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Function & Disability Journal

Func Disabil J. 2019 (Aug 24);2:16. https://doi.org/10.34171/fdj.2.16.

Correlation between vocal fatigue index and voice handicap index scores in Persons with laryngeal pathologies

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Received: Mar. 18, 2019 Published: Aug 24, 2019

Abstract

Background: Voice is the unique means of human's verbal expression, which is produced in the larynx. Laryngeal pathologies can coexist with vocal fatigue and a feeling of voice handicap. The aim of this study was to determine descriptive statistics of males and females and compare the related means. Meanwhile, it was attempted to determine the correlation between Vocal Fatigue Index (VFI) and Voice Handicap Index (VHI).

Methods: This is a cross-sectional and descriptive-analytic study conducted on 110 patients with laryngeal pathologies. Fifty four participants were males with mean age of 43.7 years (SD=15.6), and 56 were females with mean age of 40.1 years (SD=11.1). Data was analyzed using SPSS 21 at a significance level of P<0.05. Descriptive statistics, Kolmogorov-Smirnov test, Spearman and Pearson's co-efficient of correlation, paired t-test, and Mann-Whitney U test were used.

Results: There was significant correlation between the tiredness and physical discomfort factors of VFI and VHI in patients with laryngeal pathologies (P<0.05). In these patients only the correlation of third factor of VFI with factors of VHI was not significant.

Conclusion: The findings of this study indicated that the feeling of vocal fatigue, and especially tiredness, may lead to the feeling of vocal handicap in patients with laryngeal pathologies. According to the findings, females may have significantly more physical discomfort than males, which needs more attention in future studies.

Keywords: Laryngeal pathology, Vocal fatigue index, Voice handicap index

Conflicts of Interest: The authors have no conflict of interest in this study.
Funding: Iran University of Medical Sciences

Cite this article as: Afkhami M, Amirishavaki Y, Qhelichi L, Kamali M, Ensafi Z, Azari S. Correlation between vocal fatigue index and voice handicap index scores in Persons with laryngeal pathologies. *Func Disabil J. 2019* (Aug 24);2.16. https://doi.org/10.34171/fdj.2.16.

Introduction

Objective analysis and assessment is a clinical challenge and some studies have confirmed the multidimensional aspect of vocal assessment (1-4). Voice is the unique means for verbal communication produced in the larynx. When voice production is disordered, or the larynx has a pathological change, it can lead to some types of perceptions for patients (4), such as feelings of fatigue or even handicap during daily communication, which can have different levels of severity. The perceptions of any patient from his/her own voice disorder by means of a perceptual self-reported questionnaire such as Vocal Fatigue Index (VFI) and Voice Handicap Index (VHI) are becoming common in clinical settings (4-11). There is a new tendency about using these questionnaires as standard tools for clinical decision making (8).

The VFI and VHI are widely used in different researches and becoming clinically in access. Both questionnaires have been translated and validated in several languages (5, 9-20). These translations have been evaluated for linguistic or cross-cultural adaptation too. The Farsi translations

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↑What is "already known" in this topic:
There is a new tendency about using Vocal Fatigue Index (VFI) and Voice Handicap Index (VHI) as standard tools for clinical decision making. There might be a correlation between VFI and VHI in patients with laryngeal pathologies

→What this article adds:
The correlation coefficients of the relationship between tiredness factor of VFI and different factors of VHI was significantly high.

of VHI and VFI have been provided and validated by Moradi et.al. and Naderifar et.al., respectively; moreover, some of their psychometric properties have been analyzed (9, 15). Moradi et.al. (2013) reported cutoff point at VHI for screening voice disorders among Persian speakers (21). VHI was developed first by Jacobson et al. in 1997 (22) and VFI by Nanjundeswaran et al. in 2015 (23).

Virginie Woisard et al. studied the relationship between VHI and several voice laboratory measurements and noted that the laboratory measurements and the VHI can give independent information in practice (4). Also, Moghtader et al. (2019) studied the relationship between the two indices of VFI and VHI in university professors who had/had not reported voice complaint (24).

VHI includes 30 items and has three subscales of functional, physical, and emotional and a total score can be calculated too (22). Some studies showed that there are significant correlations between some voice parameters and the items of VHI (4, 25, 26).

Vocal fatigue includes some of symptoms during or after use of voice maybe prolonged or short. Some of these symptoms can be laryngeal discomfort, presence of pain in the throat or neck area, reduction of pitch and loudness range or some changes in different dimensions of voice and feeling of a need for cough or throat clearing; all these symptoms are self-reported and may recover after rest (27-30).

This study seeks to answer the following question: “Is there a positive correlation between VFI and VHI of a group of patients with laryngeal pathologies or not?”

The main aim of this study was to determine the results of these two self-rating scales, i.e., VFI and VHI in two groups of male and female patients with laryngeal pathologies and compare the related data. Meanwhile, it was attempted to determine the correlation between VFI and VHI.

Methods

This is a cross-sectional study with descriptive and analytic method. The sample size was calculated according to the results of a pilot of 20 patients. The correlation between factors of VFI and general score of VHI was so that correlation coefficients were between 0.254 and 0.540. The lowest correlation coefficient was considered. The sample size was calculated 106, with a confidence level of 95% and a test power of 75%. Finally, 110 patients from referred patients to one of the hospitals of Tehran were examined in this study.

Inclusion criteria of this study were: age range of 18 to 80 years; with voice problem and laryngeal pathology confirmed with stroboscopic evaluation; vocal fatigue according to the patient's report; normal hearing according to the patient's report; reading and writing ability in Farsi; and at least three months of voice disorder according to the patient's report. Exclusion criteria of this study were: a history of neurological disorder according to the patient's report; and a history of laryngeal surgery according to the patient's report.

The participants were 110 patients with laryngeal pathologies (54 males and 56 females). All participants were Farsi speakers with different Iranian dialects who were literate and could complete the VFI and VHI questionnaires. All of the subjects had obtained clinical diagnosis by an ENT specialist and a speech pathologist. Informed consent was obtained from all the participants included in this study.

A total of 54 males and 56 females participated in the study. The male subjects had mean age of 43.7 (SD=15.6) years and the females 40.1 (SD=11.1) years.

Table 1 shows that the subjects who participated in this study had 12 different vocal pathologies. Cancer, MTD, and polyps were the most common pathologies (more than 64% of subjects). Vocal polyps, cancer, and Reinke's edema were more common in males, but vocal nodules, MTD, and vocal fold paralysis were more common in females. None of females had Reinke’s edema, inflammation and papilloma. Percentage of vocal nodules (n=8) in woman was four times more than males (n=2); and the percentage of MTD and paralysis in females (n=14 and 6, respectively) was two times more than males (n=7 and 3, respectively); and the percentage of vocal polyps was two times more in males (n=12) in comparison with females (n=6). Totally, only 8.1 percent of all of the patients had one of GERD, Reinke’s edema, cyst, inflammation, or papilloma.

Data collection tools in this study were three questionnaires: one demographic checklist and two questionnaires of VFI and VHI. The demographic checklist was used for gathering information of the inclusion criteria. Persian questionnaires for VFI (9) and VHI (15) are two standard questionnaires.

Our sampling method was convenience sampling; all the patients of ENT clinic of Amir A'alam Hospital of

Table 1. The number of subjects with the type of vocal pathology

NO	Diagnostic category	No of subjects		Percentage (total)
		Males	Females	
1	Vocal nodules	2	8	9.1
2	Vocal polyps	12	6	16.4
3	Reinke's edema	2	-	1.8
4	Sulcus vocalis	2	3	4.5
5	MTD	7	14	19.1
6	Inflammation	1	-	0.9
7	Paralysis	3	6	8.2
8	Cancer	19	13	29.1
9	Papilloma	1	-	0.9
10	Cyst	1	1	1.8
11	Web	3	3	5.5
12	GERD	1	2	2.7

Tehran University of Medical Sciences (TUMS) were referred to a speech-language pathologist for sampling in the time period of 7 months. The patients were diagnosed as persons with laryngeal problems by ENT clinicians in hospital. The time for collecting the data of each patient was 25 –35 minutes.

At first, all participants were asked to complete the demographic checklist and then the VFI and the VHI questionnaires. Both questionnaires were presented in one session. The instructions were explained for each questionnaire, and then the participants completed the questionnaires in a quiet room. Each of the questionnaires has three parts.

The VFI questionnaire includes 19 questions. The first part deals with tiredness; the second part is about physical discomfort; and improvement of symptoms of vocal fatigue after rest is the third part. First eleven questions are related to tiredness, next 5 questions are related to physical discomfort, and the other three questions are related to improvement of symptoms of vocal fatigue after rest, or the third factor of VFI. Scores of each question are considered 0-4 (0=never, 1=very seldom, 2=sometimes, 3=often, 4=always). Amount and repetition of any experienced symptom is considered for selection of related score.

The VHI questionnaire has 30 questions. It has three parts about physical, emotional, and functional aspects. Each part has 10 questions. Patients select a score of 0-4 for each of the questions (0=never, 1=almost never, 2=sometimes, 3=almost always, 4=always).

For data analysis, SPSS 21 software was used at a significant level of $P<0.05$. Descriptive statistics were used for calculation of means and standard deviations of variables. Kolmogorov-Smirnov test was used for determination of normal distribution of the data. Emotional factor of VHI and two factors of VFI, i.e., physical discomfort and improvement of symptoms were not normally distributed. Spearman and Pearson's co-efficient of correlation were used to assess the correlation of the factors of VFI and VHI. In addition, paired t-test and Mann-Whitney U test were used to compare mean scores of males and females.

Results

This study aimed to correlate between two self-evaluation rating indices, i.e., VFI and VHI in a group of patients with laryngeal pathologies.

A total number of 110 dysphonic subjects were included in the study. The mean age of the subjects was 43.7 (SD=15.6) years for males and 40.1 (SD=11.1) years for females. VFI and VHI questionnaires were collected. The means and standard deviations were obtained for different factors of VFI and VHI of the 110 subjects.

As shown in the Table 2, the mean values of females were higher than values of males from descriptive statistics view. The difference of VHI factors in males and females was more in physical discomfort factor of VFI and in emotional factor of VHI.

One-Sample Kolmogorov-Smirnov test showed that the distribution of data was normal only in these variables: tiredness factor of VFI; physical and functional factors of VHI. Therefore we used Pearson's correlation coefficient test only for these variables, and for other variables we used Spearman's rho correlation coefficient test. Following is the table of Spearman's and Pearson's correlation of factors of VFI and VHI.

By using Spearman's and Pearson's co-efficient correlation (Table 3), it was found that the tiredness factor of VFI was correlated with all factors of VHI and the total score of VHI; and the correlation was statistically significant ($P<0.05$). The mentioned correlation coefficients were 0.571 for emotional, 0.628 for functional, and 0.718 for physical factors of VHI and 0.700 for total score of VHI. The correlation of second factor of VFI, i.e., physical discomfort, with all three factors of VHI was positive and weak, but was statistically significant ($P<0.05$). The correlation of third factor of VFI, i.e., improvement of symptoms, with physical factor of VHI was positive and weak

Table 2. The mean and standard deviation scores of males and females for factors of VFI and VHI

		Group	No	Mean	Std. Deviation
VFI	Tiredness	Male	54	24.28	10.789
		Female	56	26.55	9.863
		total	110	25.44	10.343
	Physical Discomfort	Male	54	5.37	4.380
		Female	56	8.23	5.781
		total	110	6.83	5.315
	Improvement of Symptoms	Male	54	8.30	4.364
		Female	56	8.34	4.494
		total	110	8.32	4.410
VHI	Functional	Male	54	13.59	8.66
		Female	56	14.41	8.96
		total	110	14.01	8.785
	Physical	Male	54	18.7	7.64
		Female	56	19.89	7.24
		total	110	19.00	7.459
	Emotional	Male	54	11.33	9.31
		Female	56	13.73	10.82
		total	110	12.55	10.137
	Total	Male	54	43	23
		Female	56	48	24.36
		total	110	45.56	23.73

Table 3. Correlation of factors of VFI with the factors of VHI (n=110)

VFI factor	VHI factor	Coefficient Correlation 'R'	P-value
Tiredness	Emotional	0.571**	0.000
	Physical	0.718**	0.000
	Functional	0.628**	0.000
	Total VHI	0.700**	0.000
Physical Discomfort	Emotional	0.420**	0.000
	Physical	0.353**	0.000
	Functional	0.237**	0.006
	Total VHI	0.366**	0.000
Improvement of Symptoms	Emotional	-0.040	0.339
	Physical	0.101	0.147
	Functional	-0.099	0.151
	Total VHI	-0.032	0.739

• Underlined values of rho are Pearson's correlation coefficients and others are Spearman's rho.

and was not significant, but the correlation of third factor of VFI with emotional and functional factors of VHI was negative, very weak, and non-significant.

The comparison of the factors of VFI in males (N=54) and females (N=56) showed that only the difference between values of males and females in physical discomfort factor of VFI was significantly different (P=0.004). Also, the comparison of the factors of VHI in males and females showed that the differences were not significant.

Discussion

According to the findings of this study, presence of significant correlation between two factors of VFI, i.e., the tiredness and physical discomfort with all of the factors of VHI and with the total score of VHI shows that factors of vocal fatigue and vocal handicap can be related to each other, and it seems that the feeling of vocal fatigue may lead to the feeling of vocal handicap. It may be interesting that correlation coefficients of the relationship between tiredness factor of VFI and different factors of VHI is significantly high (between .571 and .718). This finding is compatible with findings of the study, which has been done on university professors (24). It is interesting that the correlation pattern in both of the studies is the same. In both of the studies, the correlation between the two factors of VFI, i.e., tiredness and physical discomfort, and different factors of VHI was positive and significant, but this correlation about third factor of VFI was not significant.

A weak, negative, and non-significant correlation of the third factor of VFI, i.e., improvement of symptoms with factors of VHI may be due to the nature of the factor. This factor is different from the other factors which are indices of vocal fatigue, but the factor is improvement of symptoms as a result of rest (9, 23).

Our findings showed that females had more means in different factors of VFI and VHI in comparison with males, but only the mean of physical discomfort factor of VFI in females was significantly more, and the differences in the two other factors of VFI and three factors of VHI were not significant. The significant more physical discomfort in females may be due to the consequence of other factors, because the mean of all other factors of VFI and VHI were more in females, but the difference in physical factor was more and significant. This may be due to lesser amount of physical tolerance of the body of women in comparison with men. The contribution of the tolerance of tiredness and emotional factor must be considered too, because after physical discomfort, the highest level of difference was related to tiredness factor of VFI, and emotional factor of VHI. Although we did not find similar results about differences between males and females, there are some studies which have showed similar findings about VHI or VFI (31, 32). One factor about non-significance of the differences between genders may arise of the details of development of a questionnaire. For example, about VHI, items which may reflect a dependency on the gender variable were removed (22).

Conclusion

The findings of this study indicate that factors of VFI and VHI can be related to each other, and the feeling of vocal fatigue, and especially tiredness, may lead to the feeling of vocal handicap in patients with laryngeal pathologies. The other important finding of this study is that females may have significantly more physical discomfort than males, though this is not the case about other factors of VFI and three factors of VHI.

Limitations to the Study

The research studied only 110 dysphonic patients including 54 males and 56 females. Our main limitation was that we did not have a larger sample with different groups of laryngeal pathologies or different vocal symptoms.

Acknowledgment

This article has been derived from a MSc. thesis submitted to the Speech-Language Pathology Department, School of Rehabilitation Sciences of Iran University of Medical Sciences (IUMS). The patients of this study were selected from Amir A'alam Hospital of Tehran University of Medical Sciences (TUMS).

Conflict of Interests

The authors declare that they have no competing interests.

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Original Article
http://fdj.iums.ac.ir
Function & Disability Journal

Func Disabil J. 2019 (Aug 24);2:16. https://doi.org/10.34171/fdj.2.16.

رابطه بین شاخص خستگی صوت و شاخص معلولیت صوت در افراد مبتلا به آسیب‌های حنجره

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چکیده

مقدمه: صوت وسیله منحصر به فرد انسان، جهت بیان کلامی است، که در حنجره تولید می‌شود. آسیب‌های حنجره‌ای، می‌توانند با خستگی صوتی و احساس معلولیت صوت، همراه باشند. هدف این مطالعه تعیین آماره‌های نتایج دو پرسشنامه خودارزیابی شاخص خستگی صوت (VFI) و شاخص معلولیت صوت (VHI) در دو گروه از مردان و زنان مورد مطالعه، مقایسه بین دو گروه و وجود رابطه بین VFI و VHI است.

روش‌ها: این مطالعه یک مطالعه توصیفی‌تحلیلی و مقطعی است که در مورد ۱۱۰ بیمار مبتلا به آسیب حنجره‌ای انجام شده است. ۵۴ نفر از آنها مرد با میانگین سنی ۴۳/۷ سال (انحراف معیار ۱۵/۶) و ۵۶ نفرشان نیز زن با میانگین سنی ۴۰/۱ سال (انحراف معیار=۱۱/۱) بودند. داده‌های این مطالعه با استفاده از SPSS21 در سطح معنی‌داری بیش‌از ۰/۰۵ مورد تحلیل آماری قرار گرفت. از آمار توصیفی، آزمون کولموگوروف اسمیرنف، ضریب همبستگی اسپیرمن و پیرسون، آزمون تی زوج و آزمون یو من ویتنی استفاده شده است.

یافته‌ها: در بیماران مبتلا به آسیب حنجره‌ای، بین عوامل خستگی و ناراحتی جسمی از دو شاخص خستگی صوتی (VFI) و معلولیت صوتی (VHI)، رابطه‌ای قوی (P<۰/۰۵) وجود داشت. در این بیماران که مبتلا به آسیب حنجره‌ای بودند، فقط رابطه سومین عامل VFI با عوامل VHI معنی‌دار نبود.

نتیجه‌گیری: یافته‌های این مطالعه حاکی از آن است که احساس خستگی صوتی، و به ویژه خستگی می‌تواند منجر به احساس معلولیت صوتی در بیماران مبتلا به آسیب حنجره‌ای شود. بر اساس این یافته‌ها، زنان در مقایسه با مردان ممکن است بطور معنی‌داری ناراحتی جسمی بیشتری داشته باشند، که نیازمند توجه بیشتری در مطالعات بعدی است.

کلیدواژه‌ها: آسیب حنجره‌ای، شاخص خستگی صوت، شاخص معلولیت صوتی

Conflicts of Interest: *The authors have no conflict of interest in this study.*
Funding: *Iran University of Medical Sciences*

Cite this article as: Afkhami M, Amirishavaki Y, Qhelichi L, Kamali M, Ensafi Z, Azari S. Correlation between vocal fatigue index and voice handicap index scores in Persons with laryngeal pathologies. *Func Disabil J. 2019* (Aug 24);2.16. https://doi.org/10.34171/fdj.2.16.