Objective: To validate the Pediatric Voice-Related Quality-of-Life (PVRQOL) survey, which was designed to assess voice changes over time in the pediatric population.

Design: Prospective longitudinal study.

Setting: Outpatient pediatric otolaryngology office practice.

Participants: One hundred twenty parents of children aged 2 through 18 years having a variety of otolaryngological diagnoses including disorders that affect the voice.

Interventions: The previously validated Pediatric Voice Outcomes Survey and the PVRQOL were jointly administered to the parents of the study participants. Test-retest reliability was accomplished by having 70 caregivers repeat the instrument 2 weeks after the initial visit. The Cronbach \( \alpha \) value was calculated to determine reliability. Instrument validity was determined by examining convergent and discriminant validity.

Main Outcome Measure: Correlation of PVRQOL scores with Pediatric Voice Outcomes Survey scores.

Results: Reliability of the PVRQOL was established by evaluating the Cronbach \( \alpha \) value (.96; \( P < .001 \)) and by test-retest reliability (weighted \( k \) value, .8). Validity of the PVRQOL was tested by evaluating its ability to show significant change in voice-related quality-of-life after adenoidectomy (discriminant validity) \( (P < .001) \). The PVRQOL also proved valid when the overall score was correlated with the previously validated Pediatric Voice Outcomes Survey \( (r = 0.7; P < .001) \).

Conclusion: The PVRQOL is a more comprehensive survey than the previously validated Pediatric Voice Outcomes Survey and is another valid instrument to examine the health-related quality-of-life issues in pediatric voice disorders.


The field of outcomes research has shed light on the fundamental need for all disciplines in medicine to track functional outcomes as closely as other traditional medical factors relative to therapeutic interventions. In pediatric laryngology, new strategies are being sought to assess pediatric vocal disorders and to measure the success of various treatment strategies that are available or are being developed. The diagnostic assessment of a child’s voice includes laryngostroboscopic, acoustic, and aerodynamic evaluations. Of potential equal importance is the functional effect of the child’s vocal disorder as it relates to his or her health-related quality of life (HRQOL), defined as the subjective and objective impact of dysfunction associated with illness or injury, medical treatment, and health care policy.1

Several instruments have been designed to measure HRQOL relative to voice and vocal issues. The Voice Handicap Index has been validated as a 10-item instrument designed to measure the emotional, physical, and functional aspects of adult voice disorders by specifically recording the patients’ own perception of their vocal handicap.2,3 The Voice-Related Quality-of-Life Measure (VRQOL) is another 10-item instrument that was designed and validated as a self-administered instrument for adult populations with voice disorders to measure both social-emotional and physical-functional aspects of voice problems.3 The Voice Outcomes Survey (VOS) was designed and validated as a 5-item instrument to measure clinical change in adults with unilateral vocal fold paralysis who would be undergoing surgery.4

Whereas meaningful data have been previously published about strategies for obtaining voice samples and performing voice analysis in children,5,6 little work has explored VRQOL in the pediatric population. Most instruments validated to explore issues of VRQOL in adults\(^2\)\(^4\) have not...
been validated either for direct child response or for parent proxy application. The sole exception is the modified VOS, also known as the Pediatric Voice Outcomes Survey (PVOS). The PVOS was validated by examining a specific population of children with and without tra-checotomies. The survey was shown to be internally consistent and able to support a proposed interpretation of scores based upon theoretical implications within the constructs, a concept known as discriminant validity. To broaden the applicability of the PVOS to children with a full spectrum of vocal disorders, normative scores were identified for a pediatric otolaryngological population without voice disorders. The PVOS was shown to be a brief, valid, and reliable instrument that is simple to administer and to complete and is responsive to changes in VRQOL. The brevity of the PVOS, however, hindered its ability to reflect specific subdomains, such as social-emotional concerns associated with voice problems. Moreover, the VOS was designed specifically to document global changes in voice preoperatively and postoperatively; it was not designed to be sensitive enough to track potentially more subtle changes in vocal function over time after less dramatic interventions. The objectives of this study were to validate the VRQOL instrument and to identify how its 2 subdomains, physical-functional and social-emotional effects, correlate with the PVOS.

**INSTRUMENTS**

**PEDIATRIC VOICE OUTCOMES SURVEY**

The PVOS (Figure 1) is a 4-item instrument designed to measure VRQOL. This instrument was shown to have a Cronbach α value of .86 and was found to be valid for use in VRQOL; high scores describe a relatively poor VRQOL; high scores describe a better VRQOL.

**METHODS**

During a 6-month period, the PVOS and the PVRQOL were jointly administered to 120 parents of children aged 2 through 18 years having a variety of otolaryngological problems seen in the outpatient office practice of 3 pediatric otolaryngologists (M.J.C., M.S.V., and C.J.H.). One hundred four caregivers com-

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**PEDIATRIC VOICE-RELATED QUALITY-OF-LIFE SURVEY**

**Figure 2.** Pediatric Voice-Related Quality-of-Life survey.

(P = .004) in a previous study. The raw scores are transformed to a scale of 0 (worst) to 100 (best) for ease of interpretation. Low scores describe a relatively poor VRQOL; high scores describe a better VRQOL.

The PVRQOL (Figure 2) is a 10-item instrument designed to measure VRQOL and is adapted from the adult VRQOL instrument. Individual item structure has been altered to reflect parent proxy administration rather than self-administration. The use of parent proxy instruments is thought to be especially important in young children because parents may be better able to comprehend the scope of their child’s problem and parental concern is an important driving force in the child’s being seen by a specialist for consultation. The PVRQOL raw scores are transformed to a scale of 0 to 100 for ease of interpretation. Subdomain scores reflecting both social-emotional and physical-functional effects are reported.
pleted the survey. Instrument administration was performed in accord with institutional review board approval. The children’s ages and initial diagnoses were documented, as was information about previous therapeutic otolaryngological interventions that had been performed. All initial instruments were completed in person by standard paper questionnaire at the pediatric otolaryngologists’ office. The first 70 parents who completed the instruments completed the instruments again 2 weeks after the initial application to analyze test-retest reliability; this second questionnaire was completed at home and returned by standard mail in a preaddressed envelope. The completed forms were entered onto a Microsoft Access database, and analysis was performed by linking the database to an SAS software package (version 8.1; SAS Institute Inc, Cary, NC). Reliability analysis was determined by calculating the Cronbach α coefficient and test-retest reliability. Validity was assessed by evaluating the ability of the instrument to accurately reflect changes in VRQOL in children who had undergone operative intervention, the assumption being that a procedure such as adenoidectomy would alter the overall vocal quality (discriminant validity). Criterion validity was assessed by correlating the PVRQOL with the PVOS, an instrument that had previously been validated in this patient population; cross-correlations between the 2 subdomains of the PVRQOL instrument (social-emotional and physical-functional) and the PVOS were also performed.

RESULTS

Data including age, sex, diagnoses, and any otolaryngological surgical procedures performed before the survey for the 120 study patients are listed in the Table. The most common stated reason for the otolaryngological visit was either otitis media (28%) or suspected obstructive sleep apnea secondary to adenotonsillar hypertrophy (26%). The most common stated reason for the otolaryngological visit was obstructive sleep apnea secondary to adenotonsillar hypertrophy (25%) were tympanostomy tube placement (15%), adenoidectomy (7%), and adenotonsillectomy (5%); 67% of the patients had not undergone surgery before completing the study.

The scores for both instruments were normalized to a scale of 100. A score of 100 represents the highest QOL, which meant that the parents perceived no problems with their child’s voice, no limitations on voice function, and no adverse social or emotional effects attributable to their child’s voice quality. The mean (SD) score for the PVOS portion of the instrument was 83.2 (21.8), and for the PVRQOL portion of the survey was 91.1 (15).

RELIABILITY ANALYSIS

The instrument’s reliability was assessed by calculating the Cronbach α coefficient. This is a statistical measure to determine the internal consistency among test items. This was determined to be .96 (α > .55 deemed acceptable). This calculation evaluates the effect of systematically deleted questions within the central construct. Test-retest reliability was shown by giving the PVOS and PVRQOL to a subpopulation of 70 caregivers twice within 2 weeks. The weighted k value was calculated to be 0.8. This value implies a significant degree of test-retest consistency.

<table>
<thead>
<tr>
<th>Variable</th>
<th>No. (%) of Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographic data</td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>72</td>
</tr>
<tr>
<td>Female</td>
<td>48</td>
</tr>
<tr>
<td>Age, y</td>
<td></td>
</tr>
<tr>
<td>2-5</td>
<td>46 (38)</td>
</tr>
<tr>
<td>6-10</td>
<td>39 (33)</td>
</tr>
<tr>
<td>11-18</td>
<td>35 (29)</td>
</tr>
<tr>
<td>Otolaryngological diagnosis</td>
<td></td>
</tr>
<tr>
<td>VPI</td>
<td>4 (3)</td>
</tr>
<tr>
<td>Dysphonia</td>
<td>10 (8)</td>
</tr>
<tr>
<td>Adenotonsillar hypertrophy</td>
<td>29 (25)</td>
</tr>
<tr>
<td>Otitis Media</td>
<td>20 (24)</td>
</tr>
<tr>
<td>Sinus Disorder</td>
<td>9 (7)</td>
</tr>
<tr>
<td>Other</td>
<td>39 (33)</td>
</tr>
<tr>
<td>Previous otolaryngological surgical procedure</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>80 (67)</td>
</tr>
<tr>
<td>Adenotonsillectomy</td>
<td>6 (5)</td>
</tr>
<tr>
<td>Adenoidectomy</td>
<td>9 (7)</td>
</tr>
<tr>
<td>PET placement</td>
<td>18 (15)</td>
</tr>
<tr>
<td>Other</td>
<td>7 (6)</td>
</tr>
</tbody>
</table>

Abbreviations: PET, pressure equalization tube; VPI, velopharyngeal insufficiency.

VALIDITY ANALYSIS

The validity of the survey was evaluated by several parameters, including convergent and discriminant validity. There was a high correlation between the PVOS and the PVRQOL (r = .70, P < .001). There was, similarly, a high correlation between the PVOS and the physical-functional portion of the PVRQOL (r = .69; P < .001). The PVRQOL had a decreased but still significant correlation with the social-emotional portion of the PVRQOL (r = .33; P < .001). The significant correlation between the PVOS and the PVRQOL is indicative of convergent validity; that is, the survey questions are testing for the same construct, namely, VRQOL.

Discriminant validity was shown by the ability to demonstrate significant differences among subpopulations in which there was a preconceived hypothesis that a difference existed. The example in the current study is the population of children who had undergone adenoidectomy. It is commonly observed that children manifest a change in their voice character after adenoidectomy. Preoperative and postoperative scores of the 9 patients who had undergone adenoidectomy were compared using the Wilcoxon rank sum test for PVQRO and showed a significant change in postoperative scores (P < .001).

COMMENT

There are several validated instruments for measuring HRQOL in adult patients with voice disorders. These include the VOS, the VRQOL survey, and the Voice Handicap Index. The Voice Handicap Index consists of 3 do-
mains (emotional, physical, and functional) with 10 items in each.2-4

These instruments rely on direct responses by the patient to determine the effect of vocal function or dysfunction on their quality of life. Younger children lack the maturity, cognitive skills, and insight required to complete these surveys. Therefore, parental response is often necessary to determine a child's VRQOL. Parental querying is additionally relevant because it is usually caregivers who are dissatisfied with the child's vocal status and initiate evaluative consultation. A previous study7 has shown that administration of voice surveys to parent proxies is a reliable means of determining VRQOL in children.

The VOS, a measurement of vocal function, had been previously modified as the PVOS for use in the pediatric population, in which its validity has been established.7 Similarly, this study has shown that the VRQOL can be modified and validated for use in children by parent proxy format. Since both surveys attempt to measure how voice will affect HRQOL, it is not surprising that the PVORS would show a high correlation with the PVOS.

The PVOS scores correlated highly with the physical-functional scores on the PVRQOL. However, the scores correlated less significantly with the social-emotional subdomain of the PVRQOL. One possibility for this is that the study population was a general pediatric otolaryngology patient population. Patients with specific voice complaints may have a more significant correlation between the social-emotional scores and PVOS because they or their parents would likely perceive their voice as a problem.

We did not specifically test for a significant difference in scores between children with dysphonia and children with non–voice-related disorders. Although the scores for this subpopulation were typically lower than for other patients in the study, there were too few children in this group to make a statistical comparison. We are enrolling children with only voice complaints to validate the PVRQOL in this specific group of patients. This may also reveal that social-emotional scores have a higher correlation with the PVOS scores.

Both of these instruments have been designed to determine how the child perceives his or her voice problem. A potential deficiency is that neither directly addresses parental concern about their child's voice. Furthermore, despite the PVRQOL being more comprehensive than the PVOS, there exists the possibility of further expanding these instruments to address other areas of voice quality of life. These are areas that may need to be explored with future validity studies.

CONCLUSION

This study proves the PVRQOL to be a valid instrument that highly correlates with PVOS scores. The physical-functional subdomain scores on the PVRQOL agree most closely with the PVOS. Social-emotional measurements correlate less but are still significant. It is important to stress that the PVRQOL has been validated in a general pediatric otolaryngology population but has not yet been validated in the pediatric voice population. We are enrolling patients for this portion of the study and envision that this will prove helpful in judging the outcome of surgical and medical therapeutic interventions in children with voice disorders.

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Correspondence: Christopher J. Hartnick, MD, MS Epi, Department of Otolaryngology, Massachusetts Eye and Ear Infirmary, 243 Charles St, Boston, MA 02114 (Christopher_Hartnick@meei.harvard.edu).

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REFERENCES