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ORIGINAL ARTICLE

Correlations among the Mandarin Voice Handicap Index, its shortened version, and the Voice-Related Quality of Life Measure for laryngectomees

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Abstract

Background: The Voice Handicap Index (VHI) and the Voice-Related Quality of Life Measure (V-RQOL) are seldom administered to alaryngeal patients who use pneumatic artificial larynx (PAL) and esophageal speech (ES). As such, the specificity of VHI and 10-item VHI (VHI-10) for assessing voice-related changes in such patients is unclear. Accordingly, this study investigated the correlation between scores on the VHI, its shortened version (VHI-10), and the V-RQOL for Mandarin-speaking laryngectomees using PAL and ES, with the aim of establishing which of these instruments is suited to such patients.

Methods: The participants comprised 126 PAL and 26 ES patients from Taiwan who completed the Mandarin VHI and V-RQOL. Fifty-two of these alaryngeal participants then completed both those instruments a second time, between 8 and 64 days later.

Results: One item appearing in both the Mandarin long-form VHI and the VHI-10 was excluded because more than half the participants left it unanswered. The correlation of scores on the remaining 29 items on the former with the nine on the latter was high (r = 0.968), while that between the former and V-RQOL scores was moderate (r = –0.569), as was the correlation between short-form VHI and Mandarin V-RQOL scores (r = –0.582). Structural equation modeling was then used as the basis for simplifying the Mandarin long-form VHI into a new 10-item VHI specifically for alaryngeal Mandarin speakers (MA-VHI-10), to eliminate the scoring effect of the original VHI's and VHI-10's work-related item. MA-VHI-10 scores were highly correlated with those on the Mandarin long-form VHI (r = 0.983).

Conclusion: The Mandarin versions of long-form VHI, short-form VHI, and MA-VHI-10 are interchangeable for a Mandarin-speaking alaryngeal population. However, neither of the former two instruments should be substituted for the V-RQOL.

Keywords: Esophageal speech; Pneumatic artificial laryngeal speech; Total laryngectomy; Voice handicap index; Voice-related quality of life

1. INTRODUCTION

Self-report instruments are useful means of learning the magnitude of patients' problems.[1] Several such instruments have been developed to measure voice-related quality of life, including the Voice Handicap Index (VHI),[1] the 10-item VHI (VHI-10),[2] the Voice-Related Quality of Life Measure (V-RQOL),[3] the Voice Outcome Survey,[4] the Voice Activity and Participation Profile,[5] the Voice Symptom Scale,[6] and the Self-Evaluation of Communication Experiences After Laryngectomy (SECEL).[7] Among them, three of the most commonly used are the VHI, VHI-10, and V-RQOL.[8,9] However, apart from the SECEL, there are few if any alaryngeal-specific measures of the psychosocial consequences of total laryngectomy.[7] In the absence of such alternatives, the VHI, VHI-10, and V-RQOL—all of which are voice-related measures—are often adopted to assess the impact of voice problems on alaryngeal patients.[10–23]

Understanding the relationship between these voice-related instruments will facilitate clinicians' assessments of the impact of laryngectomies on patients' quality of life. Prior statistical results have indicated a strong correlation between scores on the VHI and V-RQOL in groups of 65, 132, and 150 patients with voice disorders,[24–26] as well as in a group of 54 alaryngeal patients using valved speech.[15] Correlation between the VHI-10 and V-RQOL, meanwhile, was found to be strong in a large group of 804 dysphonic patients.[9] However, no studies have hitherto compared the VHI, VHI-10, and V-RQOL with a group of alaryngeal patients using pneumatic artificial larynx (PAL) or esophageal speech (ES), and the degree to which these instruments are comparable for alaryngeal Mandarin speakers has not previously been examined either.

PAL and ES speech are two commonly adopted alaryngeal phonations in Taiwan. Because a prior survey of 148 laryngectomees showed that 62.5% of them used PAL speech and 18.4%,

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ES speech,[27] the present study focused on alaryngeal patients from these two groups. As aformentioned, the VHI, VHI-10, and V-RQOL are not alaryngeal-specific measures.[1–3] The purpose of the current study is twofold: first, to compare the responsiveness of the Mandarin version of the VHI against that of its shortened version and the V-RQOL among a sample of alaryngeal speakers in Taiwan and second, to provide another option for clinicians to assess the quality of life for individuals who had total laryngectomies after retirement or who had been unemployed for a long period, for whom there is currently no reasonable response option to the work-related statement in the measure. This has an effect on the scoring of the VHI and VHI-10, which in turn affects how clinicians interpret the results.[15] The present study, therefore, proposes that a new subset of 10 items from the original VHI be used as a Mandarin alaryngeal VHI (MA-VHI-10), to eliminate the scoring effect of the original VHI's and VHI-10's work-related item.

2. METHODS

2.1. Participants

The participants were 152 patients with total laryngectomies who used either a PAL (n = 126) or ES speech (n = 26) as their primary mode of verbal communication (Table 1). All could comprehend and complete the questionnaire by themselves. Table 1 also sets forth the subjects' cancer treatment types, sexes, and ages. The PAL group members were aged from 39 to 82 and the ES ones, 35 to 74. All participants were members of the Association of Laryngectomees in Taiwan, which offers free weekly 2-hour rehabilitation classes. Questionnaires were sent by mail for participants to self-administer if they did not attend these classes regularly. Data were collected with the approval of the Institutional Review Board of the Chung Shan Medical University Hospital, and all the participants gave their informed consent to take part.

The study commenced in 2017 and was completed in 2021. During that 4-year time frame, data from 101 of the participants who filled out the VHI and from 104 who filled out the V-RQOL were published separately.[21,22] The current study continued collecting data derived from both those instruments until the number of participants reached 152.

Table 1

Characteristics of speakers with total laryngectomy (n = 152)

Characteristics	Number of patients (%)	Mean (SD)	Range
Sex			
Female	6 (3.9)		
Male	146 (96.1)		
Age, y		60.7 (9.10)	35-82
≤40	2 (1.3)		
41-50	17 (11.2)		
51-60	57 (37.5)		
61-70	55 (36.2)		
71-80	17 (11.2)		
>80	4 (2.6)		
Cancer treatment			
Surgery alone	41 (27.0)		
Surgery and radiation	29 (19.1)		
Surgery and chemotherapy	6 (3.9)		
Surgery, chemotherapy, and radiation	76 (50.0)		
Alaryngeal speech mode			
Esophageal speech	26 (17.1)		
Age, y		59.5 (9.70)	35-74
Pneumatic artificial laryngeal speech	126 (82.9)		
Age, y		60.9 (8.98)	39-82

Adapted from Wang CC, Liao JS, Lai HC, Lo YH. The Mandarin Voice Handicap Index for laryngectomees with pneumatic artificial laryngeal and esophageal speech. Am J Speech Lang Pathol 2021;30:1781–92. 2021 by American Speech-Language-Hearing Association. Adapted with permission.

2.2 . Instruments

The VHI, V-RQOL, and VHI-10 used in the present study were all in Mandarin, and the former two were published in the authors' previous studies.[1–3,21,22] The VHI's three dimensions assess the functional, physical, and emotional domains, respectively (Supplementary Appendix A, http://links.lww.com/JCMA/A150).[1,21] Each of these three dimensions includes 10 items. Patients are asked to rate its 30 statements using a five-point Likert-type scale, ranging from 0 = never to 4 = always. A total VHI score, obtained by adding up the gross values assigned to each item, therefore, ranges from 0 to 120; and the higher the score, the greater the respondent's perception of his/her own voice handicap. The VHI-10, which is the 10-item version of the VHI, can be seen in full in Supplementary Appendix B (http://links.lww.com/JCMA/A150).[2] The V-RQOL was developed for assessing the treatment outcomes of dysphonic patients by measuring two primary domains, social-emotional and physical functioning (Supplementary Appendix C, http://links.lww.com/JCMA/A150),[3,22] via four and six items, respectively. Patients are asked to rate these 10 statements using a five-point Likert-type scale, ranging from 1 = not a problem to 5 = the problem is as bad as it can be. Scores for the social-emotional and physical functioning dimensions, and the final composite/10-question V-RQOL score, are converted using an algorithm to a scale of 0 to 100. The higher a person's V-RQOL score, the better their voice-related quality of life.[3]

2.3. Procedure

All 152 alaryngeal participants were asked to complete Mandarin versions of the V-RQOL and the 30-item VHI.[21,22] The ideal number of participants to fill out these questionnaires would have been five or 10 times the number of items in them.[28] Importantly, those participants who were retired or long-term unemployed were allowed not to answer the VHI's item F22, "My voice problem causes me to lose income," because a forced choice would not reflect their real situations.

2.4. Test-retest reliability

To determine test-retest reliability, 52 alaryngeal patients, 39 from the PAL group and 13 from the ES group, were asked to fill out the Mandarin VHI and V-RQOL a second time. The mean interval between these first and second response sessions was 13 days, with an SD of 12 days (range, 8-64 days).

2.5. Statistical analysis

Cronbach's alpha coefficient was used to evaluate internal consistency. Test-retest reliability and correlations between the subscales were analyzed with intraclass correlation coefficients (ICCs). ICC estimates and their 95% CIs were calculated using the SPSS statistical package based on a single-rating, absolute-agreement, two-way random-effects model. Content validity was applied to ascertain whether every item in the instrument represented each measured construct. The correlation between V-RQOL and Mandarin VHI scores was analyzed with Spearman correlation coefficients.

3. RESULTS

Item F22 of the Mandarin VHI was excluded altogether because >50% of the participants left it unanswered. The mean score assigned to the responses to the same instrument's other 29 items was 54.55 (SD = 28.54; range, 0-116 points). Mean score for the responses to the nine items that remained on the Mandarin

VHI-10 after the exclusion of item F22 was 18.61 (SD = 9.11; range, 0-36 points). The mean raw score for the responses to the 10 items on the Mandarin V-RQOL was 25.93 (SD = 9.81; range, 10-50 points).

Scores for the 29 Mandarin VHI items were classified into three categories, based on self-perception of severity. V-RQOL responses were classified into four, based on self-perception of satisfaction (Tables 2 and 3).

3.1. Internal consistency analysis

In the 29-item version of the VHI, nine items (1, 3, 5, 6, 8, 11, 12, 16, and 19) pertain to the functional domain, 10 (2, 4, 10, 13, 14, 17, 18, 20, 21, and 26) to the physical domain, and 10 (7, 9, 15, 23, 24, 25, 27, 28, 29, and 30) to the emotional domain. A Cronbach's alpha value above 0.7 is considered to represent acceptably high reliability. Cronbach's alpha coefficients were well above this threshold for the functional (0.938), physical (0.942), and emotional (0.949) subscales and for the questionnaire as a whole (0.978).

In the nine-item version of the VHI, four items (1, 3, 16, and 19) pertain to the functional domain, three (10, 14, and 17) to the physical domain, and two (23 and 25) to the emotional domain. Again, high Cronbach's alpha coefficients were computed for the functional (0.869), physical (0.806), and emotional (0.874) subscales and for the overall instrument (0.936).

Lastly, in the V-RQOL, four items (4, 5, 8, and 10) relate to social-emotional functioning and six (1, 2, 3, 6, 7, and 9) to physical functioning. Cronbach's alphas were again high for both domains (social-emotional, 0.910; physical functioning, 0.889) and for the instrument as a whole (0.937).

3.2. Test-retest reliability

The gaps between the two administrations of the VHI and V-RQOL to the present study's subsample of 52 patients were categorized into two lengths: between 8 and 28 days (n = 48) and ≥29 days (n = 4). Based on the 95% CIs of the ICC estimates, correlation coefficients imply good reliability if between 0.75 and 0.9 and excellent reliability if >0.9.[29] With respect to the VHI, strong test-retest reliability was identified both for the total score and for each subscale's score, with ICCs ranging from 0.82 to 0.87 (Table 4). In the case of the V-RQOL, strong test-retest reliability was identified for total score and both domains' scores, with all ICCs being 0.88 or 0.89 (Table 4).

3.3. Content validity

Pearson or Spearman correlations have both been extensively used in studies relating to the correlation of instruments. This section, therefore, reports values for both. Henceforth, the phrase "Mandarin long-form VHI" will be used to refer to the 29 items from the 30-item VHI that remained after deleting Item F22; and "Mandarin short-form VHI" will refer to the nine items from the VHI-10 that remain following the same deletion.

In the Mandarin long-form VHI, the correlation values of item scores with total score ranged between 0.628 and 0.861 (Pearson), and between 0.608 and 0.859 (Spearman). The value of corrected item with total correlation was between 0.601 and 0.848. Both types of correlations were also computed to assess the relationship between total score and the three subscale scores, and these were found to be high: ranging from 0.881 to 0.968 (Pearson) and from 0.869 to 0.965 (Spearman).

With respect to the Mandarin short-form VHI, the correlation values of item score with total score were between 0.647 and 0.886 (Pearson) and between 0.627 and 0.877 (Spearman). The value of corrected item with total correlation was between 0.558 and 0.853. Both types of correlation coefficients were again calculated to assess the relationship between total score and the three subscale scores, and these were also found to be high: 0.756 to 0.963 (Pearson) and 0.750 to 0.962 (Spearman).

For purposes of analyzing the V-RQOL, scores were obtained by adding up the gross value from each statement. The correlation values of item score with total score were between 0.694 and 0.852 (Pearson) and between 0.693 and 0.840 (Spearman). The value of corrected item with total correlation was between 0.615 and 0.814. When both types of correlations were performed to assess the relationship between the total score and the two subscale scores, these were again found to be high: from 0.820 to 0.967 (Pearson) and from 0.778 to 0.959 (Spearman).

3.4. Spearman's rank-order correlation

Overall scores on the Mandarin long-form VHI, short-form VHI, and V-RQOL for all 152 alaryngeal patients were used for analysis (Tables 5 to 7; Fig. 1). The Spearman correlation coefficient of the comparison between the long-form and short-form Mandarin VHIs' overall scores was 0.968 ($p < 0.001$). The same coefficient for the comparison of the long-form Mandarin VHI's and V-RQOL's overall scores was –0.569 ($p < 0.001$) and for that of the short-form Mandarin VHI's and V-RQOL's overall scores was –0.582 ($p < 0.001$). The ranges of these results have the following meaning: a value <0.3 (including a negative value) indicates poor correlation; values between 0.3 and 0.5, fair correlation; those between 0.5 and 0.7, good correlation; and those between 0.7 and 0.9, excellent correlation.

Table 2

Pattern of long-form VHI scores

Overall score	Score	SD	Number of patients	%
Minimal (0-30)	16.52	9.79	33	21.7
Moderate (31-60)	45.37	9.16	54	35.5
Severe (61-120)	81.49	15.83	65	42.8

Long-form VHI: 29 items from the VHI (item 22 excluded).
VHI = Voice Handicap Index.

Table 3

Pattern of V-RQOL scores

Grade	Score	SD	Number of patients	%
Excellent (76-100)	86.79	6.78	46	30.3
Fair to good (51-75)	63.60	6.53	57	37.5
Poor to fair (25-50)	39.05	7.46	37	24.3
Poor (<25)	6.88	7.16	12	7.9

The scores for the social-emotional and physical functioning domains, and a final composite 10-question V-RQOL score were converted algorithmically to a scale of 0 to 100.
V-RQOL = Voice-Related Quality of Life.

Table 4

Test-retest reliability for domain and total scores

			95% CI	
Questionnaire	Domain	Intraclass correlation	Lower bound	Upper bound
Long-form VHI	Functional subscale	0.872	0.787	0.924
	Physical subscale	0.828	0.715	0.898
	Emotional subscale	0.830	0.721	0.898
	Total score	0.864	0.775	0.919
V-RQOL	Social-emotional	0.881	0.801	0.930
	Physical functioning	0.890	0.816	0.935
	Total score	0.897	0.828	0.940

Long-form VHI: 29 items from the VHI (item 22 excluded).
V-RQOL = Voice-Related Quality of Life; VHI = Voice Handicap Index.

Table 5

Spearman correlation coefficients between total and subdomain scores, long-form VHI, and short-form VHI

	1	2	3	4	5	6	7	8
Long-form VHI (29 items)								
Functional	0.965							
Physical	0.951	0.880						
Emotional	0.964	0.911	0.869					
Short-form VHI (9 items)	0.968	0.959	0.908	0.927				
Functional	0.937	0.970	0.846	0.892	0.962			
Physical	0.899	0.852	0.925	0.822	0.915	0.818		
Emotional	0.860	0.832	0.769	0.891	0.901	0.829	0.750	

All correlations are significant at the 0.01 level. Long-form VHI: 29 items from the VHI (item 22 excluded). Short-form VHI: nine items from VHI-10 (item 22 excluded).
VHI = Voice Handicap Index; VHI-10 = 10-item Voice Handicap Index.

3.5. Structural equation modeling

The present study utilized structural equation modeling (SEM) to perform confirmatory factor analysis as a means of reducing the selected 29 items of the original VHI to form a new instrument, the 10-item MA-VHI-10, specifically for use by alaryngeal speakers. The data used for this purpose were the scores assigned to those 29 items by all 152 participants. The LISREL 8.8 software for Windows and its default maximum likelihood estimation method were used to estimate parameters. The process of SEM item selection was based on the modification index (MI), the sizes of factor loadings, and the following guidelines. First, the item with the highest MI value was deleted, followed by the next highest, and this process was continued until an acceptable level of fit indices was achieved. Second, in cases where items had a factor loading of <0.7, the items were dropped from the construct. Third, if the MI values of a pair of items had a high correlation to each other, the item that lowered the χ^2 value most was deleted.[30,31]

The validity of MA-VHI-10 was examined using overall model fit. The fit indices used were the Goodness of Fit Index (GFI), the Adjusted Goodness of Fit Index (AGFI), the Comparative Fit Index (CFI), the Root Mean Square Error of Approximation (RMSEA), and the Standardized Root Mean Square Residual (SRMR). In general, the criteria for an acceptable data fit include an RMSEA value below 0.08, SRMR value below 0.05, and other fit-index values above 0.90.[32] A χ^2 value that is nonsignificant also indicates a good model fit. In the present study, as indicated in Fig. 2, all these criteria were met (after

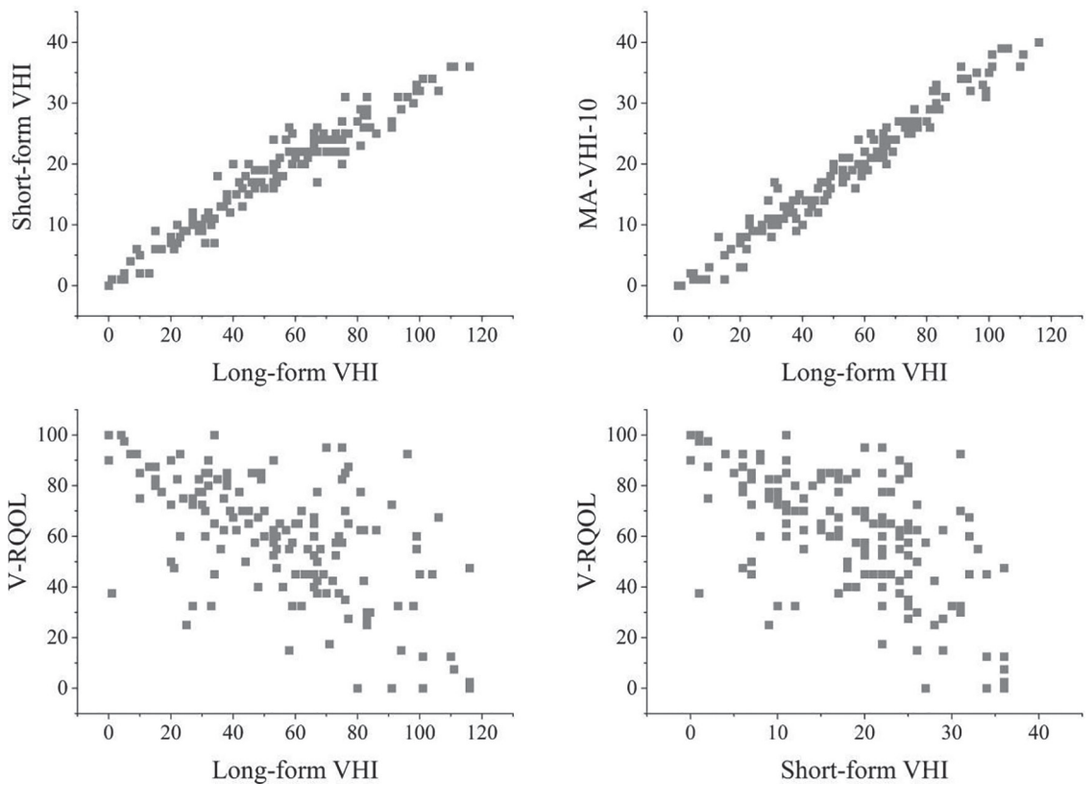

Fig. 1 Correlations between pairs of instruments based on their total scores. Long-form VHI data exclude the score for item F22 in the Voice Handicap Index. Short-form VHI data exclude the score for item F22 in VHI-10.[2] MA-VHI-10: the current study's reduction of the 29 items in VHI to form a set of 10 items that differs from the set in the VHI-10 developed by Rosen et al.[2] MA-VHI-10 = Mandarin alaryngeal 10-item Voice Handicap Index; V-RQOL = Voice-Related Quality of Life; VHI = Voice Handicap Index.

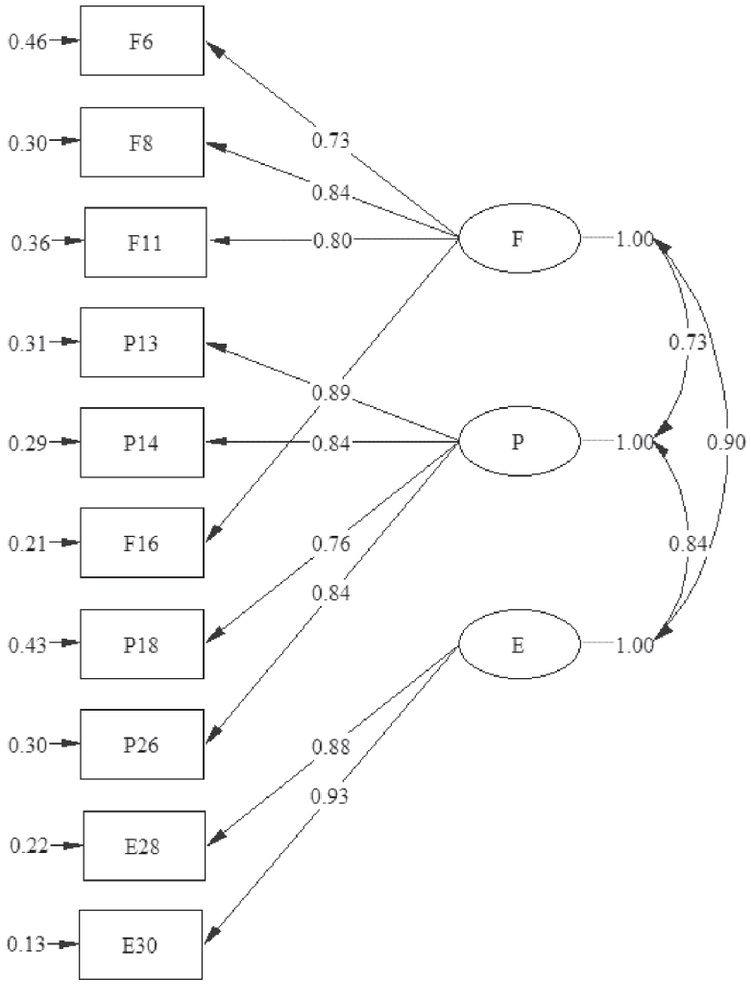

Fig. 2 Results of structural equation modeling. The arrows from the three factors (E, F, and P) in ovals to the 10 variables in squares represent factor loadings, which ranged between 0.73 and 0.93 for the 10 items. The numbers next to each of the 10 variables in squares represent their respective error values, which ranged between 0.13 and 0.46. E = emotional; F = functional; P = physical.

item deletion: χ^2 [32, N = 152] = 45.56, p = 0.057, GFI = 0.94, AGFI = 0.90, CFI = 0.99, RMSEA = 0.05, SRMR = 0.03). The arrows from the factors to the observable variables represent factor loadings (Table 9; Fig. 2).

The participants' mean score on the MA-VHI-10 was 19.07 (SD = 10.34; range, 0-40 points). There was a correlation between total score on the Mandarin version of the VHI and that on the MA-VHI-10 of 0.983 (Spearman; $p < 0.001$). Cronbach's alpha coefficients for the MA-VHI-10's total score and for its functional, physical, and emotional subscales were 0.947, 0.904, 0.891, and 0.906, respectively.

A one-way between-subjects analysis of variance was then conducted to explore the effect of speech modes on the functional, physical, and emotional aspects of the participants' self-reported voice problems. The results indicated that the use of PAL vs ES had no significant effect on functional aspects (F(1, 150) = 0.345; p = 0.558), physical aspects (F(1, 150) = 0.173; p = 0.678), or emotional aspects (F(1, 150) = 0.002; p = 0.965).

4. DISCUSSION

In evaluating outcomes in post-laryngectomy recovery and rehabilitation, the ability to communicate is a critical dimension. Administering broad-based quality-of-life questionnaires to Mandarin-speaking alaryngeal patients is important, insofar as the impact of undergoing a total laryngectomy on the life of an individual does not necessarily have a direct relationship with the magnitude of the voice-related problems she/he experiences.[1,3,21,22] Prior research has used the VHI, VHI-10, or V-RQOL for this purpose. To align with those VHI, VHI-10, and V-RQOL studies, this one evaluated the validity of the physical, functional, and emotional aspects of the Mandarin long-form VHI and Mandarin short-form VHI, and the validity of the social-emotional and physical functioning aspects of the Mandarin V-RQOL for alaryngeal patients, as well as differences between PAL and ES patients' perceived voice handicaps. Strong test-retest reliability for the total and domain scores was found.[21,22]

Close examination of the degree to which the Mandarin long-form and short-form VHI and the V-RQOL are comparable for alaryngeal Mandarin speakers revealed a very high correlation between the Mandarin long-form and short-form VHI, both overall and in all their domains (Table 5; Fig. 1). This suggests that the two instruments assess the same constellation of voice complaints and can be substituted for each other when assessing total laryngectomies' impact on the quality of life of Mandarin

Table 6

Spearman correlation coefficients between total and subdomain scores, long-form VHI, and V-RQOL

	1	2	3	4	5	6	7
Long-form VHI (29 items)							
Functional	0.965						
Physical	0.951	0.880					
Emotional	0.964	0.911	0.869				
V-RQOL	–0.569	–0.560	–0.529	–0.562			
Social-emotional	–0.513	–0.492	–0.466	–0.537	0.920		
Physical functioning	–0.556	–0.557	–0.524	–0.531	0.959	0.778	

All correlations are significant at the 0.01 level. Long-form VHI: 29 items from the VHI (item 22 excluded).
V-RQOL = Voice-Related Quality of Life; VHI = Voice Handicap Index.

Table 7

Spearman correlation coefficients between total and subdomain scores, short-form VHI and V-RQOL

	1	2	3	4	5	6	7
Short-form VHI (9 items)							
Functional	0.962						
Physical	0.915	0.818					
Emotional	0.901	0.829	0.750				
V-RQOL	–0.582	–0.584	–0.488	–0.548			
Social-emotional	–0.516	–0.509	–0.421	–0.518	0.920		
Physical functioning	–0.574	–0.581	–0.493	–0.517	0.959	0.778	

All correlations are significant at the 0.01 level. Short-form VHI: nine items from VHI-10 (item 22 excluded).
V-RQOL = Voice-Related Quality of Life; VHI = Voice Handicap Index; VHI-10 = 10-item Voice Handicap Index.

speakers. Thus, clinicians can choose either one, depending on their needs. Short-form instruments may be more attractive to those working in busy outpatient departments, whereas long-form ones may provide richer information in research settings.[33]

However, the correlations between, on the one hand, both the long-form and short-form Mandarin versions of the VHI, and on the other, the V-RQOL, were moderate in all domains (Tables 6 and 7; Fig. 1). Although these findings are generally consistent with those reported in the literature, the degree of correlation in the current study is not as high as reported elsewhere.[9,15,24–26] The moderate correlation between these two types of instruments means they should not be substituted for each other. The variables driving this nonsubstitutable character may include respondents' age, treatment type (eg, radiation vs chemotherapy),[15] types of vocal dysfunctions,[25] socioeconomic status and social support,[23] cross-cultural differences and individual cultural backgrounds,[34] and speech modes. In terms of the latter, it should be noted that prior studies by Kasper et al,[24] Portone et al,[25] and Dehqan et al,[26] all of whose participants were laryngeal, reported strong correlations between scores on the VHI and V-RQOL. Kazi et al[15] reported similar results with participants who were alaryngeal, but in contrast to the present study's, they used valved speech. In light of the current article's finding that the V-RQOL cannot be replaced by either the VHI or its shortened version, clinicians will need to carefully consider which type of instrument is better suited to their particular quality-of-life assessment needs.

The existing VHI instruments' income-related question allows laryngectomees who have retired or been unemployed for a lengthy period no reasonable answer option, and tellingly, the majority of the current study's participants left it unanswered.[15] This effect undoubtedly skews score calculations for both the long- and short-form VHIs. For that reason, the present researchers developed another set of 10 items from the original 30-item VHI, to better assess the impact of total laryngectomies on Mandarin speakers' quality of life. Statistical analysis confirmed that the newly selected 10 items of the MA-VHI-10 could sensitively measure voice-related changes in PAL users and ES speakers (Table 9), and the correlations between Mandarin

Table 8

Spearman correlation coefficients between total and subdomain scores, long-form VHI, and VHI-10 for Alaryngeal Mandarin speakers

	1	2	3	4	5	6	7	8
Long-form VHI (29 items)								
Functional	0.965							
Physical	0.951	0.880						
Emotional	0.964	0.911	0.869					
MA-VHI-10	0.983	0.958	0.924	0.952				
Functional	0.911	0.950	0.794	0.891	0.942			
Physical	0.911	0.843	0.961	0.824	0.906	0.752		
Emotional	0.895	0.829	0.804	0.939	0.914	0.828	0.763	

All correlations are significant at the 0.01 level. Long-form VHI: 29 items from the VHI (item 22 excluded); MA-VHI-10: the current study's reduction of the 29 items in VHI to form a set of 10 items that differs from the set in the VHI-10 developed by Rosen et al.[2]
MA-VHI-10 = Mandarin alaryngeal 10-item Voice Handicap Index; VHI = Voice Handicap Index; VHI-10 = 10-item Voice Handicap Index.

Table 9

MA-VHI-10 for Alaryngeal Mandarin speakers

MA-VHI-10	
F6	I use the phone less often than I would like.
F8	I tend to avoid groups of people because of my voice.
F11	I speak with friends, neighbors, or relatives less often because of my voice.
F16	My voice difficulties restrict personal and social life.
P13	My voice sounds creaky and dry.
P14	I feel as though I have to strain to produce voice.
P18	I try to change my voice to sound different.
P26	My voice "gives out" on me in the middle of speaking.
E28	I feel embarrassed when people ask me to repeat.
E30	I am ashamed of my voice problem.

The letter preceding each item number corresponds to the subscale (E, F, and P) in the VHI (Supplementary Appendix A, http://links.lww.com/JCMA/A150).
E = emotional subscale; F = functional subscale; MA-VHI-10 = Mandarin alaryngeal 10-item Voice Handicap Index; P = physical subscale; VHI = Voice Handicap Index.

long-form VHI and MA-VHI-10 scores were high across all domains (Table 8; Fig. 1). This high correlation suggests that the two instruments are interchangeable. As a universal instrument, the VHI-10 developed by Rosen et al[2] would ideally allow data sets to be compared and contrasted across countries and cultures. The patient-reported outcomes captured by the newly selected 10 items from the original VHI adequately reflected the impact of voice disorders on alaryngeal Mandarin speakers' everyday lives statistically and at the same time, minimized the unnecessarily wide overall and functional domain score discrepancies that could have arisen from the inclusion of an income item that was not relevant to a high proportion of such patients.

When interpreting the present study's findings, however, the following limitations should be borne in mind. First, its patient data were collected at one time point or at most two time points not more than two months apart, and it, therefore, could not evaluate change in quality of life over the long term. Thus, future research that is truly longitudinal is warranted. Second, previous studies have indicated that none of the current instruments are ideal because of major deficiencies in item generation and reduction,[8,9] and the current study encountered a similar situation. Specifically, its use of SEM to reduce the original 29 VHI items down to 10 could have meant that the final item set was affected by selection bias, given that only 152 alaryngeal Mandarin speakers were included. Future studies of this topic could, therefore, usefully include larger numbers of participants.

In conclusion, numerous studies have sought to capture their participants' voice outcomes using the VHI, the VHI-10, and the V-RQOL. The current research has increased our understanding of the degree to which these instruments are comparable and thus is expected to help clinicians choose the one most suitable for patients with specific disorders. The Mandarin versions of the long- and short-form VHI and the newly developed MA-VHI-10 were found to be highly correlated, which suggests that the two instruments are interchangeable when studying alaryngeal Mandarin-speaking populations. However, the present study's data do not support the replacement of the V-RQOL by either the long- or the short-form VHI when studying such a population. Rather, VHIs and the V-RQOL capture different aspects of the key problems that alaryngeal patients experience and thus can effectively complement each other as components of a follow-up strategy for individuals undergoing post-laryngectomy communication rehabilitation.

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APPENDIX A. SUPPLEMENTARY DATA

Supplementary data related to this article can be found at http://links.lww.com/JCMA/A150.

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