Application of the Mandarin Chinese Version of the Voice Handicap Index

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Summary: Objectives. To investigate the characteristics and clinical application of Mandarin Chinese version of the Voice Handicap Index (VHI).

Methods. A cross-culture adaptation was used to develop the Mandarin Chinese version of the VHI. The translated version was then administered to 1766 dysphonic patients and 120 control subjects; 210 of the patients were treated with phonosurgery or BOTOX injection. Disorders were chronic laryngitis, benign vocal fold disorders, pathologic sulcus vocalis, benign or malignant tumors of vocal fold, spasmodic dysphonia (SD) and unilateral vocal fold paralysis (UVFP), and functional dysphonia.

Results. The Cronbach’s α score for the overall VHI was 0.956; the functional, physical, and emotional subscales had values of 0.922, 0.872, and 0.933, respectively. The test-retest reliability coefficient was 0.991 (P < 0.01). Correlations between the subscales and the overall VHI as well as among the subscales were all significant (P < 0.01) Principal-component analysis revealed six-factor eigenvalues exceeding 1, explaining 75.39% of the total variance. The total VHI scores and subscale scores were statistically higher for dysphonic groups (P < 0.001). The order of disease classification from highest score to lowest score was: SD, functional dysphonia, UVFP, sulcus vocalis, benign and malignant tumor, benign vocal fold disorders, and chronic laryngitis. The emotional scores were the highest in SD, and followed by functional dysphonia; the physical scores were the highest in the other groups. Treatment leads to statistically improvement in VHI scores (P < 0.05).

Conclusion. The Mandarin Chinese version of VHI appears to be a reliable and valid tool in assessing dysphonia in Mandarin Chinese speakers.

Key Words: Voice Handicap Index–Quality of life–Mandarin Chinese version–Voice disorders.

INTRODUCTION

Verbal communication is integral to day-to-day interactions; therefore voice disorders affect not only the voice quality, but can also contribute to psychological and social problems, altering the patient’s quality of life. To reflect the impact the dysphonia has on a patient’s life, subjective personal evaluations should be employed in addition to objective measures. There are several patient self-assessment instruments designed to measure the effect dysphonia has on the quality of life. These measures include the Voice Handicap Index (VHI),1 the voice-related quality of life (V-RQOL) measure,2 the Voice Outcome Survey,3 and the Voice Symptom Scale (VoSS).4 The VHI was developed in 1997 by Jacobson et al.5 Various publications have reported that the VHI is clinically applicable and can be used to evaluate the effectiveness of various therapies.5-10 To date, the VHI questionnaire has been translated and adapted into German, Spanish, Portuguese, Dutch, Hebrew, and Chinese. Recently, studies by Hsiung et al.8 and Lam et al.9 reported the application of the VHI in Tai Wan (Taiwanese) and Hong Kong (Cantonese) Chinese populations, respectively. However, the reliability, the validity of the Chinese VHI was untested in the study by Hsiung et al.8 Lam et al9 just published backward translated version of the Chinese VHI; the Mandarin Chinese version of the VHI questionnaire has not yet been published and explored for use in the evaluation of Mandarin-speaking dysphonic people in mainland China.

The primary purpose of the investigation was to develop a Mandarin Chinese version of the VHI and then to investigate its reliability and validity as well as its clinical application.

SUBJECTS AND METHODS

Translation and cross-cultural adaptation

A cross-cultural adaptation of the original VHI was used to develop our Mandarin Chinese version according to the standard procedures used for health-related quality of life (HRQOL) measures.11 The original English version of the VHI was translated into Mandarin Chinese independently by four translators. Three of the translators were voice experts and the fourth was a language expert. The initial translations in Mandarin Chinese were reviewed and modified by clinical voice experts. In a preliminary investigation, the reviewed versions of the Mandarin Chinese VHI were given to 30 dysphonic patients and 30 control subjects (they were not included in 1886 cases discussed in this article). After this preliminary trial, the items were further evaluated and modified according to Chinese cultural and language habits to develop the revised Mandarin Chinese versions of the VHI. The primary purpose of the investigation was to develop a Mandarin Chinese version of the VHI and then to investigate its reliability and validity as well as its clinical application.
Subjects
This study included 1776 dysphonic patients and 120 control subjects. The patients visited our Department of Otolaryngology-Head and Neck Surgery between July 2006 and August 2008. The age range in the dysphonic group was 6–86 years (mean: 43), with 995 female and 771 male patients. All patients underwent general head and neck examination, videostroboscopic examination, and acoustic analysis. Some of the patients needed further laryngeal electromyography or pathological examination to diagnose their condition. The medical procedure was approved by our institutional review board.

The patients were categorized into six different groups on the basis of their diagnosis. Chronic laryngitis was detected in 463 patients. The 945 patients with benign vocal fold disorders, including vocal nodules, vocal polyps, vocal cysts, or Reinke’s edema, were grouped together. Pathologic sulcus vocalis was diagnosed in 95 patients. One hundred and twenty-five patients were grouped together with benign or malignant tumors localized in the vocal fold benign tumors, including adult-onset papilloma, fibroma, or hemagioma. A remaining 84 patients displayed unilateral vocal fold paralysis (UVFP), and 32 patients presented with spasmodic dysphonia (SD). A final group of 22 patients were diagnosed with functional dysphonia.

Two hundred and ten of the patients were treated with phonosurgery or BOTOX injection. These patients needed to complete the VHI twice at pretreatment and 2 months after BOTOX injection for SD patients and 6 months postoperatively for the other patients.

The control group consisted of family members of patients visiting our department. The group included 50 men and 70 women ranging in age from 16 to 70 years (median: 36). All control subjects agreed to be volunteers. They had no history of voice disorders, and they had normal articulation and resonance.

All patients and control subjects were asked to complete our Mandarin Chinese version of VHI. The questionnaire consisted of 30 items, addressing functional (F), physical (P), and emotional (E) aspects of voice disorders. When completing the VHI, the patient was asked to rate each statement with a score between 0 (never) and 4 (always), resulting in a minimum total score of 0 and a maximum total score of 120. The more severe the patient perceived their voice handicap, the higher their score on the VHI.

Analysis
The SPSS/PC 8.0 package (SPSS Inc., Chicago, IL) was used for statistical analysis of the data. Cronbach’s α statistic was used to evaluate internal consistency. Test-retest reliability and correlation between the subscales was analyzed with Pearson correlation coefficients. Factor analysis was used to evaluate construct validity. Discrimination validity was confirmed with rank-sum and multiple-comparison tests.

RESULTS
Internal consistency
Internal consistency was determined by calculating Cronbach’s α. In this study, Cronbach’s α coefficient in the patient group

### TABLE 1.

<table>
<thead>
<tr>
<th>VHI</th>
<th>Rank-Sum Test</th>
<th>Pearson Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Z</td>
<td>P</td>
</tr>
<tr>
<td>Total</td>
<td>0.524</td>
<td>0.535</td>
</tr>
<tr>
<td>Functional</td>
<td>0.421</td>
<td>0.716</td>
</tr>
<tr>
<td>Physical</td>
<td>0.977</td>
<td>0.413</td>
</tr>
<tr>
<td>Emotional</td>
<td>0.146</td>
<td>0.879</td>
</tr>
</tbody>
</table>

(n = 1766) for the overall VHI was 0.956. On the functional, physical, and emotional subscales, the Cronbach’s α values were 0.922, 0.872, and 0.933.

Test-retest reliability analysis
The first 50 cases (30 patients and 20 control subjects) completed the VHI twice with a 2-week interval. The differences between two VHI scores were not statistically significant (P = 0.535). There was a strong correlation between the first and the second measurement (R = 0.991(50), P < 0.01) (Table 1).

Content validity
Pearson correlation coefficients between the total score and three subscale scores were high; 0.879, 0.869, and 0.901 for the functional, physical, and emotional scales, respectively. Correlation coefficients among the subscale scores ranged from 0.643 to 0.680 (Table 2).

Construct validity
The construct validity of the translated VHI version was evaluated by principal-component analysis (factor analysis). The result shows that six factors were extracted according to the Kaiser criterion of retaining eigenvalues larger than 1.00. The cumulative proportion of the six factors was 75.39% (Table 3), indicating that the six factors accounted for 75.39% of the total variance. The loading was higher than 0.4 for all of the items on the six factors. However, most of the variance was explained by the first factor (43.70%). The six factors were in accordance with three subscales of the VHI. Factor 1 related to the emotional subscale; factor 2, factor 5, and factor 6 related to the physical subscale; factor 3 and factor 4 related to the functional subscale.

### TABLE 2.

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Total Correlation</th>
<th>Functional Correlation</th>
<th>Physical Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Functional</td>
<td>0.879*</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Physical</td>
<td>0.869*</td>
<td>0.643*</td>
<td>—</td>
</tr>
<tr>
<td>Emotional</td>
<td>0.901*</td>
<td>0.688*</td>
<td>0.680*</td>
</tr>
</tbody>
</table>

*P<0.01.
Discrimination validity and clinical application
Rank-sum test and multiple-comparison tests results showed that the total VHI scores and subscale scores were significantly higher for dysphonic groups than for the control group, and there was a significant difference among different diseases \((P < 0.001)\) (Table 4).

The order of disease classification from VHI highest score to lowest score (most debilitating to least debilitating) was: SD, functional dysphonia, UVFP, sulcus vocalis, benign and malignant tumor of vocal fold, benign vocal fold disorders (vocal fold cyst, Reinke’s edema, vocal fold polyp, vocal nodule), and chronic laryngitis. The emotional scores were the highest in SD, followed by functional dysphonia; in other groups, the physical scores were higher than functional scores and emotional scores.

In 210 patients with treatment, 138 (including 91 patients with vocal polyps, 12 patients with vocal cysts, 16 patients with Reinke’s edema, and 19 patients with benign tumors of vocal folds) underwent microphonosurgery. Seventeen patients with early glottal carcinoma underwent cordectomy. Fat or fascia transplantation was performed in 19 patients with pathologic sulcus vocalis, and 15 patients with UVFP. Twenty-one patients with SD were treated with BOTOX injection. Treatment leads to statistically significant improvement in the VHI scores \((P < 0.05)\) (Figure 1).

Table 3.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Items</th>
<th>Eigenvalue</th>
<th>Contribution (%)</th>
<th>Cumulative Proportion (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>One</td>
<td>F9, P10, E1, E2, E4, E5, E7, E8, E9</td>
<td>12.62</td>
<td>43.70</td>
<td>43.70</td>
</tr>
<tr>
<td>Two</td>
<td>P1, P3, P4, P5, P6, P8, E3</td>
<td>2.27</td>
<td>8.43</td>
<td>52.13</td>
</tr>
<tr>
<td>Three</td>
<td>F4, F5, F6, F8</td>
<td>2.14</td>
<td>7.61</td>
<td>59.74</td>
</tr>
<tr>
<td>Four</td>
<td>F1, F2, F3, F7</td>
<td>1.90</td>
<td>6.04</td>
<td>65.78</td>
</tr>
<tr>
<td>Five</td>
<td>P4, P6, P10</td>
<td>1.76</td>
<td>5.34</td>
<td>71.12</td>
</tr>
<tr>
<td>Six</td>
<td>P2, P9, P7</td>
<td>1.36</td>
<td>4.27</td>
<td>75.39</td>
</tr>
</tbody>
</table>

DISCUSSION

The VHI questionnaire is the most widely used self-assessment tool for the patients with dysphonia. It has been formally translated and validated in several languages. In our study, the original VHI questionnaire was translated into Mandarin Chinese according to a standardized procedure of HRQOL measures.

Reliability involves the degree to which the results of measurement are consistent across repeated measurements. The correlations for the complete VHI and all three of the subscales were all above 0.991, suggesting that these measures are reliable when analyzing an individual subject. Cronbach’s \(\alpha\) statistic is a classic method for evaluating the internal consistency of a rating scale. The widely accepted cutoff is a Cronbach’s \(\alpha\) of 0.70 or higher for a scale to be considered acceptably reliable. The higher Cronbach’s \(\alpha\) coefficient, the higher the internal consistency, and the more homogeneous the questions. In this study, Cronbach’s \(\alpha\) coefficient for the overall VHI and three subscales ranged from 0.872 to 0.956. These levels of reliability and internal consistency are similar to other language versions of the VHI.5,7

Validity is the degree to which an instrument measures the construct it is intended to measure. Analysis with Pearson correlation coefficients indicated that the correlation between the total score and three subscale scores of the translated version was strong (ranging from 0.869 to 0.901), suggesting that all three of the subscales reflect an overall change in quality of life.

Table 4.

<table>
<thead>
<tr>
<th>Groups</th>
<th>n</th>
<th>Total (Mean ± SD)</th>
<th>Functional (Mean ± SD)</th>
<th>Physical (Mean ± SD)</th>
<th>Emotional (Mean ± SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control group</td>
<td>120</td>
<td>2.09 ± 3.07</td>
<td>0.38 ± 0.93</td>
<td>1.45 ± 2.33</td>
<td>0.02 ± 0.13</td>
</tr>
<tr>
<td>Dysphonic patients</td>
<td>1766</td>
<td>42.85 ± 23.97</td>
<td>11.41 ± 8.92</td>
<td>19.63 ± 8.57</td>
<td>11.52 ± 9.76</td>
</tr>
<tr>
<td>Chronic laryngitis</td>
<td>463</td>
<td>32.92 ± 22.55</td>
<td>8.07 ± 8.59</td>
<td>17.72 ± 9.51</td>
<td>8.12 ± 8.63</td>
</tr>
<tr>
<td>Benign vocal fold disorders</td>
<td>945</td>
<td>38.57 ± 21.33</td>
<td>9.28 ± 8.31</td>
<td>20.36 ± 9.23</td>
<td>10.07 ± 9.16</td>
</tr>
<tr>
<td>Sulcus vocalis</td>
<td>95</td>
<td>65.25 ± 22.12</td>
<td>17.89 ± 9.21</td>
<td>25.25 ± 6.91</td>
<td>22.11 ± 9.81</td>
</tr>
<tr>
<td>Tumors of vocal fold</td>
<td>125</td>
<td>56.67 ± 25.27</td>
<td>16.78 ± 11.53</td>
<td>25.27 ± 8.66</td>
<td>14.41 ± 10.37</td>
</tr>
<tr>
<td>Spasmodic dysphonia</td>
<td>32</td>
<td>79.16 ± 24.84</td>
<td>23.97 ± 8.99</td>
<td>27.66 ± 7.67</td>
<td>27.53 ± 8.76</td>
</tr>
<tr>
<td>Unilateral vocal fold paralysis</td>
<td>84</td>
<td>67.12 ± 25.23</td>
<td>21.57 ± 10.51</td>
<td>25.42 ± 7.68</td>
<td>19.13 ± 11.18</td>
</tr>
<tr>
<td>Functional dysphonia</td>
<td>22</td>
<td>70.82 ± 25.07</td>
<td>20.27 ± 9.59</td>
<td>26.86 ± 8.29</td>
<td>25.88 ± 12.84</td>
</tr>
</tbody>
</table>

Abbreviation: SD, standard deviation.
\(a\) Comparison between dysphonic patients and control group.
Factor analysis is a technique designed to reveal whether or not the pattern of responses on a number of tests can be explained by a smaller number of underlying traits or factors. These common factors represent the basic structure of questionnaire. The cumulative proportion of common factor is at least 40%, in which each item should be on a higher load (>0.4) in one common factor, and be on a lower load in other common factors. Factor eigenvalue reflects the amount of variance accounted for by each factor. Initial factors were extracted according to the Kaiser criterion of retaining eigenvalues larger than 1.00. In our study, principal-component analysis of construct validity revealed six-factor eigenvalues exceeding 1, explaining 75.39% of the total information of the VHI. The six factors were in accordance with three subscales of the VHI.

Factor analysis detected some inconsistencies within the survey. The factor analysis did not include the items E6 “Because of my voice, I feel handicapped,” E10 “Because of my voice, I feel ashamed,” and F10 “I get less income.” It may be relevant that the Chinese economic and cultural conditions cause lowering of values on these questions. Traditional Chinese culture people are reluctant to confess their strong negative or depressive feelings. Furthermore, China is still a developing country; hence, most people’s income cannot be apparently affected by their voice change. Factor analysis generated results that did not completely conform to the structure of our scale. The item E3 “I find others can’t understand why my voice is like that” is included in factor 2, which relates to the physical subscale. Item P3, “People ask me: ‘What’s wrong with your voice?’” also reflects the response to a patient’s abnormal voice; whether those two items can be merged is still being discussed.

The ability of the questionnaire to discriminate between different vocal-disorder populations demonstrates construct validity. In our study, the total VHI scores and subscale scores were significantly higher for the dysphonic groups than for the control group, and there was a significant difference among different diseases. The order of disease classification from highest score to lowest score (most debilitating to least debilitating) was: SD, functional dysphonia, UVFP, sulcus vocalis, benign and malignant tumor of vocal fold, benign vocal fold disorders, and chronic laryngitis. The emotional subscale scores were the highest in SD, followed by functional dysphonia. It suggests that the emotional and psychological factors play a more important role in the effect of V-RQOL of those patients, and patients with higher emotional subscale scores need to further consult with a psychologist before or after treatment in otolaryngology to obtain satisfactory curative effect. In other groups, the physical scores were higher than functional and emotional scores. Treatment also leads to statistically significant improvement in the VHI scores. Therefore, as a useful supplementary instrument to measure the voice-disorder severity and the treatment’s effect, the VHI questionnaire can comprehensively assess the voice handicap’s effect on the life quality and the difference after the treatment, especially in physical, functional, and emotional aspects.

CONCLUSIONS

Based on the results of this study, the Mandarin Chinese version of the VHI scale has a good reliability and validity when applied to both normal and dysphonic Mandarin Chinese speakers. The measure conforms well to the demands of traditional Chinese culture. The survey presented can be used as a self-assessment tool for dysphonic patients in mainland China.

REFERENCES

Appendix A. Translation of Chinese Version of the Voice Handicap Index

Voice Handicap Index
Instructions: To describe the degree that the problem of your voice has affected your life, please circle the numbers that you feel like the same.
0 = Never 1 = Seldom 2 = Sometimes 3 = Almost Always 4 = Always

PART 1: FUNCTIONAL
F1: It is difficult for others to hear me because of my voice. 0 1 2 3 4
F2: It is difficult for others to understand me in a noisy room. 0 1 2 3 4
F3: My family has difficulty to hear me when I call them in the other room. 0 1 2 3 4
F7: People ask me to repeat when talking face to face. 0 1 2 3 4

Because of my voice:
F4: I use the telephone less times. 0 1 2 3 4
F5: I tend to avoid talking with many people. 0 1 2 3 4
F6: I talk with my friends, neighbors, and relatives less than before. 0 1 2 3 4
F8: My voice restricts my personal and social life. 0 1 2 3 4
F9: I feel it’s difficult for me to join in a conversation. 0 1 2 3 4
F10: I get less income. 0 1 2 3 4

PART 2: PHYSICAL
P1: I feel I run out of air when I talk. 0 1 2 3 4
P2: The sound of my voice varies during a day. 0 1 2 3 4
P3: People ask me: “What’s wrong with your voice?" 0 1 2 3 4
P4: My voice sounds dry and hoarse. 0 1 2 3 4
P5: I feel I must push to produce voice. 0 1 2 3 4
P6: The clarity of my voice is unstable. 0 1 2 3 4
P7: I try to change my voice to make it sound different (better). 0 1 2 3 4
P8: It takes me a lot of effort to speak. 0 1 2 3 4
P9: My voice is worse in the evening. 0 1 2 3 4
P10: My voice goes away in the middle of speaking. 0 1 2 3 4

PART 3: EMOTIONAL
E1: I am nervous when I talk with others because of my voice. 0 1 2 3 4
E2: People feel unhappy by my voice. 0 1 2 3 4
E3: I find others can’t understand why my voice is like that. 0 1 2 3 4

Because of my voice:
E4: It upsets me 0 1 2 3 4
E5: I am less extroverted than before. 0 1 2 3 4
E6: I feel handicapped. 0 1 2 3 4
E7: I feel annoyed when people ask to repeat. 0 1 2 3 4
E8: I feel embarrassed when people ask to repeat. 0 1 2 3 4
E9: I feel incompetent (useless). 0 1 2 3 4
E10: I feel ashamed. 0 1 2 3 4
Appendix B. Mandarin Chinese Version of the Voice Handicap Index

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
<th>Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Functional</td>
<td>言语障碍指数表&lt;br&gt;Voice Handicap Index (VHI)</td>
<td>F1 由于我的嗓音问题别人难以听清我说话 &lt;br&gt;F2 在嘈杂环境中别人难以听明白我说的话 &lt;br&gt;F3 当我在房间另一头叫家人时，他们难以听见 &lt;br&gt;F4 面对面交谈时，别人会要我重复我说过的话 &lt;br&gt;F5 我打电话的次数较以往减少 &lt;br&gt;F6 我会刻意避免在太多的地方与人交谈 &lt;br&gt;F7 我减少与朋友、邻居或亲人说话 &lt;br&gt;F8 限制了我的个人及社交生活 &lt;br&gt;F9 我感到在交谈中话跟不上 &lt;br&gt;F10 我的收入受到影响</td>
</tr>
<tr>
<td>Physical</td>
<td>言语障碍指数表&lt;br&gt;Voice Handicap Index (VHI)</td>
<td>P1 我说话时我会感觉到干燥 &lt;br&gt;P2 我的嗓音是否稳定，会有变化 &lt;br&gt;P3 人们会问我：“你的声音出了什么问题？” &lt;br&gt;P4 我的声音听上去嘶哑干涩 &lt;br&gt;P5 我感到好像需要努力才能发出声音 &lt;br&gt;P6 我声音的清晰度无常 &lt;br&gt;P7 我会尝试改变我的声音以便听起来有所不同 &lt;br&gt;P8 我说话时感到很吃力 &lt;br&gt;P9 我的声音晚上会更差 &lt;br&gt;P10 我说话时会出现失声的情况</td>
</tr>
<tr>
<td>Emotional</td>
<td>言语障碍指数表&lt;br&gt;Voice Handicap Index (VHI)</td>
<td>E1 我的声音使我难以与他人交谈感到紧张 &lt;br&gt;E2 别人听到我的声音会觉得难受 &lt;br&gt;E3 我发现别人并不能理解我的声音问题 &lt;br&gt;E4 我感到苦恼 &lt;br&gt;E5 我变得不如以前外向 &lt;br&gt;E6 我觉得自己身体有缺陷 &lt;br&gt;E7 别人让我重复刚说过的话时，我感到烦恼 &lt;br&gt;E8 别人让我重复刚说过的话时，我感到尴尬 &lt;br&gt;E9 我感到羞愧 &lt;br&gt;E10 我感到羞愧</td>
</tr>
</tbody>
</table>