being, specific to the singing voice, is essential. The Singing Voice Handicap Index 10 (SVHI), developed by Cohen et al⁸ is a 10-item instrument to estimate a person's perception of disability caused by their voice problem. From its original version in English by Cohen et al,⁸ SVHI has been translated and validated in various languages, such as Korean,¹⁷ Italian,¹⁸ and Polish.¹⁹ Recently, a study focusing on translation of the SVHI-10 to Tamil has been made with classically trained Carnatic singers.²⁰

This study is aimed on translating and validating the Tamil version of Voice-Related Quality of Life (T-VRQOL) for its use in Tamil-speaking population throughout the world. Also, through this study, comparison of VRQOL between singers (with and without voice complaints) and non-singers, and correlation between the T-VRQOL and the Tamil Singing Voice Handicap Index 10 (TSVHI-10) were established.

Method

Participants

The study included 120 native Tamil speakers; 80 classically trained Carnatic singers and 40 non-singers, between 20 and 50 years of age. The participants were segregated into 3 groups. Group 1 consisted of 40 singers without voice complaints, Group 2 included 40 singers with voice complaints, and Group 3 comprised 40 non-singers. Although the participants in Groups 1 and 3 had no voice complaints, Group 2 comprised singers with a complaint of altered voice quality, pitch, and loudness; vocal fatigue, tiredness of voice; tensed and stressed voice pattern, or those who reported of difficulties in communication consequent to their voice problem. The singers included in Groups 1 and 2 had a minimum training in classical Carnatic singing of at least 1 year. Participants in each group were further subdivided into 2 sub-groups, based on their age. Sub-group A encompassed people between 20 and 35 years of age and sub-group B covered persons aged between 36 and

50 years. Individuals with neurological, psychological, and other medical issues such as respiratory pathologies and those who were unfamiliar with Tamil were excluded from the study. The participants were from various areas of Tamil Nadu, and they volunteered to participate in the study.

Procedure

Development of the T-VRQOL. The English version of VRQOL was translated independently, by a speech language pathologist who is a native speaker of Tamil and is also highly proficient in spoken and written English. The Tamil-translated materials were then analyzed by a bilingual expert panel, comprising 2 speech language pathologists and 2 linguists, for any discrepancies. Following this, a blind back translation was performed by 1 linguist and 2 speech language pathologists. The 3 retranslated English versions of the questionnaire were then compared against the original version. Of the translations, the items that were translated most accurately from English to Tamil and then back to English were selected for inclusion in the final version of the questionnaire.

The translated inventory was distributed to 10 native Tamil speakers, who were also acquainted with English and were able to read and write both languages (5 singers and 5 speech language pathologists) to check the translated copy of the T-VRQOL. A gap of 2 days was maintained between the providing of 2 versions (English and Tamil). The speakers were given a 3-point rating scale to grade the items from very familiar to non-familiar. All the filled inventories in both languages were assessed after that, to determine whether they conveyed the same meaning. Questions in the Tamil version that were rated at "one" were selected for the inventory. Questions with ratings "two" or "three" were re-framed according to the familiarity of the Tamil speakers.

Administration of the questionnaires. Approval was obtained from the Ethical committee of Madras ENT Research Foundation. The study included 2 self-reporting Tamil questionnaires:

- (a) TSVHI-10, a 5-point rating scale translated and adapted by Rangarajan et al.²⁰
- (b) T-VRQOL.

With the demographic questionnaire, basic information such as age, sex, occupation, and vocal and non-vocal habits were collected from all the participants. After briefing the study, the participants were seated comfortably in a quiet, well-lighted room, and were asked to complete the T-VRQOL and the TSVHI-10 questionnaires. An oral permission was taken from all participants for the dissemination of results, and they were informed that they had the right to withdraw, at any time during the course of the study. To confirm test-retest reliability, the instruments were re-administered to 30 subjects (10 from each of the 3 groups) after 7 days of the initial administration. The

Table 1. Items under the domains of the TSVHI-10 and the T-VRQOL.

DOMAIN	TSVHI-10	T-VRQOL
Physical	7, 10	1, 2, 3, 6, 7, 9
Functional	1, 3, 6	
Social	–	4, 5, 8, 10
Emotional	2, 4, 5, 8, 9	

Abbreviations: T-VRQOL, Tamil version of Voice-Related Quality of Life; TSVHI-10, Tamil Singing Voice Handicap Index-10.

completed T-VRQOL and TSVHI-10 responses were collected and tabulated for further reliability and validity analyses.

Analysis

T-VRQOL is a 5-point rating questionnaire. A score of “1” indicates normal health, whereas a score of “5” indicates a problem as severe as it could be. Items 1, 2, 3, 6, 7 and 9 correspond to the physical-functioning domain and items 4, 5, 8 and 10 correspond to the social-emotional domain.¹¹

TSVHI-10 comprises 10 items. Items 1, 3, and 6 correspond to functional aspects of the voice problem. Items 7 and 10 correspond to physical aspects, whereas questions 2, 4, 5, 8, and 9 correspond to emotional aspects.⁸ Lower scores in T-VRQOL and TSVHI-10 represents better VRQOL and lower voice handicap, respectively. Table 1 summarizes the items in various domains of the T-VRQOL and the TSVHI-10.

The data obtained were subjected to descriptive and statistical analysis. Statistical analysis was carried out using SPSS statistics 17.0. Cronbach α and Pearson correlation confirmed the reliability of the proposed methodology. Validity was confirmed by establishing convergent criterion and divergent parameters. A comparison between and within the groups was done using one-way analysis of variance (ANOVA) and post hoc (Tukey Honest Significant Difference [HSD]) analysis. A confidence interval of 95% was maintained during analysis.

Results and Discussion

The primary purpose of this study is to determine the reliability and to validate the adapted T-VRQOL to suit the Tamil populace. Comparison between the levels of VRQOL and voice handicap measure among singers and non-singers, and the age- and sex-related correlations were also analyzed.

Reliability analysis

The reliability of T-VRQOL was estimated by calculating the Cronbach α coefficient. A score of 0.9 was obtained for the newly adapted questionnaire, indicating an excellent internal consistency. Table 2 depicts the overall as well as item specific Cronbach α values.

As indicated in procedure for T-VRQOL administration section above, test-retest reliability was evaluated by re-administering T-VRQOL and TSVHI-10 to a subset of participants. This was performed 7 days after the initial administration. It was determined that the test-retest reliability calculates to 0.98, indicating a significant degree of test-retest reliability.

Validity analysis

Validity testing refers to the degree to which a test measures what it claims to measure. In this study, VRQOL among singers with and without voice complaints, and non-singers was calculated using the T-VRQOL questionnaire. The construct validity was demonstrated by verifying the discriminant and convergent validities.

Discriminant validity. Discriminant validity can be proved by a test’s ability to demonstrate significant differences among sub-populations where preconceived differences existed. For this study, singers and non-singers can be considered as the 2 discriminant test groups. In this study, singers showed a higher score than non-singers, irrespective of voice complaints. This is true for both the overall T-VRQOL score and for each of its domains as well. This proves discriminant validity, as evident from Table 3.

Higher T-VRQOL score among singers reveals that the VRQOL is better among non-singers than singers. When the T-VRQOL scores of singers with and without voice complaint were compared, it is observed that the overall as well as the physical-functional and social-emotional domain mean scores were higher for singers with voice complaint (Group 2) than singers without voice complaint (Group 1). The significance between and among the groups was proved with a confidence level of 95%, using one-way ANOVA and post hoc (Tukey HSD) analysis. Morawska et al²¹ report mean VRQOL score of 25.032 for the occupational voice users and 14.5 for persons with no voice complaints, thereby supporting the finding of better status of voice apparatus in the control group (people with no voice disorders) than the study group (occupational voice users). Discriminant validity was also confirmed by performing age- and sex-related comparisons among the participants.

Age analysis of the T-VRQOL

Data obtained from Groups A and B were analyzed to find the significant difference between the 2 age groups. Group A comprised participants with age between 20 and 35 years and Group B between 36 and 50 years.

On comparing the T-VRQOL scores, results revealed that participants in Group B (36-50 years) obtained higher mean values when compared with Group A (20-35 years), in all the 3 groups (Groups 1, 2, and 3). This explicates the influence of age, indicating a better VRQOL among the

Table 2. Cronbach α values for each of the 10 items of the T-VRQOL.

ITEMS	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Corrected Item–Total Correlation	0.65	0.51	0.78	0.6	0.58	0.66	0.57	0.7	0.7	0.73
Cronbach α : 0.9										

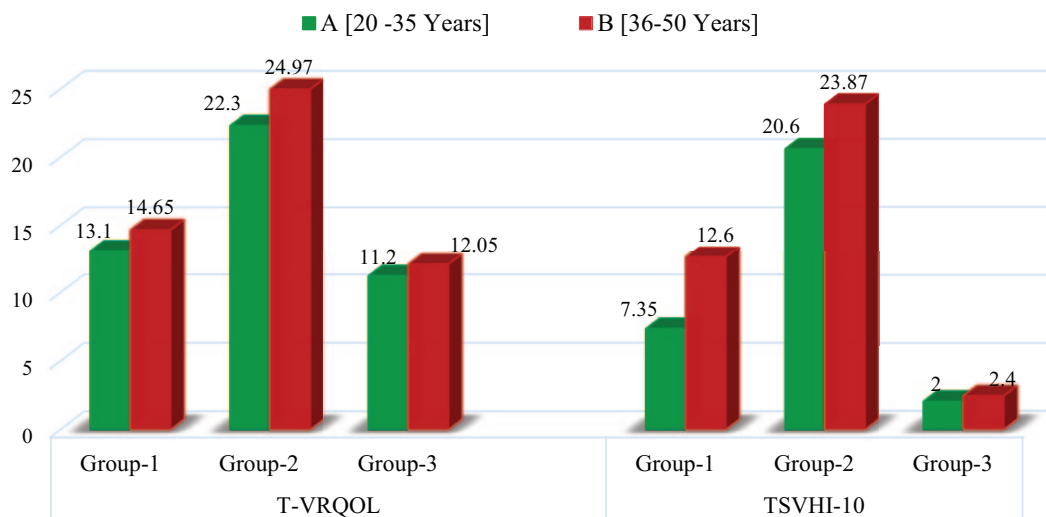
Abbreviation: T-VRQOL, Tamil version of Voice-Related Quality of Life.

Table 3. Mean and SD values of the T-VRQOL and the TSVHI-10 (overall and domains) between and within the 3 groups along with one-way ANOVA and post hoc (Tukey HSD) values.

		GROUP 1		GROUP 2		GROUP 3		F	P VALUE
		MEAN	SD	MEAN	SD	MEAN	SD		
T-VRQOL	Total	13.88	4.7	24.3	4.78	11.63	1.58	112.88	<.001
	Physical-Functional	8.15	2.26	14.5	3.11	7.08	1.03	118.88	<.001
	Social-Emotional	5.73	2.77	9.8	2.61	4.55	0.89	58.03	<.001
TSVHI-10	Total	9.78	7.64	23.05	4.11	2.2	2.75	156.82	<.001
	Functional	2.98	2.59	7.28	1.97	1.05	1.6	90.23	<.001
	Physical	2.53	1.95	5.43	1.66	0.73	0.87	90.21	<.001
	Emotional	4.48	3.71	10.35	3.00	0.43	0.74	125.21	<.001

Abbreviations: ANOVA, analysis of variance; HSD, Honest Significant Difference; T-VRQOL, Tamil version of Voice-Related Quality of Life; TSVHI-10, Tamil Singing Voice Handicap Index-10.

Group 1—singers without voice complaints; Group 2—singers with voice complaints; and Group 3—non-singers. Considering the difference within groups (1 vs 2, 2 vs 3, 1 vs 3), Groups 1 and 3 are significantly different according to Tukey HSD.

**Figure 1.** Mean scores of the T-VRQOL and the TSVHI-10 in Group 1 (singers without voice complaint), Group 2 (singers with voice complaint), and Group 3 (non-singers). T-VRQOL indicates Tamil version of Voice-Related Quality of Life; TSVHI-10, Tamil Singing Voice Handicap Index-10.

younger participants (Group A). Similar result was obtained for the domains of T-VRQOL and overall TSVHI-10. The significant difference for the total T-VRQOL scores between the 2 age groups was confirmed using ANOVA. Results reveal a F value of 23.91 and a $P < .001$. Figure 1 depicts the scores obtained among the groups. Study by Verdonck-de

Leeuw and Mahieu,²² in 2011, reported that the VRQOL with its domains are influenced by age, in such a way that the deterioration in the acoustic voice signal and an increase in the self-reported voice instability were significant, as the age increased. Although these findings were reported with the participants in older age group when compared with this

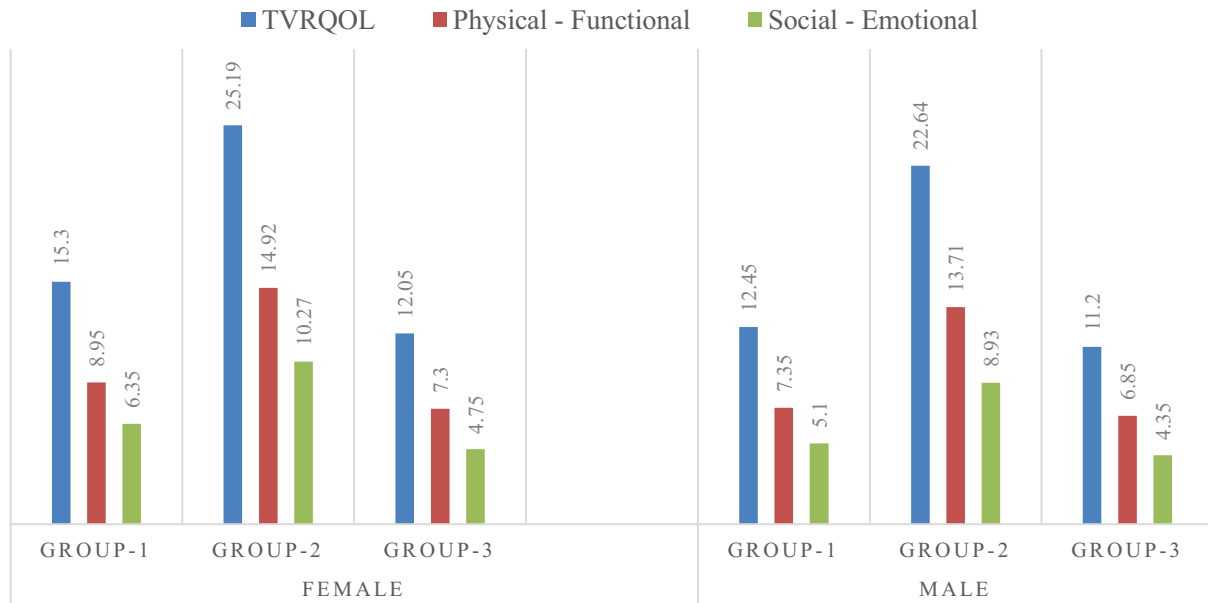


Figure 2. The mean T-VRQOL score of men and women in Groups 1, 2, and 3. T-VRQOL indicates Tamil version of Voice-Related Quality of Life; TSVHI-10.

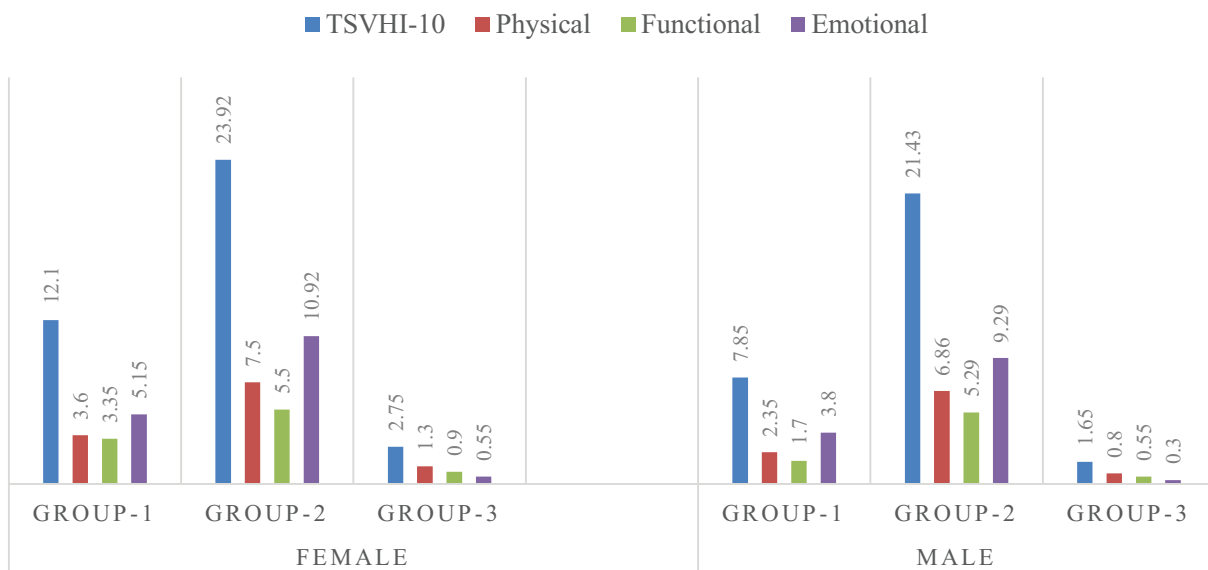


Figure 3. The mean TSVHI-10 score of men and women in Groups 1, 2, and 3. TSVHI-10 indicates Tamil Singing Voice Handicap Index-10.

study, the effect of age was observed to be similar on the scores of VRQOL.

Sex analysis of the T-VRQOL

Comparing the mean T-VRQOL and TSVHI-10 scores of the male and female participants, results revealed greater handicap scores for female candidates when compared with male candidates, indicating a better VRQOL among the male candidates. Determining the significant difference between the 2 sex groups using ANOVA, for overall T-VRQOL and TSVHI-10 scores, reveals an F value of 6.15 and 6.28, respectively, and a P value of .015 and .014, respectively. This finding is supported

in the literature by Rasch et al,²³ which verified that among the participants, women scored higher in VRQOL than the men. Figures 2 and 3 depict the mean values of T-VRQOL and TSVHI-10 by female and male participants.

Convergent validity. Convergent validity was assessed by correlating the T-VRQOL with the TSVHI-10. Strong positive correlation was evident between the T-VRQOL and the TSVHI-10 ($r=0.84$; $P<.001$) as depicted in Table 4.

Cross-correlations between the domains of the T-VRQOL (social-emotional and physical-functional) and the TSVHI-10 (functional, physical, and emotional) were performed, and it was observed that the T-VRQOL positively correlated with

Table 4. Pearson correlation (*r* values and *P* values) obtained for the T-VRQOL and the TSVHI-10.

		T-VRQOL			TSVHI-10			
		TOTAL	PHYSICAL-FUNCTIONAL	SOCIAL-EMOTIONAL	TOTAL	FUNCTIONAL	PHYSICAL	EMOTIONAL
T-VRQOL	Total	.863**	.838**		.838**	.759**	.774**	.809**
	Physical-Functional			.788**	.801**	.738**	.779**	.745**
	Social-Emotional				.795**	.730**	.776**	.739**
TSVHI-10	Total					.924**	.898**	.964**
	Functional						.763**	.827**
	Physical							.814**
	Emotional							

** Correlation is significant at the .01 level (2-tailed).

the TSVHI-10. There was a strong correlation between the physical-functional domain of the T-VRQOL and the physical domain of the TSVHI-10 ($r=0.78$; $P<.001$) and a strong correlation between social-emotional domain of the T-VRQOL and the emotional domain of the TSVHI-10 ($r=0.74$; $P<.001$). The significant correlation between the TSVHI-10 and the T-VRQOL is indicative of convergent validity, that is, the survey questions are testing for the same construct, namely, VRQOL. In the year 2012, study by Aaby and Heimdal¹⁴ documents a strong positive correlation between Norwegian version of VRQOL and Voice Handicap Index.

Summary

This study attests T-VRQOL to be a highly reliable and a valid instrument that measures the impact a voice problem imposes on the physical-functional and social-emotional aspects of quality of life. The correlation of T-VRQOL with the TSVHI-10, and the influence of age and sex on the VRQOL and voice handicap scores are also explained. Hence, through this study, the Tamil VRQOL is proposed as an useful instrument that not only evaluates the impact a voice disorder incurs on the individual's quality of life but also estimates how VRQOL is altered as a response to the treatment.

Author's Note

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Author Contributions

Conceived and designed the experiments: AR, JL, PSD; Analyzed the data: AR; Wrote the first draft of the manuscript: AR; Contributed to the writing of the manuscript: AR, JL; Agree with manuscript results and conclusions: AR, JL, PSD;

Jointly developed the structure and arguments for the paper: AR, JL; Made critical revisions and approved final version: AR, JL.

Ethical Approval

This article does not contain any studies with animals performed by any of the authors. Approved by the Ethical committee of Madras ENT Research Foundation.

Informed Consent

Informed oral consent was obtained from all individual participants included in the study.

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REFERENCES

- Juslin PN, Laukka P. Communication of emotions in vocal expression and music performance: different channels, same code? *Psychol Bull.* 2003;129:770–814.
- Mithen S, Morley I, Wray A, Tallerman M, Gamble C. The singing Neanderthals: the origins of music, language, mind and body. *Cambridge Archaeol J.* 2006;16:97–122.
- Arunachalam R, Boominathan P, Mahalingam S. Clinical voice analysis of Carnatic singers. *J Voice.* 2014;28:128.e1–128.e9.
- Johnson JK, Louhivuori J, Stewart AL, Tolvanen A, Ross L, Era P. Quality of life (QOL) of older adult community choral singers in Finland. *Int Psychogeriatr.* 2013;25:1055–1064.
- Lloyd AT, Lehman J, Meemon N, Lewis V, Ruddy BH. Quantifying laryngopharyngeal reflux in singers: perceptual and objective findings. *Biomed Res Int.* 2017;2017:29098155.
- Koufman JA, Blalock PD. Vocal fatigue and dysphonia in the professional voice user: Bogart-Bacall syndrome. *Laryngoscope.* 1988;98:493–498.
- Feder RJ. Varix of the vocal cord in the professional voice user. *J Am Acad Otolaryngol.* 1983;91:435–436.
- Cohen SM, Jacobson BH, Garrett CG, et al. Creation and validation of the Singing Voice Handicap Index. *Ann Otol Rhinol Laryngol.* 2007;116:402–406.
- Roy N, Barkmeier-Kraemer J, Eadie T, et al. Evidence-based clinical voice assessment: a systematic review. *Am J Speech-Language Pathol.* 2013;22:212–226.
- Hanschmann H, Lohmann A, Berger R. Comparison of subjective assessment of voice disorders and objective voice measurement. *Folia Phoniatr Logop.* 2011;63:83–87.
- Hogikyan ND, Sethuraman G. Validation of an instrument to measure Voice-Related Quality of Life (V-RQOL). *J Voice.* 1999;13:557–569.
- Gasparini G, Behlau M. Quality of Life: validation of the Brazilian version of the Voice-Related Quality of Life (V-RQOL) measure. *J Voice.* 2007;23:176–181.

13. Schwanfelder C, Eysholdt U, Rosanowski F, Graessel E. Voice-related quality of life: structure, validity and factors of the German Questionnaire. *Folia Phoniatr Logop.* 2008;60:241–248.
14. Aaby C, Heimdal JH. The Voice-Related Quality Of Life (V-RQOL) measure—a study on validity and reliability of the Norwegian version. *J Voice.* 2012;27:258.e29–258.e33.
15. Sielska-Badurek E, Rzepakowska A, Sobol M, Osuch-Wójcikiewicz E, Niemczyk K. Adaptation and validation of the voice-related quality of life measure into polish. *J Voice.* 2016;30:773.e7–773.e12.
16. Tezcaner ZÇ, Aksoy S. Reliability and validity of the Turkish version of the voice-related quality of life measure. *J Voice.* 2017;31:262.e7–262.e11.
17. Lee AR, Sim HS. The Korean version of the Singing Voice Handicap Index. *Commun Sci Dis.* 2013;18:194–202.
18. Baracca G, Cantarella G, Forti S, Pignataro L, Fussi F. Validation of the Italian version of the Singing Voice Handicap Index. *Eur Arch Otorhinolaryngol.* 2013;271:817–823.
19. Seilska Badurek EM, Sobol M, Cioch A, OsuchWojcikiewicz E, Rzepakowska AM, Niemczyk K. Adaptation and validation of Singing Voice Handicap Index into Polish. *Clin Otolaryngol* 2017;42:994–999.
20. Rangarajan A, Santhanam DP, Selvaraj JL. Translation and validation of Tamil version Of Singing Voice Handicap Index–10 (TSVHI-10) [published online ahead of print September 17, 2017]. *J Voice.* doi:10.1016/j.jvoice.2018.08.003.
21. Morawska J, Niebudek-Bogusz E, Zaborowski K, Wiktorowicz J, Śliwińska-Kowalska M. V-RQOL as a tool for assessing the impact of voice disorders on the quality of life in occupational voice users. *Otorynolaryngologia.* 2015;14:96–103.
22. Verdonck-de Leeuw IM, Mahieu HF. Vocal aging and the impact on daily life: a longitudinal study. *J Voice.* 2004;18:193–202.
23. Rasch T, Günther S, Hoppe U, Eysholdt U, Rosanowski F. Voice-related quality of life in organic and functional voice disorders. *Logoped Phoniatr Vocol.* 2005;30:9–13.