Validation of the Mandarin Chinese Version of the Pediatric Voice-Related Quality of Life (pVRQOL)

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Summary: Objectives. The purposes of this study were to adapt and validate the English version of the pediatric Voice-Related Quality of Life questionnaire into Mandarin Chinese, and to determine the cutoff point for screening children with and without voice disorders.

Methods. A total of 377 parents were enrolled from May 2016 to June 2017, including 195 parents of children with voice disorder (patient group) and 182 parents of children without voice disorder (control group). The internal consistency, test-retest, contents and clinical validity, and sensitivity and specificity were analyzed. The clinical cutoff point was determined.

Results. The questionnaire showed strong internal consistency in the patient group ($\alpha = 0.89$ for the total score, $\alpha = 0.88$ for the social-emotional domain, and $\alpha = 0.81$ for the physical functioning domain) and good test-retest reliability (intraclass correlation coefficient = 0.93), as well as moderate to strong contents validity ($r = 0.72$–0.95). The total score and subscales scores in the patient group were significantly higher than the control group ($P < 0.001$). The mean score of the physical functioning domain was lower than that of the social-emotional domain in the patient group. The clinical cutoff point was 96.25 (sensitivity = 78.0%, specificity = 100.0%).

Conclusion. The Mandarin Chinese version of pediatric Voice-related Quality of Life questionnaire was a valid and reliable questionnaire, which can be used as a screening test for the pediatric population with and without voice disorders.

Key Words: Parents–Children–Quality of life–Validity–Reliability.

INTRODUCTION

Voice is a vital and necessary tool for communication in daily life. Previous studies have shown that voice disorders can impair social and emotional development, academic performance, communication and voice-related quality of life (VRQOL) in children.[1–3] Unfortunately, because of the inadequate knowledge of vocal hygiene, vocal abuse and misuse, and little attention paid to prevention and treatment, voice disorders are very common in the pediatric population. The prevalence ranged from 3.9% to 30.3%.[4–6] Murray et al[7] reported that there were over one million children with voice disorders in the United States. Connor et al[2] suggested that voice disorders may be underestimated in children because voice disorders do not present overt clinical symptoms that extensively diminish the functional well-being of the children. Therefore, more attention should be given to children who have or who are at risk of having voice disorders.

Voice disorders can be evaluated by subjective or objective methods, including videostroboscopy, acoustic measures, and aerodynamic analyses, which provide quantitative information regarding the physiological changes in the phonatory system.[8] However, the functional impacts of voice disorders can be influenced by culture, family background, expectations, standards, or personal concerns.[9,10] Therefore, the assessment of physiological changes of the voice and evaluation of voice disorders can be supplemented by VRQOL questionnaires to assess the impacts of voice disorders on the overall well-being of the children. For the pediatric population, as children may not be able to understand the terminology used in the questionnaires, parental evaluation protocols are therefore recommended in the pediatric voice clinic.[2,11,12] The most commonly used questionnaires include the pediatric Voice Handicap Index,[13] the pediatric Voice-Related Quality of Life questionnaire (pVRQOL),[11] the pediatric Voice Outcome Survey,[14] and the pediatric Voice Symptom Questionnaire.[15] The pVRQOL has been translated into several languages and is widely used in clinical studies.[12,16–18] To date, there is no Mandarin Chinese version of pVRQOL available in the literature. Therefore, the first purpose of this study was to adapt and validate the pVRQOL into Mandarin Chinese.

Additionally, as a clinical assessment tool, the questionnaire must have the ability of screening voice disorders. This ability can be determined based on the sensitivity and specificity of the questionnaire using the receiver operating characteristics (ROC) curve and the clinical cutoff point. Therefore, the second purpose of this study was to determine the clinical cutoff point of the Mandarin Chinese version of pVRQOL for differentiating between children with voice disorder and those without.

METHODS

The present cross-sectional study enrolled parents of children with and without voice disorders. The children were aged between 2 and 14 years. The data were collected at the Department of Otolaryngology, Head & Neck Surgery in the West China Hospital, Sichuan University, and in the Women & Children's Central Hospital, Chengdu, China, from May 2016 to June 2017. This study was approved by the Ethics Committee of Sichuan

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University. All participants signed the informed consent before data collection.

Participants

A total of 377 parents participated in this study, including 195 parents of children with voice disorder (patient group) and 182 parents of children without voice disorder (control group). Their reading, writing, and cognitive abilities were normal. The children with voice disorders were diagnosed by an otolaryngologist using videostroboscopic examination (Pentax, LH-150PC, 11 mm, Tokyo, Japan). The children in the control group did not report any present or past history of voice disorders, any voice complaints, or other diseases which influenced the voice.

Procedures

The Mandarin Chinese version of pVRQOL was translated by two bilingual translators. Compared with the original English version, we deleted the sixth rating scale (6 = not applicable), and all items were translated into Chinese after careful consideration according to Chinese cultural and language habits with slight wording changes. Then, three otolaryngologists who had at least 5 years' experience in the field of voice disorders and were fluent in English discussed and refined each item. This pilot Mandarin Chinese version of pVRQOL was completed by 20 parents of children with voice disorders to evaluate the comprehensibility of the items. Some minor changes were made and the final Mandarin Chinese version of pVRQOL was developed (Appendix A), which was composed of 10 items, and were divided into two subscales: the social-emotional domain (items 4, 5, 8, and 10) and the physical functioning domain (items 1, 2, 3, 6, 7, and 9). Each item was graded on a five-point Likert scale. The raw scores about total score and subscales scores were transformed to a scale of 0–100,[19] where 0 indicated a very poor VRQOL and 100 indicated a very good VRQOL.[11]

The internal consistency of the Mandarin Chinese version of pVRQOL was assessed by Cronbach alpha (α) coefficient. A Cronbach α value of 0.9 or above was excellent, between 0.8 and 0.9 was good, and between 0.7 and 0.8 was satisfactory.[20] Intraclass correlation coefficient (ICC) was used to evaluate test-retest reliability of the total score and subscales scores. There were 50 parents of children with voice disorders who completed the questionnaire again 2 weeks after the first completion and before treatment. In addition, the content validity and clinical validity were assessed. The receiver ROC curve test was used to study the clinical utility of the Mandarin Chinese version of pVRQOL based on sensitivity and specificity, and children with and without voice disorders were classified based on the area under the curve (AUC). An AUC value of 0.7 or above was considered satisfactory.[21]

Statistical analysis

The statistical analysis was performed using SPSS version 22 (SPSS Inc., IBM Corp., Armonk, NY). Demographic data were analyzed descriptively for the patient and control groups. The reliability of the Mandarin Chinese version of pVRQOL was evaluated by examining the internal consistency (Cronbach α coefficient) and test-retest reliability (ICC). The content reliability was analyzed using Pearson product-moment correlation. The nonparametric Mann-Whitney *U* test was used to compare the differences between the patient group and control group in subscales scores and total score. The total score and subscales scores were compared among the three subgroups in patient and control groups using Kruskal-Wallis test, and *post hoc* analysis using least significance difference test. *P* values < 0.05 were considered as statistically significant.

TABLE 1.
Demographic Parameters of the Children

Items	Patient Group		Control Group	
Gender	n	%	n	%
Female	63	32.3	86	47.3
Male	132	67.7	96	52.7
Age (y)				
Mean ± SD	5.3 ± 2.2		5.1 ± 2.6	
Range	2–14		2–14	

Abbreviations: SD, standard deviation.

RESULTS

All participants completed the questionnaire without professional assistance in about 3–5 minutes.

Demographic data

The patient group consisted of 195 parents of children with voice disorders (Table 1). The children (63 girls and 132 boys) were aged between 2 and 14 years (Mean = 5.3 years; SD = 2.2 years) (Table 1). The children were divided into three subgroups based on the videostroboscopic findings: vocal fold nodules (n = 145, 74.4%), chronic laryngitis (n = 39, 20.0%), and vocal fold polyps (n = 11, 5.6%) (Table 2). There were 182 parents of children (Mean = 5.1 years, SD = 2.6 years) without voice disorders in the control group.

Internal consistency

The Mandarin Chinese version of pVRQOL showed good internal consistency for the total score in the patient group (α = 0.89) and the control group (α = 0.88). For the patient group, good internal consistency was obtained in the two subscales (α = 0.81, 0.88). For the control group, satisfactory to good internal consistency were found in the subscales scores (α = 0.76, 0.87) (Table 3).

TABLE 2.
Diagnoses of Voice Disorders in the Patient Group

Types of Diseases	n	%
Vocal fold nodules	145	74.4%
Chronic laryngitis	39	20.0%
Vocal fold polyps	11	5.6%
Total	195	

TABLE 3.
Internal Consistency of the Total Score and Subscales Score in the Mandarin Chinese Version of pVRQOL

Subscales	Number of Items	Cronbach α Coefficient: Patient Group	Cronbach α Coefficient: Control Group
Social-emotional	4	0.88	0.87
Physical functioning	6	0.81	0.76
Total pVRQOL	10	0.89	0.88

Abbreviations: pVRQOL, pediatric Voice-Related Quality of Life.

Test-retest reliability

The test-retest reliability for the patient group was strong in the total scores (ICC = 0.93), as well as in the social-emotional (ICC = 0.92) and physical functioning domains (ICC = 0.91) (Table 4).

Content validity

The Pearson product-moment correlation test showed a moderate positive correlation between social-emotional and physical functioning domains in the Mandarin Chinese version of pVRQOL ($r = 0.72$, $P < 0.001$). Strong positive correlations between the total score and the social-emotional subscales scores ($r = 0.90$, $P < 0.001$) and between the total score and the physical functioning subscale score ($r = 0.95$, $P < 0.001$) were identified.

Clinical validity and all items analysis

The mean scores for all 10 items of the Mandarin Chinese version of pVRQOL in the patient group were significantly higher than those in the control group ($P < 0.001$, Table 5). The total score and subscales score of the Mandarin Chinese version of pVRQOL in the patient group were significantly lower than the control group ($P < 0.001$). In addition, the mean score of physical functioning subscale was lower than that of social-emotional subscale in the patient group (Table 6).

TABLE 4.
Test-Retest Reliability of Total Score and Subscales Score for the Mandarin Chinese Version of pVRQOL in the Patient Group

Subscales	ICC	95% CI: Lower	95% CI: Upper
Social-emotional	0.92	0.86	0.95
Physical functioning	0.91	0.85	0.95
Total score	0.93	0.87	0.96

Abbreviations: pVRQOL, pediatric Voice-Related Quality of Life; ICC, interclass correlation coefficient; CI, confidence interval.

TABLE 5.
Comparison of Items in the Mandarin Chinese Version of pVRQOL in the Patient Group and the Control Group

Items	Patient Group: Mean	Patient Group: SD	Control Group: Mean	Control Group: SD	Z	*P*
Q1	2.15	0.981	1.25	0.517	–9.824	<0.001
Q2	2.10	1.038	1.15	0.480	–10.715	<0.001
Q3	2.90	0.987	1.13	0.439	–15.389	<0.001
Q4	1.64	0.864	1.12	0.522	–7.715	<0.001
Q5	1.62	0.930	1.08	0.371	–7.599	<0.001
Q6	1.72	1.014	1.13	0.515	–7.622	<0.001
Q7	1.84	1.095	1.10	0.409	–8.643	<0.001
Q8	1.37	0.798	1.06	0.261	–5.023	<0.001
Q9	1.89	0.918	1.18	0.476	–9.080	<0.001
Q10	1.33	0.758	1.05	0.229	–4.331	<0.001

Abbreviations: SD, standard deviation; pVRQOL, pediatric Voice-Related Quality of Life.

Comparisons among three subgroups of patients and the control group

There were significant differences in social-emotional, physical functioning domains, and total scores among the four groups (three patient subgroups and the control group) ($P < 0.001$).

For the social-emotional domain, post hoc analysis revealed that the vocal fold nodules group had significantly lower scores than the chronic laryngitis group ($P < 0.001$) and the control group ($P < 0.001$). No significant differences were found between the chronic laryngitis group and the vocal fold polyps group ($P > 0.05$), between the chronic laryngitis group and the control group ($P > 0.05$), and between the vocal fold polyp group and the control group ($P > 0.05$, Figure 1A).

For the score of physical functioning domain and the total score, *post hoc* analysis revealed that the vocal fold nodules group, vocal fold polyps group, and chronic laryngitis group had significantly lower scores than the control group ($P < 0.001$ for all three comparisons). Moreover, the vocal fold nodules group had significantly lower score than the vocal fold polyps group ($P < 0.001$) and chronic laryngitis group ($P < 0.001$). There were no significant differences between the scores of the vocal fold polyps and chronic laryngitis groups ($P > 0.05$, Figure 1B, 1C).

Comparisons between social-emotional and physical functioning domains within subgroups

The scores of physical functioning domain were significantly lower than those of social-emotional domain in the vocal fold nodules, chronic laryngitis groups, and vocal fold polyps ($P < 0.001$, Table 7).

The ROC curve and clinical cutoff point

In the present study, the AUC was 0.93 ($P < 0.05$, 95% CI = 0.901–0.956) (Figure 2). The sensitivity and specificity were highest (78.0% and 100.0% respectively) at the clinical cutoff point of 96.25 (Table 8).

TABLE 6.
Comparison of the Mandarin Chinese Version of pVRQOL Total Score and Subscales Score in the Patient and the Control Groups

	Patient Group	Control Group		
Domain	Mean ± SD	Mean ± SD	Z	*P*
Social-emotional	87.69 ± 17.90	96.06 ± 8.04	–8.740	<0.001
Physical functioning	72.54 ± 17.93	98.04 ± 7.73	–14.846	<0.001
Total score	78.60 ± 16.67	96.85 ± 7.49	–14.635	<0.001

Abbreviations: SD, standard deviation; pVRQOL, pediatric Voice-Related Quality of Life.

DISCUSSION

The English version of pVRQOL is a specific questionnaire for assessing VRQOL in children with voice disorders with good validity, reliability, and responsiveness,[11] and it is a widely used instrument in the pediatric voice clinics worldwide.[17] Therefore, the present study aimed to adapt and validate the pVRQOL into Mandarin Chinese. The results from the present study showed that the Mandarin Chinese version of pVRQOL had good internal consistency in total score and subscales scores, which indicated that the Mandarin Chinese version of pVRQOL was a reliable and valid instrument for assessment of the children with voice disorders. These findings were consistent with previous studies. Boseley et al[11] reported that the Cronbach α value was 0.96 in the original English version of pVRQOL. In the Brazilian version, the Cronbach α values were 0.84 in total score, 0.62 in the social-emotional domain, and 0.81 in the physical functioning domain.[12]

Our results also indicated excellent test-retest reliability for the total score, as well as for the social-emotional and physical functioning subscales. These findings were in agreement with those reported in previous studies.[12,22] The high test-retest reliability suggested that the Mandarin Chinese version of pVRQOL had a high stability and reproducibility over time. In addition, the Pearson product-moment correlation coefficient for the total

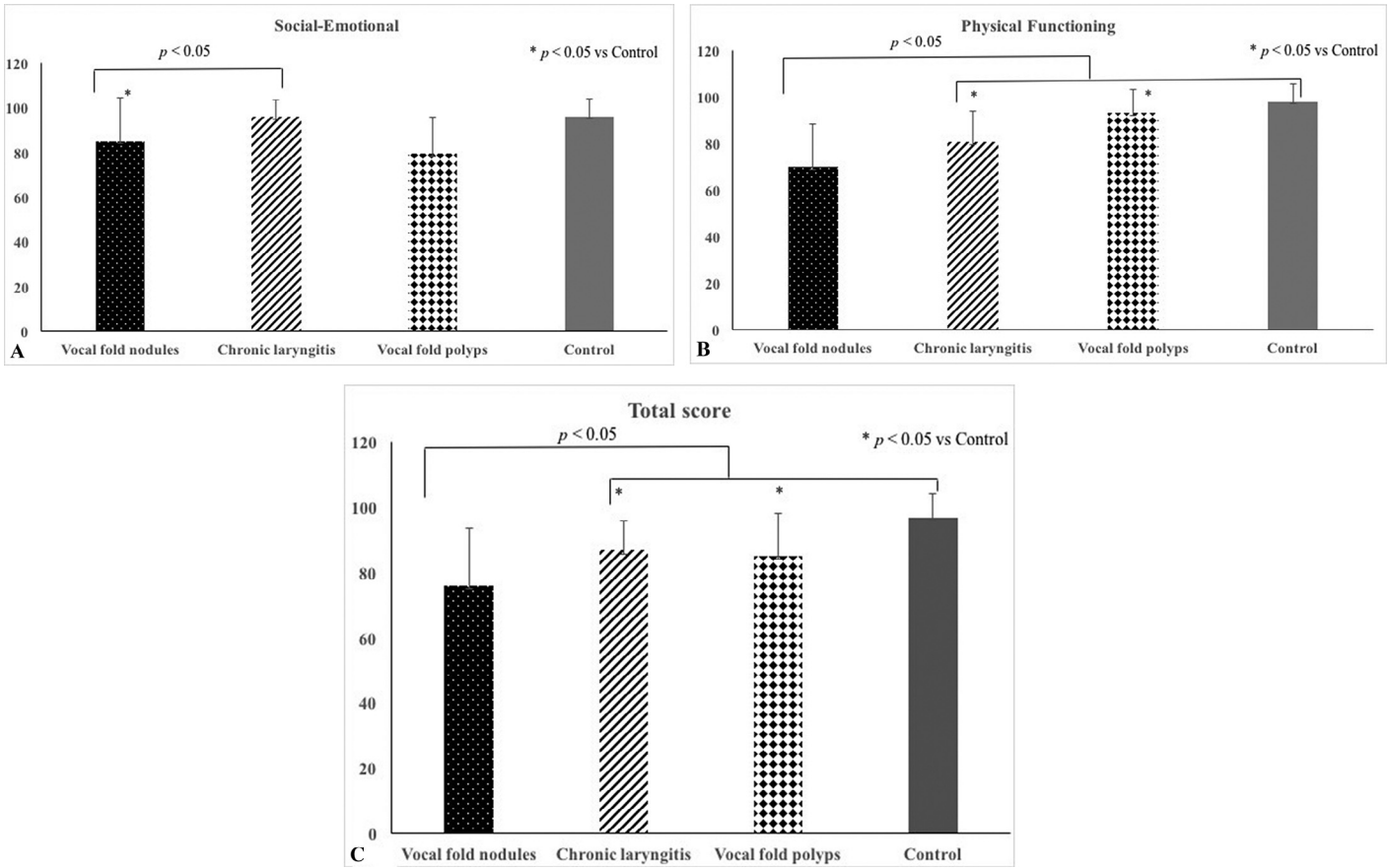

FIGURE 1. Comparison of the Mandarin Chinese version of pVRQOL scores in the subgroups with different voice disorders and the control group. **A.** The comparison of social-emotional domain score between the subgroups with different voice disorders and the control group. **B**. The comparison of physical functioning domain score between the subgroups with different voice disorders and the control group. **C.** The comparison of the total score between subgroups with different voice disorders and the control group

TABLE 7.
Comparison of the Social-Emotional and Physical Functioning Domain Scores Within Subgroups in Patients

Domains	Vocal Folds Nodules	Chronic Laryngitis	Vocal Folds Polyps
Social-emotional (Mean ± SD)	85.04 ± 19.52	95.99 ± 7.65	93.18 ± 10.25
Physical functioning (Mean ± SD)	69.83 ± 18.41	80.66 ± 13.30	79.55 ± 16.40
P	<0.001	<0.001	<0.001

Abbreviations: SD, standard deviation; pVRQOL, pediatric Voice-Related Quality of Life.

score and subscales scores in the patient group were higher than 0.7, indicating that the Mandarin Chinese version of pVRQOL had adequate contents validity.

In addition, there were 195 parents of children with voice disorders in this study. The children with voice disorders were predominately boys (67.7%). This predominance, which had been reported in previous studies,[23–25] may be related to the more impulsive and aggressive behaviors in boys than in girls.[26,27] The disorder of vocal fold nodules was the most common pathology in the patient group (74.4%), followed by chronic laryngitis (20.0%) and vocal fold polyps (5.6%). The results were consistent with previous studies that vocal fold nodules were the major diagnosed lesion in dysphonic children.[28,29]

As expected, the score of total score and subscales scores in the Mandarin Chinese version of pVRQOL were lower in the patient group than in the control group. These findings are in agreement with those found in other studies.[12,30,31] The results showed that the Mandarin Chinese version of pVRQOL was a validated tool for identifying voice disorders and assessing VRQOL in children. The Mandarin Chinese version of pVRQOL also showed good stability for each item. The present study showed that the mean total score in the patient group was 78.60, which was comparable to that reported by Ribeiro et al[12] (78.65) using the Brazilian version of pVRQOL. Moreover, the mean total pVRQOL score (96.85) in the control group was comparable with the results obtained by Blumin et al using the English version (97.0),[32] by Marati et al[31]using the English version (96.8), and by Ribeiro et al[12] using the Brazilian version (99.05).

The mean physical functioning score was lower than the mean social-emotional score in the patient group and subgroups. Similar results had been reported in another study,[33] which revealed that the physical functioning domain of the pVRQOL was the most affected domain in the patients. A possible explanation for the lower physical functioning score is that the physical

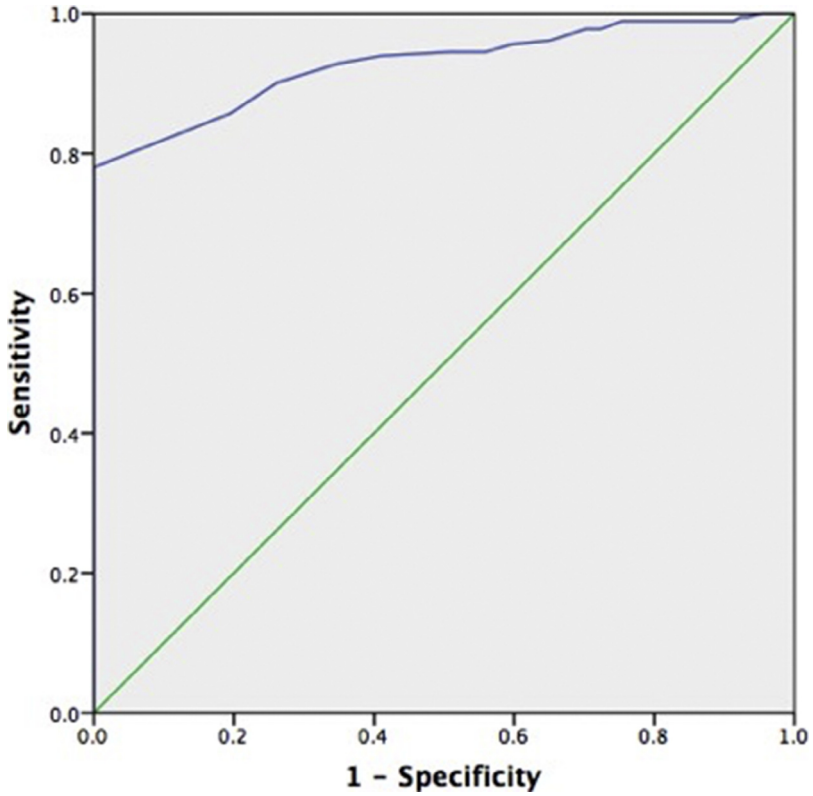

FIGURE 2. ROC curve of the total score in the Mandarin Chinese version of pVRQOL. pVRQOL, pediatric Voice-related Quality of Life; ROC, receiver operating characteristics curve.

TABLE 8.
Coordinates of the ROC Curve for the Cutoff Point of the Mandarin Chinese Version of pVRQOL

Cutoff Points	Sensitivity	1-Specificity
9.000	1.000	1.000
15.000	1.000	0.995
21.250	1.000	0.990
30.000	1.000	0.979
40.000	1.000	0.974
43.750	1.000	0.969
46.250	1.000	0.954
48.750	0.995	0.933
51.250	0.995	0.923
53.750	0.989	0.913
57.500	0.989	0.887
61.250	0.989	0.841
63.750	0.989	0.831
66.250	0.989	0.800
68.750	0.989	0.754
71.250	0.978	0.723
73.750	0.978	0.703
76.250	0.962	0.651
78.750	0.956	0.595
81.250	0.945	0.559
83.750	0.945	0.508
86.250	0.940	0.410
88.750	0.929	0.349
91.250	0.901	0.262
93.750	0.857	0.195
96.250	0.780	0.000
98.750	0.659	0.000
101.000	0.000	0.000

Abbreviations: pVRQOL, pediatric Voice-Related Quality of Life; ROC, receiver operating characteristics curves.

discomfort symptoms, for example, running out of air when talking, having trouble in doing his or her job or schoolwork because of the changes in his or her voice quality, and constant need to repeat himself or herself to be understood, can be easily observed or perceived by their parents. In addition, the negative impacts on social-emotional well-being of children, such as anxiety, frustration, or depression, caused by changes in his or her voice quality, can be easily ignored.

The present study showed that patients with vocal fold nodules had significantly lower social-emotional score, physical functioning score, and total pVRQOL score than the patients with chronic laryngitis. Moreover, these patients had significantly lower social-emotional score and total pVRQOL score than the patients with vocal fold polyps. Moradi et al[10] reported that the total score of the VRQOL questionnaire might be influenced by the different classification of voice disorders in adults. For the pediatric population, Merati et al[31] reported that the mean pVRQOL total score of patients with vocal fold paralysis (70.5) was lower than those with vocal nodules (84.8) and with paradoxical vocal fold dysfunction (86.7). The findings from the present study implied that the Mandarin Chinese version of pVRQOL may be used to evaluate VRQOL in children with different vocal disorders as in the other language versions of pVRQOL.

On the other hand, the results showed that the vocal fold polyps group did not show significantly lower social-emotional domain score than the control group as expected. This may be attributed to the large difference in group sizes (vocal fold polyps group = 11, control group = 182). Moreover, studies have shown that the same patient may show different levels of VRQOL when different questionnaires, for example, the Voice Handicap Index and the VRQOL, were used.[8,34] It could be possible that when other questionnaires were used, the vocal fold polyps group may show a lower level of quality of life than the control group. Therefore, we recommend that a variety of questionnaires may be used to assess the VRQOL in patients with different voice disorders. This can ensure a more comprehensive profile of the patients' well-being for appropriate treatment planning in clinical setting.

The second objective of the present study was to investigate the clinical screening ability of the Mandarin Chinese version of pVRQOL. In the present study, the high sensitivity and specificity were found (0.78 and 1.00, respectively) at the clinical cutoff point of 96.25, which was similar to a previous study.[35] This indicated that 96.25 was the threshold for screening the children with voice disorders from those without voice disorders in China using the Mandarin Chinese version of pVRQOL.

CONCLUSION

The Mandarin Chinese version of pVRQOL showed good internal consistency, test-retest reliability, and clinical validity. The clinical cutoff point was 96.25 (sensitivity = 78.0%, specificity = 100.0%). The Mandarin Chinese version of pVRQOL questionnaire can be used as a screening test in research and clinical practices for the pediatric population in China.

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APPENDIX A

1 = None, not a problem 无
2 = A small amount 很少
3 = A moderate amount 有时
4 = A lot 经常
5 = Problem is "as bad as it can be" 总是

Items	1	2	3	4	5
1. My child has trouble speaking loudly or being heard in noisy situations.					
1.在嘈杂环境中，孩子难以大声说话或别人难以听见我孩子的声音					
2. My child runs out of air and needs to take frequent breaths when talking.					
2.孩子说话时会感到气短，说话时需要频繁吸气					
3. My child sometimes does not know what will come out when he or she begins speaking.					
3.他/她的声音不稳定					
4. My child is sometimes anxious or frustrated (because of his or her voice).					
4.孩子的嗓音问题使他/她感到焦虑或沮丧					
5. My child sometimes gets depressed (because of his or her voice).					
5. 孩子的嗓音问题使他/她感到难过					
6. My child has trouble using the telephone or speaking with friends in person.					
6.孩子的嗓音问题使他/她用电话或面对面与朋友交流时存在困难					
7. My child has trouble doing his or her job or schoolwork (because of his or her voice).					
7.孩子的嗓音问题使他/她难以完成与言语表达相关的作业					
8. My child avoids going out socially (because of his or her voice).					
8. 孩子的嗓音问题使他/她回避参加社交活动					
9. My child has to repeat himself or herself to be understood.					
9.交谈时，别人常要孩子重复他/她说过的话					
10. My child has become less outgoing (because of his or her voice).					
10. 孩子的嗓音问题使他/她不如以前外向					

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