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Abstract

Objective

To evaluate the internal consistency, reliability and clinical validity of the Italian version of the Pediatric Voice Handicap Index (pVHI). Patients and Methods: The parents of 30 children with dysphonia and 43 asymptomatic children were included in the study. Each parent was asked to complete the Italian pVHI autonomously. The voice of each child was assessed perceptually through the GRB parameters of the GRBAS scale. Internal consistency was analyzed through Cronbach's coefficient. For test-retest reliability analysis, the Italian pVHI was filled twice, with a 2-week interval, and the scores obtained were compared through the Pearson correlation test. Clinical validity was as-sessed comparing the scores obtained in the pathological and the control group using the Mann-Whitney test. Finally, the correlation between pVHI and the perceptual parame-ters was assessed. Results: All of the parents filled in the en-tire questionnaire autonomously. An optimal internal consis-tency was found (= 0.95); the test-retest reliability in the parents of both groups of children was high (r 1 0.88). The control group scored significantly lower than the pathological group (p = 0.0001). The pVHI scores positively correlated with perceptual assessment of voice disorders. Conclusion: The Italian pVHI is easily administered, highly reproducible, and exhibits excellent clinical validity.

Introduction

Pediatric dysphonia is not uncommon, and approximately 6–9% of all children have voice problems [1] . The most frequent causes are vocal fold nodules, which have been found in 38–78% of children evaluated for chronic hoarseness [2] , but other vocal fold lesions, such as local-ized edema and irregularity at the junction of the ante-rior and middle third of the vocal fold, have recently been found in 13.3% of 617 examined children [3] . Other dis-eases, such as laryngeal papillomatosis, subglottic steno-sis, laryngeal cleft and vocal fold paralysis are far less common, but severely impact on the voice of a child [4] . Common adult laryngeal diseases, such as vocal fold polyps or cysts, are also found in children, though occasionally.

Adult voices are usually assessed multimodally. One recently proposed evaluation is based on the five aspects of perception, endoscopic examination, acoustics, aerodynamics, and subjective self-assessment [5] , a set of measurements that is not yet commonly used for children. Although the development of flexible fiberoptic endoscopes has made office pediatric laryngeal examinations every-day practice [6] , and although it has been shown that computer-assisted voice analyses correlate well with perceptual evaluations thus extending their use in the management of pediatric dysphonia [7, 8] , subjective ratings have only recently been introduced in pediatrics.

Self-assessments such as the Voice Handicap Index (VHI) [9] , the Voice Outcome Survey [10] , Voice-Related Quality of Life [11] and the Outcome Scale [12] are currently being used throughout the world to assess dysphonia as an outcome measure in adult populations [13, 14] ; the VHI has been translated into different languages, is used in many countries, and has been applied to various patient groups [15–24] . Recently a shortened version of the VHI has been introduced, which is easily gaining international spread [25–28] .

The field of pediatric voice subjective rating is in its infancy; a well-studied instrument is the Paediatric Voice Outcome Survey [29] , which consists of five questions and relies on parents as the source of information. The Paediatric Voice Outcome Survey has been validated in 108 children and normative data have been obtained from 385 parents. More recently it has been validated in 120 parents of children with a variety of otolaryngologic diagnoses and so it is a valid and reliable means of measuring voice-related quality of life in children [30, 31] . However, the fact that it only has five questions means that it cannot address the physical, functional and emotional aspects of voice disorder in any depth. Previous application of the VHI to a pediatric population showed that an adaptation for children was necessary [32] . More recently a Pediatric Voice Handicap Index (pVHI) was published [33] ; it has been validated in 33 parents of dysphonic children and 45 parents of children with no present or past voice disorder. The pVHI is in the form of parental proxy and consists of 23 questions divided into functional (7 questions), emotional (7 questions) and physical domains (9 questions) to which the children's parents are asked to answer, using a 5-point scale ranging from 0 (never) to 4 (always). Thus, the pVHI appears to be a useful tool in following a child's development following surgical, medical and behavioral interventions.

Looking through the literature no validated translation of the pVHI into any language was found. The aim of this study was to develop an Italian version of the pVHI and to evaluate its internal consistency, reliability and clinical validity.

Patients and Methods

An Italian version of the original pVHI was developed; items of the questionnaire were translated into Italian, translated back into English and compared with the original items by a qualified professional translator. Ten parents of children with dysphonia (8 females and 10 males) with a mean age of 7.8 years (range 6–10) were enrolled in a pilot study; each parent autonomously filled in the first translation of the Italian pVHI and discussed the wording and meaning of each item in the pVHI with the senior clinician. The wordings of the questionnaire were modified on the basis

of the suggestions of parents involved in the pilot study and a final version was compiled (see 'Appendix 1').

Participants

Clinical data were obtained from the parents of 30 consecutive dysphonic children (27 males and 3 females) consulting for voice disorders. The median age of the participants was 7.13 8 6.67 years, with a range of 3–11 years. This group of patients was diagnosed with a variety of voice disorders by a phoniatrician and a speech and language pathologist: bilateral vocal fold nodules, unilateral vocal fold paralysis, vocal fold cyst and muscle tension dysphonia were found in 13, 7, 5 and 2 children, respectively; laryngeal cleft, anterior commissure web, subglottic stenosis were found in single cases.

Forty-three parents of asymptomatic control children, 30 boys and 13 girls, with no history of voice disorder were included to establish normative data. The mean age was 11.22 8 3.78 years, ranging from 3 to 13 years. An experienced phoniatrician and a speech pathologist rated the voice of each child in both groups recruited on conversational speech and sustained vowels. The GRB parameters of the GRBAS scale [34] were used for auditory perceptual analysis.

Internal Consistency

The internal consistency of the Italian version of the VHI was assessed using Cronbach's alpha coefficient. A value greater than 0.8 is considered 'good' and greater than 0.9 'excellent', while a value greater than 0.7 is often considered 'satisfactory'. For this analysis the pVHI scores obtained from the parents of children with and without dysphonia were used.

Test-Retest Reliability Analysis

For pVHI test-retest reliability analysis, the Italian pVHI was completed twice with an interval of approximately 2 weeks be-tween each administration by the parents of both the dysphonic children and the controls. This interval was selected because no substantial change was expected to take place in the voice condi-tion of the children within this period. When the parents com-pleted the second pVHI, they had no access to their responses from the first pVHI. The test-retest reliability was assessed for the total score as well as for each of the three subscales of pVHI.

Validity

For the pVHI clinical validity assessment, the pVHI total scores as well as the scores of each of its three subscales, obtained from the parents of the dysphonic children, were compared with the normative data obtained from the 43 parents of asymptom-atic children. Furthermore, the correlation between pVHI and the GRB parameters of the GRBAS scale was analyzed in order to as-sess external validity.

Table 1. Total pVHI scores and emotional, physical and functional subscale scores obtained from the parents of dysphonic children and in the control group

	Physical pVHI	Functional pVHI	Emotional pVHI	Total pVHI
Dysphonic children (n = 30)	18.387.3 (4–30)	8.186.2 (2–24)	6.686.1 (2–20)	33.1815.8 (16–66)
Control children (n = 43)	2.683.2 (0–4)	2.482.3 (0–4)	0.8781.2 (0–3)	5.884.9 (0–8)

Results are reported as means 8 standard deviation; ranges are reported in parentheses

Table 2. Test-retest reliability in the 30 parents with dysphonic children and in the control group assessed by Pearson test

pVHI scale and subscale	Test mean value		Retest mean value		Pearson test	
	dysphonic children	control group	dysphonic children	control group	patients	dysphonic children
Physical pVHI	18.387.3 (4–30)	2.683.2 (0–4)	18.288.2 (4–29)	1.781.8 (0–3)	0.93*	0.89*
Functional pVHI	8.186.2 (2–24)	2.482.3 (0–4)	7.485.6 (2–22)	1.982.1 (0–4)	0.92*	0.91*
Emotional pVHI	6.686.1 (2–20)	0.8781.2 (0–3)	5.084.7 (2–18)	0.581.0 (0–3)	0.89*	0.91*
Total pVHI	33.1815.8 (16–66)	5.884.9 (0–8)	30.4814.4 (15–64)	2.4882.5 (0–6)	0.95*	0.90*

The results are reported as means 8 standard deviation; ranges are reported in parentheses. * $p < 0.001$.

Statistical Analysis

Statistical tests were performed using the SPSS 17.0 statistical software (SPSS, Inc., Chicago, Ill., USA). The internal consistency was assessed using Cronbach's alpha coefficient. Pearson's correlation coefficient was used to evaluate the test-retest reliability of the VHI by comparing the baseline and retesting responses. Non-parametric Mann-Whitney test was used to assess the differences between the control and the pathological groups for all subscales as well as for the total score. The correlation between pVHI, its three subscales and GRB scores were assessed using Pearson's cor-relation coefficient.

The study was carried out according to the Declaration of Helsinki and approved by the Institutional Review Board. Each parent included in the study gave written informed consent.

Results

The parents of all of the 30 dysphonic children and of the 43 controls included in the study managed to complete the VHI without any need of assistance; the time required to fill in the questionnaire never exceeded 10 min. The mean scores obtained from the parents of children with dysphonia and from controls are reported in t able 1 . The severity ratings of the pathological group showed the highest scores for the physical pVHI subscale, followed by the functional and emotional subscales.

Internal Consistency Analysis

The overall Cronbach's α coefficient value for the questionnaire obtained from the 73 parents was extremely high (α= 0.95); for the physical, functional and emotional subscales the Cronbach's α coefficient values were α = 0.93, α = 0.92, and α = 0.89, respectively.

Reliability Analysis

The pVHI scores obtained for the intrarater reliability analysis in both the patient and control groups are reported in table 2 . A minor decrease in the mean pVHI score in the retest condition was visible in both groups; however, the Pearson correlation score was very high for each group in the total pVHI and in each of its three subscales.

Validity Analysis

Using the Mann-Whitney test, a significant difference between the dysphonic and the control group was found for the total pVHI (p = 0.0001) and the physical (p = 0.0001), functional (p = 0.0001) and emotional subscales (p = 0.0001).
The mean GRB values were 2.0 +/- 0.5, 1.6 +/- 0.7, 1.1 +/- 0.9 in the dysphonic children and 0.05 +/- 0.2, 0.07 +/- 0.2, 0.23 +/- 0.4 in the control group. The correlation values between pVHI and its three subscales and GRB parameter Schindler scores are reported in table 3 . The overall pVHI score positively correlated with voice perceptual assessment; the correlations were higher between physical as well as overall pVHI and G parameter, while a weak correlation between emotional pVHI and B parameter was found.

Table 3. r values of the Pearson test, showing the correlation be-tween the pVHI and its three subscales and the GRB parameters of the GRBAS scale

	Physical pVHI	Functional pVHI	Emotional pVHI	Total pVHI	p
G	0.75	0.49	0.48	0.74	<0.001
R	0.62	0.43	0.50	0.64	<0.001
B	0.40	0.39	0.38	0.47	<0.001

Discussion

The psychometric properties of the Italian pVHI were studied in a group of 30 parents of dysphonic children and in a control group of 43 parents; the results showed strong internal consistency, high test-retest reliability, optimal clinical validity and good external validity for the overall pVHI scores, as well as for the scores of the physical, functional and emotional domain of the pVHI. These data are in agreement with those reported in the original study by Zur et al. [33] .

Specific findings related to the Italian pVHI are noteworthy. In particular, each of the questionnaires was completed fully, suggesting that all of the parents understood all of the questions and were comfortable answering all of them. Therefore, it might be speculated that the Italian pVHI is not a burdensome instrument as it is easily self-administered and requires no more than 10 min to complete.

The internal consistency of the Italian pVHI appeared high with Cronbach's α coefficient values ranging from 0.89, for the emotional subscale, to 0.93 for the physical one. The overall Cronbach's α coefficient value was extremely high (α= 0.95). As far as the reliability of the Italian pVHI is concerned, the scores obtained in the test-retest condition in both the patient and control groups support the idea that the pVHI has a high stability and reproducibility over time. In fact, the Pearson correlation scores in both the patient and control groups were always higher than 0.88, a value considered optimal for both group comparison and individual measurements over time [35] . Similar findings were reported in the original study on the pVHI [33] , where test-retest reliability was also assessed through Pearson's test and values ranged between 0.79 for the emotional subscale and 0.95 for the functional subscale. Furthermore, in the original study of VHI for adults, internal consistency and reliability measures showed similar values [9] .

The scores of the physical domain of the pVHI were higher than the scores of the emotional and functional domains, which accords with previous reports in both pediatric and adult populations [20, 33] . A possible explanation would be that the physical symptoms are the prominent perceptual parameters parents directly associate with dysphonia while emotional and functional is-sues are not specifically associated with a voice disorder. In particular in pediatric dysphonia it is not uncommon to see a different perception of dysphonia severity by the children and the parents; in fact the children often do not recognize their voice as disordered, while the parents are afraid of the hoarseness they hear [36] .

Data from the present study indicate that the pVHI may be a sensitive tool for identifying voice disorders. The overall pVHI score and its three domains in the control group were significantly lower than those found in the voice-disordered group. These findings agree with those of several studies in adult patients, according to which voice-disordered patients had significantly higher scores than the control group [16–18, 20] ; also in the original study by Zur et al. [33] , the

difference in the pVHI scores obtained from parents of dysphonic children and controls was statistically significant [33] .

Correlation between auditory perceptual ratings of dysphonia and pVHI scores ranged between fair and very good. In the original studies of both the adult VHI and the pVHI, validity was assessed by comparing VHI scores with self-rating of dysphonia severity [9, 33] ; the correlation found was good in both studies. Even if validity was analyzed in a different way in our study, the validity of the Italian pVHI could be assumed to be satisfactory.

We acknowledge the limitations of our study because of the small number of patients, their heterogeneity and the possibility that other uncontrolled factors, such as age, may impact on the Italian pVHI. Nevertheless, we hope that our effort will encourage future studies on a larger population in order to investigate how dysphonia is perceived by parents of children with a voice disorder. In particular, it would be useful to have more extensive data on pVHI from groups of parents whose children present different voice disorders.

Conclusions

In conclusion, the Italian pVHI is easily administered, highly reproducible, and exhibits excellent clinical validity. Therefore, it appears to be a useful questionnaire for the initial assessment of children with voice disorders as well as for evaluation over time. The pVHI provides ad-ditional information for the clinician to better under-stand the manner in which parents perceive the voice of their children and is recommended in the standard pro-tocol for voice assessment.

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