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Reliability and validity of the Dutch pediatric Voice Handicap Index

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ABSTRACT

Introduction: The pediatric voice handicap index (pVHI) has been developed to provide a better insight into the parents' perception of their child's voice related quality of life. The purpose of the present study was to validate the Dutch pVHI by evaluating its internal consistency and reliability. Furthermore, we determined the optimal cut-off point for a normal pVHI score.

Methods: All items of the English pVHI were translated into Dutch. Parents of children in our dysphonic and control group were asked to fill out the questionnaire. For the test re-test analysis we used a different study group who filled out the pVHI twice as part of a large follow up study. Internal consistency was analyzed through Cronbach's α coefficient. The test-retest reliability was assessed by determining Pearson's correlation coefficient. Mann-Whitney test was used to compare the scores of the questionnaire of the control group with the dysphonic group. By calculating receiver operating characteristic (ROC) curves, sensitivity and specificity we were able to set a cut-off point.

Results: We obtained data from 122 asymptomatic children and from 79 dysphonic children. The scores of the questionnaire significantly differed between both groups. The internal consistency showed an overall Cronbach α coefficient of 0.96 and an excellent test-retest reliability of the total pVHI questionnaire with a Pearson's correlation coefficient of 0.90. A cut-off point for the total pVHI questionnaire was set at 7 points with a specificity of 85% and sensitivity of 100%. A cut-off point for the VAS score was set at 13 with a specificity of 93% and sensitivity of 97%.

Conclusions: The Dutch pVHI is a valid and reliable tool for the assessment of children with voice problems. By setting a cut-off point for the score of the total pVHI questionnaire of 7 points and the VAS score of 13, the pVHI might be used as a screening tool to assess dysphonic complaints and the pVHI might be a useful and complementary tool to identify children with dysphonia.

1. Introduction

Reports on childhood dysphonia describe prevalence varying from 6 to 22% [1,2]. The most frequent causes in school-age children are vocal fold nodules, but also edema or irregularity of the vocal fold, laryngeal papillomatosis, cysts and polyps, laryngotracheal stenosis, vocal fold paralysis or a laryngotracheo-esophageal cleft can result in dysphonia. Dysphonia may negatively affect the quality of life in children [3,4].

A number of tools are available for assessment of dysphonia; traditional endoscopy, perceptual assessment and objective (computer assisted) voice analysis can all be used to assess voice disorders. Given the impact of an impaired voice on the quality of life of a child with effects on the social, emotional and functional well-being, it is important to evaluate the voice related quality of life [3,5–8]. Zur et al. [9] developed the pediatric voice handicap index (pVHI), based on the original voice handicap index (VHI) for adults [10] to assess voice related quality of life in children. This pVHI is a parent proxy questionnaire which enables practitioners to quantify the impact of voice disturbance on the child's well-being and to evaluate surgical, medical and behavioral interventions. Parent proxy questionnaires benefit pediatric self-reported questionnaires like the children's voice handicap index-10 (CVHI10) [11] for the reason that they are not suitable for young children who are unable to understand certain terminologies used in the questionnaire and because young children

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might not be able to express and specify their impairment. The aim of this study was to validate the Dutch version of the pVHI and to evaluate its usefulness as a diagnostic tool by determining a 'cut-off point' for a normal score of the total pVHI questionnaire and VAS score.

2. Methods

2.1. Development of the Dutch pVHI

The pVHI consists of three parts: a talkativeness scale, a questionnaire and a visual analogue scale (VAS) score. Parents judge their child's talkativeness on a seven-point scale ranging from 1 (quiet listener) to 7 (extremely talkative). The questionnaire consists of 23 questions divided into three domains: functional (7 questions), physical (9 questions) and emotional (7 questions), using a five-point scale ranging from 0 (never) to 4 (always). Scores on the three domains are added up to form the total pVHI questionnaire varying from 0 to 92. Higher scores indicate worse voice related quality of life. Lastly, parents judge the overall quality of their child's voice on a visual analogue scale (VAS, varying from 0 to 100), where higher scores indicate worse voice quality.

All items of the original, English version of the pVHI (see Appendix A) were translated into Dutch by two speech language therapists, consequently translated back into English and finally compared with the original items by a bilingual physician and a bilingual, native English speech therapist. The final version was compared with the original version by Zur et al. [9]. After some small, semantic adaptations based on Zur's comments the final version of the Dutch pVHI was established (see Appendix B).

2.2. Participants

The internal consistency of the Dutch pVHI was analyzed using data obtained from a group of dysphonic children and a group of asymptomatic schoolchildren. Our dysphonic group included patients who visited our pediatric outpatient clinic for dysphonia between July 2010 and November 2014. This group was investigated by a speech therapist and an ear nose throat (ENT) surgeon. If indicated, the family agreed to an exam and the child tolerated laryngoscopy, endoscopic examination was done. During this visit all parents were asked to fill out the pVHI. Data were retrospectively obtained from the records. The control group consisted of asymptomatic children recruited from schools in the neighborhood of the hospital. Children with a history of voice complaints or voice treatment were excluded from participation in this study. The control group was matched to the dysphonic group for age and gender. For the test re-test analysis, we used the pVHI's of a cohort of children with a history of laryngotracheal stenosis who filled out the questionnaire twice as part of a large follow up study [12]. They completed the pVHI twice with no intervention in between and no access to their previous responses.

The Clinical Research Ethics Committee at our hospital approved this study for all three groups of children.

2.3. Statistical analysis

Continuous variables were analyzed using the non-parametric Mann Whitney *U* test and categorical variables using the chi-squared test. The internal consistency was assessed using Cronbach's coefficient α. An α greater than 0.9 was considered 'excellent'. The test-retest reliability was assessed by determining the level of agreement between the results of the first and the second pVHI with Pearson's correlation coefficient. A value between 0.41 and 0.60 was considered 'moderate', a value between 0.61 and 0.80 was considered 'substantial' and a value $\geq$ 0.81 was considered 'almost perfect'. Receiver Operating Characteristics (ROC) curves, sensitivity and specificity where calculated to set a cut-off point for total pVHI questionnaire and VAS score. A *p*-value of <0.05 was considered significant. All statistics and analysis were performed using SPSS version 20 (IBM, Chicago, USA).

3. Results

Parents of 79 children with voice disorders and 122 parents of children in the control group filled out the questionnaire. Baseline characteristics are given in Table 1.

A variety of voice disorders was diagnosed in the dysphonic group, these are given in Table 2. Sixteen patients refused endoscopic examination.

The outcome of the talkativeness scale, the questionnaire and the VAS of both groups are given in Table 3. In two cases the talkativeness was missing and in tree cases the VAS score was missing. However in all cases all questions of the questionnaire were completed. Except for talkativeness, all scores differed significantly between the dysphonic group and the control group.

Table 4 shows the results for the internal consistency for each of the three domains and for the total pVHI questionnaire score using data from 201 children, both the control group and the dysphonic group.

For the test re-test analysis parents of 32 children with a history of surgery for laryngotracheal stenosis completed the pVHI twice with an interval of at least 2 days and at most 3 months. This group

Table 1
Comparison between dysphonic and control group regarding age and gender.

		Dysphonic group n = 79	Control group n = 122	p - value
Age (years)		8.9 (4–18)	9.6 (4–17)	0.10
Gender	boys	44 (55.7%)	65 (53.3%)	0.74
	girls	35 (44.3%)	57 (46.7%)	

Age at visit (range in years). Gender is reported in number and percentage (%).

Table 2
Voice disorders diagnosed in the dysphonic group.

	Dysphonic group n = 79
Vocal fold nodules	30
Unilateral vocal fold paralysis	8
Vocal cord cyst/polyp	7
Incomplete posterior glottic closure	7
Laryngeal web	3
Bilateral vocal fold paralysis	1
Papillomatosis	1
Laryngopharyngeal reflux	1
No apparent disorders	5
Endoscopic examination refused by patient	16

Table 3
The talkativeness, pVHI questionnaire scores including subscores for each domain, and VAS score of the pVHI obtained from the parents of the dysphonic group and the control group.

	Dysphonic group n = 79	Control group n = 122	p - value
Talkativeness	5 (4–6)[a]	4 (4–5)[c]	0.29
Functional	7 (3–13)	2 (2–4)	<0.001
Physical	14 (10–19)	0 (0–1)	<0.001
Emotional	5 (1–10)	0 (0–0)	<0.001
Total pVHI	25 (16–41)	2 (2–5)	<0.001
VAS	61 (28–76)[b]	2 (2–6)[c]	<0.001

Data are presented in median (25%–75%).
[a] Available in 77 cases.
[b] Available in 76 cases.
[c] Available in 120 cases.