

What is the risk of dysphonia in workers who use their voice in a university environment?

Qual o risco de disfonia em trabalhadores que usam a voz em ambiente universitário?

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ABSTRACT

Purpose: To assess the risk of dysphonia and presence of voice change in professionals from different categories working in a university environment. **Methods:** Cross-sectional research using the Dysphonia Risk Screening Protocol to analyze the variables sex, age, hydration, smoking, professional category and vocal demand and to calculate the final score. Voice recording took place in the work environment using the CAPE-V protocol. Judges performed the auditory-perceptual analysis. Data were compared between the groups with high/low risk of dysphonia and presence/absence of voice disorders. **Results:** 80 individuals participated, with an average age of 47.7 years, 84% female. There was a high risk of dysphonia in 70%, and voice change in 34%. Insufficient hydration and smoking were frequent. In the group with a high risk of dysphonia and who had voice disorders, the presence of employees from the administrative area stood out, and, in the group with lower risk and no changes, health employees were outstanding. Older age was associated with voice disorders, regardless of groups. **Conclusion:** Identification of high risk of dysphonia and the relevant presence of voice changes in individuals from different professional categories who are part of the university environment suggest the need to propose preventive actions and promote workers' health.

Keywords: Voice disorders; Dysphonia; Risk factors; Occupational health; Speech, Language and Hearing Sciences

RESUMO

Objetivo: avaliar o risco de disfonia e a presença de alteração vocal em profissionais de diferentes categorias que atuam em ambiente universitário. **Métodos:** pesquisa transversal com uso do Protocolo de Rastreamento de Risco de Disfonia para análise das variáveis gênero, idade, hidratação, tabagismo, categoria profissional e demanda vocal e para cálculo do escore final. A gravação da voz ocorreu no ambiente de trabalho, com uso do protocolo Consenso da Avaliação Perceptivo-Auditiva da Voz - CAPE-V. A análise perceptivo-auditiva foi feita por juízes. Os dados foram comparados entre os grupos alto/baixo risco de disfonia e presença/ausência de alteração vocal. **Resultados:** participaram 80 indivíduos, média de idade de 47,7 anos, 84% do gênero feminino. Observou-se alto risco de disfonia em 70% deles e alteração vocal em 34%. Hidratação insuficiente e tabagismo foram frequentes. No grupo com risco elevado de disfonia e presença de alteração vocal destacaram-se os funcionários da área administrativa e, no grupo com menor risco e sem alteração, os funcionários da saúde. Idade mais avançada foi associada à presença de alteração vocal, independentemente dos grupos. **Conclusão:** a identificação do alto risco de disfonia e a relevante presença de alterações vocais em indivíduos de diferentes categorias profissionais que fazem parte do ambiente universitário sugerem a necessidade de propostas de ações preventivas e de promoção de saúde do trabalhador.

Palavras-chave: Distúrbios da voz; Disfonia; Fatores de risco; Saúde do trabalhador; Fonoaudiologia

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INTRODUCTION

In addition to favorable general working conditions to develop their activities properly and with quality of life, individuals who use their voice professionally need both the integrity of the structures involved in phonation and their functioning with good vocal quality⁽¹⁾. Voice disorders can compromise social and occupational communication, in addition to having negative impacts on listeners, which can reflect unfavorably on the worker's quality of life^(2,3).

In addition to structural or functional changes in the larynx, voice problems may be related to excessive or inappropriate use of the voice, stress, medication, comorbidities, habits and lifestyle of the individual. The advancement of age can also have a negative impact. Physical, social, environmental, organizational and psychological factors at work can also influence the onset of voice changes⁽⁴⁾. Women have a higher prevalence of dysphonia and in some professional categories they are the majority, as in basic education⁽⁵⁾.

The presence of voice changes in certain professional categories can signal collective illness determined by voice wear under precarious occupational conditions. Thus, characterization of the Work-Related Voice Disorder (WRVD) has been sought for years, and took place in 2018. A WRVD is defined as any form of vocal deviation directly related to use of the voice in professional activity, which reduces, compromises or prevents workers' performance and/or communication, with or without an organic change in the larynx⁽⁶⁾.

To protect the health of workers who use their voice professionally, the commitment of health professionals and managers is necessary to develop actions to track the risk of dysphonia and associated factors, in order to establish strategies focused on the nexus between work and voice, so that the conditions and characteristics of the work itself are the object of interventions to promote and protect the voice of these workers⁽⁷⁾.

There is significant scientific production on the voice of teachers and singers due to their greater susceptibility to dysphonia; however, other professional categories may also be at high risk of voice problems⁽⁸⁾. Professionals such as telemarketing operators, salespeople, religious preachers, among others, have aroused the interest of specialists⁽⁹⁻¹²⁾. However, other categories, such as health professionals and those with administrative functions, for example, have not been the focus of studies on the subject. These professionals work in different locations and have greater or lesser vocal demand, depending on their work dynamics. In the bibliography reviewed, no studies were found dedicated to investigating such categories in the same professional environment.

The classification by Koufman and Isaacson⁽¹³⁾ proposes a breakdown into four levels, according to the demand and the vocal quality required for exercise of professional activity: level I, called the vocal elite, comprises actors and singers, who, in addition to the high vocal demand, depend on an expressive refinement of vocal quality; level II refers to professional users of their voice, such as teachers, speakers or religious preachers, and its main characteristic is that only a moderate voice change can have consequences; level III includes non-professional voice users (merchants, doctors, lawyers) and, finally, level IV includes those who do not depend on the voice for their performance⁽¹³⁾.

Looking at the university environment, there may be a mistaken perception that only higher education teachers need voice care. Since universities cover different courses, with different specialties, and need a large administrative structure, there is a huge range of professionals who attend this environment daily. In addition to courses in the areas of exact, biological and human sciences, there are university hospitals, radio and newspaper, choirs and even kindergarten, elementary and high school.

In the routine of the university's Speech-Language Therapy clinic where the study was carried out and which resulted in this article, workers from different professional categories seek care in the voice area, a fact that commanded interest because they are often neither elite voice professionals (level I) or even level II⁽¹³⁾. Thus, it is noteworthy that not only higher education teachers in this environment can present a high risk of dysphonia, with damage to their professional activity and impact on quality of life. As they are inserted in this environment, it is the responsibility of Speech-Language Therapists to promote actions to improve this scenario.

The objective of this study, therefore, was to assess the risk of dysphonia and verify the presence of voice change in professionals who work in a university environment, except for higher education professors. The survey was also concerned with identifying hydration and smoking habits, vocal demand, history of dysphonia and physical conditions in the work environment.

METHODS

This is an observational cross-sectional study approved by the Research Ethics Committee of the institutions involved (reports 3.342.404 and 2.827.746).

In this phase of the research, employees of a public university who were registered with the Specialized Service in Safety Engineering and Occupational Medicine [Serviço Especializado em Engenharia de Segurança e Medicina do Trabalho – SESMT], whose functions fell under vocal demand levels I, II or III⁽¹³⁾ were included. Higher education teachers did not participate in this phase because they were not registered with SESMT and will be part of the next stages of the research.

The study included all professionals who were interested, regardless of age, gender, length of time in the position, or work regime at the university, who participated in all stages of the research and who signed the Free and Informed Consent Form. Professionals who did not complete the research phases and also those who had vocal symptoms related to upper airway infection were excluded from the sample at the time of voice recording.

The functions exercised by these professionals were distributed in order to compose four professional categories: administrative (secretary, administrative assistant), education (kindergarten and elementary school teachers), health (nurse, doctor, physiotherapist, Speech-Language Therapist, veterinarian and psychologist) and communication (journalist, announcer, editor, choir conductor and cultural agent).

Participants received, in their institutional e-mail available on the SESMT register, the invitation to participate, containing information about the research, instructions, the Free and Informed Consent Form and the access link to complete the General Dysphonia Risk Screening Protocol (DRSP-G) 14. As employees joined, new e-mails were sent to those who had not yet responded, a usual routine at the university, for participation in different scientific researches.

The instruments and procedures adopted at this stage of the study were:

- filling in the electronic questionnaire: the DRSP-G was used to calculate the risk of dysphonia, through its score that can vary from 0 to 131. The higher the score, the greater the risk for dysphonia; it allows classification of risk of dysphonia as high or low, with the cut-off point for high risk being 29.25 for women, 22.75 for men and 27.10 for the elderly⁽¹⁴⁾. The DRSP-G makes it possible to survey several aspects of voice disorders. For this study, data on habits related to use of the voice (hydration and smoking), vocal demand, history of dysphonia and conditions of the work environment were considered;
- voice recording: participants who filled out the questionnaire were contacted again, by e-mail, to schedule the voice recording, to be carried out at their workplace, in a quiet room; an iPad (Apple Inc., USA) with attached microphone (ShureMotiv MV88) was used for recordings and the vocal tasks of sustained vowel emission, sentence reading and spontaneous speech, proposed in the CAPE-V protocol, were performed⁽¹⁵⁾.

The auditory-perceptual analysis of voices with CAPE-V was performed by the first two authors, so that evaluators did not have access to the professional category and other data that identified the analyzed voice. Based on the three different vocal tasks, the general degree of vocal deviation was determined, and professionals with a voice disorder index greater than 35.5⁽¹⁶⁾ were considered as having voice disorders.

From the classification of the risk of dysphonia, obtained through the DRSP-G, and the presence of voice change, diagnosed by analysis of the general degree of vocal deviation, through CAPE-V, four groups were formed: low risk of dysphonia without voice change (A), low risk with change (B), high risk without change (C) and high risk with change (D).

Groups were compared in relation to the variables: gender, age, hydration, smoking, professional category and vocal demand. Age was also analyzed in relation to professional categories. Finally, all variables were analyzed for the presence of voice disorders, regardless of the risk of dysphonia.

General and group descriptive statistical analysis were carried out and ANOVA One-Way and t-Student tests were applied for comparisons of numerical variables. The Chi-square test was used to analyze the association between categorical variables. A significance level of 5% was considered.

RESULTS

Of the 1354 professionals who make occupational use of their voice at the university, 145 (11%) returned the completed questionnaires. 80 (55%) recorded their voice, which represents

6% of the total. The mean age was 47.7 years, with a standard deviation (SD) of 10.2. 67 women (84%) and 13 men (16%) participated.

Among the 80 workers, 30 (37.5%) belonged to the administrative category (ADM), 22 (27.5%) to the health area (HLT), 21 (26%) were professionals in basic or fundamental education (EDU) and seven (9%) belonged to the communication area (COM).

Of the total, 53 participants (66%) declared a smoking habit and 48 (60%) mentioned insufficient hydration. A vocal demand time between 2 hours and 1 minute and 5 hours was indicated by 22 (28%) participants; between 5 hours and 1 minute and 8 hours by 25 (31%) and more than 8 hours by 33 (41%).

Regarding their history of vocal problems, 47 (59%) workers reported having suffered voice changes more than once and seven (9%) at least once.

As for environmental conditions, 51 (64%) professionals reported the presence of dust, 51 (64%) reported internal or external noise interfering with use of their voice and 35 (44%) declared working in air conditioned environments.

When distributed between the groups, according to risk and voice change, they were characterized as follows:

- Group A (low risk of dysphonia, without voice disorder): 17 (21%) workers (6 ADM, 6 HLT, 1 EDU and 3 COM), mean age 47 years (SD = 10.6), 16 women and one man;
- Group B (low risk of dysphonia, with voice disorder): seven individuals (9%) (4 ADM, 2 HLT, 1 EDU), mean age 52.7 years (SD = 12.9), six women and one man;
- Group C (high risk of dysphonia, without voice disorder): 36 workers (45%) (9 ADM, 10 EDU, 12 HLT and 4 COM), mean age 45.3 years (SD = 10), 27 women and nine men;
- Group D (high risk of dysphonia, with voice disorder): 20 workers (25%) (11 ADM, 6 EDU, 3 HLT), mean age 51.1 years (SD = 8.4), 18 women and two men.

56 (70%) professionals with a high risk of dysphonia and 27 (34%) with voice disorders were observed.

In the comparison between groups regarding the selected variables, it was not possible to include group B due to the reduced number of participants. In the comparison between the three groups (A, C and D), there was no difference in relation to the variables studied: age and gender (Table 1), hydration, smoking, professional category and vocal demand (Table 2).

Due to dispersion of the data, it was not possible to apply a statistical test to compare the groups formed according to risk and voice change in relation to the professional categories, as some cells were left with numbers below three. Descriptively, it should be emphasized that, in the group with high risk of dysphonia and presence of voice change, 55% of participants belonged to the ADM category; among those with low risk and

Table 1. Comparison between groups regarding age and gender.

Aspects analyzed		Low risk without change (A)	High risk without change (C)	High risk with change (D)	One-Way ANOVA test (p)
Age (years old)	Average	47.1	45.3	51.1	0.110
	Median	46.0	44.0	52.0	
	Standard deviation	10.6	10.0	8.4	
Gender N (%)	Female	16 (94.1)	25 (75.0)	18 (90.0)	Chi-square test (p)
	Male	1 (5.9)	9 (25.0)	2 (10.0)	

Subtitle: N (%) = number of subjects (percentage)

no voice change, 41.2% were from HLT, and of those with high risk and no voice change 36.1% came from the EDU category.

Mean ages were similar in the different professional categories (Table 3). Regarding the median it was found that, in the ADM group, half the workers were over 52 years old and, in the HLT group, more than 51 years old (Table 3).

Considering only the presence of dysphonia, regardless of the risk of dysphonia, the group with voice disorders had

a higher mean age, compared to the group without voice disorders (Table 4). Moreover, the ADM group was at the limit of statistical significance, regarding the greater number of professionals with dysphonia (Table 5). Water intake considered adequate in the DRSP-G is six glasses or more, or approximately 1.5 liters or more daily. Thus, it was observed that over half the sample had insufficient hydration, as well as the habit of smoking.

Table 2. Comparison between groups regarding hydration, smoking, professional category and vocal demand.

Aspects analyzed	Low risk without change (A)		High risk without change (C)		High risk with change (D)		Total		Chi-square test (p)	
	N	%	N	%	N	%	N	%		
Hydration	Adequate	7	41.2	13	36.1	8	40.0	28	38.4	0.925
	Inadequate	10	58.8	23	63.9	12	60.0	45	61.6	
Smoking	Absence	6	35.3	9	25.0	9	45.0	24	32.9	0.303
	Presence	11	64.7	27	75.0	11	55.0	49	67.1	
Vocal demand	2 hours and 1 minute to 5 hours	6	35.3	10	27.8	5	25.0	21	28.8	0.217
	5 hours and 1 minute to 8 hours	8	47.1	8	22.2	6	30.0	22	30.1	
	More than 8 hours	3	17.6	18	50.0	9	45.0	30	41.1	

Subtitle: N = number of participants; % = percentage

Table 3. Comparison between professional categories in relation to age.

Age (years old)	Professional categories				One-Way ANOVA test (p)
	Administrative	Communication	Education	Health	
Average	49.2	44.1	46.5	48.3	0.618
Median	52.0	45.0	46.0	51.0	
Standard deviation	10.2	7.7	10.6	10.9	
n	30	7	21	22	

Subtitle: n = number of subjects

Table 4. Comparison between groups with and without voice changes in relation to age.

Age (years old)	CAPE-V		Student t-test (p)
	Without change	With change	
Average	45.9	51.5	0.019*
Median	45.0	52.0	
Standard deviation	10.1	9.6	
n	53	27	

*statistically significant

Subtitle: CAPE-V = Consensus of the Perceptual-Auditory Assessment of the Voice; n = number of subjects

Table 5. Comparison between groups with and without voice changes in relation to gender, hydration, smoking, professional category and vocal demand.

Aspects analyzed	CAPE-V				Total		Chi-square test (p)	
	Without change		With change		N	%		
	N	%	N	%				
Gender	Female	43	81.1	24	88.9	67	83.8	0.569
	Male	10	18.9	3	11.1	13	16.3	
Hydration	Adequate	20	37.7	12	44.4	32	40.0	0.735
	Inadequate	33	62.3	15	55.6	48	60.0	
Smoking	Absence	15	28.3	12	44.4	27	33.8	0.233
	Presence	38	71.7	15	55.6	53	66.3	
Professional category	Administrative	15	28.3	15	55.6	30	37.5	0.058
	Communication/ Education	21	39.6	7	25.9	28	35.0	
	Health	17	32.1	5	18.5	22	27.5	
Vocal demand	2 hours and 1 minute to 5 hours	16	30.2	6	22.2	22	27.5	0.752
	5 hours and 1 minute to 8 hours	16	30.2	9	33.3	25	31.3	
	More than 8 hours	21	39.6	12	44.4	33	41.3	

Subtitle: CAPE-V = Consensus of Perceptual-Auditory Assessment of Voice; N = number of subjects; % = percentage

DISCUSSION

A great number of people use their voice professionally and many end up developing vocal problems, without realizing that they depend on the voice to perform their work activities. It is essential to understand the professional categories in which this issue is relevant and to know the factors leading these workers to vocal illness.

When reference is made to use of the voice in a university environment, one naturally thinks of the vocal demands of the higher education teacher, but this universe encompasses different professional categories with different vocal demands. Thus, this research included professional categories not routinely investigated, but which need attention in order to make health decisions based on scientific evidence, so that preventive and curative steps can be taken.

An important first point to be considered in this study was the low adherence of employees to the proposal. Return on the questionnaires was well below expected average, which would be around 25%⁽¹⁷⁾, and only half the participants (approximately) who completed the questionnaire were willing to carry out the voice recording, even with the offering that it occur in their own workplace. The people most exposed and/or with the most voice changes may be those who answered the questionnaire and participated in recording of the voices, a possible bias in the study, which could not be controlled. Promotion actions to discuss the issue of professional use of the voice at university level may contribute to greater identification of these professionals with the theme, self-perception regarding their voice and identification of potential dysphonia risk factors.

There was no difference between groups, in relation to age, when classified according to voice change/risk of dysphonia or to professional category. However, an association was observed between higher mean age and presence of voice disorders. Older age can favor the occurrence of dysphonia due to the physiological changes caused by aging⁽¹⁸⁾. Thus, specific actions must be considered for older individuals in each group. In addition to age and its possible impacts on the voice, work environment conditions, mental states and lifestyle can also interfere with the voice and should be further investigated.

As in this research, men generally participate less in activities related to health care for various cultural and social reasons, and much has been thought about the importance of encouraging their greater participation^(19,20).

High risk of dysphonia and presence of voice change among those working in the administrative area attract the attention of specialists and indicate the need for investigations focusing on labor issues in this professional category. It is noteworthy that the high risk can be influenced by working conditions, such as ergonomic factors, noise, air conditioning, high mental load and work demands, issues related to organization and work relationships, among others^(21,22), which need to be analyzed in the future.

Among the participants who were kindergarten and elementary school teachers, the high risk of dysphonia observed was expected, due to aspects involving teaching^(5,23,24). A high prevalence of voice disorders in this group was also expected and, in fact, was above that found in the largest epidemiological study conducted in Brazil⁽²⁵⁾. Factors such as unfavorable conditions in the work environment and stress^(23,24), in addition to individual aspects, such as comorbidities and smoking, are the factors that

increase risk. In this scenario, the existence of organizational and emotional components of work should be considered, such as excessive demand, little control and autonomy, which can entail risks to workers, decrease quality of life at work and increase risk of dysphonia⁽²⁶⁾. A previous survey using the same instrument employed in this study found that teachers of kindergarten and elementary education in a private school in São Paulo had a high risk of dysphonia, regardless of whether or not they had voice changes; the signal-to-noise ratio proved to be inadequate in most classrooms evaluated, reinforcing the possible impact of environmental factors⁽²⁷⁾.

Evidence that the health professionals group has a lower risk of dysphonia may be associated with differentiated vocal demand: when it is necessary to speak a lot it generally involves more personal conversations and orientations, in which interlocutors are closer.

Insufficient hydration and high smoking have been observed as important risk factors for dysphonia. Intake of less than 1.5 liters of water per day was considered insufficient. The literature indicates that water consumption should vary from seven to 12 glasses per day, that is, more than 1.5 liters and up to 3.0 liters⁽²⁸⁾. It is noteworthy that water consumption was below recommended, since more than half the workers included in the research ingested less than 1.5 liters per day. Adequate hydration contributes to good vocal performance and comfortable emission⁽²⁸⁾, and water intake in small amounts throughout the day is advised, especially during professional use of the voice.

High smoking has also been found in another survey on professional voice, and vocal problems caused by smoking are well established⁽²⁹⁾. An epidemiological study that analyzed voice disorders in teachers and non-teachers found smoking rates 50% higher in Brazilians as compared to Americans, and that both Brazilian teachers and non-teachers had high smoking rates, around 80%⁽²⁵⁾. Future detailing of these data investigating the number of cigarettes consumed and smoking time, and whether it occurs associated with other factors, such as alcohol consumption—which can boost negative vocal effects, is considered important given the long-term effects.

Vocal demand of over eight hours a day was reported by an expressive number of participants. Half the group at high risk of dysphonia and with voice disorders had this high vocal demand. In the group with no high risk and no change, only the smallest part reported such high demand. These data strengthen the notion that voice disorders are not linked only to inappropriate use of the voice, lowering the blame for the injury on the worker and endorsing the need to overcome the most unfavorable work conditions⁽⁷⁾.

In addition, physical environment conditions point to the presence of factors that interfere with use of the voice⁽⁵⁾. The fact that many professionals have a history of dysphonia also has to be considered, as it reveals that this scenario is not new.

Professionals with low risk of dysphonia and with voice disorders, who were present in a smaller number, are assumed to have organic dysphonia. Therefore, it is necessary that future studies consider aspects of general health and comorbidities to better elucidate the issue. These professionals and all others who presented voice change will be referred to the otorhinolaryngology service of the referral hospital for laryngeal diagnosis and speech-language assessment, and the suitable course of action will then be defined. Indicated cases will be notified via the WRVD investigation form.

For participants who did not present changes but were identified as being at a high risk of dysphonia, the suggestion is to carry out orientation workshops on vocal well-being, self-perception and vocal improvement. For those at low risk and who did not experience voice changes, proposals are being studied to develop support material to be disseminated without the need for physical presence.

The limitations of the research are mainly due to the sample size, even though results have reflected the reality of this population, which may benefit from the protection measures.

In a society that values health policies, epidemiological studies are relevant; in the area of voice they are scarce and, therefore, desirable.

It is noteworthy that the study's findings make experts aware of the high risks and the high rate of voice changes found. Low adherence should also guide actions to motivate and educate university professionals about the relevance of the voice for their professional activity, and protective measures can be proposed to managers.

The study led to the conclusion that there is a high risk of dysphonia among the participants, including in the absence of voice change, in addition to a high occurrence of dysphonia in the sample as a whole.

Inadequate hydration, smoking and high vocal demand proved to be relevant variables in all groups studied, as well as negative conditions in the work environment, factors to be addressed in the actions that will be developed. Specific issues affecting employees in the administrative area will also be considered, since it was the category most present in the group with a high risk of dysphonia and voice change.

Separately, the variables studied did not differentiate between groups, which shows the importance that, in future studies, multivariate analyzes should be carried out and other PRRD data inserted. Continuity of the research is justified by the fact that 70% of the sample had a high risk of dysphonia and about 30% had a change in voice, making it necessary to broaden the understanding of this event to outline and plan actions. It is also noteworthy that the scenario indicates the need for preventive and health promotion actions to be developed with these workers.

CONCLUSION

A high risk of dysphonia and a relevant presence of voice change were found among professionals from different categories who work in a university environment and who do not act as teachers of higher education. Factors such as insufficient hydration, high smoking and negative conditions in the physical environment were observed.

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