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Review Article

Translated Versions of Voice Handicap Index (VHI)-30 across Languages: A Systematic Review

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Abstract

Background: In this systematic review, the aim is to investigate different VHI-30 versions between languages regarding their validity, reliability and their translation process.

Methods: Articles were extracted systematically from some of the prime databases including Cochrane, googlescholar, MEDLINE (via PubMed gate), Sciencedirect, Web of science, and their reference lists by Voice Handicap Index keyword with only title limitation and time of publication (from 1997 to 2014). However the other limitations (e.g. excluding non-English, other versions of VHI ones, and so on) applied manually after studying the papers. In order to appraise the methodology of the papers, three authors did it by 12-item diagnostic test checklist in "Critical Appraisal Skills Programme" or (CASP) site. After applying all of the screenings, the papers that had the study eligibility criteria such as; translation, validity, and reliability processes, included in this review.

Results: The remained non-repeated articles were 12 from different languages. All of them reported validity, reliability and translation method, which presented in details in this review.

Conclusion: Mainly the preferred method for translation in the gathered papers was " Brislin's classic back-translation model (1970), although the procedure was not performed completely but it was more prominent than other translation procedures. High test-retest reliability, internal consistency and moderate construct validity between different languages in regards to all 3 VHI-30 domains confirm the applicability of translated VHI-30 version across languages.

Keywords: Voice handicap index, VHI-30, Translation, Validity, Reliability, Voice disorder

Introduction

According to the World Health Organization (WHO), the assessing of health and before-after therapy outcomes are not sufficient for indicating the severity of disease, rather evaluation of quality of life is essential as a complementary assessment (1-3). A common method in order to evaluate quality of life is questionnaires, which the developed English ones are usually translated and adapted to be applicable according to the other cultures and languages (4, 5).

In a more specific view to health, it is true also regards to the speech disorders that despite of numerous objective evaluations to assess speech behavior in adults (6,7) or children (8,9,10), however the importance of subjective questions to evaluate the speech and in a more details voice disorders, using patient-centered measures have been asserted in some studies (11-13). Although there are several tests to do it but one of the most conventional is Voice Handicap Index [VHI] (14).

The VHI was developed and validated by Jacobson et al. (12) that consists of three domains including functional, physical, and emotional aspects of voice disorders and is administered by patients themselves regardless to the type of their voice disorder in a five-point Likert-type scale manner for each item (from 0 = never to 4 = always). Patients with severe voice disorder would gain higher total VHI scores, which the highest score can be 120. It is a valid and reliable instrument for assessing self-perception of patient's voice handicap (12), which has been translated and validated into many languages (13-23).

It is remarkable that despite of lack of the strong relationship between objective voice evaluations (e.g. acoustic and aerodynamic) and VHI scores (24-26), it is widely applied as a useful instrument to evaluate patient's self-perception from their severity of voice disorder, its effect on their life and also therapy outcomes (27). Although many studies have indicated that objective measurements are of valuable importance in diagnosis voice disorders however those are not applicable to evaluate patients self-assessment of the range of their disability (28).

The experienced disability resulted from voice disorder is affected by several factors including occupation, psychological mood, social interactions, and individual's routine functions (29). There are several instruments to assess subjective self-assessment of voice disorders such as the Voice Symptom Scale (VoiSS) (30), the Voice Related Quality of Life Measure (V-RQOL) (31), the Vocal Performance Questionnaire (VPQ) (32), and the Voice Handicap Index (VHI) (12). Although all of these questionnaires were valuable but VHI was more accepted and has been used widely in evaluation of outcome of treatments at clinics and in research. In addition, the Agency of Healthcare Research and Quality in 2012 announced the VHI as a valid and reliable diagnostic instrument (33).

Nowadays translation and adaptation has been done on the VHI into many languages including German (34), Chinese (35), Portuguese (36), and Polish (37). All of them used VHI for patients with different voice disorders but there are only two studies compared patients group with control group (29, 36).

Jacobson's study indicated high test-retest reliability, internal consistency, and correlation between VHI scores and patient's self-judgment of severity of their disorder (12). By getting information about validity and reliability of the VHI versions in other languages and showing high scores for them, the importance of trans-cultural searches would be clearer. In addition to research goals, some studies supported the applicability of VHI in clinic and found high sensitivity to show patient's perceived changes related to their voice after variety of interventions including surgery, medical, and voice therapy (38-40). One of the advantages of the VHI is its attention to the main dimensions of the patient's QOL voice related experiences including the functional domain (the range of the patient's ability to communicate in different conditions via their voice), the physical domain (whatever the patient percept during vocalization), and the emotional domain [attends to the emotional aspects of the voice problem] (41). In order to define item-total correlations of VHI, in a study by applying Pearson's correlation those with lower than 0.35 coefficiency were deleted or reformulated (42).

The main reasons to do a review on VHI may be two. The first is regard to its popularity of usage in clinics for patients with voice disorder. The second one is the highest frequency of VHI applicability as an instrument to evaluate voice related QOL compared to the others in voice studies (43). In addition, confirmation of the VHI's validity and reliability by Agency of Healthcare Research and Quality increased its value and importance (44). After the acknowledgment at 2002, the VHI was accepted to be translated and adapted as a tool to assess the voice problems impacts on patient's participation in other cultures and languages and also its psychometric values (Reliability and Validity) were defined for every languages including; German (45-49), Portuguese (50), Lithuanian (51), Polish (52,53), French (54), Taiwanese (55,56), Hebrew (57), Swedish (58), Italian, Dutch, and Flemish Dutch (59). In addi-

tion, recently equalization was done on eight European translations (59).

Reliability refers to the equality of values produced from an instrument under the same conditions. There are different prevalent methods to define reliability of an instrument consist of parallel-test reliability, test retest reliability, split half reliability, and internal consistency (60).

Validity implies that what is intended to be measured is really what the diagnostic tool evaluates. In order to investigate validity two applied approaches are content validity and construct validity (61).

Content equivalency of the translated items is not expected by only direct translation an instrument from a language to another (62, 63). It has been accepted that in order to validate and possibility of applying a tool in a cross-cultural study the back-translation is necessary (64, 65, and 66). The Brislin's back-translation model is used as the most widely preferred method among all translation models. Although researchers because of some problems in performing Brislin's back-translation model use the modified rather the classic one and apply it in a team method or use a combination of the other translation approaches (67). However, these researchers may eliminate their problems in translation temporarily by not using the classic Brislin's back-translation model completely but unfortunately, usually it results in decreased validity and content equivalency of the translated version. Therefore, the fact emphasizes the importance of considering appropriate methods, which guaranties valid translated instrument especially in cross-cultural studies before conducting it.

Brislin has suggested some rules to enhance content equivalency between translated and original instrument in cross-cultural studies such as avoiding from copying the content and length of the original version in direct translation (68). Brislin in order to gain this object has also recommended four methods consist of back translation procedure, committee technique, pretest method, and bilingual approach (62).

Generally, in the back translation procedure the instrument firstly is translated from original language to the target language and then is performed reversely by another independent translator and finally the two original and target language translated versions are compared and edited several times by another translators until all of them agree about the equivalency of the two versions (62). Given the fact that the back translation technique is performed by several independent bilingual translators (69) therefore, the problem of finding high numbers of bilingual translators would be a weakness of this model.

The committee procedure is administered by a team of bilingual expert translators (more than three people) and it can be more useful when there is the problem of availability to the bilingual translators. The pretest method is another translation procedure that is applied as a pilot study to determine the potential possible problems that may occur during the main study in bigger size sample (62). The fourth method, the Bilingual model, is a participant-centered technique, which the tool is administered by bilingual participants in the both original and object languages and then the causes of the differences between completed instruments in two languages are discussed by the researches (62).

Because of some reported limitations from studies used Brislin's classic back-translation model to elevate their translated instrument validity and equivalency, Jones et al. proposed a combined translation technique (65). In this approach a combination of back translation, committee, and bilingual models are used in a several steps method until reach to a translated version, which is reliable and equivalent to the original one. Although there may be some preferences for this combination technique over Brislin's classic back-translation model but it has also some limitations that should be mentioned (65).

By getting information about validity and reliability of the VHI versions in other languages and showing high scores for them, the importance of trans-cultural searches would be clearer. In addition, it would encourage the other authors in other languages to choose the best method in order to translate VHI to their own languages. For example, the studies are more valuable that have performed combined translation technique, and

included both validity and reliability on their translated questionnaire and applying it for patient group will increase its reliability and validity.
Therefore regards to the importance of VHI in evaluation of voice-disordered patients and its widespread usage across languages and the lack of a systematic review on it, so performing this paper is unavoidable.

Methods

Defined study criteria for eligibility were articles published from 1997 [the year of VHI development by Jacobson (12)] to 2014 in English language which included translation, reliability, and validity reports of VHI-30 version. Collection data was done by searching electronic resources including; Cochrane, googlescholar MEDLINE (via PubMed gate), Sciencedirect, Web of science, and their reference lists. In some cases, which the full text was not available, and also in order to find more related studies, by contact with the correspondent author's article the paper was gotten.
All the databases were investigated by key word of "voice handicap index" by title limitation and time of publication (from 1997 to 2014) albeit without applying any other limitation, format of article, language, and so on. All the researched articles were gathered in step 1, then in step 2 all the papers were investigated by title, nonrelated ones were deleted, and the included articles transferred to next stage, screening by abstract, which has its own several steps. Therefore in next steps, papers written in non-English languages, those about other versions of VHI rather than VHI-30, articles without having translation or validity and reliability processing report and repeated ones were excluded in third, fourth, fifth, and sixth steps respectively, this process was done for every databases (Fig. 1).

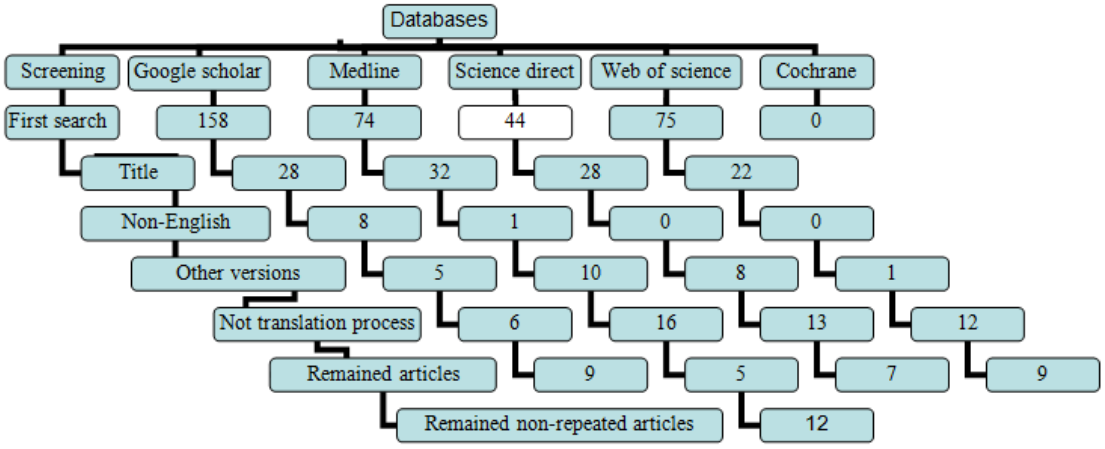

Fig. 1: Process of reviewing diagram

In order to assessment of methodology of selected studies and assessing the risk of bias of individual studies, a 12 item diagnostic test checklist in "Critical Appraisal Skills Programme" or (CASP)(http://creativecommons.org/licenses/by-nc-sa/3.0/) was used to judge about the methodological quality of the studies. Every checklist was performed by each author independently, and judged studies to be excluded according to the checklist were again proposed at a panel of 3 authors, therefore if two of them decided to delete or accept the paper, it was done. All the including and excluding process by the title, abstract, and full text was done by 3 authors. After this stage, according to the mentioned 6 steps, the variables for which data were sought included translation procedure, content validity, construct validity, internal consistency, and test-retest reliability.

Results

According to the first searches throughout the mentioned electronic resources in method section, generally 351 articles were found. After screening by title and omitting the digressed ones, 109 citations remained. Follow by that, in applying the exclusion criteria at screening by abstract stage, writing language of 9 papers were not English, and 23 ones did not precede on VHI-30 therefore were excluded. As well as, 37 articles because of lack of translation or validity and reliability method were deleted until after lay away repeated ones finally 16 paper identified to be included in the last step of review by full article.

After getting help from the diagnostic test checklist of CASP, from the 16 remained papers; one study was deleted because it could not compliance the questions from 9 to 12 for all three author's assessment, because the study was designed on Swedish VHI version adapted for singers. As well as three other studies due to the above questions were deleted at the panel (Fig. 1). Therefore, translation process and the status of reliability and validity have been explained in the 11 different languages (2 different studies in Arabic) in the next section below.

- **Hebrew** (Ofer Amir, Odelia Ashkenazi, Tali Leibovitzh, Orit Michael, Yael Tavor, and Michael Wolf, 2006): The original English was translated to Hebrew by 4 lay native Hebrew who were highly proficient in writing and speaking English. The four Hebrew versions were, then, translated back to English by four native speakers of English, who are also lay persons, highly proficient in written and spoken Hebrew. These four retranslated English versions were compared with the original VHI, individually for each item of the questionnaire. Following this procedure, a final Hebrew version was obtained, which was assembled by the items that translated most accurately from English to Hebrew and then back to English. The final Hebrew version was then presented, along with the original version, to four English–Hebrew bilingual judges. These judges confirmed that the final Hebrew version is comparable with the original English version (21).
- **Spanish**(Faustino Núñez-Batalla, Paz Corte-Santos, Blanca Señaris-González, José L. Llorente-Pendás, Carmen Górriz-Gil, and Carlos Suárez-Nietoa, 2007)**:** After the first translation, the different items were discussed among the authors of this study and other professionals dealing with voice disorders. As a result, note was made of the suggestions to change some expressions. The modifications were introduced on the basis of linguistic and cultural differences (42).
- **Arabic:** (Khalid H. Malki, Tamer A. Mesallam, Mohamed Farahat, Manal Bukhari , Thomas Murry, 2010): The original English version of the VHI was translated into Arabic by two Arabic bilingual experienced phoniatricians Items on the questionnaire were translated into Arabic, back-translated into English, and compared with the original items by a qualified professional translator familiar with American English and Arabic. The back translation was subsequently sent back to the investigators for review and comments. The Arabic version of the VHI was then pilot-tested with ten consented Saudi subjects with voice disorders. Subsequently, the VHI was amended according to their suggestions after reviewing the pilot data (70).
- **Arabic** (AHMAD F. SALEEM 1 & YASER S. NATOUR, 2010)**:** The English version of the VHI was translated into MSA by the authors this version was then reviewed by a bilingual professional linguistic translator (English/ Arabic), who provided valuable suggestions for the sentence structure to make it easier for the layperson to understand. This revised version was then presented to a number of Arabic speakers with no voice problems,

who confirmed that all items were well understood. Following this, the revised version emerged as the final version of the VHI, and its wording was maintained (71).

- **Greek** (Meropi E. Helidoni, Thomas Murry, Joanna Moschandreas, kChristos Lionis, Athanasia Printza, and George A. Velegrakis, 2011)**:** It was done according to the "Minimal Translation Criteria" which its forward translation performed by two Greek SLP, who were proficient in the English and Greek also a Greek/English bilingual professional translator did the backward translation (14).
- **Italian** (Antonio Schindler, Francesco Ottaviani, Francesco Mozzanica, Cinzia Bachmann, Elena Favero, Ilenia Schettino, and Giovanni Ruoppolo, 2010)**:** Forward and back translation and comparison with the original items has been done but its process was not reported (72).
- **Mandarin Chinese:** (Wen Xu, Demin Han, Hongyan Li, Rong Hu, and Li Zhang, 2010)**:** The original English version of the VHI was translated into Mandarin Chinese independently by four translators. Three of the translators were voice experts and the fourth was a language expert. The initial translations in Mandarin Chinese were reviewed and modified by clinical voice experts. In a preliminary investigation, the reviewed versions of the Mandarin Chinese VHI were given to 30 dysphonic patients and 30 control subjects (they were not included in 1886 cases discussed in this article). After this preliminary trial, the items were further evaluated and modified according to Chinese cultural and language habits to develop the revised Mandarin Chinese versions of the VHI. The revised Mandarin Chinese versions were translated back into English independently by qualified professional translators. The retranslated English versions were reviewed by Professor Thomas Murry, and the final retranslated English version confirmed by Professor Barbara Jacobson. The revised Mandarin Chinese version that corresponded to the final retranslated English version was chose to be the final Mandarin Chinese version of the VHI for presentation in this article (73).
- **Bizilian Portuguese (**Mara Behlau, Luciana de Moraes Alves dos Santos, and Gisele Oliveira, 2011)**:** Forward and backward translations were done by 3 bilingual English-Portuguese people separately, also A committee of five voice specialists revised the final protocol. To evaluate cultural and linguistic equivalency, the option "not applicable" was introduced to each item of the questionnaire, which was then administered to 10 patients. Subsequently, the VHI was amended according to their suggestions .None of the questions were shown to be invalid (74).
- **Hindi** (Datta R, Sethi A, Singh SH, Nilakantan A, Venkatesh MD, 2011)**:** The first translation from English to Hindi was done by one of the coauthors and then was discussed in a committee (authors) and finally back translation (Hindi to English) performed by a school teacher (75).
- **Norwegian** (Karlsen T,Grieg ARH, Heimdal JH, Aarstad JH, 2012)**:** The original English VHI was translated into Norwegian by a SLP and a physician follow by that it was investigated in a panel of five SLPs for elevating its accuracy of translation. After doing back translation into English by an independent person and another evaluating the equivalency the final Norwegian version tested in a normal voice group as a pilot study (76).
- **Croatian** (Bonetti A, Bonetti L, 2013)**:** The primary Croatian VHI version was prepared by 3 experts from its original English version and after applying Croatian cultural and linguistic habits and back translation (Croatian-English) the final VHI Croatian version was ready to use (77).

- **Persian** (Moradi N, Pourshahbaz A, Soltani M , Javadipour S , Hashemi H, Soltaninejad N, 2013)**:** forward translation performed by two English translators and a SLP who were native Persian language. Then the translation was discussed in a panel including 5 experts. After preparing the refined Persian translated one, the backward translation was done by a bilingual clinical expert and was found understandable and equivalent to original English VHI-30 by another translator. At last the final Persian VHI was presented to a group of voice disordered people as pilot in order to defining the non-understandable words (78).

Discussion

Regarding to the translation procedures used to convert the English version of VHI-30 to other languages, generally it was according to " Brislin's classic back-translation model (1970) " method which described before but only in some languages [e.g. Hebrew, Portuguese, Mandarin Chinese, Arabic (70), and Spanish] the model was applied completely and in order to evaluate cultural and linguistic equivalency of the translated VHI, a panel including voice specialists judged the questionnaire items to enhance the validity of the instrument.

In addition, some studies asserted that because the VHI is intended for use by lay persons, the use of professional terminology was not considered to be desirable. Therefore, they decided to use translators who are not professionally knowledgeable in the field of speech and voice. The studies include Portuguese (only for forward translation), Hebrew (for both forward and back translation), and also in Arabic study (71) speech pathologist translated it but lay bilingual English-Arabic confirmed and edited them. Translation by lay people also may be a good point for those studies.

Another thing that in some VHI language versions such as Mandarin Chinese and Hebrew was considered was performing the translation by several people separately and independently which this decreased the bias of affecting the translator's ideas on each other and also increasing the reliability of the translation. In addition, across the all of the investigated studies, only in Mandarin Chinese VHI version, the final retranslated English version sent to the original English VHI developer (Jacobson) to confirm it so this may be positive point for Mandarin VHI version.

Attending to the Table 1 two essentially issues for a test to be applicable are remarkable which includes reliability and validity:

Reliability

There are two different types of reliability, which has done in the mentioned VHI versions, which consists of test-retest and internal consistency. Except to Hebrew and Norwegian versions (did not report) all of them reported high test-retest reliability (external reliability) which this would be an important strength for VHI versions in different languages especially because this high reliability is across all of the 3 domains of VHI test (Table 2).

In case of internal consistency all of them used Cronbach's alpha coefficient, which strong results were concluded except to Greek version (was not reported), therefore all 3 domains of VHI test despite their different language versions were homogeny and consistent.

Validity

Regarding to content validity in most of languages it was done rather than the Greek, Italian, and Arabic (71) versions, which were not reported, but unfortunately, only a few of them described its process precisely. Therefore, we cannot judge about their procedure to perform it.

In order to determine construct validity, participants completed general questions, regarding their satisfaction with their voice then the correlation between the responses and VHI total scores were calculated by different statistics methods but it was not done in some studies such as Portuguese, Italian, and Arabic (70).

Table 1: Validity and Reliability of translated versions of VHI-30 across languages.

language	Content validity	Construct validity	Internal consistency (Cronbach's alpha coefficient)	Test-retest reliability
Greek	-	Spearman's rank correlation coefficient = 0.55/ (P <0.0001)	0.95	ICC= 0.96
Brazilian/Portuguese	done	-	0.88	Wilcoxon = 0.100 (P<0.001)
Italian	-	-	0.93	Pearson correlation test= 0.97
Mandarine	Pearson correlation coefficients ≥ 0.86	principal-component analysis > 1	0.95	Pearson correlation coefficient: R = 0.991(50), P < 0.01
Hebrew	done	Spearman correlation coefficients = 0.76	0.97	
Arabic/ (Ahmad F)	-	Pearson: r = 0.52, P = 0.01	0.955	r = 0.89
Arabic/ (Khalid H)	done	-	0.97	r = 0.89, P = 0.001
			Also by spearman (correlation between items):r ≥ 0.88	
Spanish	done	r=0.76; P<0.001	0.93	r=0.822; P<0.001
Persian	done	Clinical validity:/ (P=0.000)	0.87	r=0.96
Hindi	done	r=0.44; P<0.001	0.95	r=0.95; P<0.001
		Clinical validity: P<0.001		
Norwegian	done	variance ranged between 40 and 60% (allP<0.001)	0.93	Not done
Croatian	done	Clinical validity:P=0.000	0.94	0.92

Table 2: Evaluation of different VHI-30 versions between languages

Languages	T by more than 3 people	T by lay person	T by voice expert	Panel	Back translation	Confirmation the final BT by Jacobson	Cultural equation	Validity	Reliability
Hebrew (2006)	+	+	-	+	+	-	-	+	+
Spanish (2007)	-	-	+	+	-	-	+	+	+
Arabic (Saleem,2010)	-	-	+	-	-	-	+	+	+
Arabic (Khalid,2010)	-	-	+	-	+	-	+	+	+
Greek (2010)	-	-	+	-	+	-	+	+	+
Italian (2010)	-	-	-	-	+	-	-	+	+
Mandarin (2010)	+	-	+	+	+	+	+	+	+
Brazilian (2011)	-	+	_	+	+	-	+	+	+
Hindi (2011)	-	-	+	-	+	-	-	+	+
Norwegian (2012)	-	-	+	+	+	-	-	+	+
Croatian (2013)	-	-	+	-		-	-	+	+
Persian (2013)	-	-	+	+	+	-	+	+	+

T: translation, BT: back translation, (-): not reported, (+): reported

Surprisingly despite the fact that different self-rating questionnaires were applied in the languages but all of them showed moderate correlation with total VHI score, this finding is in concordance with Jacobson et al. (12), and supporting his prognosis which high score of self-rating of voice handicap may concurrent with high scores in three domains of VHI.

Regarding to this review, VHI seems to be a valid and reliable instrument to evaluate the impacts of voice disorder on patient's life despite of its translated language version. In addition, VHI can be applied for varieties of voice disorders as a base rate and effects of different interventions such as voice therapy, surgery, and so on. Also, even by some adaptations for special groups such as singers. There were limitations in getting full text of some studies searched from the mentioned databases therefore; we were forced to get them from its correspondent author that took a lot of time from us. As well as in this paper it was tried to cover important electronic databases, however access to some of the prime ones was not possible so we preferred to ignore them. Therefore, it may create the risk of not including all of the existing studies on VHI. Although there may be bias of losing studies without having the "voice handicap index" phrase or "VHI" in their title, although the studies consist of VHI translation, reliability, and validity process.

Conclusion

According to this manuscript, VHI-30 is a valuable and reliable instrument across different languages. Therefore, it can be considered as an effortful evaluating tool to be translated in other languages, to present more services to voice disordered patients.

Ethical considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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References

1. WHO (1997). Measuring Quality of Life: The World Health Organization Quality of Life Instruments. WHO/MSA/MNH/PSF; pp. 1–15. Available at http://www.who.int/mental_health/media/68.pdf.
2. Guyatt GH, Feeny DH, Patrick DL (1993). Measuring health-related quality of life. *Ann Intern Med*, 118: 622–629.
3. Gill TM, Feinstein AR (1994). A critical appraisal of the quality of quality-of-life measurements. *JAMA*, 272: 619–626.
4. Guillemin F, Bombardier C, Beaton D (1993). Cross-cultural adaptation of healthrelated quality of life measures: literature review and proposed guidelines. *J Clin Epidemiol*, 46: 1417–1432.
5. Ciconelli RM, Ferraz MB, Santos W, Meina˜o I, Quaresma MR (1999). Traduc¸a˜o para a li´ngua portuguesa do questiona´rio gene´rico de qualidade de vida SF-36 (Brazil SF-36). [Translation of the SF-36 into Brazilian Portuguese]. *Ver Bras Reumatol*, 39: 143–150.
6. Seifpanahi S, Bakhtiar M, Salmalian T (2011). Objective Vocal Parameters in Adults with Down Syndrome in Farsi. *Folia Phoniatr Logop*, 63(2): 72-6.
7. Seifpanahi S, Dadkhah A, Dehqan A, Bakhtiar M, Salmalian T (2008). Motor control of speaking rate and oral diadochokinesis in hearing-impaired Farsi speakers. *Logoped Phoniatr Vocol*, 33(3): 153-9.
8. Bakhtiar M, Seifpanahi S, Ansari H, Ghanadzade M, Packman A (2010). Investigation of the reliability of the SSI-3 for preschool Persian-speaking children who stutter. *J Fluency Disord*, 35(2): 87-91.

9. Dehqan A, Bakhtiar M, Seifpanahi S, Ashayeri H (2008). Relationship between stuttering severity in children and their mothers' speaking rate. *Sao Paulo Med J*, 126(1) :29-33.
10. Bakhtiar M, Abad AD, Seifpanahi MS (2007). Nonword repetition ability of children who do and do not stutter and covert repair hypothesis. *Indian J Med Sci*, 61(8): 462-70.
11. Hogikyan ND, Wodchis WP, Spak C, Kileny RK (2001). Longitudinal effects of Botulinum toxin injections on voice-related quality of life (V-RQOL) for patients with adductory spasmodic dysphonia. *J Voice*, 15: 576–586.
12. Jacobson BH, Johnson A, Grywalski C, Silbergleit A, Jacobson G, Benninger MS, Newman CW (1997). The Voice Handicap Index (VHI): development and validation. *Am J Speech Lang Pathol*, 6: 66–70.
13. Ma EP, Yiu EM (2001). Voice activity and participation profile: assessing the impact of voice disorders on daily activities. *J Speech Lang Hear Res*, 44: 511–524.
14. Helidoni ME, Murry T, Moschandreas J, Lionis C, Printza A, Velegrakis GA (2010). Cross-cultural adaptation and validation of the Voice Handicap Index into Greek. *J Voice*, 24: 221–227.
15. Lam PKY, Chan KM, Ho WK, Kwong E, Yiu EM, Wei WI (2006). Cross-cultural adaptation and validation of the Chinese Voice Handicap Index-10. *Laryngoscope*, 116: 1192–1198.
16. HsiungMW, Lu P, Kang BH,WangHW (2003). Measurement and validation of the Voice Handicap Index in voice-disordered patients in Taiwan. *J Laryngol Otol*, 117: 478–481.
17. Nawka T, Wiesmann U, Gonnermann U (2003). Validierung des Voice Handicap Index (VHI) in der deutschen Fassung. [Validation of the German version of the Voice Handicap Index (VHI)]. *HNO*, 51: 921–929.
18. Guimara˜es I, Abberton E (2004). An investigation of the Voice Handicap Index with speakers of Portuguese: preliminary data. *J Voice*, 18:71–82.
19. Woisard V, Bodin S, Puech M (2004). The Voice Handicap Index: impact of the translation in French on the validation. *Rev Laryngol Otol Rhinol*, 125: 307–312.
20. Pruszewicz A, Obrebowski A,Wiskirska-Woznica B,WojnowskiW (2004). Complex voice assessment—polish version of the Voice Handicap Index (VHI). *Otolaryngol Pol*, 58: 547–549.
21. Amir O, Ashkenazi O, Leibovitzh T, Michael O, Tavor Y, Wolf M (2006). Applying the Voice Handicap Index (VHI) to dysphonic and non-dysphonic Hebrew speakers. *J Voice*, 20: 318–324.
22. Amir O, Tavor Y, Leibovitzh T, Ashkenazi O, Michael O, Primov-Fever A, Wolf M (2006). Evaluating the validity of the Voice Handicap Index-10 (VHI-10) among Hebrewspeakers. *Otolaryngol Head Neck Surg*, 135: 603–607.
23. Hakkesteegt MM,Wieringa MH, Gerritsma EJ, Feenstra L (2006). Reproducibility of the Dutch version of the Voice Handicap Index. *Folia Phoniatr Logop*, 58: 132–138.
24. Hsiung MW, Pai L, Wang HW (2002). Correlation between voice handicap index and voice laboratory measurements in dysphonic patients. *Eur Arch Otorhinolaryngol,* 259: 97–99.
25. Wheeler KM, Collins SP, Sapienza CM (2006). The relationship between VHI scores and specific acoustic measures of mildly disordered voice production. *J Voice,* 20: 308–317.
26. Behrman A, Sulica L, He T (2004). Factors predicting patient perception of dysphonia caused by benign vocal fold lesions. *Laryngoscope,* 114: 1693–1700.
27. Murry T, Rosen CA (2000). Outcome measurements and quality of life in voice disorders. In: The Otolaryngologic Clinics of North America: Voice Disorders and Phonosurgery. Eds, Rosen CA, Murry T. WB Saunders Inc, Philadelphia, pp. 905–916.
28. Benninger MS, Atiuja AS, Gardner G, Graywalski C (1998). Assessing outcomes for dysphonic patients. *J Voice*, 12**:** 540–550.
29. Rosen CA, Lee AS, Osborne J, Zullo T, Murry T (2004). Development and validation of the Voice Handicap Index-10. *Laryngoscope*, 114: 1549–1556.
30. Deary IJ, Wilson JA, Carding PN, MacKenzie K (2003). VoiSS: a patient-derived voice symptom scale. *J Psychosom Res*, 54: 483–489.
31. Murry T, Medrado R, Hogikyan ND, Aviv JE (2004). The relationship between ratings of voice quality and quality of life measures. *J Voice*, 18: 183–192.
32. Deary IJ, Webb A, Mackenzie K, Wilson JA, Carding PN (2004). Short self-report voice symptom scales: psychometric characteristics

of the Voice Handicap Index-10 and the Vocal Performance Questionnaire. *Otolaryngol Head Neck Surg*, 131: 232–235.
33. Agency for Healthcare Research and Quality (2002). Criteria for determining disability in speech-language disorders. Evidence Report. Technology Assessment.
34. Nawka T, Wiesmann U, Gonnermann U (2003). Validierung des Voice Handicap Index (VHI) in der deutschen fassung. *HNO*, 51: 921–929.
35. Hsiung MW, Lu P, Kang BH, Wang HW (2003). Measurement and validation of the Voice Handicap Index in voice disordered patients in Taiwan. *J Laryngol Otol,*117: 478– 481.
36. Guimara˜es I, Abberton E (2004). An investigation of the Voice Handicap Index with speakers of Portuguese: preliminary data. *J Voice*, 18: 71–82.
37. Pruszewicz A, Obrebowski A, Wiskirska-Woznica B, Wojnowski W (2004). Complex voice assessment: Polish version of the Voice Handicap Index (VHI). *Otolaryngol Pol*, 58: 547–549.
38. Rosen CA, Murry T, Zinn A (2000). Voice handicap index change following treatment of voice disorders. *J Voice*, 14: 619–623.
39. Behrman A, Rutledge J, Hembree A (2008). Vocal hygiene education, voice production therapy, and the role of patient adherence: a treatment effectiveness study in women with phonotrauma. *J Speech Lang Hear Res,* 51: 350–366.
40. Stojadinovic A, Henry LR, Howard RS (2008). Prospective trial of voice outcomes after thyroidectomy: evaluation of patient-reported and clinician-determined voice assessments in identifying postthyroidectomy dysphonia. *Surgery*, 143: 732–742.
41. Nawka T, Leeuw IM, Bodt MD, Guimaraes I, Holmberg EB, Rosen CA, Schindler A, Woisard V, Konerding RW (2009). Item Reduction of the Voice Handicap Index Based on the Original Version and on European Translations. *Folia Phoniatr Logop*, 61: 37–48.
42. Núñez-Batalla F, Corte-Santos P, Señaris-González B, Llorente-Pendás JL, Górriz-Gil C, Suárez-Nietoa C (2007). Adaptation and Validation to the Spanish of the Voice Handicap Index (VHI-30) and its Shortened Version (VHI-10). *Acta Otorrinolaringol Esp*, 58(9): 386-92.
43. Franic DM, Bramlett RE, Bothe AC (2005). Psychometric evaluation of disease specific quality of life instruments in voice disorders. *J Voice,* 19: 300 –15.
44. Agency for Healthcare Research and Quality (2002). Criteria for determining disability in speech-language disorders. Evidence Report,Technology Assessment. 52.
45. Gunther S, Rasch T, Klotz M, Hoppe U, Eysholdt U, Rosanowski F (2002). Determination of subjective impairment in dysphonia: A methodological comparison. *HNO*, 53: 902 – 4.
46. Hakkesteegt MM, Wieringa MH, Gerritsma EJ, Feenstra L (2006). Reproducibility of the Dutch version of the voice handicap index. *Folia Phoniatr Logop,* 58: 132–8.
47. Machulla R, Hacki T, Hoppe U, Rosanowski F (2006). Voice Handicap Index (VHI) in rehabilitation medicine. *HNO*. 54: 52 – 8.
48. Nawka T, Wiesmann U, Gonnermann U (2003). Validation of the German version of the Voice Handicap Index. *HNO*, 51: 921 – 30.
49. Weigelt S, Krischke S, Klotz M, Hoppe U, Kollner V, Eysholdt U (2004). Voice handicap in patients with organic and functional dysphonia. *HNO*, 52: 751 – 6.
50. Guimaraes I, Abberton E (2004). An investigation of the Voice Handicap Index with speakers of Portuguese: Preliminary data. *J Voice*, 18: 71 – 82.
51. Siupsinskiene N (2002). Importance of voice quality evaluation in the assessment of treatment outcome after endolaryngeal microsurgery. *Medicina*, 38: 1183 – 91.
52. Pruszewicz A, Obrebowski A, Wiskirska-Woznica B, Wojnowski W (2004). Complex voice assessment — Polish version of the Voice Handicap Index (VHI). *Otolaryngol Pol,* 58: 547 – 9.
53. Ratajczak J, Wojdas A, Rapiejko P, Jurkiewicz D (2005). Subjective and objective assessment of voice quality after surgical treatment of overgrowth changes in vocal folds. *Pol Merkur Lekarski*, 19: 327 – 30.
54. Woisard V, Bodin S, Puech M (2004). The Voice Handicap Index: impact of the translation in French on the validation. *Rev Laryngol Otol Rhinol (Bord)*, 125: 307–12.
55. Hsiung MW, Lu P, Kang BH, Wang HW (2003). Measurement and validation of the voice handicap index in voice-disordered patients in Taiwan. *J Laryngol Otol*, 117: 478 – 81.

56. Hsiung MW, Pai L, Wang HW (2002). Correlation between voice handicap index and voice laboratory measurements in dysphonic patients. *Eur Arch Otorhinolaryngol*, 259:97 – 9.
57. Amir O, Ashkenazi O, Leibovitzh T, Michael O, Tavor Y, Wolf M (2006). Applying the Voice Handicap Index (VHI) to dysphonic and non-dysphonic Hebrew speakers. *J Voice*, 20: 318 – 32.
58. Ohlsson A-C, Dotevall H (2009). Voice handicap Index in Swedish. *Logoped Phoniatr Vocol,* 34: 60 – 6.
59. Leeuw IM, Kuik DJ, Bodt M, Guimaraes I, Holmberg EB, Nawka T (2008). Validation of the voice handicap index by assessing equivalence of European translations. *Folia Phoniatr Logop*, 60: 173 – 8.
60. Allen M, Yen W (1979). Introduction to Measurement Theory. Brooks-Cole Inc, Monterey, p. 45-49.
61. Cronbach L, Meehl P (1955). Construct validity in psychological tests. *Psychol Bull*, 52: 281–302.
62. Brislin RW (1970). Back-translation for cross-cultural research. *J Cross Cult Psychol*, 1: 185–216.
63. Sechrest L, Fay TL (1972). Problems of translation in cross-cultural research. *J Cross Cult Psychol,* 3: 41–56.
64. McDermott MA, Palchanes K (1992). A process for translating and testing a quantitative measure for cross-cultural nursing research. *J N Y State Nurses Assoc,* 23: 12–15.
65. Jones PS, Lee JW, Pillips LR, Zhang XE, Jaceldo KB (2001). An adaptation of Brislin's translation model for cross-cultural research. *Nurs Res*, 50: 300–304.
66. John MT, Hirsch C, Reiber T, Dworkin SF (2006). Translating the research diagnostic criteria for temporomandibular disorders into German: evaluation of content and process. *J Orofac Pain,* 20: 43–52.
67. Thato S, Hanna KM, Rodcumdee B (2005). Translation and validation of the condom self-efficacy scale with Thai adolescents and young adults. *J Nurs Scholar,* 37: 36–40.
68. Brislin RW, Lonner WJ, Thorndike RM (1973). Cross-Cultural Research Method. Wiley, NY, USA.
69. Triandis HC, Brislin RW (1984). Cross-cultural psychology. *Am Psychologist*, 39: 1006–1016.
70. Malki KH, Mesallam TA, Farahat M, Bukhari M , Murry T (2010). Validation and cultural modification of Arabic voice handicap index. *Eur Arch Otorhinolaryngol*, 267: 1743–1751.
71. Saleem AF, Nator YS (2010). Standardization of the Arabic version of the Voice Handicap Index: An investigation of validity and reliability. *Logoped Phoniatr Vocol*, 35: 183–188.
72. Schindler A, Ottaviani F, Mozzanica F, Bachmann C, Favero E, Schettino L, Ruoppolo G (2010). Cross-cultural Adaptation and Validation of the Voice Handicap Index Into Italian. *J Voice*, 24(6): 708-714.
73. Xu W, Han D, Li H, Hu R, Zhang L (2010). Application of the Mandarin Chinese Version of the Voice Handicap Index. *J Voice*, 24(6): 702-707.
74. Behlau M, Santos LMA,Oliveira G (2011). Cross-Cultural Adaptation and Validation of the Voice Handicap Index Into Brazilian Portuguese. *J Voice*, 25(3): 354-359.
75. Datta R, Sethi A, Singh S, Nilakantan A, Venkatesh MD (2011). Translation and validation of Voice Handicap Index in Hindi. *J Laryngol Voice*, 1(1): 12-17.
76. Karlsen T, Grieg ARH, Heimdal JH, Aarstad JH (2012). Cross-Cultural Adaption and Translation of the Voice Handicap Index into Norwegian. *Folia Phoniatr Logop*, 64: 234–240.
77. Bonetti A, Bonetti L (2013). Cross-Cultural Adaptation and Validation of the Voice Handicap Index Into Croatian. *J Voice*, 27(1): 130.e7-130.e14.
78. Moradi N, Pourshahbaz A, Soltani M , Javadipour S , Hashemi H, Soltaninejad N (2013). Cross-Cultural Equivalence and Evaluation of Psychometric Properties of Voice Handicap Index Into Persian. *J Voice*, 27(2): 258.e15-258.e22.