

## Measurement and validation of the voice handicap index in voice-disordered patients in Taiwan

MING-WANG HSIUNG, M.D., PAI LU, PH.D.\*, BOR-HWANG KANG, M.D., PH.D.,  
HSING-WON WANG, M.D., PH.D.

### Abstract

Voice disorders can cause problems for patients emotionally, physically, economically and functionally. Neither subjective nor objective voice examinations are able to evaluate such factors adequately. For this study, a retrospective analysis of 79 dysphonic cases was conducted using the voice handicap index (VHI) to gather comprehensive data across a variety of voice disorders. Of the 79 cases, 41 involved glottic insufficiency, 26 involved vocal polyps or mass, and 12 involved functional voice disorders. Cases were assessed with the VHI using physical (P), functional (F), emotional (E) parameters and a total (T) of the three. P, F, E and T variables were entered into a statistical programme and analysed using one-way analysis of variance (ANOVA). Mean  $\pm$  SE values for P, F, E and T, respectively, in glottic insufficiency cases were  $31.61 \pm 1.10$ ,  $26.49 \pm 1.43$ ,  $26.06 \pm 1.54$ , and  $84.20 \pm 4.21$ . Mean  $\pm$  SE values for P, F, E and T, respectively, in vocal mass cases were  $30.69 \pm 1.73$ ,  $25.23 \pm 1.90$ ,  $23.96 \pm 1.82$ , and  $79.88 \pm 5.08$ . The mean  $\pm$  SE values of P, F, E and T, respectively, in functional voice disorders were  $20.92 \pm 2.06$ ,  $18.33 \pm 1.82$ ,  $16.83 \pm 1.86$ , and  $56.08 \pm 5.23$ . We found the mean glottic insufficiency was significantly greater than functional voice disorders for each measure. There were significant differences between vocal mass and functional voice disorders means for P and T. Glottic insufficiency and vocal mass means were not significantly different for any measure. Problems in the physical realm were identified as the most severe amongst all patients. Glottic insufficiency patients were found to suffer the most in every VHI value. Although VHI is a relatively new method by which to measure discomfort in voice-disordered patients, it provides a mechanism for patients to define their discomfort and for therapists to better target recovery programmes to patient's needs.

**Key words:** Voice Disorders; Reproducibility of Results; Taiwan

### Introduction

Measuring the severity of voice disorders in dysphonic patients is typically a daunting task. Traditional methods include subjective judgment (grade, roughness, breathiness, asthenia, strain) as well as objective measurements (videolaryngostroboscopy, acoustic analysis, phonatory function, etc.). Scores based on the subjective judgments of therapist evaluations can produce different answers and lack a firm basis upon which to conduct objective scientific comparisons. Current objective measurements are limited in their application and efficacy due to variations in readings between voice disorders and differences in measuring techniques, token numbers required minimum survey group sizes, and analysis tools. Therefore, while traditional measurements can provide valuable data, they fail to offer insight into why the same voice disorder can result in differing handicaps and disabilities.

The terms of 'impairment', 'disability' and 'handicap', as defined by the World Health Organization (WHO),<sup>1</sup> mean 'any loss or abnormality of psychological, physiological, or anatomical structure or function', 'a restriction or lack of ability manifested in the performance of daily tasks' and 'a social, economic, or environmental disadvantage resulting from an impairment or disability', respectively. Therefore, 'inability to glide the voice to a high or low pitch' can be classified as a disability and 'inability to perform work tasks due to his/her husky voice' may be classified as a voice handicap.

The WHO defines health as a multidimensional concept incorporating physical, mental and social states of being.<sup>2</sup> However, most conventional medical treatments tend to give first priority, and the greatest attention, to a patient's physical well-being. Emotional and social well-being is frequently overlooked in modern clinical treatment protocols. In treating voice problems, most therapists also focus

From the Departments of Otolaryngology, Tri-Service General Hospital and National Defense Medical Center, Taipei and the Department of Public Health\*, National Defense Medical Center, Taipei, Taiwan, R.O.C.

Accepted for publication: 3 March 2003.

most on the physical aspects of voice. However, various voice-disordered diseases manifest differently among patients in different professional groups (e.g. teachers, housewives, sales representatives, service sector workers, etc.).

There exist few standardized methods to assess psychosocial consequences in voice-disordered patients. Thomas *et al.*<sup>3</sup> developed a linear analogue scale to assess voice quality and daily functionality in patients with laryngeal cancer. It was the first attempt to assess functional impacts and develop voice quality measurements. Jacobsen *et al.*<sup>4</sup> developed the VHI that used instruments to quantify the psychosocial consequences of voice disorders. Rosen and Murry<sup>5</sup> used VHI to assess the severity of dysphonia in singers and non-singers. Rosen *et al.*<sup>6</sup> measured improvements, based on patient perceptions, following treatment for four different voice disorders. These measurements demonstrated that a voice-disordered patient's subjective feelings regarding his or her voice disorder was as important as an effective physical treatment programme.

VHI offers the ability for researchers to obtain further information about patients' subjective perceptions and provides data valuable to pre- and post-operative evaluations.<sup>7,8</sup> Although many reports recognize the detrimental impact that voice disorders can have on social functions and quality of life, few instruments outside of VHI can address this issue. With this in mind, this study attempts to answer the following questions:

- (1) How great is the severity of VHI in different groups of voice-disordered patients?
- (2) How great is the severity of VHI between the three factors (emotional, physical, functional) in VHI of voice-disordered patients?

## Materials and methods

### Selection of patients

There were 79 patients with dysphonia who underwent VHI testing at the Tri-Service General Hospital in Taipei, Taiwan. Each patient in this study received a multidisciplinary voice evaluation including a thorough history, complete head and neck examination, medical-speech evaluation consisting of perceptual, acoustic, and phonatory function testing, and videolaryngostroboscopy. A diagnosis was made after the examinations listed above.

The diagnosis of dysphonic patients included vocal mass of polyp ( $n = 26$ ), functional voice disorder ( $n = 12$ ), and glottic insufficiency ( $n = 41$ ). The vocal mass or polyp was grouped into one group due to the similarities in presentation and management. Glottic insufficiency resulted from a variety of factors, including vocal scarring, bowing, sulcus, and paralysis. The diagnoses were selected on the basis of their frequency of occurrence in our department and they represented a variety of voice disorders.

### VHI measurements

Seventy-nine patients underwent VHI evaluation prior to treatment. VHI, proposed by Jacobson *et al.*<sup>4</sup> in 1997, comprises 10 voice disorder variables in three domains (emotional (E), physical (P), and functional (F)). Patients are requested to note the frequency of each variable on a five-point scale (never, almost never, sometimes, almost always, always). The VHI is scored pre-operatively for dysphonic patients on a 1 to 5 scale (1 = never, 5 = always). Scores in each domain (E, P and F) ranged from 10 (unaffected) to 50 (severely affected). The total score ('T') sums E, P and F. The T score ranges from 30 (unaffected) to 150 (severely affected). Scores were also tabulated for each domain and combined domain total.

### Statistical analysis

E, P, F, and T were entered into a statistical programme and the variables of each were analysed using one-way Analysis of Variance (ANOVA) followed by Tukey's (honestly significant difference), (HSD)) method for multiple comparisons, if overall ANOVA is significant. Differences were regarded as statistically significant if  $p < 0.05$ .

## Results

### Sample population

There were 79 patients in the initial study group, 34 (43 per cent) were male. The average age was  $50.5 \pm 13.5$  years (ages ranged from 18 to 79 years).

### General results in VHI

In all three subgroups of patients, the mean value of the P domain is larger than either the F or E domains (Table I). The mean value of the F domain is larger than that of E.

TABLE I  
MEAN VALUES FOR VOICE HANDICAP INDEX (VHI) SUBSCALE IN VOICE-DISORDERED PATIENTS (N = 79)

	n	P Mean $\pm$ SE	F Mean $\pm$ SE	E Mean $\pm$ SE	T Mean $\pm$ SE
GI	41	31.61 $\pm$ 1.10	26.49 $\pm$ 1.43	26.06 $\pm$ 1.54	84.20 $\pm$ 4.21
VM	26	30.69 $\pm$ 1.73	25.23 $\pm$ 1.90	23.96 $\pm$ 1.82	79.88 $\pm$ 5.08
FVD	12	20.92 $\pm$ 2.06	18.33 $\pm$ 1.82	16.83 $\pm$ 1.86	56.08 $\pm$ 5.23
Overall ANOVA P Value		0.003	0.025	0.013	0.05
Inter-group comparison		GI>FVD <sup>++</sup> VM>FVD <sup>++</sup>	GI>FVD <sup>+</sup>	GI>FVD <sup>++</sup>	GI>FVD <sup>++</sup> VM>FVD <sup>+</sup>

P = Physical score; F = Functional score; E = Emotional score; T = Total score; SE = Standard error; GI = Glottic insufficiency; VM = Vocal mass; FVD = Functional voice disorder; <sup>+</sup> =  $p < 0.05$ , <sup>++</sup> =  $p < 0.01$ .

*Subgroups in VHI.* The mean value of different domains in every subgroup are tabulated in Table I. The overall ANOVA showed significant differences among three groups for three measures as well as total score.

*Inter-group comparisons using VHI.* The results of multiple comparisons showed that the glottic insufficiency subgroup is larger than the functional voice disorder subgroup on all measures, the vocal mass subgroup (mean) is significantly greater than the functional voice disorder subgroup for P and T only. No significant difference was found between the glottic insufficiency and vocal mass subgroups.

## Discussion

With progressive improvements in technology, it is now possible to focus not only on the physical aspects of health, but also on the emotional and social effects of disease. Two decades ago, a husky voice would have been regarded either only as a voice problem or as the physical manifestation of disease. However, today physicians are aware that, for the patient, such problems involve not only discomfort or change of voice, but also have psychosocial impacts. Therefore, disease is not only bodily discomfort, it also covers all aspects of life which will be affected by the disease itself. This trend has already been recognized by many authors.<sup>3-9</sup> Therapists should maintain a sensitivity to this trend and be aware of its importance.

To validate and verify the importance of psychosocial consequences, there have been many assessments of voice-disordered patients conducted previously.<sup>3-9</sup> At first, only the functional impacts of voice quality were surveyed in limited groups and among groups of voice-disordered patients with particularly difficult problems.<sup>3</sup> In 1997, Jacobsen *et al.*<sup>4</sup> developed the VHI to evaluate the physical, functional, and emotional impact of voice disorders. Following Jacobsons' model, Rosen and Murry<sup>5</sup> focused their research on comparing voice-related problems in singers and non-singers. They found significantly lower scores among singers, revealing a significant handicap for this group that could not be ignored when considering treatment options and therapy regimens. Rosen *et al.*<sup>6</sup> indicated VHI was a useful measurement for monitoring the efficacy of treatment in voice-disordered patients. Murry and Rosen<sup>7</sup> compared different groups of voice-disordered patients with VHI and found the highest score in patients with vocal fold paralysis. While many large sample surveys were conducted, they neither evaluated each domain within different voice disorders nor attempted to explain why different scores arose between different groups. Benninger *et al.*<sup>8</sup> also compared different groups of voice-disordered patients using VHI and found that patients with vocal fold oedema returned the highest score. However, their research did not include patients with functional voice disorders. Patients in this category are most frequently treated in out-patients clinics. Although VHI is widely used progressively,

the following points of VHI have not been explored previously: why is the physical domain score the largest and why is the functional score the lowest in voice-disordered patients?

Glicklich *et al.*<sup>9</sup> proposed another methodology, voice outcome survey (VOS), to examine treatment results in patients with vocal fold paralysis. They concluded VOS is a brief, valid, reliable, and sensitive tool to evaluate clinical change in patients with unilateral vocal fold paralysis. However, VOS incorporates only five questions and, thus, cannot address patients' physical, functional, and emotional voice disorder aspects in any depth. Moreover, Glicklich's study indicates that VOS does not validate all aspects of dysphonic patients.

VHI incorporates three domains – the functional, emotional, and physical. The functional domain addresses the effect of the disorder on a patient's life following voice change. The emotional domain addresses emotional changes following voice impairment. The physical domain addresses the effect on self-perception and physical discomfort after voice change. The task of measuring voice disorder severity may be affected by these factors. However, as already noted, while subjective and objective measurements provide certain insight regarding voice impairment as compared to the expected normal voice and are routinely observed in order to benchmark a patient's condition, they fail to indicate why patients with similar voice disorders experience different levels of handicap severity.<sup>4</sup> VHI, by recognizing this problem inherent in traditional assessment methods, represents a significantly new development in the field of voice dysfunction.

Voice problems may result from functional voice disorders, vocal fold mass, and glottic insufficiency. Functional voice disorder refer to voice disorders which are unrelated to identifiable organic disease.<sup>10</sup> It implies a disturbance of vocal function due to habitual misuse of voluntary muscles in the oral and pharyngolaryngeal muscles groups, in the breathing system, or in more general postural groups.<sup>11</sup> As functional voice disorder is not attributable to any organic disease, common symptoms include tired voice and husky voice. Successful treatment is most often therapeutic (non-surgical). Vocal mass includes the presence of vocal polyps, cysts, or nodules. Such benign lesions are not difficult for laryngologists to detect and symptoms can be treated by phonosurgery in combination with, or without, speech therapy.<sup>12</sup> Glottic insufficiency includes vocal fold paralysis, bowing, sulcus, and scarring. Treatment of patients in this group is the most challenging for doctors, because glottic insufficiency patients often show symptoms of husky voice associated with choking, odynophagia, and tightness of throat etc. in various levels of severity. These symptoms sometimes are difficult to cure and cause the most severe handicaps in patients' physical and emotional aspects of life. In theory, patients with milder symptoms should be relatively easy to treat and diagnose and will have milder physical and psychosocial handi-

caps. Our study shows that the glottic insufficiency subgroup returned the highest VHI score, followed by the vocal mass subgroup and functional voice disorder subgroup, respectively. In this study, theory is supported by observed results.

VHI can be used in self-perception and outcome assessment in pre-operative and post-operative conditions.<sup>7,8</sup> Murry and Rosen<sup>7</sup> studied dysphonic patients in the three subgroups and found vocal fold paralysis had the highest VHI score, with functional voice disorder showing the lowest, after vocal polyp and cysts. This report concurred with our own observations. Benninger *et al.*<sup>8</sup> also divided dysphonic patients into three groups and found the highest handicap level among patients with vocal fold paralysis. Their observations also concur with our own in this study. These observations may be explained in that patients with vocal fold paralysis and glottic insufficiency face the most severe symptoms both subjectively and objectively.

The chief complaint related to voice disorders is easy transfer of focus to physical aspects and physical treatment. This was the same complaint highlighted in previous reports.<sup>8</sup> It is probable that patients are used to expressing their physical complaints but not emotional or functional ones. Another reason for this phenomenon may be that the physical manifestation of voice problems is the first issue to gain attention. Emotional changes and functional disturbances come to the fore only after a while. The result has been that therapists focus more on the physical aspects of the disease due to the patients' own perception to the detriment of emotional and functional aspects. Achieving a proper treatment programme in the future will rely on changes of attitude among *both* therapists and patients.

Although VHI provides significant benefits, as mentioned above, it should not be viewed as a comprehensive tool and should be used in conjunction with other subjective and objective examinations. The latter can identify lesions in vocal folds and alert doctors to the appropriate surgical or therapy treatments needed to correct the patient's condition. Therefore, multiple dimension evaluations, including subjective and objective evaluations as well as VHI are the best way of identifying lesions and mapping out the most effective treatment programme.

In conclusion, although VHI research is only in its early stages, it has proven useful in identifying a patient's perception of his/her voice disorder. We

gathered significant subjective data from many VHI aspects. This data can provide valuable input into the pre-operative evaluation process and serve as one of several dimension treatment protocols.

## References

- 1 World Health Organization. *International Classification of Impairments, Disabilities and Handicaps*. Geneva: World Health Organization, 1980
- 2 World Health Organization. The economics of health and disease. *WHO Chron* 1970;**25**:20–4
- 3 Llewellyn-Thomas HA, Sutherland HJ, Hogg SA, Ciampi A, Harwood A, Keane T, *et al.* Linear analogue self-assessment of voice quality in laryngeal cancer. *J Chron Dis* 1984;**37**:917–24
- 4 Jacobson BH, Johnson A, Grywalski C, Silbergleit A, Jacobson G, Benninger MS, *et al.* The voice handicap index (VHI): development and validation. *Am J Speech Lang-Pathol* 1997;**6**:66–70
- 5 Rosen CA, Murry T. Voice handicap index in singers. *J Voice* 2000;**14**:370–7
- 6 Rosen CA, Murry T, Zinn A, Zullo T, Sonbolian M. Voice handicap index change following treatment of voice disorders. *J Voice* 2000;**14**:619–23
- 7 Murry T, Rosen CA. Outcome measurements and quality of life in voice disorder. In: Rosen CA, Murry T, eds. *The Otolaryngologic Clinics of North America: Voice Disorders and Phonosurgery*, Philadelphia: WB Saunders, 2000:905–16
- 8 Benninger MS, Ahuja AS, Gardner G, Grywalski C. Assessing outcomes for dysphonic patients. *J Voice* 1998;**12**:540–50
- 9 Glicklich RE, Glovsky RM, Montgomery WW. Validation of a voice outcome survey for unilateral vocal fold paralysis. *Otolaryngol Head Neck Surg* 1999;**120**:152–8
- 10 Colton RH, Casper JK. *Understanding Voice Problems: a Physiologic Perspective for Diagnosis and Treatment*. Baltimore: Williams and Wilkins, 1996
- 11 Morrison M, Rammage Nichol H, Pullan B, May P, Salkeld L. *The Management of Voice Disorders*. San Diego: Singular, 1994
- 12 Dworkin JP, Meleca RJ. *Vocal Pathologies: Diagnosis, Treatment, and Case Studies*. San Diego: Singular, 1997

Address for correspondence:  
Ming-Wang Hsiung, M.D.,  
Department of Otolaryngology,  
Tri-Service General Hospital,  
No. 325, Sec. 2, Chengkung Road,  
Neihu District, Taipei 114,  
Taiwan.

Fax: 886-2-8792-7193  
E-mail: hsiunm01kimo@yahoo.com.tw

---

Dr M.-W. Hsiung takes responsibility for the integrity of the content of the paper.

Competing interests: None declared

---