

Vocal fatigue and associated factors in university teachers in remote education

Fadiga vocal e fatores associados em professores universitários em ensino remoto

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ABSTRACT

Purpose: To verify the self-perception of vocal fatigue and associated factors in university professors in remote teaching during the COVID-19 pandemic. **Methods:** Cross-sectional, observational, descriptive and analytical study, with a remote approach with university professors in teaching during the COVID-19 pandemic. After acceptance, the participants answered a sociodemographic questionnaire, the Vocal Signs and Symptoms Questionnaire, Vocal Fatigue Index Protocol and Vocal Handicap Index 10. The analysis of the data identified through descriptive and initial statistics, using the given Chi-square and Mann-Whitney tests. Associations between qualitative variables were verified using chi-square and Fisher's exact tests. The IFV and IDV-10 means were verified with the number of signs and symptoms using the Mann-Whitney test. **Results:** Sample of 91 teachers, mostly female (83.5%), and mean age of 44.0 years. Teachers had an average of 3.8 signs and symptoms and the total score of the IFV indicated the presence of vocal risk, with values considered for dysphonic subjects. Teachers don't want vocals. **Conclusion:** University professors in remote teaching self-assessed being at risk for vocal fatigue. Among the factors associated with IFV, professors who presented more than two vocal signs and symptoms had a greater sensation of vocal fatigue. No self-perception of voice handicap was observed, however, those who had more than two vocal signs and symptoms had worse self-perception of voice handicap.

Keywords: Voice; Fatigue; Professors; Distance education; Self-evaluation

RESUMO

Objetivo: Verificar a autopercepção da fadiga vocal e fatores associados em professores universitários em ensino remoto durante a pandemia de COVID-19. **Métodos:** Estudo transversal, observacional, descritivo e analítico, com abordagem quantitativa com professores universitários em ensino remoto no período da pandemia de COVID-19. Os participantes, após o aceite, responderam a um questionário sociodemográfico, Questionário de Sinais e Sintomas Vocais, Protocolo Índice de Fadiga Vocal (IFV) e Protocolo Índice de Desvantagem Vocal 10 (IDV-10). A análise dos dados ocorreu por meio da estatística descritiva e inferencial. As associações entre as variáveis qualitativas foram verificadas por meio dos testes Qui-quadrado e Exato de Fisher. Já as médias do IFV e IDV-10, foram comparadas com o número de sinais e sintomas por meio do teste de Mann-Whitney. **Resultados:** Amostra de 91 professores, maioria do gênero feminino (83,5%) e média de idade de 44,0 anos. Os professores apresentaram média de 3,8 sinais e sintomas e o escore total do IFV indicou a presença de risco para fadiga vocal, com valores compatíveis para indivíduos disfônicos. Não apresentaram desvantagem vocal. **Conclusão:** Os professores universitários em ensino remoto se autoavaliaram apresentando risco para fadiga vocal. Entre os fatores associados ao IFV, os docentes que apresentaram mais de dois sinais e sintomas vocais tiveram maior sensação de fadiga vocal. Não foi observada autopercepção de desvantagem vocal, porém, aqueles que apresentaram mais de dois sinais e sintomas vocais tiveram pior autopercepção para desvantagem vocal.

Palavras-chave: Voz; Fadiga; Docentes; Educação a distância; Autoavaliação

Study carried out at Núcleo de Ciências Humanas, Sociais e de Políticas Públicas – NUCISP, Centro de Ciências Integradoras, Universidade Estadual de Ciências da Saúde de Alagoas – UNCISAL – Maceió (AL), Brasil.

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Conflict of interests: No.

Authors' contribution: MBPS was responsible for preparing the research and the schedule, surveying the literature, collecting and analyzing data, writing the article; EPGM was responsible for preparing the research and the schedule, data analysis, correction of the article's writing, approval of the final version and submission and procedures of the article; VFAP advisor, was responsible for preparing the research and the schedule, analyzing the data, correcting the writing of the article and approving the final version.

Funding: None.

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Received: August 08, 2022; **Accepted:** October 26, 2022

INTRODUCTION

The year 2020 was marked by the state decree of a pandemic in the country, caused by the Coronavirus Disease (COVID-19), which implied the implementation of several measures to combat it to minimize the high rate of contamination. Among these measures were the suspension of face-to-face pedagogical activities and the performance of classes in a remote environment (*home office*)⁽¹⁾.

The emergency remote teaching generated by the pandemic caused some changes in the teacher's classroom environment, as well as the increase in hours worked, an adaptation of didactic strategies, use of previously little-used software, in addition to the aggravation of the emotional issues of teachers, caused by stress and social isolation⁽²⁾.

From the changes in the working conditions of these teachers, there was a gradual decline in the quality of life of these professionals, particularly regarding psychological, and social aspects and the work process. This decline in the quality of life also brought, as a consequence of this working class, professional exhaustion, fatigue, and stress in dealing with situations beyond their control⁽³⁾.

Psychological stress, also caused by the change related to the undetermined workplace and the transition from classes to the synchronous online model, resulted in shockingly high vocal symptoms⁽⁴⁾. In this situation, voice intensity may increase to compensate for the vocal symptoms present, causing overload at the glottic level and muscle tension⁽⁵⁾.

Many studies claim teachers are at greater risk of developing vocal problems⁽⁶⁻⁸⁾. Given the changes that occurred in their work environment, added to the lack of preparation to teach online classes, the incidence of dysphonia was obtained, compared to the traditional territory of face-to-face courses^(9,10).

A review study carried out with home office workers, which sought to understand psychological and organizational aspects, found that this virtual environment is challenging and stressful, greatly affected by the lack of "eye to eye" during communication, which is replaced by "eye to screen"⁽¹¹⁾. Furthermore, in this remote context, non-verbal communication proves to be an essential factor for the effectiveness of the transmission of the message and for attracting the student's attention⁽¹²⁾.

Another study showed the damage generated in communication in this remote scenario. It concluded that, as it is a way of working that must remain post-pandemic, training is necessary to reduce vocal risks since they are related to the environment and form of communication⁽⁹⁾.

Until then, most of the orientations and vocal preparations performed were directed to teachers who work in face-to-face teaching, even for university professors, they are still less studied when compared to children's, elementary and high school teachers. Currently, teachers have had to adapt, changing their work environment to a home office, without training and with a space not ergonomically prepared for their long hours of classes.

A better understanding of aspects of vocal fatigue, discomfort and voice handicap in remote teaching, in university professors, become relevant, since such factors can precede dysphonia. In this way, raising the symptoms, and knowing the self-perception of these professionals regarding the presence of vocal fatigue and other factors that can lead to vocal illness, arising from a remote teaching environment, becomes practical for them to

benefit from guidelines capable of allowing better performance in the online class scenario.

Despite being in a home office environment, exposure to internal or external noise, bad ergonomics, and the high workload of small classes, among other factors, can contribute to the emergence of a voice disorder, and the etiology of dysphonia is multifactorial.

Knowing and analyzing this reality in the remote teaching of teachers is also essential for elaborating proposals aimed at promoting vocal health and well-being⁽¹³⁾. It is believed that this online scenario will still accompany the university professor for a long time, even with the return to face-to-face classes.

Given the above, the objective of this study was to verify the self-perception of vocal fatigue and associated factors in university professors in remote teaching, during the COVID-19 pandemic.

METHODS

This is a descriptive, analytical, cross-sectional study with a quantitative approach. Considering an estimated proportion of vocal fatigue of 50%, a sampling error of 5%, with a confidence level of 95%, the sample size was estimated at 385 participants. However, only 91 university professors, of both genders, from public and private institutions, in remote activity, answered the questionnaire, during the period from September to December 2021. The research protocol was approved by the Research Ethics Committee of the University of Health Sciences of Alagoas - UNCISAL, under CAAE 5005956.0000.5011.

University professors were eligible, regardless of gender, over 20 years of age and who had been working remotely for at least six months, until the beginning of data collection. Professors with a medical diagnosis of laryngeal disorders and dysphonia, who were undergoing speech therapy at the time of the research, with psychological disorders and hearing disorders were excluded. Teachers who taught in distance education courses (DE) and who worked exclusively as internship supervisors were also excluded.

Participants were recruited by sending an invitation to participate in the research via email to the selected higher education institutions (HEIs) and through dissemination on the researchers' social networks (WhatsApp). Thus, the "virtual snowball" sampling method was followed, with invitations with a link to access the electronic questionnaire. At the time, guidelines were made available regarding the objectives and stages of the study, in addition to the electronic data collection form accompanied by the Free and Informed Consent Term (FICT).

Therefore, data collection took place online, through a form created in Google Forms, which contained instructions on how to fill in the instruments used for display. Initially, the professor had to read the eligibility criteria to verify his eligibility for the study. If he met the requirements was directed to the acceptance page.

Those who agreed to participate in the research read and signed the informed consent digitally, with a copy sent to their e-mail. After voluntary acceptance, the participant responded to the collection instruments, which contained a sociodemographic questionnaire, prepared by the researchers, which allowed the characterization of the sample in terms of age, gender, functional status, conditions and environment of small classes.

Subsequently, they completed the following instruments: The vocal Signs and Symptoms Questionnaire (VSSQ)⁽¹⁴⁾; Vocal Fatigue Index Protocol (VFI)⁽¹⁵⁾ and the Vocal Handicap Index Protocol 10 (VHI-10)⁽¹⁶⁾.

The QSSV comprises a list of 14 vocal signs and symptoms and aims to identify their occurrence and relate them to using voice in the work environment. For each “yes” answer, 1 point should be assigned, the total being the simple sum of the number of signs and symptoms presented by the participant. A previous study shows teachers present at least 3.7 vocal symptoms⁽¹⁷⁾. This information led to elaborating two categories - VSSQ up to three symptoms and VSSQ above three symptoms - to compare the number of vocal signs and symptoms with the means of the VFI and VHI-10 scores.

The self-perception for the vocal fatigue index followed the VFI protocol, using the version translated and validated for Brazilian Portuguese⁽¹⁵⁾. The VFI consists of 17 questions divided into four domains: fatigue and vocal limitation (factor 1), vocal restriction (factor 2), physical discomfort associated with the voice (factor 3) and recovery with vocal rest (factor 4). Higher values mean an increase in symptoms, except for the vocal recovery item, in which the higher the score, the greater the vocal recovery. The cutoff points adopted are: 4.50 for Factor 1; 3.50 for Factor 2; 1.50 for factor 3; 8.50 for Factor 4 and 11.50 for the total score, “which separates dysphonic individuals from vocally healthy individuals”⁽¹⁵⁾.

Responses are scored on a 0 to 4-point scale, where 0 corresponds to “absence” and 4 corresponds to “always occurs” (0 = never, 1 = almost never, 2 = sometimes, 3 = almost always, 4 = always)⁽¹⁵⁾.

The voice handicap self-assessment was performed using the VHI. This instrument contains ten questions and the answers are obtained through a scale of responses from 0 to 4, with 0 corresponding to the option “never”; 1, representing “almost never”; 2, “sometimes”; 3, “almost always” and 4, corresponding to “always”⁽¹⁶⁾. The total score is calculated by a simple sum and varies from 0 to 40 points, considering that the higher the result, the greater the voice handicap perceived by the individual. The cutoff point adopted for the presence of voice handicaps is 7.5⁽¹⁸⁾.

Considering the cutoff points for total VFI and VHI-10 scores, respectively 11.50 and 7.5, two categories identified as “absent” and “present” were created for self-perception of the vocal fatigue index and voice handicap. This grouping served to compare these indices with sociodemographic factors.

Data analysis was performed using descriptive and inferential statistics, and calculations were performed using SPSS 25 statistical software (IBM Corporation, Armonk, NY). Nominal qualitative variables were described using relative and absolute frequencies. For quantitative variables, measures of central tendency (mean and median), variability (standard deviation) and position (minimum, maximum, first quartile and third quartile) were used.

To verify the normality of the distribution of quantitative variables, the Kolmogorov Smirnov test was performed, which showed no normality. For the association between the nominal qualitative variables, the Chi-square or Fisher’s Exact tests were used according to the characteristics required by the test. The Mann-Whitney test was used to compare the independent groups, in terms of the number of vocal signs and symptoms, with the mean VFI and VHI-10 scores. The significance level adopted was 5%.

RESULTS

The sample consisted of 91 teachers in remote teaching 76 (83.5%) female and 15 (16.5%) male, with a mean age of 44.0 (\pm 9.48) years, with a minimum age of 27 years and a maximum of 72 years. None of the participants performed any other activity as voice professionals at the time of collection.

As for the time of teaching activity, the majority (53; 58.3%) had been teaching for more than 10 years. Only 3 (3.3%) participants taught classes in more than two HEIs, the majority (66; 72.5%) exercising this activity in only one HEI. The workload of small classes was concentrated, for the most part, in up to 20 hours/classes (75; 82.4%), with only 1 (1.1%) teacher, at the time of collection, with more than 40 hours / classes. During the research period, 74 (81.3%) professors had been teaching small classes for more than a year.

Among the most mentioned home environments for teaching remote classes, the following were noted: living/dining room (47; 51.6%), office (30, 33.0%), bedroom (9; 9.9%) and 5 (5.5%) mentioned another environment in their residence. The presence of noise in the background teach classes was only present for 30 (33.0%) of the teachers.

As for water intake during classes, among those who reported drinking water during classes, 36 (54.5%) said drinking 2 to 4 glasses of water and 22 (33.3%), less than 2 glasses, with a total of 66 (72.5%) of the participants informed this type of hydration during the classes. Only 3 (4.5%) of the 66 who hydrated during classes reported drinking more than 8 glasses of water. As for the presence of signs and symptoms, the most associated with work activity were: hoarseness, vocal fatigue or change in voice after use for a short time, sore throat, dry throat, throat clearing and effort to speak (Table 1).

Regarding the distribution of the means of the VFI, VHI-10 and VSSQ protocols, the total score of the VFI was obtained above the cut-off point (greater than 11.50), demonstrating that teachers self-evaluated themselves at risk for vocal fatigue, with a mean score of 21.9 (\pm 10.6) points. Still regarding the VFI, the domain analysis (factors 1, 2, 3 and 4) showed that the participants presented fatigue and vocal limitation, vocal restriction, physical discomfort associated with the voice and did not perceive improvement in vocal quality after rest (Table 2).

As for the VHI-10, there was no self-perception of voice handicap among teachers (Table 2), with a proportion of 75.8% below the cut-off point (less than 7.5) (Table 3).

The average number of vocal signs and symptoms, identified through the VSSQ, resulted in 3.8, with the maximum number of symptoms presented equally to 13, which may suggest a possibility of compromising vocal health.

The comparison of sociodemographic variables with the groups “absence” and “presence” of self-perception for vocal fatigue and voice handicap showed a difference only between the variable workload (CH) of remote classes (in hours) and voice handicap ($p=0,00$) (Table 3). It can be inferred, in this case, that professors with a workload of less than 20h/week, at the time of collection, showed a lack of self-perception of voice handicap.

Teachers with more than three vocal symptoms (VSSQ greater than 3 symptoms) presented a median difference ($p=0,00$), with high values for the total VFI. There was also a difference for the factor 1 ($p=0,00$) and factor 3 ($p<0,00$) domains. As for factor 4, vocal recovery after rest, it was possible to notice that

Table 1. Occurrence of signs and symptoms reported through the Vocal Signs and Symptoms Questionnaire

Vocal signs/symptoms	No		Yes		Yes/related to work activity	
	n	%	n	%	n	%
1. Hoarseness?	65	71.4	26	28.6	21	80.8
2. Does your voice get tired or change after using it for a short time?	56	61.5	35	38.5	20	57.1
3. Trouble singing or speaking softly?	68	74.7	23	25.3	07	30.4
4. Difficulty projecting your voice?	69	75.8	22	24.2	04	18.2
5. Difficulty singing high pitched?	66	72.5	25	27.5	08	32.0
6. Discomfort when speaking?	60	65.9	31	34.1	08	25.8
7. Monotone voice (monopitch)?	69	75.8	22	24.2	02	9.1
8. Effort to speak?	79	86.8	12	13.2	10	83.3
9. Dry throat?	75	82.4	16	17.6	12	75.0
10. Sore throat?	41	45.1	50	55.0	14	28.0
11. Clearance?	70	76.9	21	23.1	11	52.4
12. Sour or bitter taste in the mouth?	59	64.8	32	35.2	01	3.1
13. Difficulty swallowing?	69	75.8	22	24.2	02	9.1
14. Voice instability or tremor?	80	87.9	11	12.1	06	54.6

Subtitle: n = absolute frequency; % = relative frequency

Source: Research data

Table 2. Description of the average score obtained for the Vocal Fatigue Index, Vocal Handicap Index and vocal signs and symptoms

	Mean	SD	Min	Max	Q1	Median	Q3
VFI - Factor 1 - Fatigue and Vocal Limitation	9.2	7.1	0	27	4	7	14
VFI - Factor 2 - Vocal Restriction	4.0	3.1	0	12	2	3	7
VFI - Factor 3 - Physical discomfort associated with voice	3.5	3.7	0	16	0	2	6
VFI - Factor 4 - Recovery with vocal rest	6.8	4.1	0	12	3	8	11
VFI Total	21.9	10.6	1	50	13	20	30
VHI-10	4.8	6.5	0	31	0	2	7
VSSQ	3.8	3.5	0	13	1	3	6

Subtitle: VFI = Vocal Fatigue Index; VHI-10 = Vocal Handicap Index 10; VSSQ = Vocal Signs and Symptoms Questionnaire; SD = standard deviation; Min = minimum value; Max = maximum value; Q1 = 1st Quartile; Q3 = 3rd Quartile

Source: Research data

those with more than 3 vocal symptoms showed good recovery after vocal rest, however, without statistical value that proves the difference of the group with less than 3 vocal symptoms. For the VHI-10, those with more than 3 vocal symptoms had a median difference ($p=0,00$), compared to those with less than 3 symptoms (Table 4).

DISCUSSION

Faced with the pandemic context of COVID-19, the need for social distancing between people arose to control contamination by the SARS-CoV2 virus, which led higher education institutions to adapt from face-to-face teaching to remote teaching⁽¹⁾. As a result, teachers had to adjust to the new reality and reinvent themselves in this scenario, which resulted in exhaustion and vocal illness among these professionals.

A recently developed study, to verify the exhaustion of teachers due to remote teaching, showed an increase in the workload, which came with the need for these professionals to develop prior planning of the online activity, as well as

availability to answer students' questions in full-time and submission of activities and new assignments⁽¹⁹⁾. Associated with these requirements, teaching hours of classes in a place with environmental conditions and instruments, sometimes not suitable from an ergonomic and technological point of view, led to increased stress and possible vocal wear.

Exhausting hours of classes and the difficulty in performing satisfactory vocal rest are realities found among teachers, which make them susceptible to having more vocal problems than those who are not teachers, and vocal fatigue may be one of the initial signs and symptoms^(17,20,21). However, there is still a low demand for early treatment among teachers who present complaints and signs of vocal alterations. This search is usually when the problem is already installed and compromising the vocal performance of this professional in the classroom⁽²⁰⁾.

In a previous study with university professors in the face-to-face teaching model, the most prevalent symptoms were tiredness when speaking, burning in the throat and hoarseness⁽²²⁾. The present research showed that the teachers in the sample presented the symptoms of hoarseness, vocal fatigue or change in voice after using it for a short time, sore throat, dry throat, throat clearing and effort to speak, as the most prevalent symptoms.

Tabela 3. Comparação entre fatores sociodemográficos, ambiente de trabalho, cansaço, uso de fones de ouvido e microfone, preparação vocal e hidratação com a ausência ou presença de auto percepção de fadiga vocal e desvantagem vocal

		Self-perception of vocal fatigue				Self-perception of voice handicap			
		Absent	Present	Total	Value of p	Absent	Present	Total	Value of p
		n (%)	n (%)	n (%)		n (%)	n (%)	n (%)	
Presence of noise in the environment	NO	9 (14.8%)	52 (85.2%)	61 (100.0%)	0.74	45 (73.8%)	16 (26.2%)	61 (100.0%)	0.51
	YES	3 (10.0%)	27 (90.0%)	30 (100.0%)		24 (80.0%)	6 (20.0%)	30 (100.0%)	
	Total	12 (13.2%)	79 (86.8%)	91 (100.0%)		69 (75.8%)	22 (24.2%)	91 (100.0%)	
tired when talking	NO	1 (7.7%)	12 (92.3%)	13 (100.0%)	1.00	12 (92.3%)	1 (7.7%)	13 (100.0%)	0.17
	YES	11 (14.1%)	67 (85.9%)	78 (100.0%)		57 (73.1%)	21 (26.9%)	78 (100.0%)	
	Total	12 (13.2%)	79 (86.8%)	91 (100.0%)		69 (75.8%)	22 (24.2%)	91 (100.0%)	
Microphone usage	NO	10 (14.3%)	60 (85.7%)	70 (100.0%)	0.72	53 (75.7%)	17 (24.3%)	70 (100.0%)	0.96
	YES	2 (9.5%)	19 (90.5%)	21 (100.0%)		16 (76.2%)	5 (23.8%)	21 (100.0%)	
	Total	12 (13.2%)	79 (86.8%)	91 (100.0%)		69 (75.8%)	22 (24.2%)	91 (100.0%)	
Use of headphones	NO	5 (11.9%)	37 (88.1%)	42 (100.0%)	0.73	34 (81.0%)	8 (19.0%)	42 (100.0%)	0.29
	YES	7 (14.3%)	42 (85.7%)	49 (100.0%)		35 (71.4%)	14 (28.6%)	49 (100.0%)	
	Total	12 (13.2%)	79 (86.8%)	91 (100.0%)		69 (75.8%)	22 (24.2%)	91 (100.0%)	
hydration	NO	5 (20.0%)	20 (80.0%)	25 (100.0%)	0.29	21 (84.0%)	4 (16.0%)	25 (100.0%)	0.26
	YES	7 (10.6%)	59 (89.4%)	66 (100.0%)		48 (72.7%)	18 (27.3%)	66 (100.0%)	
	Total	12 (13.2%)	79 (86.8%)	91 (100.0%)		69 (75.8%)	22 (24.2%)	91 (100.0%)	
Time of profession in years	- To 10	4 (10.5%)	34 (89.5%)	38 (100.0%)	0.52	26 (68.4%)	12 (31.6%)	38 (100.0%)	0.16
	- More than 10	8 (15.1%)	45 (84.9%)	53 (100.0%)		43 (81.1%)	10 (18.9%)	53 (100.0%)	
	Total	12 (13.2%)	79 (86.8%)	91 (100.0%)		69 (75.8%)	22 (24.2%)	91 (100.0%)	
Time in remote activity (months)	- To 12	2 (11.8%)	15 (88.2%)	17 (100.0%)	1.00	15 (88.2%)	2 (11.8%)	17 (100.0%)	0.22
	- More than 12	10 (13.5%)	64 (86.5%)	74 (100.0%)		54 (73.0%)	20 (27.0%)	74 (100.0%)	
	Total	12 (13.2%)	79 (86.8%)	91 (100.0%)		69 (75.8%)	22 (24.2%)	91 (100.0%)	
CH of remote classes (hours)	- to 20h	12 (16.0%)	63 (84.0%)	75 (100.0%)	0.11	62 (82.7%)	13 (17.3%)	75 (100.0%)	0.00*
	- More than 20h	0 (0.0%)	16 (100.0%)	16 (100.0%)		7 (43.8%)	9 (56.3%)	16 (100.0%)	
	Total	12 (13.2%)	79 (86.8%)	91 (100.0%)		69 (75.8%)	22 (24.2%)	91 (100.0%)	

Chi-square test or Fisher's exact test; *Statistically significant values (p<0.05)

Subtitle: n = absolute frequency; % = percentage relative frequency; CH = workload

Source: Research data

Table 4. Comparison of mean scores for the Vocal Fatigue Index and its factors with the number of vocal signs and symptoms

	VSSQ up to 2 symptoms					VSSV p to 2 symptoms					Value of p
	MD	SD	Median	Q1	Q3	MD	ST	Median	Q1	Q3	
IFV-Fator 1	7.17	6.19	6.0	2.0	11.5	11.80	7.37	10.0	4.5	17.5	0.03*
IFV-Fator 2	3.60	2.93	3.0	1.7	4.0	4.56	3.36	5.0	2.0	7.0	0.19
IFV-Fator 3	2.38	3.02	1.00	0.0	4.0	4.56	3.36	4.0	2.0	7.0	<0.00*
IFV-Fator 4	6.13	4.24	5.5	3.0	9.0	4.97	4.09	4.0	2.0	7.0	0.12
IFV Total	19.0	9.38	18.0	12.0	25.0	25.8	11.1	25.0	16.5	32.5	0.00*
IDV-10	2.71	3.61	1.0	0.0	5.0	7.54	8.26	5.0	1.0	9.5	0.00*

Mann Whitney test; *Statistically significant values (p<0.05)

Subtitle: VSSQ = Vocal Signs and Symptoms Questionnaire; MD = mean; SD = standard deviation; < = value less than; > value greater than; VFI = Vocal Fatigue Index; VHI-10 = Vocal Handicap Index 10; Q1 = 1st Quartile; Q3 = 3rd Quartile

Source: Research data

Most had up to three vocal symptoms identified by the VSSQ, with a mean of 3.8 (Table 1).

The literature shows that the average number of vocal symptoms in teachers with vocal complaints who seek care is 8.6, while those with complaints and who do not seek care have 6.6 vocal signs and symptoms; teachers without complaints present, on average, have two vocal signs and symptoms⁽²³⁾.

Still regarding the presence of vocal symptoms, a previous study, comparing the average vocal symptoms between teachers

and non-teachers, concluded that teachers have an average of 3.7 vocal symptoms⁽¹⁷⁾. Thus, the standard found in the present study confirms the standard of the previous research for teachers in general. The average is still close to those who complain and do not seek care. For the sample studied, the symptom “sore throat” was the most frequent, showing the presence of physical discomfort during classes (Table 1).

It was noticed that most of the symptoms referred to were more proprioceptive/sensory. Fatigue when speaking was reported

by most participants in the present study and was more present among those at higher risk for vocal fatigue, although there was no association between these variables ($p=1.00$). Similarly, even with no statistical significance, those in remote activity for more than one year had a vocal fatigue index greater than 11.50 (cut-off point) for the total VFI (Table 2). The same was observed for teaching time over ten years. With values higher than the cut-off point for vocal fatigue and voice handicap indices (Table 3), information that demonstrates clinical significance, as the time of teaching activity is considered a risk factor for dysphonia among teachers. The weekly teaching workload (CH) is also a risk factor for vocal problems, since high CH predisposes the teacher to vocal fatigue. Most participants had a weekly workload of up to 20 hours (75; 62.4%), a value that showed an association with the VFI-10 ($p=0.00$) (Table 3). This finding indicates that the CH of hours/remote classes and self-perception of voice handicap is different between those who scored below the cut-off point for the VFI and to those who scored above.

Self-perception questionnaires are increasingly used in research with teachers, as they seek to verify their self-perception with vocal impairments. The VFI, the protocol used in the present study to ascertain perception of the risk of vocal fatigue in the sample, showed, through the total score, that the professors were at risk for vocal fatigue, with scores well above the average of the cut-off point established to separate dysphonic from non-dysphonic individuals.

Vocal fatigue is understood as “a frequent, often debilitating condition that affects many individuals with voice problems”⁽²⁴⁾. It is defined as “a negative vocal adaptation, self-reported by the subject” and has a relationship with prolonged voice use⁽²⁵⁾. Physical as well as organizational and psychological factors are known a risk for vocal fatigue.

As already mentioned, the remote teaching modality brings numerous factors that can contribute to vocal fatigue. Communication in front of the cameras requires specific adjustments and performances from the speaker to present efficient communication. In this modality, the teacher spends many hours in a single position, sometimes with inadequate ergonomics, under tension, due to having to master technology, digital platforms, the use of the microphone, auditory monitoring and screen exposure. These factors can contribute to vocal fatigue and a high number of vocal signs and symptoms that can place these professionals in the risk group for dysphonia.

Inadequate use of headphones can compromise auditory monitoring (feedback), leading teachers to raise their voice intensity and, depending on their vocal demand, manifest signs of fatigue. Thus, the teacher in remote teaching is exposed to visual overload (exposure to the screen), vocal, auditory and mental (concentration and mastery of various resources)⁽²⁶⁾.

The indoor environments chosen to teach the classes were diverse. However, most reported that they carried out their activities by teaching classes in the living/dining room and office, at their residence. As indicated in the literature, postural imbalances caused by the environment chosen to teach classes can lead to postural changes, in addition to direct consequences on vocal parameters⁽²⁷⁾.

Research that analyzed the self-perception of symptoms of vocal fatigue and musculoskeletal pain in home office workers before and during the COVID-19 pandemic, found that inadequate ergonomics and lack of voice preparation are factors that lead to vocal fatigue symptoms⁽⁵⁾. Another study

pointed out that working from home leads to an increase in dysphonia and discomfort in the vocal tract, symptoms that are associated with the modality of communication and change in the work environment⁽⁹⁾.

Thus, from the description of the work environment used for remote teaching, by the professors in the present study, it was observed that these adaptations may be present as risk factors for vocal fatigue.

Some habits, such as drinking water during classes, can minimize some vocal symptoms and reduce vocal fatigue. Hydration reduces the level of vocal fatigue, phonatory disorders and negative aerodynamic impacts, with about eight glasses of water per day being recommended⁽²⁸⁾. In the present study, among those who reported drinking water during remote classes, 54.5% mentioned drinking two to four glasses of water during classes (Table 3). Thus, it can be inferred that the teachers were drinking an amount of water compatible with the number of hours/daily classes, since most of them had a weekly class load of up to 20 hours.

Still regarding vocal fatigue, it is recommended that, after excessive use of the voice, there is a vocal rest for its recovery. However, voice recovery after vocal rest, measured by the VFI - factor 4, showed that the teachers in the sample showed a deficit in the ability to improve their vocal quality after rest (mean 6.8), an important fact to be considered, a vocal recovery is expected after a period of vocal rest. The presence of fatigue and lack of vocal restoration after rest is indicated by the literature as a risk for the appearance of vocal disorders, especially hoarseness and loss of voice⁽²⁸⁾.

Through the present study, it was possible to verify that those with more symptoms also presented differences between the medians for the self-perception of vocal fatigue and the factors related to fatigue and vocal limitation, as well as physical discomfort associated with the voice, with significantly higher values for the group with more than three vocal symptoms. This shows that the high number of symptoms can be considered a sign for a possible risk of installing voice disorders in the sample studied, or even being responsible for the persistence of a certain problem. As for the self-perception of voice handicap and number of vocal symptoms, there was a difference between the groups with more than three symptoms when compared to those who reported less than three symptoms ($p=0.00$) (Table 4). The mean and median values were higher for those with more than three vocal symptoms, which may suggest that the high number of vocal symptoms may be a risk for the emergence of vocal alterations in the sample studied.

The findings described here allowed us to understand the vocal production conditions caused by remote classes and their implications for the teacher's vocal health. With this, it will be possible to contribute to the literature in the field of Speech-Language Pathology and Audiology, especially in the area of voice, for a look aimed at teachers who need to maintain remote teaching activities, or online activities, such as those in distance education.

The study presented some limitations, among them, the low adherence of the professors to answer the survey, thus reducing the sample; the impossibility of carrying out a vocal assessment with the teachers, since the research was carried out online, as well as the scarcity of studies with teachers in remote teaching to broaden the discussion, comparing with the results of similar studies.

CONCLUSION

University professors in remote teaching self-assessed being at risk for vocal fatigue. Among the factors associated with IFV, professors who presented more than two vocal signs and symptoms had a greater sensation of vocal fatigue, as well as worse self-perception of vocal limitation and physical discomfort. No self-perception of voice handicap was observed, however, those who had more than two vocal signs and symptoms had worse self-perception of voice handicap. It was observed that the number of symptoms can impact the voice handicap, in addition to leading to a greater feeling of vocal fatigue, these symptoms being indicators of a possible predisposition to a voice disorder.

ACKNOWLEDGMENTS

To all the teachers who participated in this study.

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