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Translation and Adaptation of the Vocal Fatigue Index into Spanish

Traducción y adaptación del Índice de Fatiga Vocal al español

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Conflicts of Interest

The authors have declared that no competing interests exist.

Data Availability Statement

All relevant data is in the article. For more detailed information, write to the Corresponding Author.

Abstract

Aim: the purpose of this study was to translate and adapt the English version of the Vocal Fatigue Index (VFI) into the Spanish language.

Methods: the English version of the Vocal Fatigue Index (VFI) was translated into Spanish by two bilingual speech-language pathologists, and then was back-translated into English. The Spanish VFI (o “Índice de Fatiga Vocal”, IFV) was administrated to a pilot group of 10 individuals, which revealed some small typographical and grammatical adjustments to the index. The final updated version was then administrated to 34 subjects (21 with voice disorders, and 13 without voice disorders). Internal consistency and scale reliability were analyzed using Cronbach alpha coefficient.

Results: a high Cronbach alpha coefficient for the three factors (0.87) was obtained. The results of the item role in reliability of the Spanish VFI demonstrated that all of them showed a positive role according to this criterion. The results of the ANOVA indicate a statistically significant difference between groups on the three scores of the Spanish translation of the VFI. In comparison to the healthy participants, those with voice disorders obtained statistically significant higher scores for the Spanish VFI subscales.

Conclusion: the present study suggests that the Spanish translation of the Vocal Fatigue Index has a good internal consistency and high reliability on each of the three factors. The results suggest that the Spanish VFI can be used reliably to identify persons with vocal fatigue and has good clinical validity.

Keywords

Voice fatigue; voice disorders; protocols; self-assessment; symptom assessment; voice; voice quality; vocal fatigue index; vocology.

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Disclaimer

The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

Resumen

Objetivo: el propósito de este estudio fue traducir y adaptar la versión en inglés del Índice de Fatiga Vocal (VFI) al español.

Métodos: la versión en Inglés del Índice de Fatiga Vocal (VFI) fue traducida al español por dos fonoaudiólogos bilingües, y después traducida de vuelta al inglés. El VFI en español (o IFV) fue administrado a un grupo piloto de 10 sujetos, lo que reveló pequeños errores tipográficos y gramaticales, los cuales fueron corregidos. La versión final fue administrada a 34 sujetos (21 con desordenes de voz y 13 sin desordenes de voz). El análisis de datos incluyó evaluación de consistencia interna y fiabilidad usando el coeficiente Alpha de Cronbach.

Resultados: se encontró un coeficiente Alpha de Cronbach alto para los tres factores (0.87). Los resultados del rol de los elementos en la fiabilidad del IFV en español sugieren que todos tienen roles positivos dentro de este criterio. Los resultados del análisis de ANOVA indican diferencias estadísticamente significativas entre los grupos en los tres componentes de la versión en español del VFI. En comparación con los participantes sanos, los participantes con problemas de voz tuvieron puntajes significativamente más altos en las subescalas del VFI en español.

Conclusión: este estudio sugiere que la traducción al español del Índice de Fatiga Vocal tiene buena consistencia interna y alta fiabilidad en los tres factores. Los resultados sugieren que el IFV en español puede ser usado con fiabilidad para identificar personas con fatiga vocal con una buena validez clínica.

Palabras clave

Fatiga vocal; desordenes de voz; protocolos; autoevaluación; evaluación de síntomas; voz; calidad vocal; índice de fatiga vocal; vocología.

Introduction

The first sign of underlying vocal health issues or vocal misuse may be an individual's experience of vocal fatigue, a multifaceted concept which is described in terms of self-perceived vocal symptoms and/or reduced physiological capacity [1]. Most reports correspond with negative adaptation to a perceptual, acoustic and/or physiological trigger, including vocal overuse or prolonged use [2], physiological change, and unhealthy vocal habits. Its symptoms include throat pain and/or burning, increased effort, sensation of debility, discomfort during phonation, sensation of bolus, and necessity for throat clearing [3]. Whatever the cause, vocal fatigue is usually aggravated by vocal use and improved after a period of rest [4, 5]; therefore, it is frequently recognized in professional voice users as teachers, singers, actors, clergies and military personnel, exposed to heavy vocal demands [6, 7].

Until recently, quantifying vocal fatigue was difficult and inconsistent with no specifically designed method to identify or quantify vocal fatigue. Nanjundeswaran et al. (2015) introduced the Vocal Fatigue Index (VFI), a self-assessment instrument designed to quantifiably discriminate English-speaking patients with a voice disorder who are experiencing vocal fatigue, from vocally healthy individuals. This instrument contains 19 ratable statements, which are divided into three domains (factors): tiredness of voice and voice avoidance, physical discomfort associated with voicing, and improvement of symptoms with rest [8].

The VFI has been valuable in assessing post treatment vocal health [9] and helped establish a relationship between vocal symptoms in school teachers and classroom size [10]. Nevertheless, because vocal fatigue symptoms are not exclusive to English speakers, it is necessary to have an equivalent tool in other languages. This process is not simple. According to The Scientific Advisory Committee of Medical Outcome Trust [11], in the development and translation of an instrument from one language and culture to another, cultural adaptation and linguistic diversity must be considered, thus solving the differences of language, cultural and social aspects that may exist for the instrument translated. Up to this moment, the VFI has been translated into several other languages, including Malayalam, Persian, Brazilian Portuguese and Spanish from Spain [12-15]. While the VFI has also been translated into Spanish (from Spain), this version was validated exclusively with female teachers. Thus, although female teachers are at a higher risk of experiencing vocal fatigue and voice disorders in general, it is nevertheless crucial to validate a Spanish version of the Vocal Fatigue Index with different populations and cultures. The objective of the present research was to develop a Spanish translation of the VFI (with cultural adaptations), as well as to verify its ability to differentiate those who presented voice disorders from those who did not.

Methods

The methods consist of the following three segments: translate the VFI into Spanish (cultural and linguistic adaptation); do a trial to test the Spanish VFI for final adjustments (verification of linguistic and cultural adaptation); and test the Spanish VFI on a group of individuals with and without voice disorders to compare to English VFI norms.

Translation Procedure

Following the protocol established by the Scientific Advisory Committee of Medical Outcome Trust [11], the 19 ratable statements in the English version of the Vocal Fatigue Index (VFI) were independently translated into Spanish by two bilingual speech-language pathologists, who conducted a conceptual translation. Next, both of the Spanish translations were analyzed semantically, and a language equivalence was established by two additional speech-language pathologists with expertise in the area of voice and English proficiency. Differences between the translations were discussed and, when necessary, modifications were made, resulting in the final translated version. Next, this Spanish version was back translated into English and compared with the original VFI test. Those of the 19 statements that were consistent with the original version in English were included in the Spanish edition of the VFI; the others were reviewed and included in the final version only after the two translators reached a consensus.

Similar to the English version of the VFI, a categorical scale was created to rate the symptoms according to frequency of occurrence, using the following Spanish statements: 0 = nunca (never); 1 = casi nunca (almost never); 2 = algunas veces (sometimes); 3 = casi siempre (almost always); and 4 = siempre (always). The translation protocol and adaptation processes are presented in Table 1.

Pilot Testing Procedure

The adjusted version of the Spanish translation of the VFI was first tried with 10 Spanish speakers. The group contained 5 female and 5 male native participants. They were occupational voice users without vocal fatigue at the moment of the administration of the questionnaire. The first author contacted these participants and administrated the adjusted version of the Spanish translation of the VFI. After this application, per feedback from the test group, small typographical and grammatical adjustments were made.

Table 1. Translation Protocol and adaptation Process of the Vocal Fatigue Index into Spanish

SPANISH TRANSLATION	BACK TRANSLATION ENGLISH	SEMANTIC AND LANGUAGE SPANISH EQUIVALENT OF THE VFI
Parte 1	Part 1	Parte 1
1. No siento ganas de hablar después de usar mi voz por un tiempo.	1. I don't feel like talking after using my voice for a while.	1. No tengo ganas de hablar luego de usar mi voz por un tiempo.
2. Mi voz se siente cansada cuando hablo más.	2. My voice feels tired after talking more.	2. Mi voz se siente cansada cuando hablo mucho.
3. Experimento una mayor sensación de esfuerzo al hablar.	3. I have to do higher vocal effort when talking.	3. Experimento mayor esfuerzo vocal al hablar.
4. Mi voz se vuelve ronca con el uso de la voz.	4. My voice gets hoarse when I talk.	4. Mi voz se pone ronca cuando la uso.
5. Se siente trabajoso usar mi voz.	5. I feel like using my voice is difficult.	5. Siento que me cuesta trabajo usar mi voz.
6. En general, tiendo a limitar mi conversación después de un periodo de uso de voz.	6. In general, I tend to limit my talking after a period of vocal use.	6. Generalmente tiendo a limitar mi habla luego de un periodo de uso vocal.
7. Evito eventos sociales cuando sé que debo hablar más.	7. I avoid social situations when I know I have to talk much.	7. Evito situaciones sociales cuando sé que tengo que hablar más.
8. Siento que no puedo hablar con mi familia después de un día de trabajo.	8. I feel like I cannot talk with my family after a period of vocal use.	8. Siento que no puedo hablar con mis familiares después de un día de trabajo.
9. Es un esfuerzo producir mi voz después de un periodo de uso de voz.	9. I need more vocal effort to produce my voice after a period of vocal use.	9. Requiero hacer mayor esfuerzo para producir mi voz después de un periodo de uso vocal.
10. Me resulta difícil proyectar mi voz con el uso de la voz.	10. I find difficult to project my voice after a period of voice use.	10. Encuentro difícil proyectar mi voz cuando la uso.
11. Mi voz se siente débil después de un periodo de uso de voz.	11. I feel my voice gets weak after a period of vocal use.	11. Siento mi voz débil luego de un periodo de uso vocal.
Parte 2	Part 2	Parte 2
12. Experimento dolor en el cuello al final del día con el uso de la voz.	12. I feel pain in my neck at the end of the day after using my voice.	12. Siento dolor en el cuello al final del día después de usar mi voz.
13. Experimento dolor de garganta al final del día con el uso de la voz.	13. I feel pain in my throat at the end of the day after using my voice.	13. Siento dolor de garganta al final del día después de usar mi voz.
14. Mi voz se siente adolorida cuando hablo más.	14. I feel pain during talking when I talk to much.	14. Siento dolor al hablar cuando hablo mucho.
15. Mi garganta me duele con el uso de la voz.	15. I feel pain in my throat when I use my voice.	15. Me duele la garganta cuando uso mi voz.
16. Siento incomodidad en el cuello con el uso de la voz.	16. I feel uncomfot on my neck when I use my voice.	16. Siento incomodidad en mi cuello cuando uso mi voz.
Parte 3	Part 3	Parte 3
17. Mi voz se siente mejor después de que he descansado.	17. My voice feels better after vocal rest.	17. Luego de hacer reposo vocal, siento mejoría.
18. El esfuerzo para producir mi voz se reduce con descanso.	18. The effort to produce my voice decreases after vocal rest.	18. Luego de hacer reposo vocal, disminuye mi esfuerzo para producir mi voz.
19. La ronquera de mi voz mejora con descanso.	19. I get better from my hoarseness after vocal rest.	19. Luego de hacer reposo vocal, me recupero de mi ronquera.

This Spanish translation of the VFI, *Índice de Fatiga Vocal* (IFV), was used for the current research. It maintained the three factors found in the original English version: eleven statements rating voice tiredness and voice avoidance; five statements eliciting description of physical discomfort associated with voicing; and three statements evaluating improvement of symptoms with rest or lack thereof. Further, a series of statements were included to collect additional data, including age, sex, and presence of vocal fatigue during the last week as well as at the time of participation.

Participants

Thirty-four participants were recruited to test the final version of the Spanish VFI using a convenience sample. After being presented the aims and methods of this research, the participants signed an informed consent form. The first group had 21 persons with clinically diagnosed voice disorders (6 men, 15 women; mean 49 y/o). Otorhinolaryngologic assessment was performed to identify current voice disorders. The second group included 13 vocally healthy individuals (4 men, 9 women; mean 39 y/o). A speech and language pathologist perceptually assessed the voice production of the participants to confirm no pathological alterations. After completing the clinical assessments, the Spanish version of the VFI questionnaire, *Índice de Fatiga Vocal* (IFV), was administered to the participants. All participants were able to complete the IFV without any help or instructions.

Statistical Analysis

A Spearman's correlation coefficient and Cronbach's alpha internal consistency coefficient were used to measure the internal consistency of the items (statements) in the Spanish version of the VFI. The reliability test was performed to examine responses to individual statements in order to assess the quality of those items and of the test as a whole. The construct validity of the measure was evaluated by a one-way analysis of variance for groups by identifying the strength and direction of the relation with the IFV. Additionally, clinical validity of the Spanish VFI was analyzed by assessing mean differences of each of the factors between participants with and without voice disorders. The results were considered statistically significant at $p < 0.05$.

The predictive value of the IFV factors for identification of patients with voice disorders was assessed by Receiver Operating Characteristic (ROC) curves, whereby the area under the curve (AUC) would reflect the level of accuracy by which the IFV factors can predict the presence of voice disorders. An AUC of 0.5 would reflect no prediction at all, while an AUC of 1 would present a perfect prediction [16]. In addition, sensitivity (proportion of participants with voice disorders who were correctly classified) and specificity (proportion of healthy voices who were correctly classified) were calculated, using the cut-off value of the IFV factors that resulted in the highest sum score of sensitivity and specificity. All statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS 21.0) for Windows.

Results

The current research attempted to translate the VFI into Spanish (cultural and linguistic adaptation); do a trial of the Spanish VFI for final adjustments (verification of linguistic and cultural adaptation); and test the Spanish VFI on a group of individuals with and without voice disorders for comparison with English VFI norms. Table 1 contains the results of the first two tasks, with the final Spanish VFI ("*Índice de Fatiga Vocal*") presented in its entirety in Appendix A. The results of the third task (i.e., testing the VFI on Spanish speaking individuals with and without voice disorders) are presented below.

Scale Reliability and Internal Consistency

Internal consistency and scale reliability of the data were performed by means of the Cronbach alpha coefficient, which determined if all items measured the phenomenon of interest to ascertain if they were correlated with one another [17]. The results showed a Cronbach alpha coefficient for the three factors of 0.87, which can be interpreted as high. The discrimination coefficient of each item and each factor score was assessed by means of the Spearman correlation coefficient (Table 2). Additionally, the results of the item (statement) role in the reliability of the Spanish VFI questionnaire (Table 3) indicated that all items showed good item role. Items (statements) included in Factor 1 (*tiredness of voice and voice avoidance*) and Factor 2 (*physical discomfort associated with voicing*) obtained coefficients higher than 0.90, whereas items included in Factor 3 (*improvement of symptoms with rest*) obtained coefficients between 0.80 and 0.90.

Table 2. Discrimination coefficients (Spearman's Correlation) between each item and total part scores of the Spanish version of the VFI

Tiredness of Voice	γ	Physical Discomfort	γ	Improvement of Symptoms	γ
1	0.80	12	0.94	17	0.91
2	0.85	13	0.92	18	0.94
3	0.88	14	0.94	19	0.90
4	0.73	15	0.92		
5	0.92	16	0.80		
6	0.86				
7	0.78				
8	0.79				
9	0.87				
10	0.90				
11	0.90				

Table 3. Cronbach's alpha internal consistency coefficients of the items of the Spanish version of the VFI

Tiredness of Voice	α	Physical Discomfort	α	Improvement of Symptoms	α
1	0.96	12	0.95	17	0.86
2	0.96	13	0.95	18	0.82
3	0.96	14	0.94	19	0.90
4	0.97	15	0.94		
5	0.96	16	0.97		
6	0.96				
7	0.96				
8	0.96				
9	0.96				
10	0.96				
11	0.96				

Construct Validity

Table 4 shows the ANOVA analysis for the two groups (with and without voice disorders). The difference on the mean value of Factor 1 (*tiredness of voice*) between groups (9.3 for participants without voice disorders, and 22.9 for participants with voice disorders) was statistically significant (p-value <0.01). The differences were also significant between groups for Factor 2 (*physical discomfort*, mean values= 2.5 for controls, and 8.8 for cases with a p-value <0.01) and Factor 3 (*improvement of symptoms*, mean values= 3.5 for participants without voice disorders, and 7.0 for participants with voice disorders with a p-value 0.01).

Table 4. One-way analysis of variance for groups

Items	ANOVA	Square sum	df	Quadratic mean	F	Sig.
Tiredness of Voice	Inter-groups	1474.1	1	1474.1	12.9	0.00
	Intra-groups	3649.3	32	114		
Physical Discomfort	Inter-groups	318.7	1	318.7	10.5	0.00
	Intra-groups	969	32	30.3		
Improvement of Symptoms	Inter-groups	97.9	1	97.9	7.4	0.01
	Intra-groups	426.2	32	13.3		

Clinical Predictive Validity Analysis

Table 5 shows the standard deviation, predictive value, and mean of the three factors of VFI (*tiredness of voice* and *voice avoidance*, *physical discomfort with voicing*, and *improvement of symptoms with rest*) in the group of participants with and without voice disorders. In comparison to healthy individuals, the ones who presented voice disorders showed statistically significant higher scores for VFI subscales (Mann-Whitney test= *tiredness of voice* = -3.13, p-value ≤ 0.01; *physical discomfort* = -2.57, p-value ≤ 0.01, *improvement of symptoms* = -2.42, p-value ≤ 0.01). The three factors of the VFI had moderate discriminatory value for voice disorders. The cut-offs for Factors 1 and 3 were similar to the mean values for the control group (9.0 and 3.5, respectively), whereas the cut-off for Factor 2 was lower than the mean value (1.5 vs 2.5). The sensitivity was high with values ranging from 0.76 to 0.86, whereas the specificity was moderate for the three factors.

Table 5. Predictive value of the Spanish version of the Vocal Fatigue Index factors

Items	Subjects without voice disorders		Subjects with voice disorders		Cut-off	AUC (SE)	Sensitivity	Specificity
	Mean	SD	Mean	SD				
Tiredness of Voice	9.3	8.9	22.9	11.6	9	0.82 (0.07)	0.86	0.62
Physical Discomfort	2.5	3.6	8.8	6.4	1.5	0.76 (0.08)	0.76	0.62
Improvement of Symptoms	3.5	4.2	7	3.3	3.5	0.75 (0.09)	0.86	0.62

Conclusions

The purpose of this study was to develop a Spanish translation of the Vocal Fatigue Index (VFI), as well as to verify its ability to distinguish between those with voice disorders and those without them. The Spanish version, *Índice de Fatiga Vocal*, was developed using both forward and backward translations, as well as cultural adaptations per an initial pilot test. The Spanish version kept the total number of items in the original version (n=19).

Consistent with the validated English version of the VFI, based on the results, the Spanish translation of the VFI in the present study had good internal consistency. Additionally, high reliability of the VFI on each of the three factors was found with average coefficients of the statements from Factors 1 and 2 of 0.96 and 0.95 respectively, and Factor 3 coefficients from 0.82 to 0.90. Given the extent of development and validation of the English VFI, it is not unexpected that the Spanish version also showed good internal consistency and reliability. This, indirectly, also indicates that the symptom statements in Spanish seem to be responsive, as a whole, to the same behavioral and physiological phenomena.

Finally, the results of the healthy control group and of the voice case respondents to the Spanish VFI showed that the instrument has good clinical validity and may be used reliably to differentiate those with vocal fatigue symptoms. For example, analysis of the three factors showed that the cut-off for “physical discomfort” is very similar with the mean value reported by Nanjundeswaran (1.5 vs. 1.44, respectively). Nevertheless, slight differences were seen: the results on the mean values of the Spanish version of the VFI appeared to be slightly higher than those reported in the original version in English [8] for “tiredness of voice” and “physical discomfort” (9.3 vs 5.15; 2.5 vs 1.44, respectively) and slightly lower for the “improvement of symptoms” (3.5 vs 5.8). While there could be several reasons for the differences (e.g., fewer participants completed the Spanish VFI in the current study than the original English study), this difference was not statistically significant.

The main limitation of this investigation was the small sample size compared to previous studies. However, we found a good sensitivity and specificity.

In summary, good psychometric properties of the Spanish VFI suggest that it is a valid, reliable, and suitable instrument for the evaluation of vocal fatigue among Spanish speaking population. This version (Appendix A) should be useful in similar ways to the English version, which has been effectively used in both clinical and research settings.

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Appendix A. Translated and adapted version to Spanish of the protocol Vocal Fatigue Index – VFI, called “Índice de Fatiga Vocal”

Índice de Fatiga Vocal

Nombre completo: _____

Fecha de nacimiento: ____ / ____ / ____

Fecha de diligenciamiento: ____ / ____ / ____

Las siguientes frases indagan sobre algunos síntomas que frecuentemente se asocian a problemas de voz. Por favor indique con una “X” la frecuencia con la que usted presenta cada síntoma utilizando la siguiente escala:

0 = Nunca

1 = Casi nunca

2 = Algunas veces

3 = Casi siempre

4 = Siempre

Parte 1

1. No tengo ganas de hablar luego de usar mi voz por un tiempo	0	1	2	3	4
2. Mi voz se siente cansada cuando hablo mucho	0	1	2	3	4
3. Experimento mayor esfuerzo vocal al hablar	0	1	2	3	4
4. Mi voz se pone ronca cuando la uso	0	1	2	3	4
5. Siento que me cuesta trabajo usar mi voz	0	1	2	3	4
6. Generalmente tiendo a limitar mi habla luego de un periodo de uso vocal	0	1	2	3	4
7. Evito situaciones sociales cuando sé que tengo que hablar más	0	1	2	3	4
8. Siento que no puedo hablar con mis familiares después de un día de trabajo	0	1	2	3	4
9. Requiero hacer mayor esfuerzo para producir mi voz después de un periodo de uso vocal	0	1	2	3	4
10. Encuentro difícil proyectar mi voz cuando la uso	0	1	2	3	4
11. Siento mi voz débil luego de un periodo de uso vocal	0	1	2	3	4

Parte 2

12. Siento dolor en el cuello al final del día después de usar mi voz	0	1	2	3	4
13. Siento dolor de garganta al final del día después de usar mi voz	0	1	2	3	4
14. Siento dolor al hablar cuando hablo mucho	0	1	2	3	4
15. Me duele la garganta cuando uso mi voz	0	1	2	3	4
16. Siento incomodidad en mi cuello cuando uso mi voz	0	1	2	3	4

Parte 3

17. Luego de hacer reposo vocal, siento mejoría	0	1	2	3	4
18. Luego de hacer reposo vocal, disminuye mi esfuerzo para producir mi voz	0	1	2	3	4
19. Luego de hacer reposo vocal, me recupero de mi ronquera	0	1	2	3	4