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Vocal symptoms and musculoskeletal pain in non professional voice users

Sintomas vocais e dor musculoesquelética em não profissionais da voz

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ABSTRACT

Purpose: To identify the presence of vocal symptoms and musculoskeletal pain in non-professional voice users, to verify whether there is a relationship between such variables, and to compare women and men. **Methods:** Crosssectional, observational study. Fifty-nine non-professional voice users (NPVU) were included. The data were collected on-line. A characterization questionnaire and self-assessment protocols were applied: Voice Symptoms Scale (VoiSS) and Musculoskeletal Pain Investigation Questionnaire (MPI). A descriptive statistical analysis was performed. The inferential statistics compared the variables between women and men and a correlation analysis was carried out between the VoiSS and MPI using the Spearman correlation test. **Results:** For the entire studied group , mean values of the total VoiSS score were observed above the cut-off point, indicating risk for dysphonia. There was musculoskeletal pain in the regions assessed, but at low frequency and mild intensity. Women had a higher frequency of pain in the shoulders, temporal region and larynx, when compared to men. There was a positive correlation between the pain frequency in the regions: neck, temporal region, below the chin and larynx/throat in all or some of MPI scores. **Conclusion:** The NPVU population in this study presented with high scores for signs and symptoms of voice disorders. Musculoskeletal pain was rarely present, with mild intensity, but more frequent in women in regions close to the larynx. There was a relationship between vocal symptoms and musculoskeletal pain, especially in regions proximal to the larynx, so that the greater the frequency of pain, the greater the presence of vocal symptoms.

Keywords: Voice; Musculoskeletal pain; Dysphonia; Voice disorders; Voice quality

RESUMO

Objetivo: Identificar a presença de sintomas vocais e dor musculoesquelética em não profissionais da voz, verificar se há relação entre essas variáveis e comparar o desempenho entre mulheres e homens. **Métodos:** Estudo transversal observacional. Participaram 59 indivíduos não profissionais da voz. Os dados foram coletados no meio on-line e aplicou-se questionário de caracterização e os seguintes protocolos de autoavaliação: Escala de Sintomas Vocais e Questionário de Investigação da Dor Musculoesquelética. Foi realizada análise estatística descritiva. A estatística inferencial comparou as variáveis entre mulheres e homens e realizou-se análise de correlação entre as variáveis de ambos os protocolos de autoavaliação por meio do teste de Spearman. **Resultados:** Para todo o grupo estudado, observaram-se valores médios do escore total da Escala de Sintomas Vocais acima do ponto de corte do questionário, indicando risco para disfonia. Houve presença de dor nas regiões avaliadas, porém, em frequência baixa e intensidade leve. Verificou-se correlação positiva entre a frequência de dor nas regiões de pescoço, temporal, abaixo do queixo e laringe/garganta e a Escala de Sintomas Vocais. Mulheres apresentaram maior frequência de dor nos ombros, na região temporal e na laringe, quando comparadas aos homens. **Conclusão:** A população de não profissionais da voz deste estudo apresentou escores elevados de sintomas de alteração vocal. A dor musculoesquelética foi pouco presente, com intensidade leve, porém, mais frequente em mulheres nas regiões próximas à laringe. Houve relação entre os sintomas vocais e a dor musculoesquelética, especialmente nas regiões proximais à laringe, de maneira que quanto maior a frequência da dor, maior a presença de sintomas vocais.

Palavras-chave: Voz; Dor musculoesquelética; Disfonia; Distúrbios da voz; Qualidade da voz

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INTRODUCTION

The voice plays an important role in interpersonal relationships, whether professional or not. Its quality and characteristics convey information to the interlocutor that goes beyond the verbal content and interferes with message comprehension. Using it inappropriately or in harmful environmental conditions has unfavorable consequences for the person's health[1], affecting their quality of life and causing symptoms and complaints.

Many people may have symptoms of vocal changes[2], which is associated with a greater risk of dysphonia[3]. Such symptoms impact emotions and limit the individual's life in different ways; hence, the worse the self-assessment of vocal quality, the greater the reported experience of limitations and emotional issues[3].

Frequent vocal symptoms are associated with stress[2] – which may be related to complaints of musculoskeletal pain[4-6], and this, in turn, may be associated with vocal use, possibly linked to behavioral dysphonia[7-12]. Neck pain has been reported in such cases, related to inadequate posture, stress, and excessive muscular effort during speech, likewise negatively impacting and limiting various aspects of the individual's life[4,8,11].

Behavioral dysphonia is the most common vocal disorder among adults[13]. The prevalence of vocal changes among nonoccupational voice users is not well defined since the literature presents heterogeneous definitions of who such professionals are[1,10]. Nonetheless, studies comparing teachers and nonteachers indicate a 7.5% prevalence of dysphonia in the latter[14].

The literature vastly describes the occurrence of dysphonia and pain symptoms related to intense and inappropriate vocal use in occupational voice users[15,16]. However, individuals who do not use their voice occupationally are also likely to develop them[13,17,18] – although the literature scarcely addresses symptoms of vocal changes in people whose voices are not the main tool of their trade[14,19].

Thus, the occurrence of such findings among nonoccupational voice users and whether these factors are related in them cannot yet be defined. Such information is important because it can help identify the risk of dysphonia in individuals who do not use their voice professionally. Thus, this study aimed to identify vocal symptoms and musculoskeletal pain in non-professional voice users, verify whether these variables are related, and compare men's and women's performances.

METHODS

This cross-sectional, observational, quantitative study was approved by the Research Ethics Committee of the originating institution under evaluation report number 3.180.318. All participants signed an informed consent form after receiving guidance and clarifications regarding procedures and data confidentiality.

The study was developed online on Survey Monkey®, following the guidelines of the Brazilian General Personal Data Protection Law (Law no. 13,709/2018). Data were collected between May and June 2022. The research inclusion criteria were not using the voice professionally or recreationally and being 18 to 60 years old. This study defined occupational voice users as singers, actors, teachers, pedagogues, music therapists, pastors, priests, lawyers, psychologists, physical therapists, speech-language-hearing pathologists, and intern undergraduate students in any of these areas. It also defined recreational voice use as activities other than their primary source of income, such as amateur singers and actors. The exclusion criteria were individuals diagnosed with hearing loss, smokers, ex-smokers for less than 5 years, and those who reported having undergone voice therapy at some point in their lives.

All participants answered a questionnaire with identification data (age, sex, state, city, occupation, working hours, chronic diseases, hormonal disorders, laryngeal surgeries, diagnosis of hearing loss, and cigarette use and time of use).

The study also collected responses to the Voice Symptom Scale (VoiSS), validated for Brazilian Portuguese[19], and the Musculoskeletal Pain Investigation Questionnaire (MPI), adapted by the authors of a previous study[8].

The VoiSS was used to self-assess symptoms of vocal changes in three domains: impairment (functioning, with 15 items), emotional (with eight items), and physical (regarding organic symptoms, with seven items), totaling 30 items evaluated on a 5-point Likert scale, in which 0 referred to "never" and 4 referred to "always". The VoiSS total score, calculated by simply summing the score of each question, indicates the overall level of vocal symptoms. The maximum score is 120 points – 60 in the impairment domain (cutoff: 11.5), 32 in the emotional domain (cutoff: 1.5), and 28 in the physical domain (cutoff: 6.5). The cutoff for the total score is 16 points[19].

The MPI presents a drawing of body parts to be evaluated, namely: the temporal region, masseters, submandibular region, larynx, front and back of the neck, shoulders, upper and lower back, elbows, wrists, hands, fingers, hips, thighs, knees, ankles, and feet. The MPI has two parts – in the first one, the participant indicates the frequency of pain in each drawn body part in the previous 12 months, using a scale ranging from 0 to 3 points, in which 0 indicates "no", 1 indicates "rarely", 2 indicates "frequently", and 3 indicates "always". In the second part of the questionnaire, the participant checks the intensity of the pain in each region, using a 100-millimeter Visual Analog Scale (VAS) – the closer to the left end, the milder the pain; the closer to the right, the greater the pain. The literature on pain provides reference values for assessing pain intensity using a 100-mm VAS, as follows: 0 to 4 mm correspond to the absence of pain; 5 to 44 mm correspond to mild pain; 45 to 74 mm correspond to moderate pain and 75 to 100 mm correspond to severe pain[20].

Data were analyzed in the Jamovi statistical software, version 2.0. The Shapiro-Wilk normality test was applied to verify the distribution of quantitative variables, followed by descriptive analysis of all participants' findings in a single group, indicating the means and standard deviations of variables with normal distribution and interquartile ranges of variables without normal distribution and ordinal qualitative variables.

The data were compared by dividing participants into male and female groups to verify differences in the study variables per sex. Student's t-test or Mann-Whitney test was used for comparative analyses, setting the significance level at 5%, with a 95% confidence interval.

A correlation matrix between VoiSS and MPI variables was performed using Spearman's correlation test. The strength of the correlation was classified according to previously established criteria[21], considering correlation coefficient (rho) values between 0.10 and 0.39 as weak, between 0.40 and 0.69 as moderate, and between 0.70 and 1.00 as strong. The correlation considered a 1% significance level and a 99% confidence interval.

RESULTS

Altogether, 100 individuals answered the study questionnaires, of which 59 (35 women and 24 men) remained in the sample after applying the inclusion and exclusion criteria. Their mean age was 29 years and 8 months (± 10.7), with a mean weekly workload of 22.1 hours (± 19.5); 44.8% (n = 26) of them were students, 32.8% (n = 20) worked in offices, and the remainder were retired (n = 2), unemployed (n = 2), and self-employed or service providers (n = 9).

The mean total VoiSS score was above the cutoff proposed by the questionnaire (16 points), suggesting a risk of dysphonia. Since the maximum VoiSS score differs for each domain, their scores were transformed into percentages to identify which one had the highest mean score. Hence, the physical domain had the highest score in percentages. The results for the total group of participants are shown in Table 1.

The median MPI values indicate that pain was absent or rare in most body regions in question. The medians also indicated mild pain in all such regions. The results of pain frequency and intensity are shown in Table 2.

The comparison between men and women found no significant differences in any of the VoiSS domain scores, and its mean total score was above the cutoff in both groups. On the other hand, the comparison showed differences in MPI in the frequency of pain in the shoulder ($p = 0.023$), temporal region ($p = 0.016$), and larynx/throat ($p = 0.019$) – it was more frequent in women in all cases with a difference. The descriptive and comparative data between the groups of women and men are presented in Table 3.

The following MPI regions were correlated with one or more VoiSS domain scores: neck with VoiSS physical domain; temporal region with VoiSS total and physical domain; submental region with VoiSS total and physical domain; and larynx/throat with VoiSS total and physical domain (Table 4). All these correlations were positive, being moderate between the temporal region and the VoiSS physical domain and weak in all other correlations. Pain intensity was not correlated with any VoiSS score in any region investigated by the pain protocol.

DISCUSSION

This study aimed to identify and relate vocal symptoms and musculoskeletal pain in non-professional voice users. Few studies have analyzed these aspects in individuals whose voices are not the main tools of their trade. Thus, these results may help identify the risk of dysphonia in non-professional voice users and its relationship with pain.

The characterization data show that most study participants were young adults under 30 years old, which justifies the high number of students. Their mean age was lower than in another study with nonoccupational voice users, but the percentage of students (between 30% and 40%) was similar[18]. This suggests that many individuals who do not use their voice professionally have not yet entered the job market. Their workload was lower than that described in other studies investigating pain in workers[22], although the standard deviation was high. Long working hours, especially when they require sitting, are known to cause musculoskeletal pain[23] and consequently affect postural adjustments, which may somehow affect voice production. Such factors may have influenced the results of this study.

The mean total VoiSS score above the cutoff showed that, on average, the study population was at risk for dysphonia[19]. The physical domain had the highest percentage score, suggesting that participants reported physical (organic) symptoms such as coughing, pain, and throat clearing or phlegm. Although this was not the initial study hypothesis, these results may have been due to collecting data for this research near the third COVID-19 wave in Brazil – a disease that affected a considerable portion of the population and can cause vocal changes and complaints of vocal tract discomfort[24]. Therefore, post-COVID vocal symptoms may have relevantly increased the vocal symptoms reported by the sample population – especially as the physical domain had the highest percentage score, involving organic sensations of vocal changes. Other studies have also pointed out COVID-19 as a possible influential factor for the increased prevalence of vocal changes in the population[25].

One aspect that caught our attention in this study was the lack of difference in vocal symptoms between men and women. Several studies indicate that women are at greater risk of dysphonia[16,18]. Therefore, their VoiSS domains' scores were expected to differ from the male group. Again, it is suspected that the pandemic may have interfered with these results. Further studies are needed with a balanced number of participants per sex, considering occupational issues and airway diseases in the short and medium term, especially COVID-19 and long COVID symptoms.

In the MPI, participants generally reported absent or infrequent musculoskeletal pain in all regions investigated. Nevertheless, despite being interpreted as mild through the VAS[20], pain intensity was above the values found in a study with dysphonic and non-dysphonic individuals, considering the values of both groups with the same questionnaire in a non-digital format[8]. This finding can be justified by the greater number of individuals working remotely in recent years, without preparation or adequate ergonomic working conditions[22]. The high number of online meetings and the lack of ergonomics in the home office are also related to vocal changes, due to the increased demand for vocal use caused by the large number of video calls and high workload[26].

Most participants in this study were students or worked in offices, sitting down, usually in front of a computer.

Table 1. Means and standard deviations extracted from the impairment, emotional, physical, and total domains of the Voice Symptom Scale

	VoiSS impairment	VoiSS emotional	VoiSS physical	VoiSS total
Mean	13.4	2.90	7.34	23.6
Standard deviation	8.73	4.13	3.61	13.7
Minimum	0	0	1	3
Maximum	32	19	17	63
Percentage score	22.33%	9.06%	26.21%	19.66%

Caption: VoiSS = Voice Symptom Scale

Table 2. Means, standard deviations, medians, and quartiles 1 and 3 of the frequency and intensity of musculoskeletal pain

		Neck	Shoulders	Upper back	Elbows	wrists/ hands	Lower back	Hip/ thighs	Knees	Ankles/ feet	Temporal	Cheeks	Submental	Larynx/ throat	Anterior neck
Frequency of pain	Mean	0.88	0.97	0.83	0.17	0.78	1.08	0.44	0.71	0.66	1.07	0.58	0.41	0.56	0.36
	SD	0.77	0.91	0.81	0.46	0.95	0.92	0.73	0.87	0.85	0.93	0.91	0.56	0.75	0.64
	Quartile 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Median	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
	Quartile 3	1.00	2.00	1.00	0.00	1.00	2.00	1.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00
Intensity of pain	Mean	18.2	23.9	18.0	18.9	20.1	18.0	17.7	19.1	19.3	27.8	15.5	13.1	19.7	13.1
	SD	18.0	22.5	18.1	15.9	25.1	17.8	23.4	20.8	21.2	25.5	15.7	13.0	18.0	11.8
	Quartile 1	3.00	3.00	5.00	7.00	1.25	5.00	2.75	4.00	5.00	3.50	5.00	4.25	5.00	3.25
	Median	12.5	15.0	9.00	14.0	7.50	7.00	5.50	10.0	7.50	22.0	11.0	9.00	15.0	10.5
	Quartile 3	28.0	36.0	23.0	24.0	31.5	33.0	21.5	31.3	34.0	53.0	15.8	22.3	27.5	17.5

Caption: SD = standard deviation

Table 3. Means, standard deviations, medians, and comparison between men and women for all variables

Instrument	Parameter	Group	Mean	SD	Quartile 1	Median	Quartile 3	p-value
VoiSS	VoiSS impairment	Women	14.235	7.480	9.00	13.00	18.25	0.371*
		Men	11.875	10.352	4.00	10.00	18.25	
	VoiSS emotional	Women	2.735	4.136	0.00	1.00	3.75	0.928**
		Men	3.208	4.253	0.00	1.00	5.00	
	VoiSS physical	Women	7.794	3.418	6.00	8.00	10.00	0.342*
		Men	6.875	3.837	4.00	6.00	10.00	
	VoiSS Total	Women	24.8	11.8	16.00	22.5	32.00	0.452*
		Men	22.0	16.4	9.75	15.5	28.75	
Frequency of pain	Neck	Women	1.059	0.736	1.00	1.00	2.00	0.051**
		Men	0.667	0.761	0.00	0.50	1.00	
	Shoulders	Women	1.206	0.978	0.00	1.00	2.00	**0.023****
		Men	0.625	0.711	0.00	0.50	1.00	
	Upper back	Women	0.971	0.797	0.00	1.00	2.00	0.079**
		Men	0.625	0.824	0.00	0.00	1.00	
	Elbows	Women	0.176	0.459	0.00	0.00	0.00	0.843**
		Men	0.167	0.482	0.00	0.00	0.00	
	Wrists/hands	Women	0.941	0.952	0.00	1.00	1.00	0.092**
		Men	0.583	0.929	0.00	0.00	1.00	
	Lower back	Women	1.118	0.946	0.00	1.00	2.00	0.914**
		Men	1.083	0.881	0.00	1.00	2.00	
	Hip/thighs	Women	0.559	0.786	0.00	0.00	1.00	0.129**
		Men	0.292	0.624	0.00	0.00	0.00	
	Knees	Women	0.824	0.869	0.00	1.00	2.00	0.248**
		Men	0.583	0.881	0.00	0.00	1.00	
	Ankles/feet	Women	0.618	0.817	0.00	0.00	1.00	0.972**
		Men	0.667	0.917	0.00	0.00	1.00	
	Temporal region	Women	1.294	0.970	0.00	2.00	2.00	**0.016****
		Men	0.708	0.751	0.00	1.00	1.00	
	Cheeks	Women	0.706	0.906	0.00	0.00	1.00	0.081**
		Men	0.417	0.929	0.00	0.00	0.00	
	Submental region	Women	0.500	0.615	0.00	0.00	1.00	0.117**
		Men	0.250	0.442	0.00	0.00	0.25	
	Larynx/throat	Women	0.735	0.790	0.00	1.00	1.00	**0.019****
		Men	0.292	0.624	0.00	0.00	0.00	
	Anterior neck region	Women	0.353	0.646	0.00	0.00	0.75	0.856**
		Men	0.375	0.647	0.00	0.00	1.00	
Intensity of pain	Neck	Women	20.440	18.111	5.00	16.00	34.00	0.117**
		Men	13.182	17.651	2.00	3.00	18.00	
	Shoulders	Women	26.818	23.579	4.25	21.50	41.00	0.389**
		Men	18.000	19.819	4.00	12.00	23.50	
	Upper back	Women	15.636	15.728	4.25	8.00	20.50	0.433**
		Men	22.636	22.092	6.00	14.00	35.50	
	Elbows	Women	20.714	17.566	8.50	14.00	33.50	0.883**
		Men	12.500	7.778	9.75	12.50	15.25	
	Wrists/hands	Women	23.350	27.211	1.00	11.50	45.00	0.498**
		Men	9.167	12.481	2.25	5.00	7.75	
	Lower back	Women	17.095	15.903	5.00	8.00	26.00	0.881**
		Men	19.583	21.509	4.25	6.50	37.50	
	Hip/thighs	Women	18.750	25.489	2.75	5.00	22.50	0.962**
		Men	13.500	13.626	4.75	10.50	19.25	
	Knees	Women	17.100	21.322	4.00	6.50	19.00	0.524**
		Men	24.000	19.907	3.75	28.00	35.25	
	Ankles/feet	Women	22.400	22.959	4.50	12.00	40.00	0.646**
		Men	12.714	16.540	5.50	6.00	11.00	
	Temporal region	Women	30.609	25.600	4.00	33.00	55.00	0.277**
		Men	19.750	25.223	2.75	10.00	25.75	
	Cheeks	Women	14.615	11.758	8.00	12.00	16.00	0.621**
		Men	17.800	24.934	4.00	9.00	11.00	
	Submental region	Women	14.909	14.138	4.00	11.00	25.00	0.532**
		Men	6.667	3.786	4.50	5.00	8.00	
	Larynx/throat	Women	20.579	17.592	5.50	16.00	27.50	0.559**
		Men	17.750	20.190	4.00	7.50	29.25	
	Anterior neck region	Women	12.692	13.187	2.00	7.00	15.00	0.374**
		Men	14.000	8.515	7.00	16.00	18.00	

*Student's t-test; **Mann-Whitney test; p-value ≤ 0.05

Caption: VoiSS = Voice Symptom Scale; SD = standard deviation

Table 4. Variables from the Musculoskeletal Pain Investigation Questionnaire correlated with domain scores of the Voice Symptom Scale

		VoiSS total	VoiSS physical
Neck	rho	-	0.372
	p-value	-	0.004*
Temporal region	rho	0.343	0.411
	p	0.008*	0.001*
Submental region	rho	0.354	0.334
	p	0.006*	0.010*
Larynx/throat	rho	0.341	0.377
	p	0.008*	0.003*

*p-value ≤ 0.01
Caption: VoiSS = Voice Symptom Scale; p = p-value; rho = correlation coefficient

No information was collected about their work model (from home or at the company) or study model (remote or in-person). However, ergonomic issues in the environment may be relevant in both in-person and remote scenarios. A study comparing telemarketers and the general population found body pain in both groups, but more so in telemarketers[9], which points again to ergonomics in classrooms and offices during remote work or teaching. Such factors may have contributed to the findings of this research and should be better explored in future studies.

The comparison of pain frequency and intensity between men and women showed that the latter had more frequent pain in the shoulders, larynx/throat, and temporal region. A study with people working from home during the pandemic identified an increased frequency of musculoskeletal pain in the neck, shoulders, and lower back, and more pain in women than in men, due to worse ergonomics at work[27]. Still, considering the high frequency of vocal symptoms in the present study, such results are noteworthy since dysphonic women[8] or people with hyperfunctional dysphonia[7] report pain more often than those without dysphonia, especially in regions proximal to the larynx, such as the ones described above.

The correlation analysis showed that the frequency of pain in the neck and the temporal, submandibular (below the chin), and laryngeal regions was related to physical (organic) vocal symptoms – i.e., the more vocal symptoms, the greater the frequency of pain. Pain in the temporal, submandibular, and laryngeal regions was also related to the total VoiSS score, indicating that the greater the vocal symptoms, the greater the pain in these regions (also called regions proximal to the larynx). A study found that vocal tract discomfort is related to symptoms of an incipient vocal change[15]. Another one found that dysphonic people's voice-related quality of life is more related to both the frequency and intensity of pain in the larynx and proximal regions[7].

The literature has shown that pain occurs mostly in the throat, neck, and back of non-professional voice users[10]. Moreover, individuals with vocal complaints report more pain than those without complaints[8,15]; hence, vocal changes not only affect the structures involved in vocal production but are also related to any tension that causes discomfort during phonation[15]. Thus, the greater the frequency of pain in the larynx and proximal regions, the greater the presence of vocal symptoms – findings that may be associated with the presence of dysphonia[8,11], especially when it is caused by muscle tension[28].

Therefore, musculoskeletal pain in regions close to the larynx, despite being greater and more frequent in occupational voice users[29], may be a symptom of dysphonia and should be taken into account in the vocal assessment of individuals with complaints (regardless of whether they use it professionally) since dysphonia is present in the general population[18], and the prevalence of vocal symptoms has increased in recent years[25]. Speech-language-hearing pathologists must pay attention to individuals who spend much of the day sitting, whether working or studying, when surveying their medical history or assessing their voices. Postural imbalances can generate inappropriate tension and interfere with voice production, impacting their health and quality of life. Research on ergonomics commonly finds musculoskeletal pain in the back and upper limbs[30], usually associated with inadequate posture during work activities[23]. Therefore, studies should also investigate vocal complaints in workers with musculoskeletal pain.

The limitations of this study include the sample size, mainly due to the lack of consensus in the literature about which professionals use their voices as a tool of their trade. In addition, the lack of information on COVID-19 infection, the occurrence of other airway diseases, and the current work modality (whether from home or in-person) also posed biases to this research. Another limiting factor was that it did not collect data on the use of protective masks. The fact that MPI is not a validated instrument also posed a bias to this study. However, its use is justified by the number of voice studies with different populations that also used it[7,10-12].

Further studies are needed to compare vocal symptoms and musculoskeletal pain between nonoccupational and occupational voice users. The discussion raised important questions regarding the pandemic since the study population was expected to have few vocal symptoms. This indicates the need for further population studies to verify the effects of the pandemic on communication disorders, focusing on the voice and longitudinal comprehension of the findings. Increasing the number of participants, especially with a balance between men and women, may elucidate other questions, such as the relationship between pain and vocal symptoms according to sex since it is known that women are at greater risk of dysphonia than men. Future studies should also include other data on health, work, and study models (in-person and remote) to find possible associations between variables.

CONCLUSION

The individuals in this study (non-professional voice users) had vocal symptoms compatible with the risk of dysphonia. The frequency of musculoskeletal pain was low in

all regions studied and, when present, its intensity was mild. However, vocal symptoms were related to the frequency of musculoskeletal pain in the larynx and proximal regions. Also, women had pain in the shoulders, temporal region, and larynx more often than men.

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