

The Validation and Reliability of the Chinese Version of the Speech Handicap Index for Patients With Oral and Oropharyngeal Cancer

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Summary: Objectives. The purpose of this study was to investigate the validity and reliability of the translated Chinese version of the Speech Handicap Index (SHI) questionnaire for Chinese-speaking patients with oral and oropharyngeal cancer.

Methods. The original English version of the SHI was translated into Chinese. Forty-two consecutive patients with oral and oropharyngeal cancer were included in the study. All subjects were asked to complete the Chinese version of the SHI and the University of Washington Quality of Life Questionnaire (UWQOL V.04). Fifteen patients were randomly retested on both questionnaires 2 weeks later. The internal consistency, test-retest reliability, construct validity, and group validity of the Chinese version of the SHI were tested using Cronbach α , Spearman correlation coefficient (r), and Mann-Whitney U tests. Descriptive and bivariate statistics were computed, and the P value was set to 0.05.

Results. The Cronbach α for the total SHI, the speech domain, and the psychosocial domain were 0.96, 0.90, and 0.92, respectively. The test-retest reliability scores for the total SHI, the speech domain, the psychosocial domain, and the overall question were 0.94, 0.97, 0.90, and 0.83, respectively. To measure construct validity, Spearman correlation coefficients between different items of the SHI and the UWQOL were all >0.4 , which signified a moderate to significant correlation. There were significant differences between patient groups when divided by age, clinical stage, educational level, radiotherapy, and reconstruction, on all or on parts of the various SHI domains.

Conclusions. The Chinese version of the SHI is a valid and reliable tool for the speech assessment of patients with oral and oropharyngeal cancer.

Key Words: Speech Handicap Index–The University of Washington Quality of Life Questionnaire–Oral and oropharyngeal cancer–Validity–Reliability.

INTRODUCTION

An important goal of the treatment for oral and oropharyngeal cancer was to achieve better disease control with less functional disturbance.¹ Speech problems are one of the most common concerns among patients with oral and oropharyngeal cancer, especially postoperatively, as more than half of all patients with oral and oropharyngeal cancer exhibit speech problems² that directly affect the quality of daily life for this population of patients. The crude incidence rate of oral cavity and pharyngeal cancer was 3.28/100 000 (2803/85 470 522) in China, and there were 2803 newly diagnosed cases according to the 72 cancer registry sites of the National Central Registry Databases in 2009.³

The Speech Handicap Index (SHI), developed originally in the Dutch language by Rinkel et al⁴ in 2008, is the first speech-specific questionnaire for patients with oral and oropharyngeal cancer. Subsequently, the English version of the SHI was successfully validated by Dwivedi et al⁵ in 2010. The French version of the SHI was adapted and validated by Degroote et al⁶ in 2011. However, there has been no validated Chinese version of the SHI until now. The purpose of this study

was to analyze the validity and reliability of the Chinese version of the SHI, as translated from the English version.

MATERIALS AND METHODS

Patients

Personal and medical information of all patients was obtained from medical records. Forty-two consecutive patients with oral and oropharyngeal cancer were collected at Peking University Dental Hospital. Twenty-six men (61.9%) and 16 women (38.1%) were included in the study. The mean age of patients was 56.2 years (range 39–77 years). Eighteen patients had tongue cancer, ten had gingival cancer, seven had a tumor on the floor of the mouth, four were diagnosed with cancer on the base of the tongue, and three patients had cancer in the palate and pharyngeal region. Most patients underwent surgery only (76.2%), whereas 10 patients received radiotherapy and/or chemoradiation after operation. Detailed description of patients characteristics is presented in [Table 1](#).

Patients with distant metastasis, another malignant tumor, or any neuromuscular or serious cognitive disease known to affect speech and phonation were excluded. Patients within the first 6 months of primary surgery, illiterates, and patients aged >80 years were also excluded from the study.

Questionnaires

Two questionnaires were used in this study. One was the validated Chinese version of the University of Washington Quality of Life Questionnaire (UWQOL V.04), and the other was the SHI ([Appendix](#)).

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TABLE 1.
Overview of Patient Characteristics (n = 42)

Characteristic	No. (%)
Sex	
Male	26 (61.9)
Female	16 (38.1)
Age (y)	
Mean (range)	56.2 (39–77); SD, 10.6
Tumor location	
Tongue	18 (42.9)
Gingival	10 (23.8)
Floor of mouth	7 (16.7)
Base of tongue	4 (9.5)
Oropharynx	3 (7.2)
T classification	
T1	11 (26.2)
T2	23 (54.8)
T3	3 (7.1)
T4	5 (11.9)
N classification	
N0	35 (83.3)
N1	6 (14.3)
N2	1 (2.4)
Clinical stage	
I	9 (21.4)
II	20 (47.6)
III	7 (16.7)
IV	6 (14.3)
Treatment	
Surgery only	32 (76.2)
Surgery + radiotherapy	10 (23.8)
Reconstruction	
Yes	28 (66.7)
No	14 (33.3)
Glossectomy	
Yes	19 (45.2)
No	23 (54.8)
Comorbidity	
Yes	7 (16.7)
No	35 (83.3)
Education	
Less than high school	18 (42.9)
High school and above	24 (57.1)
Follow-up, month	
Mean (range)	16.2 (6–64); SD, 13.9

Abbreviation: SD, standard deviation.

For the SHI, our translation process was as follows: in the first step, the Chinese version was translated by professional translators from the well-known English version, which was published by Rinkel et al.⁴ Second, the translated Chinese SHI was then retranslated into English and compared with the original version by a committee of professional bilingual experts to ensure the accuracy of the translation (Appendix). The SHI contains 30 short questions specific to two subscales—speech and psychosocial functions. Response scores for each item ranges from 0 to 4, which represents “never,” “almost never,” “sometimes,” “almost always,” and “always,”

respectively. The total SHI score is obtained by adding the scores for each item. Thus, the total score can range from 0 to 120. A general speech quality item is also included in the questionnaire to evaluate the patient’s overall speech function using four response categories: 0 for “excellent,” 30 for “good,” 70 for “average,” and 100 for “poor.”

To test validity, we compared the SHI with the UWQOL V.04, which was first introduced in 1993 by Hassan and Weymuller.⁷ The UWQOL V.04 is a widely used head and neck cancer-specific questionnaire with 12 single-question domains and three to six response options that were scaled from 0 (worst) to 100 (best) and that covered both physical and social functions. The physical function domain includes six items: chewing, speech, swallowing, taste, saliva, and appearance. The social function domain includes another six items: pain, activity, recreation, shoulder function, anxiety, and mood. Speech is evaluated using a four-point scale that is scored as 0, 30, 70, and 100. The worst result is represented by 0 and 100 the best. The social function score is calculated as the average of six social domains, each also ranging from 0 to 100. Guidance and scoring documentation on the UWQOL questionnaire was provided by Lowe and Rogers (www.headandneckcancer.co.uk).

Administration of questionnaires

Forty-two patients completed both the SHI and the UWQOL questionnaires in the outpatient clinic after first being informed of the purpose of the study and the procedure by way of a letter and a face-to-face explanation. Fifteen patients were asked to complete both questionnaires again after 2 weeks for retest reliability purposes. This study adhered to the Declaration of Helsinki regarding medical protocol and ethics, and the Ethical Review Board of Stomatology Hospital Peking University approved the study.

Statistical analysis

Internal consistency was assessed by calculating the coefficient of Cronbach α , and test-retest reliability was assessed by calculating Spearman correlation.

Construct and group validity were assessed by correlating the speech item score with related constructs from the UWQOL questionnaire. Group validity based on age, sex, tumor sites, duration of follow-ups, T classifications, comorbidity, radiotherapy, education level, and reconstruction was evaluated using the Mann-Whitney *U* test, with the significance level was set at $P < 0.05$. Statistical analysis was performed using *IBM SPSS Statistics 20* (SPSS Inc.; Chicago, IL, USA).

RESULTS

Forty-eight patients with oral and oropharyngeal cancer participated in the study, and 42 patients completed the questionnaires, for a response rate of 87.5%. The questionnaires were able to be completed during the clinical visit, and most patients were willing to talk about their speech difficulties and receive speech rehabilitation guidance after the analysis of their SHI questionnaire results. The Chinese version of the SHI demonstrated high degrees of reliability and validity, just as did the

TABLE 2.
Reliability: Internal Consistency*

Index/Domain	Cronbach α Coefficient
Total SHI (n = 30)	0.96
Speech domain (n = 14)	0.90
Psychosocial domain (n = 14)	0.92

Abbreviation: SHI, Speech Handicap Index.

* A consistently high reliability coefficient (>0.70) indicates that index/domains assess the same or high-related construct.

Dutch, English, and French versions,⁴⁻⁶ suggesting it is an efficient tool for the evaluation of speech function of patients with oral and oropharyngeal cancer.

Reliability

Internal consistency. Internal consistency reliability, as calculated by Cronbach α coefficient, was 0.96 for the total SHI (all 30 items), 0.90 for the SHI speech domain (14 items of speech function), and 0.92 for the SHI psychosocial domain (14 items of psychosocial function) (Table 2).

Test-retest reliability

The test-retest reliability of the total SHI was 0.94 as calculated by the Spearman rank correlation coefficient. The coefficients were 0.97 and 0.90 for the SHI speech domain and the psychosocial domain, respectively. Test-retest reliability of the overall speech function in SHI was 0.83 (Table 3).

Validity

Construct validity. Correlations between the total SHI score, the SHI speech domain, the SHI psychosocial domain, the overall SHI speech question, and the speech domain of UWQOL were 0.56, 0.56, 0.53, and 0.64, respectively. The correlations between the total SHI score, the SHI speech domain, the SHI psychosocial domain, the overall SHI speech question, and the social domain of the UWQOL were 0.61, 0.56, 0.59, and 0.48, respectively (Table 4).

Group validity. Group validity was evaluated by performing Mann-Whitney *U* tests. There were significant differences ($P < 0.05$) when patients were grouped by age, clinical stage, and education, radiotherapy, educational level, and reconstruction (Table 5).

DISCUSSION

There are several questionnaires for subjectively assessing cancer-specific quality of life, such as the UWQOL V.04, the European Organization for Research and Treatment of Cancer (EORTC), the Quality of Life Questionnaire–Head and Neck module (QLQ-H&N35), and the Functional Assessment of Cancer Therapy–Head and Neck (FACT-H&N).⁸⁻¹¹ However, none of these questionnaires contained more than three items on speech.

Some symptom-specific questionnaires that can be used for voice evaluation of patients with head and neck cancer, such as the Voice Handicap Index (VHI),¹² the Voice-Related Quality of Life Questionnaire (V-RQOL),¹³ and the Voice Activity Participation Profile (VAPP).¹⁴ However, as speech is a more complex process than just voice, the application of voice-specific instruments for the speech problems associated with oral and oropharyngeal cancer is questionable. The SHI, first developed by Rinkel et al⁴ in Dutch, was based mainly on the well-known VHI. It contains 30 short questions divided between two subscales: speech and psychosocial functions. Questions 22 and 23 belonged to neither field but were included in the total score.

Speech is the most distinct characteristic separating humans and animals, and it is also an important tool for communication and social activities. For patients with oral and oropharyngeal cancer, impaired speech and oral function appear to be clearly related to their global quality of life.¹⁵ Although a great deal of progress has been made recently in the evaluation of speech problems in patients with oral and oropharyngeal cancer, the only validated specific questionnaire for this patient group is the SHI, which is used in this study.⁴ Since the adaption of the VHI (in Dutch) by Rinkel et al, the SHI has been successfully translated and validated in English and French.^{5,6}

We found the SHI to have high Cronbach α coefficients for the total SHI, the SHI speech domain, and the SHI psychosocial domain, thus indicating that the questionnaire was consistent and reliably measured the same concepts. The test-retest stability scores are strong as the total SHI, the SHI speech domain, the SHI psychosocial domain, and the overall speech assessment have high test-retest correlation coefficients using Spearman rank correlation coefficient. Different domains of the SHI were compared with the validated UWQOL questionnaire using Spearman rank correlation coefficient. The correlations between the total SHI, the SHI speech domain, the SHI psychosocial domain, overall speech assessment question,

TABLE 3.
Reliability: Test-Retest Reliability* (n = 15)

Test/Retest	Total SHI	Speech Domain	Psychosocial Domain	Overall
Total SHI	$r = 0.94; P < 0.0001$	—	—	—
Speech domain	—	$r = 0.97; P < 0.0001$	—	—
Psychosocial domain	—	—	$r = 0.90; P < 0.0001$	—
Overall	—	—	—	$r = 0.83; P = 0.0001$

Abbreviation: SHI, Speech Handicap Index.

* Based on Spearman rank correlation coefficient (*r*) and associated *P* values.

TABLE 4.
Construct Validity* (n = 42)

SHI	Speech Domain of UWQOL	Psychosocial Domain of UWQOL
Total SHI	$r = 0.56; P = 0.0001$	$r = 0.61; P < 0.0001$
Speech domain	$r = 0.56; P = 0.0001$	$r = 0.56; P = 0.0001$
Psychosocial domain	$r = 0.53; P < 0.001$	$r = 0.59; P < 0.0001$
Overall SHI	$r = 0.64; P < 0.0001$	$r = 0.48; P = 0.001$

Abbreviations: SHI, Speech Handicap Index; UWQOL, University of Washington Quality of Life Questionnaire.

* Based on Spearman rank correlation coefficient (r) and associated P values.

and the speech domain of the UWQOL were highly significant. This was also the case with the correlations between the total SHI, the SHI speech domain, the SHI psychosocial domain, and the psychosocial domain of UWQOL. Although the overall SHI speech question and the psychosocial domain of UWQOL showed moderate correlation, this may be caused by the limited connection between the self-reporting speech assessment and other psychosocial subdomains in UWQOL such as shoulder function and recreation.

The group validation result of the present study indicated that the SHI was an appropriate tool for identifying differences between groups of patients. We found the patient group (>50 years old) tended to have lower scores in all SHI domains, a finding that has never been reported in other literature. The reasons may be that age-related changes in the speech mechanism lead to natural degradations in signal quality¹⁶ and that older patients are known to have poor speech functions compared with their younger counterparts who have better healing and regeneration potential.¹⁷ Furthermore, the differences between

Chinese culture and those of various western countries may account for diverse psychological effects experienced by patients with oral and oropharyngeal cancer, that result in differences among patients of different cultures in the understanding and acceptance of diseases and functional disorders. In the present study, our result also showed that early-stage and late-stage patient groups exhibited significant differences in the total SHI, the SHI speech domain, and the SHI psychosocial domain, findings that are consistent with those of Dwivedi et al.⁵ As expected, tumor stage is a known determinant of speech problems.^{18,19} Although there is no firm conclusion of the quality of life after surgery and/or radiation, it is commonly agreed that mixed modality treatment involving radiotherapy is associated with poor speech outcomes.²⁰⁻²² Accordingly, our results showed the differences between the surgery only patient group and the surgery with radiotherapy group in the total SHI and the SHI speech domain. Interestingly, there was a significant difference between patients with a high school education or above and patients with less than a high school

TABLE 5.
Group Validity* (n = 42)

Group Characteristic	Total SHI		Speech Domain		Psychosocial Domain		Overall SHI	
	Mean Rank	P Value	Mean Rank	P Value	Mean Rank	P Value	Mean Rank	P Value
Age								
≤50 y (n = 15)	15.4	0.01	15.3	0.01	15.4	0.01	14.0	0.002
>50 y (n = 27)	24.9		24.9		24.9		25.7	
Clinical stage								
Early (n = 29)	19.0	0.04	18.8	0.03	19.1	0.045	19.8	0.15
Late (n = 13)	27.1		27.5		26.9		25.4	
Radiotherapy								
Yes (n = 10)	28.1	0.048	28.3	0.045	28.1	0.052	26.2	0.17
No (n = 32)	19.4		19.4		19.5		20.0	
Education								
Less than high school (n = 18)	25.4	0.07	25.4	0.07	25.8	0.04	24.3	0.18
High school and above (n = 24)	18.6		18.6		18.3		19.4	
Reconstruction								
Yes (n = 28)	23.1	0.19	23.4	0.14	23.0	0.24	28.2	0.03
No (n = 14)	18.1		17.7		18.5		16.1	

Abbreviation: SHI, Speech Handicap Index.

* Tests of differences between groups were assessed using the Mann-Whitney U test and associated P values.

education in the SHI psychosocial domain. Because personal perception of speech impairment can be deeply influenced by one's social status and self-assessment, people with a higher level of education may have a greater opportunity to enjoy a satisfying life and have a more objective attitude toward themselves and toward life, and as a result, they may be more optimistic when facing disease and speech impairment.

The relatively small sample size is the main limitation of this study, and therefore, further studies are needed to validate the Chinese version of the SHI and our related speculations.

CONCLUSIONS

Our results demonstrate that the Chinese version of the SHI is a reliable, valid, and efficient questionnaire for the evaluation of speech outcomes in patients with oral and oropharyngeal cancer. The SHI should be used in further studies to establish its longitudinal validity and to demonstrate its clinical usefulness with larger patient sample sizes.

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APPENDIX

Name: _____
Date: _____

**University of Washington Quality of Life Questionnaire
(UW-QOL v4)**

This questionnaire asks about your health and quality of life **over the past seven days**. Please answer all of the questions by ticking one box for each question.

1. **Pain.** (Tick one box:)

- I have no pain.
- There is mild pain not needing medication.
- I have moderate pain - requires regular medication (e.g. paracetamol).
- I have severe pain controlled only by prescription medicine (e.g. morphine).
- I have severe pain, not controlled by medication.

2. **Appearance.** (Tick one box:)

- There is no change in my appearance.
- The change in my appearance is minor.
- My appearance bothers me but I remain active.
- I feel significantly disfigured and limit my activities due to my appearance.
- I cannot be with people due to my appearance.

3. **Activity.** (Tick one box:)

- I am as active as I have ever been.
- There are times when I can't keep up my old pace, but not often.
- I am often tired and have slowed down my activities although I still get out.
- I don't go out because I don't have the strength.
- I am usually in bed or chair and don't leave home.

4. **Recreation.** (Tick one box:)

- There are no limitations to recreation at home or away from home.
- There are a few things I can't do but I still get out and enjoy life.
- There are many times when I wish I could get out more, but I'm not up to it.
- There are severe limitations to what I can do, mostly I stay at home and watch TV.
- I can't do anything enjoyable.

5. **Swallowing.** (Tick one box:)

- I can swallow as well as ever.
- I cannot swallow certain solid foods.
- I can only swallow liquid food.
- I cannot swallow because it "goes down the wrong way" and chokes me.

6. **Chewing.** (Tick one box:)

- I can chew as well as ever.
- I can eat soft solids but cannot chew some foods.
- I cannot even chew soft solids.

7. **Speech.** (Tick one box:)

- My speech is the same as always.
- I have difficulty saying some words but I can be understood over the phone.
- Only my family and friends can understand me.
- I cannot be understood.

8. **Shoulder.** (Tick one box:)

- I have no problem with my shoulder.
- My shoulder is stiff but it has not affected my activity or strength.
- Pain or weakness in my shoulder has caused me to change my work / hobbies.
- I cannot work or do my hobbies due to problems with my shoulder.

9. **Taste.** (Tick one box:)

- I can taste food normally.
- I can taste most foods normally.
- I can taste some foods.
- I cannot taste any foods.

10. **Saliva.** (Tick one box:)

- My saliva is of normal consistency.
- I have less saliva than normal, but it is enough.
- I have too little saliva.
- I have no saliva.

11. **Mood.** (Tick one box:)

- My mood is excellent and unaffected by my cancer.
- My mood is generally good and only occasionally affected by my cancer.
- I am neither in a good mood nor depressed about my cancer.
- I am somewhat depressed about my cancer.
- I am extremely depressed about my cancer.

12. **Anxiety.** (Tick one box:)

- I am not anxious about my cancer.
- I am a little anxious about my cancer.
- I am anxious about my cancer.
- I am very anxious about my cancer.

Which issues have been the most important to you during the past 7 days?

Tick **up to 3 boxes.**

- | | | |
|-------------------------------------|-------------------------------------|----------------------------------|
| <input type="checkbox"/> Pain | <input type="checkbox"/> Swallowing | <input type="checkbox"/> Taste |
| <input type="checkbox"/> Appearance | <input type="checkbox"/> Chewing | <input type="checkbox"/> Saliva |
| <input type="checkbox"/> Activity | <input type="checkbox"/> Speech | <input type="checkbox"/> Mood |
| <input type="checkbox"/> Recreation | <input type="checkbox"/> Shoulder | <input type="checkbox"/> Anxiety |
-

GENERAL QUESTIONS

Compared to the month before you developed cancer, how would you rate your health-related quality of life? (Tick one box:)

- Much better
- Somewhat better
- About the same
- Somewhat worse
- Much worse

In general, would you say your **health-related quality of life** during the past 7 days has been: (Tick one box:)

- Outstanding
- Very good
- Good
- Fair
- Poor
- Very poor

Overall quality of life includes not only physical and mental health, but also many other factors, such as family, friends, spirituality, or personal leisure activities that are important to your enjoyment of life. Considering everything in your life that contributes to your personal well-being, rate your **overall quality of life** during the past 7 days. (Tick one box:)

- Outstanding
- Very good
- Good
- Fair
- Poor
- Very poor

Please describe any other issues (medical or nonmedical) that are important to your quality of life and have not been adequately addressed by our questions (you may attach additional sheets if needed).

SPEECH HANDICAP INDEX (SHI) ENGLISH VERSION

Reg. no: _____ Name: _____ Date: _____

These are some statements that many people may have used to describe their speech and the effects of their speech on their lives. Please tick the response that indicates how frequently you have the same experience.

SN	Item	Never/Almost never/Sometimes/Almost always/Always
(1)	My speech makes it difficult for people to understand me	
(2)	I run out of air when I speak	
(3)	The intelligibility of my speech varies throughout the day	
(4)	My speech makes me feel incompetent	
(5)	People ask me why I am hard to understand	
(6)	I feel annoyed when people ask me to repeat	
(7)	I avoid using the phone	
(8)	I am tense when talking to others because of my speech	
(9)	My articulation is unclear	
(10)	People have difficulty understanding me in a noisy room	
(11)	I tend to avoid groups of people because of my speech	

- (12) People seem irritated with my speech
- (13) People ask me to repeat myself when speaking face-to-face
- (14) I speak with friends and neighbors or relatives less often because of my speech
- (15) I feel as though I have to strain to speak
- (16) I find other people do not understand my speaking problem
- (17) My speaking difficulties restrict my personal and social life
- (18) The intelligibility is unpredictable
- (19) I feel left out of conversations because of my speech
- (20) I use a great deal of effort to speak
- (21) My speech is worse in the evening
- (22) My speech problem causes me to lose income*
- (23) I try to change my speech to sound different*
- (24) My speech problem upsets me
- (25) I am less outgoing because of my speech problem
- (26) My family has difficulty understanding me when I call them throughout the house
- (27) My speech makes me feel handicapped
- (28) I have difficulties to continue a conversation because of my speech
- (29) I feel embarrassed when people ask me to repeat
- (30) I am ashamed of my speech problem

How do you rate your own speech at this moment (please circle your chosen answer)?

Excellent/Good/Average/Bad

Scoring of SHI.

Values for response categories:

Never = 0

Almost never = 1

Sometimes = 2

Almost always = 3

Always = 4

For calculation of total SHI score:

Please add scores of all 30 questions. Total score range: 0–120.

For calculation of speech domain:

Please add scores of questions 1, 2, 3, 5, 6, 9, 10, 13, 15, 18, 20, 21, 26, and 28.

For calculation of psychosocial domain:

Please add scores of questions 4, 7, 8, 11, 12, 14, 16, 17, 19, 24, 25, 27, 29, and 30.

*Scores of these questions were not used in calculating SHI speech or SHI psychosocial domains; however, these were used in calculation of total SHI scores.

Values for response categories for overall speech assessment question:

Excellent = 0

Good = 30

Average = 70

Bad = 100