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Descriptors

Voice
Fatigue
Dysphonia
Teachers
Questionnaires
Speech Therapy

Descritores

Voz
Fadiga
Disfonia
Professores
Questionários
Fonoaudiologia

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Received: July 02, 2018

Accepted: October 23, 2018

Vocal fatigue in dysphonic teachers who seek treatment

Fadiga vocal em professores disfônicos que procuram atendimento fonoaudiológico

ABSTRACT

Purpose: to verify the self-perception of vocal fatigue of dysphonic teachers in school year activity who sought speech-language pathology assistance. **Methods:** Sixty teachers with voice complaints participated in the study, 30 of whom sought treatment in the *Programa de Saúde Vocal do Sindicato dos Professores de São Paulo* (SinproSP), and 30 volunteers' teachers who did not seek treatment (G2). All the participants answered a personal identification protocol and work characterization, vocal self-assessment, vocal signs and symptoms checklist, Vocal Fatigue Index protocol (VFI). In addition, a number counting from 1 to 10 and sustained vowel "e" were registered for the definition of the mean vocal deviation using perceptual-auditory judgment. **Results:** Teachers who sought treatment (G1) obtained worst scores in the VFI, more numbers of signs and symptoms, and worst self-evaluation of the voice when compared with those who did not seek treatment (G2). In addition, teachers in both groups had light to moderate vocal deviation. **Conclusion:** Dysphonic teachers who sought vocal treatment presented greater sensation of vocal fatigue, especially in the factors of tiredness of voice and voice avoidance and related to physical discomfort associated with voicing of the VFI. In addition, they reported greater number of symptoms and worse vocal self-assessment in relation to those who did not seek treatment, although both groups present deviated voices.

RESUMO

Objetivo: Verificar a autopercepção de fadiga vocal de professores disfônicos em atividade letiva que procuram atendimento fonoaudiológico. **Método:** Participaram desta pesquisa 60 professores com queixa vocal, dentre estes, 30 que buscaram tratamento no Programa de Saúde Vocal do Sindicato dos Professores de São Paulo – SinproSP (G1) e 30 professores que não buscaram atendimento (G2). Todos os participantes responderam a um questionário de identificação, a um de caracterização pessoal e do trabalho, a uma lista de sinais e sintomas vocais e ao Índice de Fadiga Vocal - IFV. Além disso, foram registradas contagem de números de 1 a 10 e vogal sustentada "é" para definição do grau de desvio vocal por meio da análise perceptivo-auditiva. **Resultados:** Os professores que procuraram o atendimento (G1) apresentaram piores escores nos protocolos IFV, maior número de sinais e sintomas, além de pior autoavaliação da voz quando comparados aos professores que não procuraram tratamento (G2). Além disso, os docentes dos dois grupos estudados apresentaram desvios de voz de leve a moderado. **Conclusão:** Professores disfônicos que procuram atendimento fonoaudiológico apresentam maior sensação de fadiga vocal, principalmente em relação aos domínios restrição vocal e desconforto físico do IFV. Além disso, apresentaram maior número de sintomas e pior autoavaliação vocal em relação àqueles que não procuraram o atendimento, apesar de ambos os grupos apresentarem vozes desviadas.

Study conduct at Centro de Estudos da Voz – CEV - São Paulo (SP), Brasil, as a requirement for conclusion of Curso de Especialização em Voz.

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Financial support: nothing to declare.

Conflict of interests: nothing to declare.



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INTRODUCTION

The term vocal fatigue has been widely discussed in the literature as a current and relevant topic for researches working with the dysphonic and populations at risk to develop vocal disorder⁽¹⁻³⁾.

Vocal fatigue can be defined as a negative vocal adaptation, self-reported by the individual due to prolonged vocal use^(2,4). It can also be described as the effort felt by the individual due to vocal loading⁽¹⁾, which improves with adequate vocal rest^(1,3,5).

The presence of vocal fatigue is often characterized as a global syndrome identified by several symptoms, such as a sensation of increased effort, laryngeal discomfort, neck and shoulder tension, neck or throat pain, loss of flexibility and vocal projection^(1,3,5,6).

Vocal fatigue is very common in teachers⁽⁴⁾, because these professionals spend several hours of their day teaching⁽¹⁾ in extremely noisy environments⁽⁷⁾. The working environment condition and the professional own performance are the two main reasons that lead to vocal fatigue. In addition, to the long periods of work, which makes the vocal rest, necessary for an adequate vocal recovery, not possible⁽⁸⁾.

However, the evaluation of vocal fatigue is still a challenge, due to its multi-causality⁽⁹⁾ and the lack of specific instruments⁽⁷⁾. Thus, finding an instrument that objectively measures this aspect is important, once it might guarantee early diagnosis and standardize treatment for vocal changes⁽⁴⁾.

Recently, a self-assessment instrument, the Vocal Fatigue Index (VFI) was developed. This protocol presents 19 questions to investigate vocal fatigue in three factors: factor 1 related to tiredness of voice and voice avoidance; factor 2, related to physical discomfort associated with voicing; and factor 3, related to improvement of symptoms with rest⁽⁹⁾.

It is known that teachers who do not seek treatment, even in the presence of vocal complaints, do not perceive variations in vocal fatigue during the school year and present lower scores in the factors of the VFI protocol when compared to dysphonic individuals^(9,10). In addition, these professionals tend to seek speech therapy only when they present high occurrence of signs and symptoms and deviated voice quality⁽¹¹⁾. However, little is known regarding vocal fatigue in teachers and if these professional seek help only when the symptom is already chronic. Therefore, identifying the self-perception of these professionals in relation to dysphonia and vocal fatigue offers data not only for speech-language pathology intervention, but also preventive strategies for those teachers.

Therefore, the objective of the present study was to verify the self-perception of vocal fatigue of dysphonic teachers in school year activity who sought speech-language pathology assistance.

METHODS

The research was accepted by the Committee for Ethics in Research of the *Universidade de Taubaté* - UNITAU (CAAE: 62322516.9.0000.5501, protocol number: 122.608).

All the individuals agreed to participate and signed an informed consent form, in accordance to the Brazilian resolution 466/12 (BRAZIL Resolution No. 466/12 of December 12th, 2012⁽¹²⁾).

Sixty teachers with voice complaints, both male and female, participated in the study, they were divided in two groups: G1 = 30 teachers who sought treatment in the *Programa de Saúde Vocal do Sindicato dos Professores de São Paulo* (SinproSP), assessed by the researcher in the first day of voice assessment, and G2 = 30 volunteers' teachers with vocal complaints and that did not seek professional guidance, they were evaluated in their work place. The teachers who participated in this study taught in different private schools of São Paulo city, in different levels of education (kindergarten, elementary and high school). The teachers were asked for the presence or not of vocal complaint that was later confirmed by the signs and symptoms checklist. This data was used to define the inclusion criteria and to make sure that the complaint was related to voice use. Teachers who reported not to have vocal complaint or who sought SinproSP only to improve communication were excluded from the analysis.

All participants were submitted to the following procedures: personal identification protocol and work characterization, vocal self-assessment, vocal signs and symptoms checklist, Vocal Fatigue Index protocol (VFI) and voice recording for subsequent auditory-perceptual judgement.

The personal identification protocol and work characterization is composed of 11 questions that investigate data such as: gender, age, level of education taught (Early childhood, Primary education - elementary and middle school), years of teaching experience, number of students per classroom, daily hours lecture/work load, presence of noise in the classroom, search for previous medical and/or speech-language pathologist assessment due to voice problems, vocal use in activities not related to their work⁽¹¹⁾.

The group of dysphonic teachers who sought treatment was composed of 25 women (83.33%) and 5 men (16.67%). Teachers' age was between 24 and 55 years old (median 37.5), years of teaching experience between 3 and 29 years (median 12), number of students per classroom was between 8 and 40 (median 20) and daily hours lecture/work load between 1 and 3 periods per day (median 2). Regarding the teachers that were evaluated in the school, 23 were women (76.67%) and 7 (23.33%) participants were men ($p = 0.518$), aged between 25 and 48 years old (median 41.5, $p = 0.459$), teaching time between 1 and 28 years (median 15, $p = 0.695$), number of students per classroom between 5 and 48 (median 25; $p = 0.214$) and work load between 1 and 3 periods per day (median 2, $p = 0.486$). Both groups were equivalent regarding: years of teaching experience, numbers of students per classroom, daily hours lecture/workload (Table 1).

Teachers self-rated their voices using a 5-point scale in which: 1 = excellent, 2 = very good, 3 = good, 4 = reasonable and 5 = bad.

The Brazilian translation for the self-assessment Vocal Signs and Symptoms checklist, a list of 14 items proposed by

Table 1. Characterization of the work and information of voice use for teachers with and without vocal complaints

Characterization of the group	Groups										P
	G1					G2					
	Mean	Median	25%	75%	SD	Média	Mediana	25%	75%	SD	
Age of the teachers	37.900	37.5	31.75	44.25	7.729	39.166	41.5	32	46	7.134	0.459
Number of students per room	21.866	20	15	28	8.186	24.206	25	18.5	30	9.182	0.214
Years of teaching experience	13.785	12	8.25	19	7.385	14.517	15	8	23	8.671	0.695
Daily hours lectures/work load	1.733	2	1	2	0.583	1.633	2	1	2	0.614	0.486

Caption: G1 - Group of teachers who sought treatment; G2 - Group of teachers who did not seek treatment; Significant values ($p \leq 0.05$) - WILCOXON test; SD - Standard Deviation

Roy et al.⁽¹³⁾ was used. Among the evaluated items are: hoarseness; voice tires or changes quality after short use; trouble speaking or singing softly; difficulty projecting voice; loss of singing range; discomfort while using voice; a monotone voice; effort to talk; chronic throat dryness; chronic throat soreness; frequent throat clearing; bitter or acid taste; swallowing difficulties and a wobbly or shaky voice.

For the self-evaluation of vocal fatigue, the Brazilian validated version of the Vocal Fatigue Index⁽⁹⁾ was used. The Vocal Fatigue Index (VFI) consists of 19 questions characterized by three factors: (1) factor 1, related to tiredness of voice and voice avoidance (questions 1 to 11); (2) factor 2, related to physical discomfort associated with voicing (questions 12 to 16), and (3) factor 3, related to improvement of symptoms with rest (questions 17 to 19). In factors 1 and 2, higher scores represent more disadvantage, while in factor 3, higher scores represent more improvement of the symptoms, i.e., less symptoms. Each question varies from a scale of 0 to 4, where 0 = never, 1 = almost never, 2 = sometimes, 3 = almost always, 4 = always. The protocol is calculated by the simple sum of the answers, and the total score varies from 0 to 76: in the subscale of tiredness of voice and voice avoidance, from 0 to 44; related to physical discomfort associated with voicing, from 0 to 20; and related to improvement of symptoms with rest, from 0 to 12⁽⁹⁾.

To assess the perceptual judgment of the voice quality the participants were instructed to count the numbers 1 to 10, and to phonate the sustained vowel “é” in comfortable pitch and loudness. Voices were recorded directly on a computer using the Fono View (CTS computing) program, with Andrea PureAudio USB external sound card and Karsect HT-2 head-mounted microphone positioned at 45° microphone-to-mouth angle and 2 cm from the mouth of the speaker. Three speech-language pathologists perceptually judged the overall voice quality using a four-point scale, in which 0 indicated the absence

of deviation; 1, mild deviation; 2, moderate deviation; and 3, severe deviation. For intra-rater reliability analysis, 20% of the speech samples were repeated and the answers from the judges with higher intra-rater reliability were considered (reliability 88.88%).

Data collection was performed between the evaluation session and the first voice therapy session in order to eliminate possible external interference in the outcomes. Subsequently, all individuals underwent conventional speech therapy in the *Programa de Saúde Vocal do Sindicato dos Professores de São Paulo* (SinproSP).

Statistical analysis was performed. The Shapiro-Wilk test was used to evidence the normal distribution between the groups, non-parametric tests, such as Wilcoxon and Z-Test were used for proportions.

RESULTS

Regarding voice self-assessment, the group of teachers who sought treatment (G1) self-rated their voice as reasonable. However, the group of teachers who did not seek treatment (G2), self-rated their voice as good ($p = 0.015$). The groups studied presented mild to moderate voice deviations, with no significant difference between them ($p = 0.119$).

In relation to the Vocal Signs and Symptoms Checklist (Table 2), G1 had higher occurrence of symptoms when compared to G2 (7.8 SD = 3.33 Vs 4.7 SD = 2.6, $p = 0.0004$). The most frequent symptoms for G1 were: tired voice, speech discomfort, monotonous voice, effort to speak, throat pain, throat clearing and wobbly or shaky voice (Table 3).

Concerning VFI, the mean scores of tiredness of voice and voice avoidance and physical discomfort associated with voicing were higher in the group of teachers who sought treatment. In the factor of improvement of symptoms with rest, no differences were found between the two groups (Table 4).

Table 2. Total value of vocal signs and symptoms for teachers with and without vocal complaints

Groups	Signs and Symptoms					P Value
	Mean	Median	25%	75%	SD	
G1	7.833	9	5	10	3.333	0.0004*
G2	4.766	5	3	7	2.686	

*Statistically significant difference

Caption: G1 - Group of teachers who sought treatment; G2 - Group of teachers who did not seek treatment; Significant values ($p \leq 0.05$) - WILCOXON test; SD - Standard Deviation

Table 3. Individual value of vocal signs and symptoms for teachers with and without vocal complaints

Symptoms	Groups				P Value
	G1		G2		
	N	%	N	%	
Hoarseness	22	73.33	16	53.33	0.1080
Voice tires or changes quality after short use	24	80.00	13	43.33	0.0035*
Trouble speaking or singing softly	20	66.67	13	43.33	0.0693
Difficulty projecting voice	19	63.33	13	43.33	0.1205
Loss of singing range	20	66.67	18	60.00	0.5921
Discomfort while using voice	17	56.67	7	23.33	0.0084*
A monotone voice	9	30.00	0	0.00	0.0011*
Effort to talk	20	66.67	11	36.67	0.0201*
Chronic throat dryness	21	70.00	17	56.67	0.2839
Chronic throat soreness	19	63.33	11	36.67	0.0389*
Frequent throat clearing	19	63.33	9	30.00	0.0097*
Bitter or acid taste	12	40.00	9	30.00	0.4168
Swallowing difficulties	4	13.33	3	10.00	0.6876
A wobbly or shaky voice	4	33.33	3	10.00	0.0283*

*Statistically significant difference

Caption: G1 - Group of teachers who sought treatment; G2 - Group of teachers who did not seek treatment; Significant values ($p \leq 0.05$) - Z-test for proportions; N - Number of participants

Table 4. VFI scores for teachers with and without vocal complaints, by domain

Factors	Groups										P
	G1					G2					
	Mean	Median	25%	75%	SD	Mean	Median	25%	75%	SD	
Vocal Restriction	24.833	27	19	32	9.663	16.666	15	12	21	6.477	0.0007*
Physical Discomfort	7.733	6.5	2	13.25	5.514	4.500	4.5	1	7.25	3.235	0.0372*
Recovery (without inversion)	9.066	10	6	12	2.935	8.866	9	7	10	2.473	0.5633
Total	35.500	37	28.28	44.5	12.880	23.833	23.5	18	30.25	8.440	0.0003*
Recovery (with inversion)	2.933	2	0	6	2.935	2.666	2.5	2	3	1.988	0.8685

*Statistically significant difference

Caption: G1 - Group of teachers who sought treatment; G2 - Group of teachers who did not seek treatment; Significant values ($p \leq 0.05$) - WILCOXON test; SD - Standard Deviation; VFI - Vocal Fatigue Index

DISCUSSION

Vocal fatigue is a common complaint among teachers^(1,5), mainly because these professionals spend continuous hours teaching, with little time to rest their voice⁽¹⁾. It can be described as a symptom of voice change of functional or organic etiology⁽¹⁴⁾ or it may be associated with compensatory behaviors that predispose to a phonotrauma and development of a pathology in the larynx⁽³⁾.

It is known that teachers tend to seek specialized help when they already have a high number of symptoms and significant voice quality deviations^(11,15), only few teachers seek preventive treatment or just after the symptoms begin. However, the literature presents inconsistent findings related to vocal fatigue treatment and its influence on the seek for vocal care.

Therefore, the present study had the objective to verify the self-perception of vocal fatigue of dysphonic teachers during school year who sought voice care. To understand teachers' perception of vocal fatigue, a self-assessment protocol was used to investigate three factors related to tiredness of voice and voice avoidance, physical discomfort associated with voicing, and improvement of symptoms with rest^(9,10).

The present research showed worse vocal self-evaluation in the dysphonic teachers who sought treatment. The literature indicates that teachers with dysphonia have worse vocal self-assessment⁽¹⁶⁾, while other teachers, even with altered voice quality, rate their voices as good⁽¹⁰⁾. Probably, the worse vocal self-perception in teachers who participated in this research influenced the search for treatment.

On the other hand, considering the number of signs and symptoms, it was observed that the teachers who sought treatment had almost twice as many symptoms as teachers who did not seek treatment (Table 2). The mean number of symptoms that motivated teachers to seek treatment is 8.6⁽¹¹⁾, which is in accordance to findings of the present research.

A Brazilian study evaluated 3,265 teachers and the results showed that the vocal symptoms were directly related to the occupational voice use. Teachers presented an average of 3.6 symptoms compared to 2.3 symptoms of the general population. Among the reported symptoms were vocal fatigue, discomfort and greater effort to speak⁽¹⁷⁾.

The literature also indicates that teachers with vocal complaints present an average of 7.8 symptoms, while teachers without vocal complaint have an average of 2.5 symptoms. The most

common symptoms are hoarseness, dry throat, sore throat and difficulty to speak⁽¹⁵⁾. The present study also found common symptoms of dry throat, neck pain and, in addition to these, there was also vocal fatigue, discomfort to speak, monotonous voice, effort to speak, throat pain, throat clearing and voice instability (Table 3).

The similarity of the results of the present study with previous published articles confirms that teachers have approximately twice as many vocal problems as non-teachers. In addition to the risks of the profession itself, another factor that may contribute to the high prevalence of vocal alterations in teachers is the predominance of women teachers. It is known that women have greater chances of developing voice problems^(18,19) due to anatomical differences and glottic proportions in the female larynx.

Considering that the two groups studied had deviated voice quality, it is believed that the average number of signs and symptoms may have helped the group with vocal complaint to seek speech therapy treatment. Perhaps, the presence of more symptoms influences the teachers' work activity and may imply limitations in their vocal performance, therefore, their professional performance. In this sense, it would be interesting for teachers to be instructed and able to identify initial vocal deviations and to recognize that teaching with many vocal symptoms may be a risk factor for vocal alteration.

Regarding vocal fatigue, teachers who sought treatment had higher scores in the factor of tiredness of voice and voice avoidance and the factor related to physical discomfort associated with voicing (Table 4). In addition, these teachers presented scores above the dysphonic teachers found in literature. The group of teachers with vocal complaints who did not seek treatment had lower scores in the factors of tiredness of voice and voice avoidance and the factor related to physical discomfort associated with voicing outcoming the dysphonic patients previously reported in the literature⁽⁹⁾. This suggests that a high number of symptoms is necessary for teachers to perceive fatigue and seek treatment, since both groups had deviated voice quality. In this way, prevention strategies and vocal training are important for these professionals to recognize the symptoms early and to seek voice care before the limitations and vocal discomfort are established. Moreover, if teachers have a better perception of their vocal symptoms, they will have better self-awareness to reduce the vocal loading and therefore, avoid future vocal problems.

Dry throat, voice breaks, throat discomfort and hoarseness are some symptoms usually related to vocal fatigue^(7,20,21). In addition, the presence of other symptoms that manifest themselves in vocal quality, vocal dynamics, respiratory support for phonation, level of discomfort and muscular tension, vocal control mechanism and level of vocal effort is also observed⁽²⁾.

Professionals who have high vocal demand, such as actors and singers, report an increase in tension and discomfort in the throat, neck and mandible regions when they are vocally fatigued⁽⁶⁾. This data corroborates the findings of the present study regarding the physical discomfort associated with vocal fatigue and the signs and symptoms of discomfort to speak, effort to speak and throat pain reported by teachers who sought

treatment, indicating that discomfort in the vocal tract region favors the effort to phonation and, therefore, generates vocal fatigue complaint.

Regarding the factor of improvement of symptoms with rest, there was no difference between the two groups (Table 4). In addition, the scores found in the present research are above the scores found for dysphonic individuals⁽⁹⁾, which may indicate a greater recovery of symptoms in the two groups studied, an aspect that favors teachers to continue to teach, even with vocal alterations. However, there may be inconsistency in the responses regarding this domain, since it may be difficult to for the individuals to answer about the recovery of something that they do not feel.

A recent study⁽²²⁾ analyzed the VFI protocol using the Mokken scale, a scale used to understand the relationship between VFI items and to develop the hierarchical understanding of self-reported trait of vocal fatigue. The authors of the study indicated that although the third factor does not meet the criteria of the scale in relation to the Loevinger H coefficient, which is an indicator of homogeneity of the items, in other words items easier to understand are related to less severe symptoms, while items more difficult to understand are related to more severe symptoms, the reliability between the three scales was high. This data reinforces the hypothesis that the participants probably had difficulty responding to the third factor due to the high complexity of the symptoms experienced. In addition, it corroborates the concept that rest and voice recovery significantly influence the vocal fatigue sensation, that is, the recovery is probably related to the chronicity of fatigue.

The vocal fatigue is highly influenced by vocal loading and high vocal loudness over long periods of time⁽⁴⁾. Therefore, if vocal fatigue is identified in early stages, it could guarantee an early intervention and prevent long-term adverse effects and inadequate vocal compensations. Vocal warm-up before the voice use and the need to emphasize vocal hygiene in the curriculum of school teachers and other professional voice users are also extremely important⁽⁷⁾.

Voice awareness strategies, as well as adequate training, are fundamental for these professionals, as they can help them in the preventive search for professional help and early diagnosis. Educational campaigns that include guidance on the symptoms of vocal fatigue may favor the chances of treatment and decrease the prevalence of signs and symptoms and vocal alteration in these professionals. Thus, the teachers will be more aware of their vocal symptoms and therefore it will be able to reduce the vocal load to avoid a voice alteration⁽¹⁰⁾.

Future research could investigate the relationship between vocal fatigue and other vocal changes, or even analyze the variation of individual responses regarding this complaint and verify which aspects should be considered to propose an effective prevention program. In addition, it would be important to investigate the relationship between the physical discomfort associated with vocal fatigue and the level of physical inactivity and life habits of the teachers using specific protocols. This could help verify if the countless hours of vocal use interfere in the increase of the vocal fatigue

CONCLUSION

Teachers with vocal complaints and those who sought treatment presented greater sensation of vocal fatigue, especially in the factors of tiredness of voice and voice avoidance and related to physical discomfort associated with voicing of the VFI. In addition, they also reported greater number of symptoms and worse vocal self-assessment compared to those who did not seek treatment, although both groups had vocal complaint and deviated voice quality. In this way, many teachers with vocal complaints continue to work and seek treatment only when their general health quality decreases.

The results of the present study can be used to follow-up teachers and help them identify and quickly perceive the symptoms associated with vocal fatigue.

ACKNOWLEDGMENTS

I am deeply grateful to my counselors for assisting me in the execution, follow-up and conclusion of this research. To CEV for allowing me to develop as a person and professional, and to SinproSP for opening the doors so that we can develop more and more studies in the area and enable evolution in patient care.

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Authors contributions

MAR was responsible for data analysis, for writing and reviewing the manuscript; FZ was responsible for the data collection, study design, data analysis and review of the manuscript; FB was responsible for the study design, data analysis and review of the manuscript; MB was responsible for the study design, data analysis and final review of the manuscript.