

# Voice Handicap Index: European Portuguese versions, validity, and usefulness

## Review Article

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### Abstract

**Aims:** With regard to the Voice Handicap Index (VHI) in European Portuguese, the aims of this study were to: (i) Identify the versions currently in use; (ii) Analyze the process used for the linguistic-cultural adaptation and the clinimetric properties; and (iii) Determine the clinical and scientific usefulness.

**Study design:** Systematic literature review.  
**Materials and Methods:** Two independent researchers searched the databases, open access repositories, and archives of two Portuguese scientific journals. Clinimetric properties and clinical and scientific usefulness were analyzed according to the international guidelines for patient reported outcome measures (PROMs).  
**Results:** In total, five questionnaires were identified in EP: the original VHI, two abbreviated versions - VHI-9i and VHI-10, and two adapted versions - pediatric (pVHI) and VHI for singers (SVHI). The VHI is unique as it provides evidence of all the ten recommended clinimetric properties.  
**Conclusions:** The VHI is recommended for clinical assessment and research, while the others have the potential to be recommended.

**Keywords:** Voice; Voice Handicap Index; Questionnaires; Clinimetric properties; Usefulness

### Introduction

The evolution of the health paradigm to a biopsychosocial perspective was accompanied by the development of a conceptual base for the definition and measurement of the health status and its universalization, the International Classification of Functioning, Disability and Health of the World Health Organization (WHO). The result of an intervention, i.e., the outcome, is no longer assessed solely through a change in the physical status, as it was traditionally through indices based on physiological measurements and the functional capacity, but also includes

the perception of an individual's health with regard to functioning and/or quality of life. Accordingly, patient-reported outcome measures (PROMs) and Proxies (reports by carers) have been created, which are subjective and individualized measures that are different from the instruments of clinical evaluation.

One of the first attempts to develop a voice-related PROM was made in the 1980s to measure the perception of the quality of life of patients with laryngeal cancer<sup>1</sup>. Four more voice-related PROMS were created in the 1990s, including the Voice Handicap Index (VHI)<sup>1</sup>, and the number has increased exponentially in the 21st century. In a systematic review of the literature in English, 67 adult voice-related PROMs and Proxies were found, and the VHI with 30 items (VHI-30) was deemed to be the most promising, with the criterion being the taxonomy of the COnsensus-based Standards for the selection of health measurement INstruments (COSMIN)<sup>2</sup>.

The VHI, a closed-ended questionnaire with 30 items, has three domains (physical, emotional, and functional), each containing 10 items<sup>1</sup>. For each item, the patient marks the level of agreement in a 5-point Likert-type scale. The total score allows the determination of the index of voice handicap (maximum of 120 points corresponding to the worst handicap). It also includes a question on the overall perception of voice classified on a 4-point scale. It is a voice-related PROM that has been linguistically and culturally adapted to more than 25 languages, including European Portuguese (EP)<sup>1,3</sup>.

Based on the assumption that a shorter questionnaire is more convenient in clinical practice because the patients are subjected to several assessments, the abbreviated version of the VHI (with 10 items selected from the original 30) was developed<sup>4</sup>. The original VHI-10 was shown to be as robust as the VHI-30 for the detection of differences among a wide range of voice disorders<sup>4</sup>. Subsequently, abbreviated versions, such as the VHI-9i, and adaptations, such as the pediatric (pVHI) and singing (SVHI), were published<sup>5-7</sup>.

Given the wide international dissemination and use of the VHI and its expansion into abbreviated and adapted versions, it is pertinent to identify the versions used in EP, the procedures used for the linguistic and cultural adaptation, and validation, as well as clinical and scientific utility. Thus, the objectives of the present study on VHI in EP were to: (i) identify the versions currently in use; (ii) analyze the procedures used for the linguistic and cultural adaptation; (iii) evaluate the clinimetric properties, and (iii) determine its clinical and scientific utility.

## Materials and Methods

### Search Strategy

A search was conducted in Pubmed, SciELO Portugal, "Index das Revista Médicas Portuguesas" (IndexRMP), and "Repositórios Científicos de Acesso Aberto de Portugal" (RCAAP) databases. Descriptors were used in English combined by Boolean operators. The search in IndexRMP and RCAAP was performed by using descriptors in Portuguese ("impacto da voz" and "autoavaliação"), as well as the names of the Portuguese authors of the retrieved documents. Subsequently, articles on the topic of voice were searched in the archives of the "Revista Portuguesa da Sociedade de Otorrinolaringologia" and "Revista Portuguesa de Terapia da Fala" and on voice instruments in the "Repositório de Instrumentos de Medição e Avaliação em Saúde" (RIMAS) of the Centro de Estudos e Investigação em Saúde (CEISUC). The search was conducted in November 2022 and no time limit was defined.

### Eligibility criteria

During the selection of PROMs, only studies conducted in the Portuguese population and published in national and international peer-reviewed journals, doctoral theses, and Master's dissertations were considered.

### Data selection

We conducted a search by title independently and then compared the selected articles to

eliminate duplicates. Subsequently, we read the abstracts and excluded the articles that did not meet the predefined criteria. In addition, we read the lists of references in the selected articles to obtain additional information.

### Data analysis

The clinimetric properties were analyzed according to the recommendations of COSMIN (Table 1). For the analysis of the clinical and scientific utility, the international recommendations were used, e.g., COSMIN<sup>2</sup>: (1) recommended – evidence of the 10 recommended properties (meeting most of the criteria) and existence of application studies by authors other than those who performed the adaptation into EP in peer-reviewed

journals; (2) recommended with caution – evidence of the nine clinimetric properties of reliability and validity (meeting the criteria) and the remaining criteria described in (1); (3) with potential to be recommended – gaps and/or major shortcomings in the linguistic and cultural adaptation and clinimetric properties, and lack of application studies by authors other than those who performed the adaptation into EP in peer-reviewed journals.

### Results

Of the 73 potential documents, only 14 articles, six Master's dissertations, and four doctoral theses were found to be eligible (Figure 1). Twelve (50%) were studies on linguistic and cultural adaptation and/or validation of

**Table 1**  
Clinimetric properties

Properties		Criteria
Reliability	Internal consistency	Cronbach's alpha $\geq 0.70$ for the overall scale and subscales.
	Test-retest or reproducibility	ICC (intra-class correlation coefficient) or Cohen's weighted Kappa is recommended, which should be $\geq 0.70$ .
	Measurement error	Standard error of measurement (SEM)/sample $> 100$ (a requirement for the factorial analysis and because a small sample has a higher probability of error).
Validity	Content validity	The linguistic and cultural adaptation should consider the analysis by experts and a pre-test with patients-cognitive interview (same target population as the original) and/or a pilot test (population not included in the subsequent validation study). The adaptation should maintain the original format.
	Structural validity	Factorial analysis in an adequate sample (e.g., item per person equal to or higher than 7 people per item or at least 100 people); the factors should explain at least 50% of the variance.
	Discriminant validity	Administration to two distinct groups (e.g., group with dysphonia and the control group), confirmation of the study hypothesis ( $p < 0.05$ ).
	Stability of the measure or validity of the linguistic and cultural adaptation	Degree of performance of the items in a translated or culturally adapted instrument that adequately reflects the performance of the items of the original version of the instrument (with similar target populations).
	Criterion validity	Concurrent validity
Predictive validity		Receiver operating characteristic (ROC) analysis with the area under the curve (AUC) value $\geq 0.7$ is recommended.
Sensitivity to change	Minimal important difference (MID)	Ability to detect MID over time in a group in which change is expected, e.g., after an intervention (clinical group), longitudinal study.

instruments, while the remaining were studies on the application of the instruments.

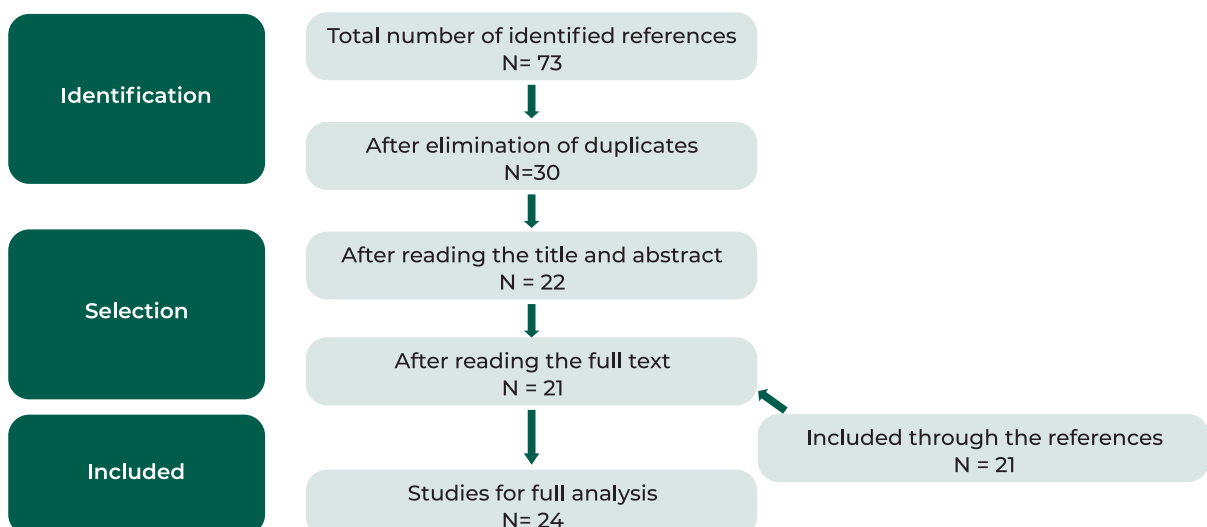
### Versions of the VHI in EP

Five versions were identified: VHI, VHI-9i, VHI-10, pVHI, and SVHI<sup>3,5,8-12</sup>.

The VHI is in accordance with the original with regard to instructions, number of items and domains, 5-point scale, and the final question about the overall perception of the severity of voice impairment on a 4-point scale<sup>3</sup>. It allows a total score and subscale score and the structure with three domains was confirmed in the EP version<sup>13</sup>. The first adaptation was performed according to the guidelines of 1998 Health Instruments and subsequently analyzed by experts (speech therapists [ST ]), and its items were reformulated according to the opinion of a bilingual (English-Portuguese) professor of English<sup>14-15</sup>. It is the most disseminated PROM (seven international articles, four national articles, five theses, and one dissertation)<sup>3,5,8,10-23</sup>. The VHI-9i (the letter i is the abbreviation for "international") was developed in an international study of 1,052 people with dysphonia (121 Portuguese individuals), and the selected items were those with the best equivalence among the eight versions in different languages and the original<sup>5</sup>. It only allows a total score (36 points for the worst handicap). The search for the

VHI-9i only yielded Master's dissertations<sup>24-25</sup>. In the VHI-10, the 10 items in EP correspond to the original version, with a subsequent review by experts<sup>4,8</sup>. It is in accordance with the original VHI format, but does not include the final question on the overall perception of voice impairment. The pVHI maintains the original format, including instructions, item for the evaluation of the type of voice disorder, a questionnaire with 23 items (functional - seven; physical - nine, and emotional - seven), and a 5-point scale. Its maximum total possible score is 92, corresponding to the worst handicap. It has a final question on the overall perception of the severity of the voice problem with a visual analog scale (VAS) of 100 mm (from 0-no problem to 10- severe problem)<sup>6,9</sup>. No studies were found on its application by authors other than those who originally adapted it into EP<sup>9</sup>, although the validation process was conducted later by other authors<sup>10</sup>. The SVHI was in accordance with the original format but it did not include the final item on the overall perception of the severity of the singing voice problem assessed using a 100-mm VAS, as in the original; however, it was used in the study of convergent validity<sup>7,11-12</sup>. The questionnaire consists of 36 items and four domains, and the 5-point scale has a maximum total score of 144, corresponding to the worst handicap. There were no studies on its application conducted

**Figure 1**  
Flow chart for the identification and selection of documents



by authors other than those who created the EP version.

### Clinimetric properties of the VHI version in EP

The VHI is the most representative of the target population and other populations, and

has the highest number of application studies in individuals with a healthy voice as well as those with a speaking and singing professional voice (Table 2). The studies on validation and application contributed to informing the 10 psychometric properties, which met the majority of the criteria proposed by COSMIN.

**Table 2**  
Clinimetric properties of the VHI

Properties		Criteria	
Reliability	Internal consistency	Total -0.95 <sup>22</sup> Total -0.972 <sup>15</sup> ; Subscales Phy=0.920 <sup>15</sup> ; F=0.964 <sup>15</sup> ; E=0.956 <sup>15</sup>	
	Reproducibility	- Data not published of Bachelor degree's monograph on speech therapy (2007, ESSAlcoitão) - Spearman Rho (rs)= 0.887 (total); 0.870 (physical); 0.640 (functional); 0.715 (emotional) - 39 elementary school teachers - Rho (rs)= 0.850 (T); 0.826 (Phy); 0.651 (F); 0.658 (E) - in 28 teachers with voice complaints; - Rho (rs)= 0.936 (T); 0.902 (Phy); 0.749 (F); 0.777 (E) - in 11 teachers without voice complaints.	
	Measurement error	<b>Adults with dysphonia</b> - Validation studies - 49 <sup>3</sup> + 121 Portuguese individuals <sup>5,13</sup> + 90 <sup>15</sup> ; - Application studies <sup>17-21</sup> > 1000 Portuguese individuals with dysphonia <b>Adults without dysphonia</b> - Original study - 56 <sup>3</sup> ; - Application studies <sup>15,22-23</sup> - 177 Portuguese individuals without dysphonia	
Validity	Content validity	Experts	Bilingual STs <sup>3</sup> ; STs <sup>15</sup>
		Pre-test	21 adults with dysphonia and 10 adults without dysphonia <sup>3</sup>
		Format	Same as that of the original. In paper and filled during the consultation <sup>3</sup>
	Construct validity	Validade estrutural	- VHI total - Factor analysis - the factors explain 71.5% <sup>15</sup> ; 56% <sup>18</sup> ; 82% <sup>23</sup> of the variance - VHI Portugal- Confirmatory factor analysis (inter-scales correlations) - Phy-F=0.84 <sup>13</sup> ; F-E=0.89 <sup>13</sup> ; Phy-E=0.79 <sup>13</sup> - Structure with three subscales confirmed (X <sup>2</sup> =6.311, gl=2.238) <sup>13</sup>
		Validade discriminante	<b>Significantly distinguishes:</b> - Individuals with dysphonia vs without dysphonia <sup>3,20-21,23</sup> - Laryngeal diseases (p<0.001) <sup>3,5,14-15; 20-21</sup> - Severity of dysphonia <sup>18</sup> - Duration of dysphonia (-1 year and + 1 year) <sup>17</sup>
		Estabilidade da medida	EP version equivalent to the original version (US) and to the versions of seven European countries <sup>13</sup> ; Cronbach's alpha similar to the original (US) - 0.95 <sup>22</sup> vs 0.92; VHI versus Overall voice perception scale- same as the original (0.60)
	Criterion validity	Validade concorrente	VHI-30 versus VHI-9i - Portuguese adults with dysphonia (rs=0.96; p<0.001) <sup>5</sup> ; VHI-10 - adults with dysphonia (rs=0.915; p<0.001); without dysphonia (rs=0.647; p<0.001) <sup>8</sup> ; RAVI- older adults with dysphonia (rs=0.63; p<0.001) and without dysphonia (rs=0.76; p<0.001) <sup>22</sup> ; SVHI in singers (rs=0.648-0.660; p<0.001) <sup>11</sup> ; Overall voice perception scale (rs=0.60; p<0.001) <sup>13</sup>
Validade preditiva		VHI ROC AUC=0.649; p=0.017 (discriminatory power only for nodules in singers) <sup>11</sup>	
Sensitivity to change		Voice therapy (8 sessions in 4 weeks): 21 individuals with hyperfunctional dysphonia (mass lesions) - pre-intervention (VHI=36.1) and post-intervention. The values of the control group (n=15) were not provided <sup>21</sup> ; Voice therapy (8 sessions in 4 weeks): 16 individuals with hypofunctional dysphonia (vocal fold paralysis /paresis), pre-intervention (VHI=21.2) and post-intervention (VHI=16.7) - p=0.226 <sup>21</sup> .	

Abbreviations : VHI, Voice Handicap Index; ROC, receiver operating characteristic curve; AUC, area under the ROC curve; SVHI, Voice Handicap Index for singers; ST; speech therapist; EP, European Portuguese; T, total; Phy, physical; F, functional; E, emotional.

**Table 3**  
Clinimetric properties of the VHI versions in EP

		VHI-9i	VHI-10	pVHI	SVHI	
<b>Reliability</b>	Internal consistency	0.91 <sup>5</sup>	0.882 <sup>8</sup>	Total – 0.890 with dysphonia and 0.989 without dysphonia <sup>10</sup>	Total – 0.94 <sup>11</sup>	
	Reproducibility	X (not mentioned) <sup>5</sup>	Spearman's rho (rs) =0.9512 <sup>8</sup>	ICC- Total=0.91; p<0.001 <sup>10</sup> Phy=0.89; F=0.74; E=0.75 <sup>10</sup>	rs=0.84; p<0.01 <sup>11</sup>	
	Measurement error	121 Portuguese adults <sup>5</sup>	90 (45 with and without voice complaints <sup>8</sup> )	Children with dysphonia- 6 <sup>9</sup> ; 147 <sup>10</sup> Without dysphonia -37 <sup>9</sup> ; 136 <sup>10</sup>	Singers and/or actors - 50 with dysphonia and 25 without dysphonia <sup>11</sup>	
<b>Validity</b>	Content validity	Experts	X <sup>5</sup>	Analysis by experts <sup>8</sup>	Three experts <sup>9</sup>	«review by a health professionals and singers» <sup>11</sup>
		Pre-test	X <sup>5</sup>	X <sup>28</sup>	X <sup>9</sup>	pilot version with five singers <sup>11</sup>
		Format same as the original	According to the VHI-30 <sup>5</sup>	Does not include the question about perception of the voice problem <sup>8</sup>	In accordance with the original <sup>9</sup>	Does not include the final question about perception of the voice problem <sup>11-12</sup>
	Construct validity	Structural validity	Factorial analysis <sup>5</sup>	X <sup>28</sup>	Subscales- Phy-F=0.76; F-E=0.85; Phy-E=0.72 <sup>10</sup>	X <sup>23</sup>
		Discriminant validity	Professionals with voice complaints vs those without voice complaints p<0.053 <sup>25</sup>	Individuals with dysphonia vs those without dysphonia p<0.001 <sup>8</sup>	Children with dysphonia vs those without dysphonia (p<0.001) <sup>9-10</sup>	Singers with dysphonia versus those without dysphonia (p<0.01) <sup>11</sup> ; Sex, marital status, and working time (p<0.05) <sup>11</sup>
		Stability of the measure	X <sup>5</sup>	Telephone interview <sup>8</sup> ≠ from the original <sup>4</sup> (interview in the 1st consultation, filled in by the patient).	Values higher than the original Sample – 147 <sup>10</sup> versus 45; ICC total > 0.91 <sup>10</sup> versus 0.82 Values lower than in the original Overall voice perception scale (0.412 <sup>10</sup> versus 0.660)	Values similar to the original Internal consistency (0.94 <sup>11</sup> versus 0.97) Discriminates between singers with dysphonia vs those without dysphonia <sup>11</sup> Values lower than the original Test-retest (0.84 <sup>11</sup> versus 0.92)
	Criterion validity	Concurrent validity	VHI9i versus VHI-30- r=0.95 <sup>5</sup> Smoking habits r=0.806 <sup>25</sup>	VHI-10 versus VHI-30 adults with dysphonia (rs=0.915 p<0.001); without dysphonia (rs=0.647 p<0.001) <sup>8</sup>	pVHI versus Overall voice perception scale (rs=0.412; p<0.001) <sup>10</sup>	SVHI versus VHI-30 in singers (rs=0.648-0.660 p<0.001) <sup>11</sup> ; EVA de 10 pontos (rs=0.62; p<0.01) <sup>211</sup>
		Predictive validity	X <sup>5</sup>	X <sup>8</sup>	ROC AUC=0.993 p<0.001 <sup>10</sup> Cutoff value=10.5 <sup>10</sup>	ROC AUC [0.511-0.560] for laryngitis, functional dysphonia and nodules <sup>11</sup>
	<b>Sensitivity to change</b>		ST Students – Pre-training – total VHI9i p>0.05; Post-training – total VHI9i – p<0.05 <sup>24</sup>	X	X	X

Abbreviations: VHI, Voice Handicap Index; VHI-10, VHI with 10 items selected from the original; pVHI, pediatric VHI; VHI-9i, international abbreviated VHI; ROC, receiver operating characteristic curve; AUC, area under the ROC curve; SVHI, Voice Handicap Index for singers; ST, speech therapist; EP, European Portuguese; T, total; Phy, physical; F, functional; E, emotional; ICC, intra-class correlation coefficient.

This is the only instrument that is equivalent to the versions adapted to other languages and the original<sup>13</sup> (Table 2). The VHI-9i demonstrated seven of the 10 clinimetric properties in a target population of more than 100 individuals, thus meeting the recommended criterion ( $\geq 0.70$ ); however, there are no data on its reproducibility (Table 3).

There is only one study on the validation of the VHI-10, which was conducted in a non-representative sample of the target population, with regard to the size and condition (laryngeal disease)<sup>8</sup>. The questionnaire was administered by a telephone interview, a strategy that differs from what is recommended and from what was used in the original version. Nevertheless, the EP version of the VHI-10 demonstrated five of the recommended clinimetric properties (Table 3). The pVHI shows results for eight clinimetric properties, with all meeting the recommended criteria except for concurrent validity ( $r_s=0.412$ , lower than 0.70) (Table 3).

The validation study on the SVHI, conducted in 75 singers and/or actors, 50 of whom had dysphonia, and 324 professionals observed in the ORL clinic of a hospital in Lisbon<sup>11</sup> meets five of the 10 clinimetric properties because structural validity and sensitivity to change were not analyzed and the criterion recommended by COSMIN for predictive validity ( $\geq 0.70$ ) was not met (Table 3).

### Clinical and scientific utility of the PROM versions in EP

The VHI is the only instrument that meets the recommended criteria (Table 4).

### Discussion

The adaptations of the four PROMs and one Proxy to EP are equivalent to their respective originals. Of these, the VHI is recommended for use in clinical and research settings because its 10 clinimetric properties have been analyzed and found to be robust. Our data confirm that the VHI is the gold standard instrument because it correlates strongly and significantly with the abbreviated versions (VHI-9i and VHI-10) and the SVHI, as has been shown internationally<sup>2</sup>. In addition, it has the advantage of the possibility of using the subscale scores in an independent manner (functional, physical, and emotional) in addition to the total score, which the abbreviated versions (VH9i and VHI-10) do not allow as they are unidimensional scales that provide only an overall result<sup>5,8</sup>. However, it can be improved, for example, by determining: (i) the cutoff value for individuals with dysphonia, which could be a useful indicator for screening cases for subsequent referral for a clinical evaluation; (ii) the equivalence between its use in the paper and digital format, as there are studies on its use in the latter format<sup>16</sup>.

**Table 4**  
Clinical and scientific utility of the PROMs in EP

	VHI	VHI-9i	VHI-10	pVHI	SVHI
<b>1. Clinimetric properties</b>					
Reliability (3)	3	2	2	3	2
Validity (6)	6	4	3	5	3
Sensitivity to change (1)	1	1	X	X	X
<b>2. Application (other authors - journals)</b>	√	X	X	X	X
<b>Classification</b>					
Recommended	√	X	X	X	X
Recommended with caution		X	X	X	X
Potentially recommended		√	√	√	√

Although there are published data on the clinimetric properties of the remaining instruments in EP (VHI-9i, VHI-10, pVHI, and SVHI), they have only been provided by academic studies<sup>5,8,10-11</sup> (not subjected to peer review)<sup>11</sup>, and/or are insufficient regarding the 10 recommended clinimetric properties, and/or do not reach the values recommended by COSMIN<sup>5,8,10-11</sup>. However, they can potentially be recommended, as soon as there is some evidence on the not yet analyzed clinimetric properties, e.g., representative target population (e.g., VHI-10), reproducibility (e.g., VH9i), concurrent validity (e.g.,  $\geq 0.70$  in the pVHI), and use of the same methods as those used in the original version (e.g., VHI-10). Among the potentially recommendable instruments, the pVHI presents the best conditions for clinical and scientific use because the missing clinimetric property (sensitivity to change) is not essential for cross-sectional studies and the remaining results were robust (with the exception of concurrent validity) in a sample of more than 300 children, which is much larger than that in the original version<sup>6,10</sup>. It is worth noting that a questionnaire to measure the construct was not used in the analysis of concurrent validity because there was none in EP. Another advantage of the pVHI is the existence of a cutoff value, a useful indicator for voice screening in children<sup>10</sup>.

### Limitations

One limitation of the present study may have been the choice of descriptors, which were possibly insufficient to find relevant information in EP. For example, the descriptors “*impacto da voz*” and “*autoavaliação*” were used, but other descriptors such as “*impacto psicossocial*” and “*questionário de opinião*” were not included. However, a search by the names of the Portuguese authors in the field of voice research, who were identified in the selected documents or known to the authors, was also performed.

An obvious limitation was the exclusion of data from monographs for bachelor's degrees to reduce the probability of error; however,

exceptionally, data on the reproducibility of the VHI were used. A final limitation was the fact that the criteria recommended by COSMIN were not strictly applied, with an “adaptation” being performed. Most of the retrieved studies do not describe results using the recommended measures (e.g., SEM; 95% confidence interval; ICC; Cohen's Kappa), which is in line with international reports<sup>2</sup> and, for this reason, the use of Spearman's correlation, for example, was considered acceptable for analyzing the reproducibility in the present study.

### Conclusion

The VHI is the only PROM recommended for voice evaluation, to support clinical diagnosis and research, whereas the remaining POMs – VHI9i, VHI-10, pVHI, and SVHI – may be recommended in the future, especially the pVHI due to its greater robustness.

### Conflicts of Interest

The authors declare that there is no conflict of interests regarding the publication of this paper.

### Data Confidentiality

The authors declare having followed the protocols in use at their working center regarding patients' data publication.

### Protection of humans and animals

The authors declare that the procedures were followed according to the regulations established by the Clinical Research and Ethics Committee and to the 2013 Helsinki Declaration of the World Medical Association.

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### Availability of scientific data

There are no datasets available, publicly related to this work.



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