International Journal of Pediatric Otorhinolaryngology 96 (2017) 131–134

Contents lists available at ScienceDirect

International Journal of Pediatric Otorhinolaryngology

journal homepage: http://www.ijporlonline.com/

Reliability and validity of the Turkish children's voice handicap index-10 (TR-CVHI-10)

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ARTICLE INFO

Article history:
Received 23 February 2017
Received in revised form
9 March 2017
Accepted 11 March 2017
Available online 14 March 2017

1. Introduction

During voice production, there can be some problems which are not in correspondence with age and gender and/or there can be some changes in voice quality, pitch, loudness, resonance and duration limiting individuals' communication. Thus, all these result in dysphonia [1]. As dysphonia affects speech intelligibility, %6 of people having dysphonia have also communication problems no matter how old they are and what their gender is [2]. Therefore, treatment of pediatric dysphonia plays a key role in preventing the problems that can occur in puberty and adulthood [3]. A correct and appropriate treatment plan is required for preventing the problems, and this is possible with a comprehensive voice evaluation. Individuals with dysphonia consult ENT clinics. Prevalence of dysphonia in school-age children consulting clinics ranges from %1 to 24 [4–6].

A comprehensive voice evaluation must include five key elements: clinician's perception of dysphonic voice, videostroboscopy, acoustic measurements, aerodynamic measurements and self-assessment by patient [7]. In the ENT clinics while examining the dysphonic children, the clinicians do not know the children's perception of their dysphonia and how voice disorder affects their life. Only the individual can give valid information about her/his dysphonia, how severe it is, how it affects her/his life [8,9], so it is very important to know about a patient's view about her/his dysphonia and to plan the perfect management for voice disorder. Although there are self-assessment tools for adults, there is no such a tool for children in Turkey. Therefore, the clinicians do not know about children's point of view about their dysphonia.

Children's Voice Handicap Index-10 (CVHI-10) is a self-assessment tool for pediatric dysphonia. It is filled in by children themselves. Ricci-Maccarini et al. [10] developed the tool. They modified the original version of the adult voice handicap index and the Italian version of pediatric voice handicap index. The modification is completed by changing the words in statements just to be sure whether the items' meaning are understood by children or not. CVHI-10 consists of 10 statements. It gives information about how dysphonia affects the children's life and the children's perception of their dysphonia. The children answer the questions by using a Likert scale ranging from 0 to 3.

There are few self-assessment tools available in Turkish such as voice handicap index, voice related quality of life, Turkish pediatric voice handicap index [11–13]. They are all standardized tools with valid and reliable statistically that is commonly used in ENT clinics. The voice handicap index and voice related quality of life are given to adult dysphonic patients; however they are self-assessment tools for adults. Turkish pediatric voice handicap index is given to dysphonic children's parents. Tadıhan-Ozkan et al. [13] translated the original version of pVHI to Turkish (Turkish-pVHI) and validated it for use with the children's parents. It is a parental proxy and shows parents' perception of their children's voice disorder. It does not focus on children's perception of their dysphonia or their perspective about having dysphonia. The original version of CVHI-10 is also available for Italian too [10]. The Italian version of it has high validity and reliability. In the light of these, the purpose of this study is to develop Turkish version of Children's Voice Handicap Index-10 and to evaluate its reliability and validity.

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http://dx.doi.org/10.1016/j.ijporl.2017.03.015

2. Materials and methods

2.1. Development of the Turkish version of the CVHI-10

At first, the items of the original version of CVHI-10 were translated to Turkish by three speech and language pathologists for the adaptation of Turkish version of CVHI-10. Then, the items were translated back to English by another three speech and language pathologists. A qualified professional translator compared the original items with the translations. To give the final form, the questionnaire was sent to the researchers for reviews and comments. The final questionnaire was pilot tested with ten dysphonic children and each item of Turkish version of CVHI-10 was discussed with them. Finally, the questionnaire was modified according to the suggestions and the final Turkish version of the CVHI-10 (Turkish-CVHI-10) was generated (see Appendix A).

2.2. Design and participants

In this study, a cross-sectional descriptive model was used including two-sample groups (dysphonic group and non-dysphonic group).

There were 162 participants, 29 of whom were dysphonic children. Dysphonic group were diagnosed by an ENT physician at four hospitals in four cities in Turkey. The participants in the non-dysphonic group had no present or past history of voice disorder, hearing loss, or any disability that might affect the children's speech and voice. The data of this group was collected from schools in four cities.

Each participant in both groups independently completed the Turkish-CVHI-10. Consent was taken from all the families of both groups. An ethical report was also taken for the study.

2.3. Statistical evaluation

All statistical tests were performed by using the SPSS software (version 22.0). The Cronbach's alpha coefficient was used to assess the internal consistency for the total score of Turkish-CVHI-10. A value between $0.6 \leq \alpha < 0.7$ is considered acceptable, $0.7 \leq \alpha < 0.9$ is good, and $\alpha \geq 0.9$ is excellent. For test-retest analysis, the Turkish-CVHI-10 was completed twice with an interval of 2 weeks by 37,8% ($n = 61$) of the total 162 children. The reliability analysis was assured by the Pearson correlation coefficients. The content validity of the Turkish-CVHI-10 was verified for language and cultural appropriateness. For the validity measures, a Mann-Whitney *U* test was used for group comparisons. To observe the diagnostic accuracy of the Turkish-CVHI-10, sensitivity, specificity and receiver operating characteristic (ROC) analysis with AUC values were calculated. $p < 0.001$ was considered to be statistically significant for all the analyses.

3. Results

3.1. Demographics

The dysphonic group consisted of 29 dysphonic Turkish children. There were 10 (34.5%) females and 19 (65.5%) males, with a mean age of 9,3 ± 2,0. This group of participants was diagnosed with vocal nodules.

The non-dysphonic group consisted of 133 non-dysphonic Turkish children. There were 64 (48,1%) females and 69 (51,9%) males with a mean age of 10,2 ± 1,8.

3.2. Reliability

162 children of both dysphonic ($n = 29$) and non-dysphonic ($n = 133$) filled in the Turkish-CVHI-10.

The internal consistency value of Turkish-CVHI-10 was good for the total score ($\alpha = 0.87$). The results of the internal consistency in the dysphonic group were also significant.

For test-retest analysis, the Turkish-CVHI-10 was completed twice with an interval of 2 weeks by 37,8% ($n = 61$) of the total 162 children. The results of test-retest reliability of Turkish-CVHI-10 total score are shown in Table 1. The correlation coefficient of the Turkish-CVHI-10 total is ($r = 0.973$). This correlation was highly significant ($p < 0.001$).

Inter-rater reliability was assigned between the two authors of the study as 100%.

3.3. Validity

The mean score of the dysphonic and control groups for the total score of the Turkish-CVHI-10 is shown in Table 2. The mean score of Turkish-CVHI-10 is 12.5 in the dysphonic group and 3.5 in the control group. According to the Mann Whitney *U* test results, the difference in the mean total score of the Turkish-CVHI-10 was significant between the two groups ($p < 0.001$) (Table 2).

There was no statistically significant difference between the dysphonic children and the control group children in terms of age and gender (Table 3). The mean score of Turkish-CVHI-10 was 9,7 ± 5.9 in female dysphonic group and 14.0 ± 6.8 in males. The overall effect of gender was not statistically significant either ($p > 0.138$). Similarly, in the control group ($p > 0.111$), there was no statistically significant difference between females (2.8 ± 2.7) and males (4.1 ± 4.1). There was no statistically significant gender effect (females 3.8 ± 4.0; males 6.2 ± 6.3, $p > 0.018$).

The effect of age was not statistically significant either ($p > 0.015$) (Table 3). No correlation was found between age and the group scores in the total score of Turkish-CVHI-10 (Table 4).

The content validity of the Turkish-CVHI-10 was verified based on a three-point scale by the three judges' opinions, and the Cronbach's alpha for total score of the Turkish-CVHI-10 was 0.878.

3.4. Sensitivity and specificity

In order to determine the discrimination of the dysphonic and control group, the cut off value of Turkish-CVHI-10 Receiver operator characteristic (ROC) curve analysis was computed. As seen in Fig. 1, the area under the ROC curve provides a highly significant result with the slopes for the total falling on the upper left corner of the space ($p < 0.001$). The Turkish-CVHI-10 has high sensitivity values and it can be considered to have a high accuracy level.

In order to observe the accuracy of Turkish-CVHI-10, the sensitivity, specificity and AUC values were also calculated (Table 5).

4. Discussion

In the current study, the Turkish version of CVHI-10 has strong reliability and validity. This is the first questionnaire in Turkish which can be filled in dysphonic children by themselves, not by their parents or someone else. It is a short, comprehensible and easy form for children to fill in.

The internal consistency of Turkish-CVHI-10 is 0.87. The Cronbach's alpha coefficient is considered to be good. According to the scores for test-retest situation, the Turkish-CVHI-10 is a stable and repeatable tool. These findings are similar with the original version

Table 1
Test-retest reliability and internal consistency reliability of the Turkish-CVHI-10.

	No. of items	Test − retest realiability (Pearson correlation)	*P* value	Internal consistency (Cronbach's alpha)
Total	10	0.973	<0.001	0.878

Table 2
The mean scores of the Turkish-CVHI-10 of both groups, and the results of Mann-Whitney *U* test.

Turkish version of the CVHI-10 total maximum score	Dysphonic Group		Control Group		*p* Value
	Mean ± SS	Minimum −Maximum Score	Mean ± SS	Minimum − Maximum Score	
Total (30)	12.5 ± 6.7	0–24	3.5 ± 3.5	0–17	<0.001

Table 3
Gender and age comparison for both groups.

	Dysphonic Group (n = 29)	Control Group (n = 133)	*P* value
Gender (F/M)			
Female	10 (34.5%)	64 (48.1%)	0.258
Male	19 (65.5%)	69 (51.9%)	
Age (year)	9.3 ± 2.0	10.2 ± 1.8	0.015

Table 4
Spearman Rank correlation coefficient between the age and Turkish-CVHI-10 scores in whole, control and dysphonic group.

	Whole group		Control Group		Dysphonic Group	
	r	*p*	*r*	*p*	*r*	*p*
Total Turkish CVHI-10	0.101	0.200	0.193	0.026	0.393	0.035

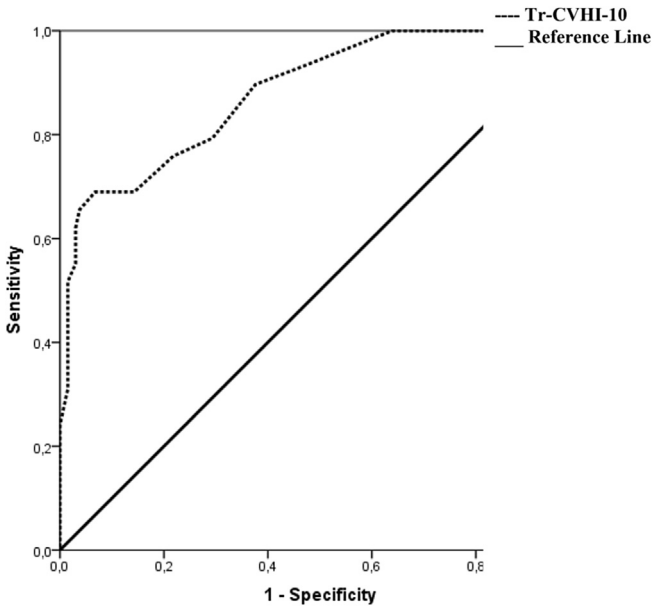

Fig. 1. ROC curve analysis of Turkish-CVHI-10.

Table 5
Cut-off point, sensitivity and specificity of the Turkish-CVHI-10.

	Cut-off point	Sensitivity	Specifity	AUC	*p* Value
Total	>9	68,97%	93.23%	0,882	<0.001

of CVHI-10. The Cronbach's alpha coefficient for the original CVHI-10 is 0.85, which is considered to be good, and it is also a stable and repeatable tool.

Turkish-CVHI-10's score ranges from 0 to 30 like the original one. When the score increases, it means the child's perception of her/his dysphonia is getting severe. Turkish version of CVHI-10 has cut-off value of 9 points with a sensitivity of 68,97% and a specificity of 93,23%. This cut-off point is different from that of the original CVHI-10. The original form has a cut-off value of 4 points. The cut-off point is used for evaluating the effect of the dysphonia on an individual's life [14]. According to our results, until it is 9 or above, children do not think they have dysphonia.

Turkish version of CVHI-10 can be said to be a sensitive tool for defining the dysphonia. The total score of the dysphonic group is significantly higher than that of the control group. This result is also similar with those of the other self-assessment tools in both adults and children (original CVHI-10, Italian version of pVHI, Korean pVHI, Arabic pVHI, Turkish pVHI) [15–18]. In all these studies, dysphonic group has significantly higher scores than the control group.

This study has some limitations. The sample size, unequal numbers of female and male participants, lack of variety of the voice disorders, and reading skills can be listed as the limitations of the study. The children diagnosed with vocal nodules were included in the study; but other diagnoses such as muscle tension dysphonia, laryngeal web, laryngeal cyst, edema, vocal cord paralysis, and gastroesophageal reflux disease, etc. were not included. We hope the further studies will be conducted with a larger population with different voice disorders in evaluating dysphonic Turkish children.

5. Conclusion

The present study is the first attempt to understand children's point of view about their dysphonia in Turkey. According to the findings, the Turkish-CVHI-10 is a valid, reliable and sensitive tool to assess the children's perception about their voice disorders. In addition, it is easy for children to fill in the form. It can help a clinician working with a pediatric group to understand how dysphonia affects the children's life from the children's point of view.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflict of interest

The authors have no conflict of interest to report concerning this article.

Appendix A

Children Voice Handicap İndex (Turkish and English versions)

ÇOCUK SES HANDİKAP İNDEKSİ

Children Voice Handicap Index

Çocuğun Adı-Soyadı:

Velisinin Adı-Soyadı:

Çocuğun Doğum Tarihi:

Uygulama Tarihi:

Yönerge: Aşağıda yer alan ifadelerin çoğu pek çok çocuğun sesini ve seslerinin hayatlarına olan etkisini açıklamada kullandığı durumlardır. Lütfen size uygun olan seçeneği işaretleyiniz.

Instructions: These are statements that many children have used to describe their voices and the effects of their voices on their lives. Circle the response that indicates how frequently you have the same experience.

0 = Asla/*Never* 1 = Nadiren/*Sometimes* 2 = Çoğu zaman/*Many Times* 3 = Her zaman/*Always*.

	0	1	2	3
1.İnsanlar sesimden dolayı beni duymakta zorlanır. *People have difficulty hearing me because of my voice.*				
2. İnsanlar gürültülü bir ortamda beni anlamakta zorlanır. *People have difficulty understanding me in a noisy room.*				
3. Sesimdeki problemler insanlarla birlikte olmamı engeller. My voice difficulties prevent me tos tay with people.				
4. Sesimden dolayı sohbetlerden uzak kaldığımı düşünüyorum. *I feel left out of conversations because of my voice.*				
5. Sesimden dolayı okul başarım düşüyor. *My voice difficulties reduce my school outcome.*				
6. Sesimi çıkarmak için zorlamam gerektiğini düşünüyorum. *I feel I have to strain to produce voice.*				
7. Sesim "parlak" değil. *My voice is not light.*				
8. Sesimdeki problem beni üzer. *My voice problem upsets me.*				
9. Sesim diğer çocuklara ya da arkadaşlarıma karşı kendimi değersiz hissetmeme neden olur. *My voice makes me feel inferior to other children or other boys.*				
10. İnsanlar bana: "Sesin neden böyle?" diye sorar. *People ask me "what's wrong with your voice?"*				
Toplam: ***Score:***				

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