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The Voice Symptom Scale (VoiSS) and the Vocal Handicap Index (VHI): a comparison of structure and content

J.A. WILSON,* A. WEBB,* P.N. CARDING,* I.N. STEEN,† K. MACKENZIE‡ & I.J. DEARY§

*Department of Otolaryngology Head and Neck Surgery, University of Newcastle, †Centre for Health Services Research, University of Newscastle, ‡Department of Otolaryngology Head and Neck Surgery, Glasgow Royal Infirmary, and §Department of Psychology, University of Edinburgh, UK

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Self report measures of voice function are in frequent use, but have had inadequate psychometric evaluation. We aimed to perform a substantial factor analysis of two measures of voice impairment, the Voice Symptom Scale (VoiSS) and the Voice Handicap Index (VHI). Both the 30-item questionnaires were completed by 319 dysphonic voice clinic attenders (99M, 220F). Principal components analysis confirmed that both instruments reflected general voice abnormality. The VoiSS comprised three factors – impairment (15 items), emotional (8 items) and related physical symptoms (7 items) – each with a good internal consistency. Analysis of the VHI suggested that it contains only two subscales. When a three-factor solution was imposed on the data, analysis failed to support the currently advised three 10-item subscale interpretations. Instead, we found a physical (voice impairment) domain (8 items), a psychosocial domain (14 items) and a factor with 8 items related to difficulty in being heard. The VHI requires further statistical refinement to identify its subscale structure. The VoiSS was developed from 800 subjects and is psychometrically the most robust and extensively validated self report voice measure available.

Keywords *questionnaire* *factor analysis* *psychometrics* *dysphonia* *voice disorders*

Many voice-rating tools are principally physician-derived. Our aim was to develop a patient-derived inventory of voice symptoms for use as a sensitive assessment tool of (i) baseline abnormality and (ii) response to change in adult dysphonia clinics. Data from a total of 481 subjects were used in the generation of a 43-item Voice Symptom Scale (VoiSS), which proved to have a high reliability (internal consistency) as an omnibus indicator of voice problems and is the most rigorously evaluated questionnaire of its kind to date.[1,2]

The VoiSS originated in an open-ended questionnaire[3] that yielded 467 difficulties and problems reported by 133 consecutive patients with voice disorders.[4] The 467 voice-related problems were identified as 53 different items. These were compiled as a self-report questionnaire and presented to a further 168 voice patients. Principal components analysis of these 53 items suggested that the patients' complaints reflected either three or five separate voice-related factors.[1] The five-factor model included, however, two factors with only moderate loadings from just a few items each. The contents of the three more substantial components concerned communication difficulties, pharyngeal symptoms and psychosocial distress. Of the 53 items, 31 were with high loadings on their principal factor, low loadings on other factors and together represented the three main symptom domains. We then scrutinized the developing questionnaire for content validity.

It was felt desirable to add disability and handicap items to the key 31 items identified by the principal components analysis in the pilot study.[1] Thirteen such items were thus drawn from the Voice Handicap Index (VHI), which was by

Correspondence: Janet A. Wilson, Professor of Otolaryngology Head and Neck Surgery, Freeman Hospital, Newcastle upon Tyne NE7 7DN, UK (e-mail: Janet.Wilson@nuth.northy.nhs.uk).

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then emerging as one of the most used clinical voice tools.[5–8] The resulting 44-item VoiSS questionnaire was completed by a further 180 subjects. Each item had a 5-point, frequency-based response scale: never, occasionally, some of the time, most of the time, all of the time. One item, relating to work, was withdrawn from the analysis, as too many subjects were not in employment for this to be meaningful, leaving 43 items.

The results of this phase of the VoiSS scale's development indicated five main factors accounting for 55.2% of the total item variance: communication problems, throat infection, psychosocial distress, voice sound and variability and, finally, phlegm. In addition to these internally consistent subscales, most of the VoiSS symptoms loaded significantly on the first unrotated principal component; thus the VoiSS total score indicated overall voice abnormality. It appeared, however, on both statistical and clinical grounds, that there may be some overlap of certain factors, e.g. phlegm and sore throat, and it was felt that the questionnaire required a further iteration before the final version of the VoiSS could be recommended for widespread clinical use. The aim of the present study was to refine further the psychometric structure of the VoiSS in a new and much larger sample. In addition, we conducted the first large psychometric analysis of the VHI at the item level, and we compared the subscale intercorrelations within and between VoiSS and the VHI.

Methods

The VoiSS (43-item version) was fully completed by 319 unselected new ENT outpatient referrals, with principal complaints of voice disorder, at two clinics in Glasgow and Newcastle upon Tyne. There were 99 men and 220 women, typical of the man:woman ratio in voice disorder patients. Just under half of the patients had various types of functional dysphonia, 36 had vocal cord paralysis and most of the remainder had one of the commoner laryngeal structural lesions (Table 1). In other words, this large sample was very typical of the UK laryngology patient population. All patients also completed the 30-item VHI.

Responses from individual items on the VoiSS and the VHI were individually entered into a database and subjected to principal components analysis. The criterion used to decide the number of factors was scree slope analysis. Rotation of components was performed using an oblique method because of the strong general component in both the questionnaires. Hereafter, we shall sometimes refer to these components as factors. The internal consistency of scales suggested by this analysis was assessed using Cronbach's alpha statistic. The scores for each factor were compared in functional patients and those in the other principal diagnostic categories. The outcome development studies were approved by the Hospital's ethical committees.

Table 1. Working diagnoses of the dysphonic patients included in the present study ($N = 319$)

Diagnosis	*N*
Functional disorders	
Non-specific functional	111
Hyperfunctional	16
Glottic chink	10
Dysphonia plicae ventricularis	5
Vocal cord palsy	36
Laryngitis	31
Reinke's oedema	18
Reflux	17
Asthma	4
Mass lesions	
Nodules	19
Vocal cord polyp	10
Papillomata	8
Malignancy	7
Leukoplakia	7
Other mass lesion	9
Miscellaneous*	11
Total	319

*Miscellaneous: globus (4), presbyphonia, gender dysphoria, atrophy, cardiac disease, haematoma, hyperthyroidism, pharyngitis.

Results

The 43 items of the VoiSS questionnaire were subjected to principal components analysis. Analysis of the scree slope suggested that three components should be extracted. These were rotated using the direct Oblimin method. Loading of each item on the rotated components was scrutinized, and a selection of items for retention in the final questionnaire was made on the standard criteria of its having a high loading (>0.4) on one factor and near-to-zero loadings (<0.2) on the other two. This ensures clear and relatively distinct factors. Using this method, 30 items were retained. Scrutiny of the deleted items revealed none with a unique or important clinical content not covered elsewhere in the questionnaire. The 30 retained items were reanalysed using principal components analysis with direct Oblimin rotation, and the final results are presented in Table 2, with the mean and standard deviations of the item responses. The three components accounted for 48.9% of the total item variance.

The factor loadings of the VoiSS analysis (Table 2) showed that all items load positively, and mostly highly, on the first unrotated principal component, which accounts for 33.1% of the total item variance. This suggests that almost all of the items share variance and relate generally to voice dysfunction. Therefore, the total score on the VoiSS may be used to gauge general voice abnormality. The rotated components relate to impairment (15 items), emotional response (8 items) and physical symptoms (7 items). The internal consistencies (Cronbach's alpha) of the general and rotated components

Table 2. Principal components analysis and internal consistency coefficients (Cronbach's alpha) of the VoiSS

Item no.	Verbatim item	FUPC†	Obliquely rotated factors			Endorse (%)‡	Mean	SD
			Factor 1	Factor 2	Factor 3			
I1	Do you have difficulty attracting attention?	**0.66**	**0.72**	0.00	0.00	63.8	1.13	1.10
I3	Do you have problems singing?	**0.50**	**0.56**	−0.01	0.00	84.8	2.54	1.46
P5	Is your throat sore?	0.29	0.00	**0.69**	0.00	76.0	1.41	1.13
I7	Is your voice hoarse?	**0.57**	**0.46**	0.12	0.13	82.4	2.47	1.14
I8	When talking in company do people fail to hear you?	**0.70**	**0.64**	−0.13	0.20	77.0	1.58	1.17
I9	Do you lose your voice?	**0.56**	**0.54**	0.33	0.00	79.6	1.49	1.11
P13	Do you cough or clear your throat?	0.18	0.00	**0.55**	−0.01	94.9	2.40	1.15
I15	Do you have a weak voice?	**0.60**	**0.70**	−0.01	0.00	82.0	1.82	1.28
I16	Do you have problems talking on the telephone?	**0.74**	**0.69**	−0.01	0.19	76.0	1.68	1.36
E17	Do you feel miserable or depressed because of your voice problem?	**0.69**	0.01	0.10	**0.74**	69.1	1.37	1.27
P18	Does it feel as if there is something stuck in your throat?	0.30	0.01	**0.60**	0.00	72.1	1.60	1.32
P19	Do you have swollen glands?	0.24	0.00	**0.59**	0.00	42.2	0.68	0.97
E21	Are you embarrassed by your voice problem?	**0.72**	0.17	−0.11	**0.75**	62.9	1.36	1.36
I22	Do you find the effort of speaking tiring?	**0.78**	**0.66**	0.00	0.24	79.6	1.63	1.31
E23	Does your voice problem make you feel stressed and nervous?	**0.72**	0.01	0.14	**0.71**	62.0	1.18	1.20
I24	Do you have difficulty competing against background noise?	**0.43**	**0.61**	−0.15	−0.01	59.9	2.13	2.60
I25	Are you unable to shout or raise your voice?	**0.69**	**0.75**	0.00	0.00	87.0	2.09	1.34
E27	Does your voice problem put a strain on your family and friends?	**0.58**	0.01	−0.01	**0.65**	44.6	0.87	1.21
P28	Do you have a lot of phlegm in your throat?	0.24	0.01	**0.60**	0.00	79.4	1.67	1.28
I30	Does the sound of your voice vary throughout the day?*	**0.51**	**0.61**	0.20	−0.13	94.3	2.14	1.14
E31	Do people seem irritated by your voice?*	**0.64**	0.20	0.00	**0.55**	22.0	0.78	1.06
P32	Do you have a blocked nose?	0.24	−0.13	**0.52**	0.21	66.3	0.92	1.01
I33	Do people ask what is wrong with your voice?*	**0.58**	**0.58**	0.01	0.01	51.2	1.79	1.30
I34	Does your voice sound creaky and dry?*	**0.64**	**0.48**	0.20	0.17	66.6	2.00	1.14
I35	Do you feel you have to strain to produce voice?*	**0.73**	**0.72**	0.00	0.10	86.7	1.93	1.25
P38	How often do you get throat infections?	0.18	0.00	**0.69**	0.00	77.1	1.16	0.94
I40	Does your voice 'give out' in the middle of speaking?*	**0.65**	**0.65**	0.17	0.00	50.3	1.54	1.15
E42	Does your voice make you feel incompetent?*	**0.71**	0.11	−0.01	**0.78**	43.4	0.87	1.22
E43	Are you ashamed of your voice problem?*	**0.62**	−0.01	0.00	**0.84**	32.0	0.59	1.06
E44	Do you feel lonely because of your voice problem?	**0.63**	−0.01	0.00	**0.84**	13.6	0.41	0.89
Cronbach's alpha (internal consistency coefficient)	–	0.92	0.89	0.73	0.90	–	–	–
Correlations among factors								
Factor 2	–	–	0.20	–	–	–	–	–
Factor 3	–	–	0.52	0.21	–	–	–	–

The item numbers in the first column are included for reference and refer to the larger item pool from which the present item set was selected.[1]
I, Impairment; P, physical; E, emotional.
*Items from the VHI.
†First unrotated principal component.
‡Endorsement is the percentage of people responding other than 'never', i.e. they experience this symptom 'occasionally' or more frequently.

are high (Table 2). The impact and emotional response-rotated components correlate positively ($r = 0.52$). Correlations between the physical component and the other two components were low.

Principal components analysis of the VHI's 30 items was carried out on the same subjects. Scree slope analysis suggested a two-factor solution. However, because all the reported research on the VHI uses a three-factor structure, a three-factor solution was imposed. These three components accounted for 57.3% of the total item variance. The response frequencies of each item in the VHI are shown in Table 3, with the means and standard deviations of the item responses and the factor loadings of the VHI analysis based on the imposed three-factor solution. As seen with the VoiSS, all the VHI's items load positively, and highly, on the first unrotated principal component, which accounts for 43.8% of the total item variance. Thus, almost all the items share variance and relate generally to voice dysfunction. The internal consistencies (Cronbach's alpha) of the three rotated components are very high (0.88–0.91).

The factor analysis solution is less clear than that of the VoiSS in three ways. First, fewer items have very high loadings on one factor combined with near-to-zero loadings on other factors. Therefore, the VHI departs further than the VoiSS from 'simple structure'. Eleven of the 30 VHI items score >0.2 on a second factor (compared with three in the 30-item VoiSS). Second, some of the VHI items do not have their highest loadings on their 'home' factor according to the published VHI scoring system. The factor 1 has 14 items: 7 from the 'functional', 6 from the 'emotional' and 1 from the 'physical' scale. Factor 2 has 8 items: 4 'emotional', 3 'functional' and 1 'physical'. Factor 3 has 8 'physical' items. Finally, the intercomponent correlations are all moderate to high (0.35–0.54; Table 3), suggesting much overlap among the rotated components' contents.

The VoiSS total and subscale scores for people with functional voice disorders and for those with more defined voice pathology are shown in Table 4. The mean scores of the three VoiSS subscales in the two questionnaires are not significantly different when comparing the 144 functional subjects with an age-matched group of 145 patients with most or less clear-cut organic problems – structural lesions or vocal cord motion impairment.

Discussion

The VoiSS is by no means the first self-report voice measure,[9–12] but it is without doubt the one most subjected to rigorous psychometric evaluation. We previously reported[4] the first phase of the development of the VoiSS tool, based on the prospective administration of an open-ended problems sheet.[3] Second, a prototype summary list of these problems was administered to 168 subjects, and these subjects underwent principal components analysis. Third, a modified 44-item scale was administered to 180 new subjects. All but one of the symptoms were highly endorsed, and principal components analysis with oblique rotation yielded the final VoiSS,[1] which has good reliability.[2]

This paper reports the fourth and final stage of the psychometric analysis, culminating in the development of the final 30-item VoiSS. Its refinement has involved responses by 800 subjects. The three components that emerge from this substantial body of research are stable across different studies. Total and subscale scores have good factor loading characteristics and good internal consistencies (Table 2). The greatest contribution of the five factors identified in our previous VoiSS factor analysis was, as might be expected, a communication factor. Two factors comprised closely allied physical symptoms – throat infection and phlegm. In the present analysis, these merge into a single 7-item physical symptom component. Such symptoms contribute both to organic and functional disorders. It should be asked why this domain has not been included in previous voice questionnaires, despite the fact that the items are all common – sore throat, globus, phlegm, blocked nose and throat clearing. In this series, the physical symptoms were well endorsed by 42–95% of respondents.

The VHI was derived retrospectively by review of the written case histories from a 7-year period, and may thus have had something of a selection bias towards the pre-conceptions of the researchers as to what constitutes a voice-related problem. In contrast, VoiSS development included patient-generated lists in a prospective, open-sheet design. This may have affected the inclusion of physical throat symptoms other than dysphonia. The three VHI categories were then identified a priori, not by factor analysis of real responses; hence, the equal number of 10 items per domain derived from 85 initial items. The single sample of 65 subjects, whose responses were used to refine the VHI item list from 85 to 30 and to assess subsequent reliability, was clearly a much smaller group than ideal (a minimum of five subjects per item would be regarded as standard for a factor analysis). Also, one in four was without a larynx,[6] and might be regarded as having a set of very specific communication problems not representative of the majority of patients presenting with voice disorders.

The data gathered from the present series of 319 subjects thus also allowed a formal factor analysis to be performed on the VHI for the first time. The scree slope analysis of the VHI suggests that it has a two- and not a three-factor structure. Moreover, even when the three-factor structure is imposed on the data, there are many items that fail to load on their nominal factor. These two failures of factor number and item factor loadings are serious limitations of the VHI, suggesting that the currently used structure is psychometrically invalid.

Total scores on VoiSS and VHI are useful general indicators of voice abnormality, incorporating psychosocial impacts of voice problems. The VoiSS physical (pharyngeal) symptom scale is not shared by the VHI (nor indeed most other voice measures to our knowledge). This scale might, it could be

Table 3. Principal components analysis and internal consistency coefficients (Cronbach's alpha) of the VHI

Item no.*	Verbatim item	FUPC†	Obliquely rotated factors			Endorse (%)‡	Mean	SD
			Factor 1	Factor 2	Factor 3			
F1	My voice makes it difficult for people to hear me	**0.73**	−0.11	0.14	**0.84**	78.4	1.70	1.11
P2	I run out of air when I talk	**0.55**	0.01	**0.40**	0.24	68.3	1.46	1.17
F3	People have difficulty understanding me in a noisy room	**0.75**	−0.01	0.17	**0.80**	83.5	2.04	1.25
P4	The sound of my voice varies throughout the day	**0.48**	−0.01	**0.78**	0.00	92.5	2.28	1.01
F5	My family has difficulty hearing me when I call throughout the house	**0.74**	−0.01	0.18	**0.80**	75.8	1.80	1.29
F6	I use the phone less often than I would like	**0.69**	0.14	0.20	**0.51**	58.2	1.44	1.44
E7	I'm tense when talking with others because of my voice	**0.79**	**0.55**	0.14	0.29	60.4	1.24	1.23
F8	I tend to avoid groups of people because of my voice	**0.75**	**0.65**	0.00	0.26	46.2	0.953	1.23
E9	People seem irritated with my voice	**0.54**	0.22	−0.13	**0.51**	46.9	0.90	1.56
P10	People ask, 'What's wrong with your voice?'	**0.55**	−0.11	0.36	**0.47**	85.5	2.01	1.17
F11	I speak with friends, neighbours or relatives less often because of my voice	**0.74**	**0.55**	0.01	0.24	46.2	0.92	1.18
F12	People ask me to repeat myself when speaking face to face	**0.77**	0.00	0.15	**0.75**	71.4	1.51	1.18
P13	My voice sounds creaky and dry	**0.59**	0.13	**0.64**	0.01	92.7	2.29	1.00
P14	I feel as though I have to strain to produce voice	**0.71**	0.01	**0.59**	0.33	87.7	2.14	1.15
E15	I find other people don't understand my voice problem	**0.69**	0.21	0.01	**0.53**	60.6	1.26	1.23
F16	My voice difficulties restrict my personal and social life	**0.77**	**0.63**	0.00	0.25	50.9	1.07	1.26
P17	The clarity of my voice is unpredictable	**0.62**	0.11	**0.67**	0.01	87.1	2.18	1.17
P18	I try to change my voice to sound different	**0.59**	**0.52**	0.25	0.00	46.2	0.94	1.14
F19	I feel left out of conversation because of my voice	**0.68**	**0.38**	−0.14	**0.53**	45.0	0.89	1.13
P20	I use a great deal of effort to speak	**0.72**	0.18	**0.44**	0.33	76.6	1.74	1.23
P21	My voice is worse in the evening	**0.45**	0.00	**0.71**	0.00	81.6	1.88	1.19
F22	My voice problem causes me to lose income	**0.35**	**0.36**	0.22	−0.11	17.0	0.42	1.05
E23	My voice problem upsets me	**0.62**	**0.72**	0.17	−0.01	72.3	1.65	1.31
E24	I am less outgoing because of my voice problem	**0.75**	**0.83**	0.00	0.01	44.7	0.96	1.25
E25	My voice makes me feel handicapped	**0.72**	**0.82**	0.00	−0.01	36.2	0.81	1.21
P26	My voice 'gives out on me' in the middle of speaking	**0.60**	0.17	**0.66**	0.00	85.5	1.86	1.01
E27	I feel annoyed when people ask me to repeat	**0.67**	0.18	−0.01	**0.66**	56.6	1.13	1.20
E28	I am embarrassed when people ask me to repeat	**0.71**	0.33	−0.15	**0.62**	52.5	1.05	1.17
E29	My voice makes me feel incompetent	**0.72**	**0.80**	−0.01	0.10	39.9	0.79	1.10
E30	I'm ashamed of my voice problem	**0.58**	**0.80**	−0.01	0.00	27.0	0.58	1.08
Cronbach's alpha (internal consistency coefficient)	–	0.95	0.91	0.88	0.91	–	–	–
Correlations among factors								
Factor 2	–	–	0.35	–	–	–	–	–
Factor 3	–	–	0.54	0.44	–	–	–	–

*P, Physical subscale; F, functional subscale; E, emotional subscale. Note the departure from these nominal scales in rotated factors 1–3.
†First unrotated principal component.
‡Endorsement is the percentage of people responding other than 'never', i.e. they experience this symptom 'occasionally' or more frequently.

Table 4. Mean VoiSS factor scores in 144 functional dysphonics (106 women) and 145 patients with defined pathology* (85 women)

	Functional		Defined pathology	
Feature	Mean	SD	Mean	SD
Age	53.4	16.5	51.6	17.3
VoiSS				
Impairment	27.0	13.5	29.7	12.3
Physical	9.6	4.7	9.5	4.8
Emotional	6.8	6.7	7.6	4.4
Total	43.3	20.0	46.5	20.4

*Laryngitis, Reinke's oedema, nodules, polyps, papillomata, cancer, other mass lesions, vocal cord paralysis.

argued, render the questionnaire 'impure' in terms of its reflection of voice quality. But, the inclusion of these allied symptoms reflects their importance to the patients whose original open-set, volunteered problem lists generated the VoiSS, and to those who have continued to endorse them in iterations of the questionnaire. Indeed, the single most often endorsed item of the VoiSS questionnaire was throat clearing (94.9%; Table 2). Likewise, certain types of intervention for voice patients also impact on more than voice quality – antireflux measures, smoking cessation, aspects of voice therapy programmes may all improve these associated symptoms.

The similarity of severity of reporting of voice problems among different diagnostic categories of dysphonia (Table 4) is of considerable interest as there are few, if any, published data of this type. Functional dysphonics usually experience short-term fluctuations in severity. Typically the problem is more apparent at the end of a working day than in the clinic setting, making it more difficult to obtain a representative recording for acoustic or perceptual rating. Thus, self-report questionnaires may provide a more meaningful index of the impact of voice disorders.

On the basis of our detailed, item-level factor analysis, the first 14-item rotated VHI component contains high loading items related to the social and personal impact of the voice problem. The two remaining 8-item scales relate to the sound of the voice and specifically to difficulties in being heard. In other words, this factor analysis has highlighted some problems with the VHI structure. Inspection of Table 3 shows that one-third of the items do not have clean factor loadings, and items are loading on the 'wrong' scales. Loosely, the scales might be labelled – psychosocial, physical voice impairment and being heard.

The VHI's separate components related to voice impairment – its sound and function – and the problem of being heard correlate highly, and are combined in one VoiSS scale. The VHI 'being heard' component may be, to some extent, a 'bloated specific', i.e. just repeatedly asking one communication-related question. Moreover, there also appears to be too much correlation among the VHI factors, indicating redundancy. High Cronbach's alphas are to be welcomed, but if too high it can indicate just asking the same question over and over again. In short, the 30-item VHI needs to be resubjected to further principal components analysis before it can be used safely. Importantly, scree slope analysis suggests that it contains just two components.

Conclusion

Voice symptom scale is the most rigorously evaluated and psychometrically robust measure currently available for the self-assessment of voice quality. Overall, VoiSS has better validated factor structure and better item coverage than VHI. Uniquely, it also includes related upper aerodigestive tract symptoms, which are well-established correlates of dysphonia and also targets for therapeutic intervention.

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References

1 DEARY I.J., WILSON J.A., CARDING P.N. *et al.* (2003) VoiSS: a patient derived voice symptom scale. *J. Psychosom. Res.* **54**, 483–489
2 WEBB A.L., CARDING P.N., DEARY I.J. *et al.* (2003) The reliability and validity of three patient self-report scales for voice related quality of life. *Clin. Otolaryngol.* (in press)
3 BARCHAM L.J. & STEPHENS S.D.G. (1980) The use of an open-ended problems questionnaire in auditory rehabilitation. *Br. J. Audiol.* **14**, 49–54
4 SCOTT S., ROBINSON K., WILSON J.A. *et al.* (1997) Patient reported problems associated with dysphonia. *Clin. Otolaryngol.* **22**, 37–40
5 BENNINGER M.S., AHUJA A.S., GARDNER G. *et al.* (1998) Assessing outcomes for dysphonic patients. *J. Voice* **12**, 540–550
6 JACOBSON B.H., JOHNSON A., GRYWALSKI C. *et al.* (1997) The Voice Handicap Index (VHI): development and validation. *Am. J. Speech Lang. Pathol.* **6**, 66–70
7 ROSEN C.A. & MURRY T. (2000) Voice Handicap Index in singers. *J. Voice* **14**, 370–377
8 ROSEN C.A., MURRY T., ZINN A. *et al.* (2000) Voice handicap index change following treatment of voice disorders. *J. Voice* **14**, 619–623
9 HOGIKYAN N.D. & SETHURAMAN G. (1999) Validation of an instrument to measure voice-related quality of life (V-RQOL). *J. Voice* **13**, 557–569
10 MU E.P.-M. & YIU E.M.-L. (2001) Voice activity and participation profile: assessing the impact of voice disorders on daily activities. *J. Speech Lang. Hearing Res.* **44**, 511–524
11 CARDING P.N. & HORSLEY I.A. (1992) An evaluation study of voice therapy in nonorganic dysphonia. *Eur. J. Disord. Commun.* **27**, 137–158
12 CARDING P.N., HORSLEY I.A. & DOCHERTY G.D. (1999) Measuring the effectiveness of voice therapy in a group of forty-five patients with non-organic dysphonia. *J. Voice* **13**, 76–113
13 HOGIKYAN N.D. & ROSEN C.A. (2002) A review of outcome measurement for voice disorders. *Otolaryngol. Head Neck Surg.* **126**, 562–572