

Original Article

Validation of the Chilean Version of the Vocal Tract Discomfort-VTD on Teachers: A Preliminary Study

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ABSTRACT

Due to the vocal load to which voice professionals such as teachers are exposed, voice disorders and vocal misuse are frequently found in this group. This makes it necessary to have quick and simple assessment instruments that allow early detection of vocal symptoms. The objective of this study was to adapt the "Vocal Tract Discomfort Scale (VTD)" to Chilean Spanish and carry out a preliminary validation of this protocol on teachers. First, the original instrument was translated to Spanish by two native speakers, and then back-translated by two English experts, in order to determine the presence of agreements and discrepancies. Subsequently, a group of experts made up of two methodologists and five speech therapists with experience in the voice field performed an appearance and content validation. Criterion validity was obtained through the correlation between the Vocal Tract Discomfort Scale and the Spanish-validated version of the Voice Handicap Index as a gold-standard test, for which the first was applied to a sample of 31 teachers. The validation of the VTD scale is reliable and provides speech therapists with a simple and understandable tool that allows them to comprehend the impact of dysphonia on people, particularly on voice professionals such as teachers.

Keywords:

Teachers; Voice; Validation; Voice Disorders

Estudio preliminar para la validación de la versión Chilena del Vocal Tract Discomfort-VTD en población docente

RESUMEN

Debido a la carga vocal a la que están expuestos los profesionales de la voz, como los profesores, son frecuentes los trastornos de voz y mal uso vocal en este grupo, lo que hace necesario poder contar con instrumentos de pesquisa rápidos y sencillos para un diagnóstico precoz de sintomatología vocal. El objetivo del presente estudio es realizar una adaptación y validación preliminar de la pauta "Vocal Tract Discomfort Scale (VTD)" al idioma español chileno en profesores. Se comenzó con la traducción al español del instrumento original por parte de dos expertos nativos y luego la retro-traducción por dos expertos en idioma inglés para determinar concordancias y discrepancias. Luego se continuó con la validación de apariencia y contenido realizada por valoración de grupo de expertos compuesto por dos metodólogos y cinco fonoaudiólogos con experiencia en el área vocal. La validez de criterio se obtuvo mediante la correlación entre la escala en estudio y el Voice Handicap Index en su versión validada al español como prueba gold-standard, para lo cual se aplicó en una muestra de 31 docentes. La validación de la escala VTD es fiable y deja a disposición de los fonoaudiólogos una herramienta sencilla y comprensible para el entendimiento del impacto generado en personas con disfonía, particularmente, en profesionales de la voz como los profesores.

Palabras clave:

Profesores; Voz; Validación; Trastornos De Voz

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INTRODUCTION

Occupational dysphonia is a public health issue, included in the insurance against work accidents and occupational diseases, defined by Law 16,744 of the Chilean Constitution (*Establece normas sobre accidentes del trabajo y enfermedades profesionales*, 1968). Dysphonia can happen to people whose work requires them to use their voice for prolonged periods, with teachers being the group of professionals at the highest risk of developing this pathology, according to the International Labor Organization (García-Real et al., 2022).

Regarding its national prevalence, a study carried out by Castillo et al. (2015) shows that 3 out of 4 teachers develop vocal disorders of varying severities, with only 6% being formally evaluated and diagnosed.

There are diverse risk factors that can impact the voice of teachers during their work, among which we can find: physical factors of the environment, chemical factors, and organizational factors. Each of them, together or separately, can lead to vocal overexertion (Mora Pino et al., 2018).

The institutions that administer Law 16,774 on occupational accidents and diseases in Chile are the ones responsible for developing prevention programs and for the early identification of occupational diseases. To accomplish this, they require sensitive, easy-to-apply, and widely used instruments (Cerdeira et al., 2016). Particularly in the case of occupational dysphonia, it is crucial to have access to appropriate instruments that allow for determining the individual impact of work conditions on the voice, and that make it possible to predict the emergence of voice pathologies.

Vocal symptomatology is considered a good correlate of phonation disorders in voice professionals since it reflects its severity and functional impact. Some of the vocal symptoms often described are hoarseness, fatigue, and increased phonation effort, among others (Cobeta et al., 2013). Thus, symptoms such as dryness, itching, burning, and irritation can indicate the presence of inflammatory changes and/or changes in the laryngeal tissue. On the other hand, symptoms such as tightness, pain, and foreign body sensation relate to an increase in muscular tension in the vocal tract, usually found in functional dysphonia (Mathieson, 1993).

Vocal self-perception questionnaires and scales are useful tools for the diagnosis of vocal difficulties since they allow for exploring the levels of etiological load, detecting vocal symptoms, and even measuring the impact of dysphonia on the patient's quality of life (Kooijman et al., 2007; Vila-Rovira et al.,

2011). Among the best-known self-perception scales, we can find the Voice Handicap Index (VHI-30) (Núñez-Batalla et al., 2007), which has been widely used in voice studies nationwide (Centeno & Penna, 2019; Elhendi et al., 2012; Troncoso-Muñoz, 2018), and the Voice Symptom Scale (VoiSS) (Contreras Ruston et al., 2016).

Considering the high prevalence of voice disorders in the teaching population, it is essential to count on a simple instrument, one with a reduced number of sections that makes it possible to detect the risk for vocal issues easily and quickly. This could help prevent voice difficulties and implement vocal hygiene programs (García-Real et al., 2022). All preventive measures start from knowing and recognizing symptoms, and are aimed at preventing the development of more serious injuries (Kyriakou et al., 2020).

The Vocal Tract Discomfort (VTD) scale (Mathieson et al., 2009) is a self-applied, simple, sensitive, and specific tool whose objective is to identify the perception of vocal tract discomfort (Mathieson, 1993). It explores symptoms that are secondary to dysphonia, with the premise that the higher the number of risk factors present for a teacher, the greater the level of severity of the vocal disorder. This instrument allows one to distinguish between a pathological and a physiological vocal condition (Torabi et al., 2016) and it provides relevant clinical information due to its predictive nature; this cannot be found in other instruments or protocols (Luyten et al., 2016).

Some studies developed by Behlau et al. (2012) show that the VTD scale is appropriate to understand vocal disorders and the person's perception of their vocal condition. These aspects are not measurable by objective instruments, which is consistent with the study by Torabi et al. (2016), who mention that the VTD scale can adequately differentiate a normal voice from a pathological one. This further increases the value of the instrument analyzed in this article.

The VTD scale has been validated for its use in several countries and languages, namely: Polish, Brazilian Portuguese, German, Italian, Arabic, Korean, Persian, and Norwegian. This makes it possible to carry out studies across various countries and cultures (Santi, Romano, & Montenegro, 2020).

As health professionals, it is indispensable to have access to instruments that have been cross-culturally adapted to our reality, since this offers greater reliability and scientific rigor in clinical practice and research (Contreras Ruston et al., 2016). Validating an instrument not only implies translating it but also considering the perceptions of health and disease of different cultures. Therefore, translation and adaptation are two complementary

procedures, which must be included in any validation process (Lira & Caballero, 2020).

Considering the above, the objective of this study is to adapt and validate the VTD scale in Chilean Spanish, in order to have an instrument that provides information on individual symptomatology and allows for assessing and categorizing patients according to vocal risk. This will make it possible to measure vocal impact by registering voice symptoms caused by the exercise of the profession, thus facilitating the detection and monitoring of vocal conditions in teachers.

Although in its original version the scale was used to detect vocal discomfort in patients with muscle tension dysphonia, this validation process was performed solely on the teaching population. This is because teachers are one of the groups that present more vocal symptomatology, which can be attributed to the high vocal load inherent to their work, and to the limited tools they have regarding proper voice use (Castillo et al., 2015; Morawska & Niebudek, 2017).

METHODOLOGY

This study was approved by the Ethics Committee of *Asociación Chilena de Seguridad*, code P0173, and each participant formally agreed to be part of the research by signing an informed consent.

To achieve cultural equivalence, the original instrument was translated into Chilean Spanish by two expert native speakers. Next, two English language experts carried out the backward translation of the scale in Chilean Spanish. The objective of the second procedure was to determine the levels of agreement and discrepancy between the original and the new versions of the scale.

Appearance and content validation

Subsequently, an appearance and content validation was carried out by expert judges, who proposed changes at both levels. To participate, the experts were required to have a K coefficient (which specifies the level of expertise in a given area) greater than or equal to 0.7. The group was made up of two methodologists and five speech therapists. The methodologists had two or more years of research experience in the area of human health, and the speech therapists had at least 2 years of clinical or academic experience in the field of voice rehabilitation, besides having specializations in the area. All the modifications suggested by the experts were included in the new version of the VTD scale.

Content and appearance validity

Criterion validity was determined by applying the Chilean Spanish version of the VTD scale to a non-random, convenience sample of 31 Chilean teachers who were affiliated with *Asociación Chilena de Seguridad* (ACHS) in Concepción. The participants needed to meet the following criteria: 1) working in subsidized and/or municipal schools that included preschool, primary, and secondary education; 2) having a workload equal to or greater than 18 hours per week (in the classroom) and being exposed to risk for vocal overuse; 3) having practiced the profession for 2 or more years; 4) being between 23 and 55 years old. Those who had previously been diagnosed with occupational vocal pathology were excluded.

The characteristics and distribution of the teacher sample used to validate the scale are detailed in Table 1.

Table 1. Characteristics of the teachers volunteering for the validation of the VTD scale.

Characteristics	
N	31
Man	4 (13%)
Woman	27 (87%)
Age	43.4 ± 11.68
Subject Taught	
Special Educational Needs	2 (6%)
Nursery Teacher	7 (23%)
General Primary Education	7 (23%)
Mathematics	2 (6%)
Science	1 (3%)
Language (Spanish)	1 (3%)
History	3 (10%)
Biology	3 (10%)
Music	3 (10%)
Physical Education	2 (6%)
English	1 (3%)
Religion	1 (3%)
VHI Application Results	
Mild	6 (19%)
Moderate	13 (42%)
Severe	13 (42%)

Quantitative Variables: Mean ± Standard Deviation.

Qualitative Variables: Frequencies (percentages).

Criterion validation was obtained through the correlation between the VTD scale and the Spanish-validated version of the VHI scale. Although the latter is not adapted to the Chilean population, it was considered the gold standard for this study since it has been widely used in the country, with results that confirm it is an appropriate instrument to assess vocal handicap or the socio-emotional impact of dysphonia (Centeno & Penna, 2019; Elhendi et al., 2012; Núñez-Batalla et al., 2007; Troncoso-Muñoz, 2018). The correlation between both tools was determined through the Pearson Correlation Coefficient.

Reliability

The reliability of the translated VTD scale was determined using Cronbach's Alpha, considering a value greater than 0.7 as adequate (Oviedo & Campo-Arias, 2005). This means that the inquiries about symptoms included in the new Chilean version of the VTD scale are correlated, which in turn confirms the internal consistency of the instrument and helps determine the patients' perception of their voice condition's impact.

Categorization of the participants according to vocal risk

To categorize the teachers according to their vocal risk (low, medium, and high), cut-off scores were determined using the Operating Characteristic (OC) Curves method. In order to accomplish the categorization into three levels of risk, two OC curves were obtained: one to determine the cut-off point for mild dysphonia, and another for severe dysphonia, using the VHI scale as the gold standard. Curve analysis allowed for selecting the cut-off point that provided the best combination of sensitivity and specificity values. Since the size of the sample used for the validation of the instrument and for obtaining the OC curves was small ($n = 31$), the results were considered preliminary values, which will be reviewed in future studies on larger samples.

RESULTS

For a better understanding and clarity of the results, they are organized into the following sections: translation and adaptation

into Chilean Spanish, content and appearance validity, reliability, and categorization of the participants according to vocal risk.

Translation and adaptation into Chilean Spanish

Based on the translation process, a ninth item (*quiebres en la voz* [vocal breaks]) was added to the scale. This item provides greater predictive value to the new version of the scale (see Table 2) as it shows a high incidence in clinical practice. Furthermore, it is frequently mentioned in bibliographic sources (Barreto-Munévar et al., 2011; de Medeiros et al., 2012; Figueredo Ruiz & Castillo Martínez, 2016). All of the above justifies the decision to incorporate it into the Chilean version of the VTD scale. Including this item increased the total score to 108 points.

Regarding the changes to appearance, an introductory page and instructions for application were added at the beginning of the scale for the patients to read. Additionally, a page was added that includes a glossary of concepts and definitions for each symptom, to help the users understand the symptoms and facilitate self-application of the scale.

Similarly, clarifying words were added to make it easier to identify each dimension. For example, in the dimension of symptom frequency, the question “¿Cuándo?” [When?] was added; in the dimension of symptom intensity, the question was “¿Cuánto?” [How much?]. In addition, the response format for each dimension was modified; unlike the original version where the score of each item is shown as correlative numbers, the new version includes empty boxes where the score of each symptom can be checked (see Figure 1).

Intermediate values (1, 3, and 5) were also included, as well as the interpretation for each score at the bottom of the VTD scale. Thus, participants were able to choose intermediate categories between “never” and “occasionally”. This was added due to the fact that it is possible to feel a symptom at least once and to relative degrees. It is also possible to assign intermediate categories to the severity of each symptom, allowing for more flexibility in the responses (see Figure 1).

Table 2. Comparison between the symptoms included in the original VTD and the validated version.

	Spanish Translation of Symptoms Original Version	Vocabulary Chosen for Validation New Version with Additional Item
1.	<i>Quemadura, ardor, herida</i>	<i>Ardor</i>
2.	<i>Apretado, tirante</i>	<i>Apretado o tenso</i>
3.	<i>Seco</i>	<i>Sequedad al hablar</i>
4.	<i>Dolor, adolorido</i>	<i>Dolor al hablar</i>
5.	<i>Cosquilleo</i>	<i>Picazón al hablar</i>
6.	<i>Bulto o trozo de algo en la garganta</i>	<i>Sensación de cuerpo extraño</i>
7.	<i>Irritable</i>	<i>Secreción o excesiva mucosidad</i>
8.	<i>Llaga</i>	<i>Fatiga al hablar</i>
9.		<i>Quiebres en la voz (new item)</i>

Figure 1. VTD scale in its new Chilean Spanish version.

SENSACIÓN	Pauta de determinación de sintomatología vocal según frecuencia de aparición de los rasgos vocales. ¿Cuándo?								Pauta de determinación de sintomatología vocal según severidad de sensación de los rasgos vocales. ¿Cuánto?							
	0	1	2	3	4	5	6		0	1	2	3	4	5	6	
PUNTUACIÓN																
Ardor (Irritación)																
Apretado o tenso																
Sequedad al hablar																
Dolor al hablar																
Picazón al hablar																
Sensación de cuerpo Extraño																
Secreción o excesiva mucosidad																
Fatiga al hablar																
Quiebres en la voz																

0: Nunca
2: Ocasionalmente
4: Frecuentemente
6: Siempre

0: Nada
2: Leve
4: Moderada
6: Severa

Content Validity

Table 3 shows the values of the K Competence Index per expert.

Table 3. Values of the K Competence Index per Expert.

Expert	K
Speech Therapist 1	0.9
Speech Therapist 2	0.8
Speech Therapist 3	0.7
Speech Therapist 4	0.8
Speech Therapist 5	0.8
Methodologist 1	0.7
Methodologist 2	0.8

The new version of the VTD scale translated into Chilean Spanish was given to the experts so they could provide their insights about the instrument. The most representative comments were: "It is a useful, adequately translated protocol, easy to use, and appropriate for its use in the context of studies on patients or voice professionals"; "There are no objections to its content or appearance. The information is clear, detailed, and pertinent"; "It is overall a good assessment instrument; it is also thorough and fulfills the objective for which it was created, which is to identify vocal conditions through the study of symptomatology."

Criterion validity

After making the pertinent modifications to the scale, it was applied to a pilot sample. The correlation between the VHI and VTD scores was determined using the Pearson Correlation Coefficient since the data had a normal distribution. The results are shown in Table 4.

The correlation between VHI and VTD scores was significant ($p < 0.05$) and indicates that participants with high VHI scores tend to score high on the VTD scale, and vice versa. However, it is noteworthy that the correlations obtained showed low or regular magnitudes.

Table 4. Pearson Correlation between the VHI and VTD scales.

	Dimension		Total Score
	When? (Frequency)	How Much? (Severity)	
Pearson Correlation	0.440	0.541	0.481
P-value	0.013	0.002	0.006

Reliability

The results obtained in the validation of the VTD scale, as well as the values for the dimensions of frequency and intensity, are presented in Table 5.

Table 5. Cronbach's Alpha for the VTD scale.

	Dimension		
	When? (9 items)	How Much? (9 items)	Total Score (18 items)
Cronbach's Alpha	0.884	0.902	0.947

The individual Pearson Correlation Coefficient values for each item, classified by dimension, and the total VTD correlation score are all greater than 0.35. This shows that each symptom has high internal consistency and reliability, proving the solidity of the instrument (see Table 6).

Table 6. Correlation between the items and the total score of the VTD scale.

Item	Pearson's Correlation item(dimension)/Total
Frequency Dimension: When?	
1.- <i>Ardor</i>	0.797
2.- <i>Apretado o tenso</i>	0.770
3.- <i>Sequedad al hablar</i>	0.740
4.- <i>Dolor al hablar</i>	0.741
5.- <i>Picazón al hablar</i>	0.747
6.- <i>Sensación de cuerpo extraño</i>	0.546
7.- <i>Secreción o excesiva mucosidad</i>	0.702
8.- <i>Fatiga al hablar</i>	0.890

9.- <i>Quiebres en la voz</i>	0.799
Total “When?”	0.989
Severity Dimension: How Much?	
1.- <i>Ardor</i>	0.715
2.- <i>Apretado o tenso</i>	0.747
3.- <i>Sequedad al hablar</i>	0.766
4.- <i>Dolor al hablar</i>	0.742
5.- <i>Picazón al hablar</i>	0.698
6.- <i>Sensación de cuerpo extraño</i>	0.529
7.- <i>Secreción o excesiva mucosidad</i>	0.700
8.- <i>Fatiga al hablar</i>	0.824
9.- <i>Quiebres en la voz</i>	0.710
Total “How Much?”	0.989

Categorization of the participants according to vocal risk

The cut-off point was set at 31 points for mild dysphonia (AUC = 0.91; 95% CI: 0.804 - 1.00) and at 64 points for severe dysphonia (AUC = 0.739; 95% CI: 0.553 - 0.925) (see Table 7).

Table 7. Levels of vocal risk for the VTD scale.

VTD Score	Level of Vocal Risk
0 – 31	Low
32 – 63	Medium
64 – 108	High

DISCUSSION

This study has allowed for validating the VTD scale, thus providing a simple and understandable tool that makes it possible to understand the impact of occupational dysphonia on people, particularly voice professionals such as teachers.

The instrument presents a high reliability, showing a total Cronbach's Alpha of 0.957. Its reliability is also high for the dimensions of frequency (0.884) and severity (0.902). These indicators are higher than those obtained in other studies; for example, in the Iranian population, the VTD scale allows for reliably measuring vocal tract sensations (frequency: 0.826 and intensity: 0.854) (Woźnicka et al., 2013). In another study carried out in a Persian-speaking population, the correlations are lower than those found in the present study (frequency: 0.770 and intensity: 0.730) (Torabi et al., 2016). The validation of this scale in Argentine Spanish also shows lower values (frequency: 0.762

and intensity: 0.756) (Santi, Romano, Dajer, et al., 2020). Based on this evidence, we believe that the results obtained in this research guarantee that the VTD scale has an internal consistency that makes it adequate to be applied to the population of Chilean teachers.

Moreover, this validated instrument shows a good level of sensitivity, proved by the fact that the correlation between the VTD and the VHI scale is better than the one obtained in other studies with similar characteristics (Torabi et al., 2016).

It is important to note that the Chilean Superintendency of Social Security (SUSESO) in its official letter No. 315, January 24, 2022, established the VTD scale as a screening tool for occupational dysphonia in telemarketers (*Superintendencia de Seguridad Social*, 2022).

This study was carried out on a small sample; therefore, it is necessary to perform further studies on larger populations. In this regard, we are aware that a research project is being developed where the VTD scale will be applied to a sample of 250 teachers.

One way of enriching the study of this instrument in the future would be to apply it to more heterogeneous groups, considering different variables that can influence the development of dysphonia. Some of these variables are age, subject taught, years of experience, classroom hours, and phonotraumatic behaviors. Moreover, it is necessary to incorporate environmental variables or social determinants into future studies, such as physical and acoustic characteristics of the workplace, sociodemographic variables, the number of students per course, and the level or grade where the teachers perform their duties.

Similarly, it would be interesting to carry out longitudinal studies to understand the behavior and evolution of vocal symptoms and conditions in voice professionals, through the application of the VTD scale. Furthermore, the scope of this scale could be expanded by applying it to other disciplines with a high vocal load, such as telephone operators, presenters, and singers.

Lastly, it is important to consider that the VTD scale does not assess all the characteristics of voice disorders and, since it focuses particularly on the symptomatology, additional instruments are required to complement the information obtained through this scale. Therefore, it is also necessary to perform acoustic, electroglottographic, or nasolaryngoscopic analyses to obtain thorough information (Behlau, 2001). However, the predictive and preventive values of the VTD scale are indisputable, especially considering the high representativeness

and predictability that vocal symptoms offer of voice disorders (Santi, Romano, & Montenegro, 2020).

CONCLUSION

In Chile, using protocols in Spanish that are not culturally validated is common (Contreras Ruston et al., 2016). Therefore, the relevance of this study is that it provides a tool for researching and monitoring voice disorders in the Chilean population, specifically in a high-risk group such as teachers. After completing the statistical tests, the results are satisfactory in terms of the cultural adaptation and validity of the scale. This new instrument will allow for quickly and easily detecting vocal symptoms to implement preventive actions and monitor intervention programs.

CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest in this study.

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ERRATA

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