EVALUATION OF RISK FACTORS FOR VOICE DISORDERS IN TEACHERS AND VOCAL ACOUSTIC ANALYSIS AS AN INSTRUMENT OF EPIDEMIOLOGICAL ASSESSMENT

Avaliação dos fatores de risco para distúrbios de voz em professores e análise acústica vocal como instrumento de avaliação epidemiológica

Raquel Aparecida Pizolato[1], Fábio Luiz Mialhe[2], Karine Laura Cortellazzi[3], Glaúcia Maria Bovi Ambrosano[4], Maria Inês Beltrati CornacchioniRehder[5], Antonio Carlos Pereira [6]

ABSTRACT

Purpose: conduct a prospective study to analyze risk factors for dysphonia in teachers, associated with presence of vocal alterations. **Method:** one-hundred-and-two teachers (81 women and 21 men) were randomly selected from 11 schools in Piracicaba/SP, with mean age 42.48 years. A questionnaire covering aspects of the work environment and organization, vocal behavior, lifestyle and signs and symptoms of vocal alterations was applied. Acoustic analysis was performed and the dependent variables assessed were Fundamental Frequency and mean Vocal Intensity. There were associations between questionnaire variables and Fundamental Frequency, and mean Intensity. The following statistical tests were used: Chi-square, Fisher´s Exact Test and Odds Ratio calculation. **Results:** individuals of the male gender had less chance of presenting altered fundamental frequency of the voice than the female gender ($p<0.0001$). Teachers who had been teaching elementary II and middle school had less chance of presenting alteration in fundamental frequency of the voice than those who taught in (first grade) primary schools I ($p=0.04$). The environmental noise was significantly associated with alteration in mean voice intensity ($p=0.02$). **Conclusion:** factors such as female gender, teaching in primary school and exposure to work environment noise are considered risk indicators for voice disorders.

KEYWORDS: Occupational Health; Voice Disorders; Faculty; Risk Factors

INTRODUCTION

Dysphonia, a change in the functioning of the voice, can be a functional and / or organic vocal tract disorder. It can be manifested by mild or

(1) Speech Therapist; PhD in Public Health, Faculty of Dentistry of Piracicaba of the State University of Campinas, SP, Brazil.

(2) Dentist; Free-educational Teacher of the area of Education for the Health of Faculty of Dentistry of Piracicaba of the State University of Campinas, SP; PhD in Public Health for Faculty of Dentistry of Piracicaba of the State University of Campinas, SP, Brazil.

(3) Dentist; Researcher of Faculty of Dentistry of Piracicaba of the State University of Campinas, SP; Post Doctoral student in Public Health of Faculty of Dentistry of Piracicaba of the State University of Campinas, SP; PhD in Public Health for University of Dentistry of the State University of Campinas, SP, Brazil.

(4) Agricultural engineer; Teacher of the area of Biostatistics of Faculty of Dentistry of Piracicaba of the State University of Campinas, SP; PhD in Sciences for the University of São Paulo, SP, Brazil.

(5) Speech Therapist; Teacher of CEFAC – Graduate Center for Health and Education; PhD in Disturbances of the Human Communication for the Federal University of São Paulo, SP, Brazil.

(6) Dentist; Professor of the area of Public Health of Faculty of Piracicaba of the State University of Campinas, SP; PhD in Public Health for University of Public Health of the University of São Paulo, SP, Brazil.

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severe symptoms, often originated or aggravated by environmental risk and behavioral factors [1].

Teachers have high prevalence of vocal problems when compared with other professionals who use their voice as an instrument of labor [2]. The most frequent symptom in these professionals is vocal hoarseness, however, others may be present, such as vocal fatigue, hoarseness and sore throat [3-5].

Socio-environmental factors related to the routine work of teachers can be considered a risk for the manifestation of dysphonia. High strain vocal use, a noisy workplace, excessive workload, lack of hydration of the vocal tract, and behaviors such as shouting and speaking with forceful intensity, are characteristics known to be harmful to the quality of the voice [1,6]. Therefore, analyzing voice quality and seeking association with risk factors for dysphonia in teachers, can assist in the planning of preventive actions.

One of the methods for analyzing voice quality is acoustic analysis, an objective approach, with the use of a computer program that quantitatively demonstrates various measurable aspects of the voice signals captured. Several acoustic parameters are studied in this analysis, the most common for voice evaluation being: fundamental frequency, jitter, shimmer and harmonic-noise[7]. The Acoustic analysis achieved greater use in the last decade, particularly in Brazil, as studies in this area have become more comprehensive. This allows an objective assessment of voice in situations initial and follow-up speech therapy, and can be used to help with epidemiological diagnostic assessments [8].

The aim of this study was to analyze risk factors for dysphonia in teachers, and associate them with the presence of voice changes, by means of acoustic voice analysis.

METHOD

This study had a cross-sectional epidemiological design and was approved by the Ethics Committee of the Faculty of Dentistry of Piracicaba (Protocol 041/2009).

The sample consisted of 102 teachers (81 women and 21 men with a mean age of 42.48 years) randomly selected out of a total of 284 teachers from 11 elementary and middle public schools in Piracicaba, São Paulo, in 2010. The exclusion criteria for the selected sample were: subjects who were smokers, individuals with a history of reported medical diagnosis of organic disease of the larynx, reported complaints of hoarseness lasting longer than 15 days, be in therapy and subjects over the age of 55. The inclusion criteria considered all participants who agreed to participate and signed the Free and Informed Term of Consent.

Teachers were asked to answer questions selected from a questionário9, with reference to sociodemographic information (gender, age), work organization (job type, time teaching, weekly schedule, number of schools at which the teacher taught, number of students per class) physical aspects of the work environment (noise inside or outside the classroom), behavioral habits and reported signs and symptoms of vocal problems. Most of the answers to the questions were closed and varied within a Likert scale, which corresponded to the categories: never, rarely, sometimes, always, and do not know. For some questions, such as workload, time of teaching career, number of schools at which the teacher taught, number of students in the classroom and hours of sleep, the responses were half-open.

After this, the subject's voice was clinically evaluated, by collecting the sustained vowel [i] isolated in the usual frequency and intensity of speech and with minimum duration of six seconds. A digital recorder (Brand ZOOM H2) was used to collect the recordings and these were recorded in monostereo mode, wav format, with sampling frequency of 44.1 KHz and 16bit. A headset microphone unidirectional model Plantronics Audio was situated three inches from the speaker's mouth, with directional pickup angle of 45 º.

The recordings were collected individually, in the classroom at the school, during non-working hours. The record beep noise was controlled at asound pressure level below 50 dB. To monitor noise, a digital decibel meter Impac ® IP-900DL data logger type II was used, calibrated (calibrator ND9 Impac ®) and programmed for automatic level, considering a range of capture intensity of 30 – 130dB (slow) in Real time mode, whose recordings were made on a PC computer with an Intel ® CoreTM 2 duo processor.

For the voice sample, acoustic analysis was performed with the aid of the VOX Metria CTS Computer. The file vowel [i] was imported using the rate of 11025 Hz, following the specifications of the program. The following acoustic parameters were analyzed: Fundamental Frequency, Jitter, Shimmer, Noise and Harmonic-to-Noise Ratio and Mean Vocal Intensity. Presence or absence of voice alteration was considered according to the parameters of normal limits determined by the program Vox Metria (Jitter 0.6% shimmer 6.5% to 2.5% Harmonic to Noise Ratio) and compared with the parameters shown in the literature (Fundamental Frequency and Vocal Intensity). The normal parameters considered for the Fundamental Frequency of the voice in males

was 96.44 to 143.88 Hz and 10; for females it was between 215-244 Hz [11]. Values were established for Vocal Intensity under the usual condition of 63.46 dB to a maximum of 72.5 dB [12]. Among the acoustic parameters analyzed, Fundamental Frequency and Vocal Intensity (dependent variables or outcome) were considered changed, the others were within normal limits for the analyzed sample and were not included in the analysis of association with the independent variables.

The questions in the questionnaire, considered the independent variables, were dichotomized as follows: sex (male and female), educational level the teacher was teaching (elementary school and middle school and II), Age (dichotomized by median: older and younger than 43 years), number of schools at which the teacher taught (one or more schools), number of students per class the teacher taught (up to 30 students and more than 30 students), workload (up to 30 hours, more than 30 hours), time of teaching career (dichotomized by median: 15 years and more than 15 years), noisy room (yes or no), stress (yes or no), screaming (yes or no), talking in competition with sound (yes or no), hours of sleep (yes or no) up to 6 hours and the variable environmental noise. To dichotomize the responses, the categories of answers seldom, never and do not know were grouped and classified as "no"; responses always and sometimes were grouped and classified as "yes."

The reported signs and symptoms of voice changes by the participants were also collected in the questionnaire, such as hoarseness, vocal fatigue, vocal fatigue, loss of voice, voice failed, thin voice, deep voice, weak voice, feeling as if there was sand in the throat, lump in the throat, pain on swallowing, sore throat and hoarseness. For analysis of the results, two dependent variables were considered: fundamental frequency of the voice and mean vocal intensity, among the acoustic parameters analyzed and were shown to be representatively changed.

The Chi-square or Fisher's exact test at a significance level of 5% was used to test the association of independent variables (questionnaire) with the dependent variables (Fundamental Frequency and Vocal Intensity) and the gross odds ratio (OR) and the respective confidence intervals of 95% (CI) were estimated. Statistical tests were performed using the SAS (Statistical Analysis System Institute Inc., Cary, NC, USA, version 9.2, 2008) software program.

RESULTS

Of the 102 teachers, 67 (66.66%) reported making continuous use of their voice and shouting during routine work. The most mentioned vocal alterations were feeling breathlessness during speech, tiring when speaking, and hoarseness; among others reported were throat clearing, irritated throat and dry throat. The prevalence of hoarseness in the last six months affected 52.96% of the teachers

Table 2 showed significant association of fundamental frequency of the voice with gender, and level of education the teacher teaches. The male subjects were less likely to have vocal alteration in the fundamental frequency of the voice when compared with females (OR = .02). Whereas, teachers who taught in Elementary Education II and Middle school were less likely to have voice alteration considering the analysis of the fundamental frequency when compared with the teachers who taught the elementary school (1st to 4th grade) (OR = 0.38). No association was found for other independent variables. The mean fundamental frequency for women was 202.90 ± 26.40 Hz, relatively below the standard values of normality considered; and for men it was 128.63 ± 32.26 Hz within the normal range considered.

According to Table 3, it can be observed that only the variable "environmental noise" was significantly associated with the mean intensity of the voice, i.e., individuals who taught without environmental noise had less chance of having changed voice intensity than those who taught with environmental noise (OR = 0.02). There was no association with other independent variables. The Mean Vocal Intensity value was 76.29 ± 4.63 dB above the value of the maximum considered.

I- IDENTIFICATION

1	Code of interviewed: .....
2	School: .....
3	Date: ...../...../.....

II- IDENTIFICATION OF THE INTERVIEW

1	NAME: .....
2	Date of birth: ...../ ...../.....
3	Sex: Female ( ) Male ( )

III- FUNCTIONAL STATUS AND WORK ENVIRONMENT

1	How long you exercise the activity of teacher ?.....
2	Besides school, do you work at another location ? 0. ( ) No 1. ( ) Yes; Where do you work and what you do ?.....
3	How long are you in this school ?.....
4	What is the age range of students which you teaches ?.....
5	How many students are in the classroom what you teach ?.....
6	How many hours a week do you teach? 1. ( ) less than 10 hours 4. ( ) 30 to 40 hours 2. ( ) 10 to 20 hour 5. ( ) more than 40 hours 3. ( ) 20 t0 30 hours
7	Is the workload is stressful ? 0. ( ) never 1. ( ) seldom 2. ( ) sometimes 3. ( ) always 4. ( ) I don´t know
8	Do you often take work home ? 0. ( ) never 1. ( ) seldom 2. ( ) sometimes 3. ( ) always 4. ( ) I don´t know
9	What do you think of the physical environment of the school ? 1. Is the classroom noisy ? 0. ( ) never 1. ( ) seldom 2. ( ) sometimes 3. ( ) always 4. ( ) I don´t know
10	If the classroom is noisy, where the noise come from? 1. ( ) schoolyard 4. ( ) Works at school 7. ( ) stereo system/TV 2. ( ) from the classroom itself 5. ( ) from the street 8. ( ) others 3. ( ) from otherclassroom 6. ( ) from the voice of people

III- VOCAL ASPECTS

1	You have changes in your voice? 0. ( ) no 1. ( ) yes
2	Do you use any resources to improve your voice when it is changed ? If yes, what resources ?.....
3	If you have voice alteration, have you already been treated with some specialized treatment? 0. ( ) No 1. ( ) Yes
4	What treatments have you ever done to change the voice? 1. ( ) speech therapy 2. ( ) medicament: ..... 3. ( ) surgery 4. ( ) others: .....
5	If you have altered voice, how long do you have this? 1. ( ) 0 to 6 months 2. ( ) 7 months to 1 year 3. ( ) 1-2 years 4. ( ) 2-4 years 5. ( ) more than 4 years
6	If you have problems in your voice, what was the cause in your opinion? 1. ( ) intensive use of the voice 6. ( ) exposure to cold 2. ( ) respiratory infection 7. ( ) exposure to noise 3. ( ) allergy 8. ( ) there was no apparent cause 4. ( ) stress 9. ( ) I don´tknow 5. ( ) constantflu10.( ) others: .....
7	Which of these sensations off flu and colds you have presented? 1. hoarseness 0. ( ) never 1. ( ) seldom 2. ( ) sometimes 3. ( ) always 4. ( ) I don´t know 2. Aphonia 0. ( ) never 1. ( ) seldom 2. ( ) sometimes 3. ( ) always 4. ( ) I don´t know 3. failure in the voice 0. ( ) never 1. ( ) seldom 2. ( ) sometimes 3. ( ) always 4. ( ) I don´t know 4. breath lessness to speak 0. ( ) never 1. ( ) seldom 2. ( ) sometimes 3. ( ) always 4. ( ) I don´t know 5. thin voice 0. ( ) never 1. ( ) seldom 2. ( ) sometimes 3. ( ) always 4. ( ) I don´t know 6. rough voice 0. ( ) never 1. ( ) seldom 2. ( ) sometimes 3. ( ) always 4. ( ) I don´t know 7. ranging thick / thin voice 0. ( ) never 1. ( ) seldom 2. ( ) sometimes 3. ( ) always 4. ( ) I don´t know 8. weak voice 0. ( ) never 1. ( ) seldom 2. ( ) sometimes 3. ( ) always 4. ( ) I don´t know 9. others.____0. ( ) never 1. ( ) seldom 2. ( ) sometimes 3. ( ) always 4. ( ) I don´t know

8	What sensations related to the throat and voice have you presented this week? 1. Hooked in the throat: 0. ( ) never 1. ( ) seldom 2. ( ) sometimes 3. ( ) always 4. ( ) I don´t know 2. sand in the throat: 0. ( ) never 1. ( ) seldom 2. ( ) sometimes 3. ( ) always 4. ( ) I don´t know 3. Lump in the throat: 0. ( ) never 1. ( ) seldom 2. ( ) sometimes 3. ( ) always 4. ( ) I don´t know 4. Hawking: 0. ( ) never 1. ( ) seldom 2. ( ) sometimes 3. ( ) always 4. ( ) I don´t know 5. Pain when talking:0. ( ) never 1. ( ) seldom 2. ( ) sometimes 3. ( ) always 4. ( ) I don´t know 6. Pain when swallowing: 0. ( ) never 1. ( ) seldom 2. ( ) sometimes 3. ( ) always 4. ( ) I don´t know 7. Difficulty swallowing:0. ( ) never 1. ( ) seldom 2. ( ) sometimes 3. ( ) always 4. ( ) I don´t know 8. Sore throat: 0. ( ) never 1. ( ) seldom 2. ( ) sometimes 3. ( ) always 4. ( ) I don´t know 9. Secretion / phlegm in the throat:0. ( ) never 1. ( ) seldom 2. ( ) sometimes 3. ( ) always 4. ( ) I don´t know 10. Dry throat: 0. ( ) never 1. ( ) seldom 2. ( ) sometimes 3. ( ) always 4. ( ) I don´t know 11. Vocal fatigue: 0. ( ) never 1. ( ) seldom 2. ( ) sometimes 3. ( ) always 4. ( ) I don´t know 12. Effort to speak: 0. ( ) never 1. ( ) seldom 2. ( ) sometimes 3. ( ) always 4. ( ) I don´t know 13. Others..... 0. ( ) never 1. ( ) seldom 2. ( ) sometimes 3. ( ) always 4. ( ) I don´tknow

IV- HABITS

1	Do you smoke ? 0. ( ) NO 1. ( ) YES
2	In relation to your vocal habits at work, do you usually: 0. ( ) never 1. ( ) seldom 2. ( ) sometimes 3. ( ) always 4. ( ) I don´t know 1. speaks for a long time: 0. ( ) never 1. ( ) seldom 2. ( ) sometimes 3. ( ) always 4. ( ) I don´t know 2. speaks as you writes on the board: 0. ( ) never 1. ( ) seldom 2. ( ) sometimes 3. ( ) always 4. ( ) I don´t know 3. shouts: 0. ( ) never 1. ( ) seldom 2. ( ) sometimes 3. ( ) always 4. ( ) I don´t know 4. speaks with sound competition 0. ( ) never 1. ( ) seldom 2. ( ) sometimes 3. ( ) always 4. ( ) I don´tknow
3	In relation to your sleep, how many hours on average do you usually sleep at night ?

Figure 1 – Questionnaire for evaluating aspects of health, work environment, and complaints of voice problems

Table 1 – Frequency (%) of responses related to the presence of signs and Symptoms of voice problems in teachers of public schools at Piracicaba, São Paulo, Brazil, 2011

Signs and Symptoms of Vocals Changes	Yes		No		Total	
	n	(%)	n	(%)	(n=102)	(%)
Hoarseness in the last 6 months	53	51.96	49	48.03	102	100
Temporary loss of voice	27	26.47	75	73.52	102	100
Voice failures	36	35.29	66	61.76	102	100
Shortness of breath	83	81.37	19	18.62	102	100
Thin voice	12	11.76	90	88.23	102	100
Rough voice	43	42.15	59	57.84	102	100
Weak voice	41	40.19	61	59.80	102	100
hawk	49	48.03	53	51.96	102	100
Sore throat	43	42.15	59	57.84	102	100
Vocal fatigue	55	53.92	47	46.00	102	100‘
Drythroat	31	30.39	71	69.60	102	100
Features of Use						
Uses voice continuously	68	66.66	34	33.33	102	100
Exceeding shout	68	66.66	34	33.33	102	100

Table 2 – Association between the fundamental frequency of the voice (dependent variable) and independent variables in teachers of public schools in Piracicaba, SP, Brazil, 2010

Independent variables	Fundamental frequency of the voice				Crude Odds Ratio	CI 95%	p
	Normal		Changed				
	n	%	n	%			
Sex*							
Female	12	14.81	69	85.19	ref		
Male	18	85.71	03	14.29	0.029	0.007-0.113	<0.0001*
Level of education that teaches *							
Elementaryschool	7	17.95	32	82.05	ref		
Elementaryandmiddle II	23	36.51	40	63.49	0.380	0.144-0.998	0.045*
Age							
≤43years	13	26	37	74.00	ref		
> 43 years	17	32.69	35	67.31	0.723	0.306-1.704	0.458
Number of schools working							
1	14	24.56	43	75.44	ref		
2or more	16	35.56	29	64.44	0.59	0.250-1.391	0.226
Number of students							
Until 30	11	28.95	27	71.05	ref		
More than 30	19	29.69	45	70.31	0.964	0.399-2.332	0.936
Working hours							
Until30 h	11	26.19	31	73.81	ref		
More than 30 h	19	31.67	41	68.33	0.765	0.318-1.840	0.550
Time teaching							
Until 15 years	15	37.50	25	62.50	ref		
More than 15	15	24.19	47	75.81	1.888	0.791-4.463	0.149
Noisy classroom							
Yes	5	38.46	8	61.54	ref		
No	25	28.09	64	71.91	1.600	0.477-5.361	0.443
Environment noise							
Yes	21	28.38	53	71.62	ref		
No	9	32.14	19	67.86	0.836	0.326-2.142	0.709
Stress							
Yes	22	29.73	52	70.27	ref		
No	8	28.57	20	71.43	1.057	0.405-2.761	0.908
Continuous use of voice							
Yes	9	29.03	22	70.97	ref		
No	21	29.58	50	70.42	0.97	0.385-2.463	0.955
Shout							
Yes	11	30.56	25	69.44	ref		
No	19	28.79	47	71.21	1.08	0.448-2.642	0.851
Talking with sound competition							
Yes	7	25	21	75	ref		
No	23	31.08	51	68.92	0.739	0.275-1.983	0.547
Hours ofsleep							
Until 6 h	14	35	26	65	ref		
More than 6 h	16	25.81	46	74.19	1.548	0.652-3.671	0.319

Chi-square and Fisher's exact test – p<0.05

Table 3 – Association between average intensity of the voice (dependent variable) and independent variables in teachers of public schools in Piracicaba, SP, Brazil, 2010

Independent variables	Fundamental frequency of the voice				Crute Odds Ratio	CI 95%	P
	Normal		Changed				
	n	%	n	%			
Sex							
Female	23	28.40	58	71.60	ref		
Male	4	19.05	17	80.95	1.685	0.512-5.548	0.579
Level of education that teaches							
Elementaryschool	10	25.64	29	74.36	ref		
Elementary school and middle II	17	26.98	46	73.02	0.933	0.376-2.315	0.881
Age							
≤43 years	13	26	37	74.00	ref		
> 43 years	14	26.92	38	73.08	0.953	0.395-2.299	0.915
Number of schools working							
1	17	29.92	40	70.18	ref		
2 ou mais	10	22.22	35	77.78	1.487	0.602-3.670	0.387
Number of students							
Until30	11	28.95	27	71.05	ref		
More than 30	16	25.0	48	75.00	1.222	0.496-3.008	0.662
Working hours							
Until 30 h	12	28.57	30	71.43	ref		
Mais de 30 h	15	25.00	45	75.00	1.20	0.493-2.918	0.687
Time teaching							
Until 15 years	10	25	30	75	ref		
More than 15	17	27.42	45	72.58	0.88	0.356-2.186	0.786
Noisy classroom							
Yes	5	38.46	8	61.54	ref		
No	22	24.72	27	75.28	1.90	0.563-6.426	0.294
Environment noise*							
Yes	15	20.27	59	79.73	ref		
No	12	42.86	16	57.14	0.33	0.866-0.132	0.021 *
Stress							
Yes	18	24.32	56	75.68	ref		
No	9	32.14	19	67.86	0.67	0.261-1.762	0.424
Continuous use ofvoice							
Yes	6	19.35	25	80.65	ref		
No	21	29.58	50	70.42	0.57	0.204-1.595	0.281
Shout							
Yes	8	22.22	28	77.78	ref		
No	19	28.79	47	71.21	0.70	0.273-1.826	0.472
Talking with sound competition							
Yes	6	21.53	22	78.57	ref		
No	21	28.38	53	71.62	0.68	0.244-1.936	0.477
Hours of sleep							
Until 6 h	11	27.50	29	72.50	ref		
More than 6 h	16	25.81	46	74.19	1.09	0.444-2.675	0.849

Chi-square and Fisher's exact tests- p<0.05

DISCUSSION

Nowadays, teachers represent the occupational group with the highest incidence of vocal alterations [1,6,13]. In surveys conducted in Brazil and worldwide, the most cited complaints by teachers were: hoarseness, vocal fatigue, pain or irritation and hoarseness; among Brazilians, the symptom of hoarseness was the most frequent [14-16]. In this study, among the symptoms of vocal problems most often cited, the most prevalent were: dry throat (30.39%), hoarseness (51.96%), vocal fatigue (53.92%) and breathlessness during speech (81.37 %). The symptoms reported by the subjects researched are consistent with those described in the literature, showing that such complaints are found in teachers[17-19].

The intense workload and continuous use of voice by teachers may justify the presence of vocal fatigue[17]. The prevalence of vocal fatigue and hoarseness is associated with the organization of the teacher's work [19,20]. The vocal fatigue associated with professional voice disorders may be manifested by over worked laryngeal muscles, stress and inadequate respiratory support. Lack of hydration and the habit of not drinking fluids during the period in which the teacher teaches can be considered aggravating factors for dryness of the vocal tract [21]. Moreover, an allergic condition in the presence of chalk dust may aggravate the symptoms of hoarseness manifested. Phlegm can also be indicative of gastroesophageal reflux, often manifested by poor eating habits in this group of individuals, who go for hours without food and dedicate themselves to work[18]. This data may also reveal the need for teachers to be educated about the practice of healthy habits in the workplace, reflecting the improvement in quality of life [21,22].

In this study, women were more likely to show changes in voice than men, indicated by the analysis of fundamental frequency, when compared with men, which corroborates the findings of another epidemiologic study [1]. Voice trauma is very common in professional voice users, although individuals exhibit different responses to this aggression. Factors such as differences in glottal configuration and quantities of fibronectin and hyaluronic acid in the vocal chords of men and women may explain why the prevalence of vocal fold nodules and Reinke's edema is higher in females in comparison with males [23]. Hyaluronic acid is a protein that increases the flow of water into the vocal folds, allowing shock absorption and protecting the edges of the vocal folds from vibratory trauma caused during phonation [24]. It is suggested in this study that women in this professional category tend to have voice changes with greater frequency and intensity when compared with people in the general population (and the same gender), and may suffer from constant traumas of the larynx due to the effort and continual use of the voice, as the body is not able to face this type of vocal wear.

Teachers who exclusively teach at the elementary school level (1st to 4th grades) were more likely to develop changes in the fundamental frequency of the voice than those who taught elementary school II and middle school (comprising the 5th grade to 3rd year high school). Data in the literature suggest that teachers of younger children are more likely to develop voice disorders, because they more often use their voices at a strong intensity in order to draw the attention of this younger audience [25].

The work environment work was considered noisy by a large portion of the teachers and was associated with the use of more forceful voice intensity. The loud noise in the workplace requires teachers to raise their voices to communicate, generating important vocal alterations such as dysphonia [26,27]. In this study, teachers who reported working in a noisy environment had a higher risk of presenting changes in vocal intensity, corroborating the findings of another study, [23] which found an association between the use of a forceful voice intensity when there was environmental noise. The authors [28] found that environmental noise in schools, associated with poor acoustics can be considered a risk for vocal problems. Thus, for teachers, speaking at a high intensity becomes a habit incorporated into the routine of everyday life, even when they are not working.

In the present study, no significant association was found between length of teaching career, number of students per class and presence of dysphonia, corroborating the findings of another study [19]. The workload and the time of teaching career were not associated with the presence of voice alteration, confirming the findings of other authors [15], however, they were in disagreement with the findings of other epidemiological studies of voice problems in teachers [1,18,29]. It was noted that the relationship between vocal alterations and daily or weekly workload, length of time working as a teacher is cause for controversy among studies, possibly due to the characteristics of the studies, such as type of professional, subject selection and sample size, which should be a better explored topic for future studies.

CONCLUSION

This research found association between sex, environmental noise and the educational level at which the teacher taught, as indicators of risk for voice disorders. There was a higher prevalence

of voice disorders in women, and increased vocal intensity in the studied sample. The results may help to direct future longitudinal studies evaluating risk factors, and with planning vocal health promotion programs for teachers, in addition to directing intersectoral actions that allow a better quality of life and voice for these professionals.

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RESUMO

Objetivo: avaliar fatores de risco para disfonia em professores e associá-los compresença de alteração vocal. **Método:** 102 professores(81 mulheres e 21 homens) selecionados aleatoriamente de 11 escolas do município de Piracicaba/SP, com média de idade de 42,48 anos. Um questionário sobre aspectos do ambiente e organização do trabalho, comportamento vocal, estilo de vida e sinais e sintomas de alterações vocais foi aplicado.Uma análise acústica da voz foi realizada e as variáveis avaliadas dependentes foram Frequência Fundamental e a Intensidade média vocal. Foram realizadas associações entre as variáveis do questionário com a frequência fundamental e a intensidade média e utilizaram-se os testes estatísticos: Qui-quadrado, Exato de Fisher e cálculo do OddsRatio e este é um estudo clínico prospectivo. **Resultados:** os indivíduos do sexo masculino tiveram menos chance de apresentarem frequência fundamental da voz alterada do que o gênero feminino (p<0,0001). As professoras que lecionavam para o ensino fundamental II e médio tiveram menos chance de apresentar alteração da frequência fundamental da voz do que aquelas que lecionavam para o ensino fundamental (p=0,04). O ruído ambiente teve associação significante com a alteração da intensidade média da voz (p=0,02). **Conclusão:** fatores como o sexo feminino lecionar para o ensino primário e estar exposto ao ruído do ambiente de trabalho foram considerados indicadores de risco para distúrbios da voz em professores.

DESCRITORES: Saúde Ocupacional; Distúrbios de Voz; Docentes; Fatores de Risco

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Mailing address:
Antonio Carlos Pereira
Departamento de Odontologia Social, Faculdade de Odontologia de Piracicaba Universidade Estadual de Campinas
Av Limeira, 901, Bairro Areião
Piracicaba – SP – Brasil
CEP: 13414-018
E-mail: apereira@fop.unicamp.br