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Classroom noise and teacher vocal load

Ruído em sala de aula e a carga vocal do professor

Ruido en el aula y la carga vocal del profesor

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Abstract

The intense vocal demands of the classroom, working conditions, and lack of knowledge about vocal health expose teachers to a high risk of vocal problems, such as dysphonia and both physical and vocal fatigue. The aim of this study was to identify the noise levels of a university campus, investigate the teachers' perception of noise, and describe the impact of the noisy environment on their voices during teaching activities. This descriptive cross-sectional study analyzed campus noise levels and collected teachers' vocal data via questionnaires and in-class speech recordings, evaluating the impact on vocal health and quality of life. The campus noise level was above recommended limits, which required greater vocal effort, leading to the report of symptoms such as hoarseness, dry throat, and tiredness. Many teachers underestimated the impact of their vocal changes and neglected preventive practices, such as vocal warm-ups and cool-downs. The analysis of voice-related quality of life and screening for voice disorders revealed the impact of noise on voice use in the classroom, especially in women, with repercussions on the teaching-learning process.

Keywords: Noise Monitoring; Voice; Faculty; Occupational Health.

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Resumo

A intensa demanda vocal da sala de aula, as condições de trabalho e a falta de conhecimento sobre saúde vocal expõem os professores ao alto risco de problemas vocais, como disfonias e fadiga tanto física quanto vocal. O objetivo deste estudo foi identificar os níveis de ruído de um *campus* universitário, investigar a percepção do ruído pelos professores e descrever o impacto do ambiente ruidoso sobre suas vozes durante a atividade docente. Estudo transversal descritivo analisou níveis de ruído no *campus* e coletou dados vocais de professores via questionários e gravação da fala em aula, avaliando impacto na saúde vocal e qualidade de vida. O nível de ruído no *campus* estava acima dos limites recomendados, o que exigiu maior esforço vocal, levando ao relato de sintomas como rouquidão, garganta seca e cansaço. Muitos professores subestimaram o impacto de suas alterações vocais e negligenciaram práticas preventivas, como aquecimento e desaquecimento vocal. A análise da qualidade de vida relacionada à voz e a triagem para distúrbios vocais revelaram impacto do ruído sobre o uso da voz em sala de aula, especialmente em mulheres, com repercussão no processo ensino-aprendizagem.

Palavras-chave: Monitoramento do Ruído; Voz; Docentes; Saúde Ocupacional.

Resumen

La intensa demanda vocal del aula, las condiciones laborales y la falta de conocimiento sobre salud vocal exponen a los profesores a un alto riesgo de problemas vocales, como disfonía y fatiga tanto física como vocal. El objetivo de este estudio fue identificar los niveles de ruido de un campus universitario, investigar la percepción del ruido por parte de los profesores y describir el impacto del ambiente ruidoso en sus voces durante la actividad docente. Un estudio transversal descriptivo analizó los niveles de ruido en el campus y recopiló datos vocales de los profesores a través de cuestionarios y grabaciones de voz en clase, evaluando el impacto en la salud vocal y la calidad de vida. El nivel de ruido en el campus estuvo por encima de los límites recomendados, lo que exigió un mayor esfuerzo vocal, llevando al reporte de síntomas como ronquera, garganta seca y cansancio. Muchos profesores subestimaron el impacto de sus alteraciones vocales y descuidaron prácticas preventivas, como el calentamiento y enfriamiento vocal. El análisis de la calidad de vida relacionada con la voz y la detección de trastornos vocales revelaron el impacto del ruido en el uso de la voz en el aula, especialmente en mujeres, con repercusiones en el proceso de enseñanza-aprendizaje.

Palabras claves: Monitoreo del Ruido; Voz; Docentes; Salud Laboral.

Introduction

As the principal occupational tool for teachers, voice quality is a key factor in students' academic, cultural, and social development. Despite its importance, the confluence of high vocal demands, challenging working conditions, and a limited awareness of vocal health places teachers at an elevated risk for developing vocal problems [1]. Consequently, the sustained use of voice without proper strategies can compromise not only their physical health but also their quality of life and professional efficacy.

As a result of their daily activities, teachers often struggle to perceive the impact of vocal overload, which can lead to alterations in socio-emotional domains such as stress and anxiety [2,3].

Teachers constitute a professional group at elevated risk for vocal disorders, a vulnerability attributed to intensive voice use compounded by factors like age, gender, and health conditions (including adverse lifestyle habits, allergies, and respiratory issues). The onset of dysphonia significantly impairs quality of life, with repercussions across communicative, physical, emotional, and social domains. These vocal impairments can also erode self-esteem, inducing feelings of insecurity that negatively impact on the teacher's professional trajectory and interpersonal relationships .

Environmental factors, such as temperature and noise, also constitute an occupational risk to the voice. In academic environments, these factors can compromise the teaching and learning process due to deficient acoustic characteristics that impair teachers' vocal endurance. The Brazilian standard NBR 10.152 specifies noise levels for acoustic comfort in various settings, including classrooms and learning spaces. For libraries, music rooms, or drawing rooms, the recommended noise level ranges from 35 to 45 dBA. Classrooms and laboratories should have levels between 40 and 50 dBA, and circulation areas between 45 and 55 dBA [5].

Studies in university environment indicate that noise levels in classrooms and circulation areas exceed recommended standards. Both teachers and students report that noise interferes with classroom activities, though this perception is more pronounced among teachers [6]. Excessive noise in the learning environment contributes to cognitive deficits in students and increases the occupational burden for educators [7]. When compounded by high workloads and limited breaks, symptoms such as hoarseness, vocal fatigue, vocal strain, globus sensation, coughing, and decreased voice volume are frequently reported among teachers [8,9].

Teachers' vocal self-perception is a critical factor, as research indicates that a failure to fully recognize the impact of vocal changes often leads to a reliance on emotional coping mechanisms. This is exemplified in a study of teachers from 77 schools; when compared to the general population, these educators not only scored higher on voice self-assessment protocols but also reported more performance-limiting vocal alterations and were more likely to utilize emotional strategies to manage their vocal issues [2].

The aim of this study was to assess the noise levels of a university campus, examine teachers' perception of noise, and characterize the impact of the acoustic environment on their voices during teaching activities.

Method

This was a descriptive cross-sectional study, approved by the Research Ethics Committee of the Faculty of Health Sciences and Technologies under Report No. 6,438,418 and CAAE No. 74323923.5.0000.8093. The sample was stratified and included teachers who were invited via email from the department websites. Those who accepted electronically signed the Free and Informed Consent Form, thereby consenting to their participation and the use of their voices for this study.

The inclusion criterion was individual interest, with no data excluded from teachers who did not participate in all stages of the study.

The data was collected in four stages. The first stage involved determining the sound pressure levels (SPL) in the buildings of a public university campus: the Teaching and Research Unit (UEP, in Portuguese), the Academic Unit (UAC, in Portuguese), the Teaching and Faculty Unit (UED, in Portuguese), and the University Restaurant. A calibrated decibel meter (DEC 5010, Instrutherm) was used, positioned at the center of each space. To avoid measurement errors, external measurements were taken at a height of 120 cm from the ground and two meters away from walls or fences. Internal measurements respected a minimum distance of one meter from sound-reflecting surfaces. Each measurement lasted five continuous minutes, using

the "A" weighting circuit and slow response, in accordance with standards NBR 10.151 [10] and NBR 10.152 [5]. Measurements were conducted during the academic holiday period to establish a baseline for environmental noise. During the academic semester, measurements were taken on various days and at different times to cover all activities on campus. For this study, due to its characteristics, we considered the SPL obtained in the UAC, which is the building where the classrooms are located.

Emails were sent to the teachers. Upon signing the informed consent form, they gained access to three protocols:

Sample Questionnaire: Developed by the research group, this 14-question questionnaire covered identifying data, vocal, respiratory, and general health complaints and history, as well as habits and medications used.

Vocal Activity and Participation Profile (VAPP) [11]: This tool allows for a detailed analysis of the impact of vocal complaints on an individual's daily activities and their social and professional performance. It provides two subscales: the Activity Limitation Score (ALS), which assesses the difficulty in performing daily activities that require voice use, and the Participation Restriction Score (PRS), which examines the impact of vocal limitations on social and professional interactions. The cutoff scores for teachers are 14.6 points for the total score, 1.65 points for the ALS, and 1.35 points for the PRS [12].

Screening Index for Voice Disorder (SIVD) [13]: This index consists of 12 vocal symptoms presented on a four-point Likert scale. The final score, ranging from zero to 12, is obtained by summing the points. The predictive cutoff value for a likely voice disorder is 5 points.

After the analysis of the information obtained, all participants were consulted about their interest in answering the Noise Questionnaire for Teachers [14]. This questionnaire, with 25 questions, investigated the predominant noise sources in the classroom, the discomfort caused by external noise sources to the Unit, situations that cause greater interference in the classroom, the classroom activities most affected by noise, and the perception of how noise influences the teacher's health. The responses were assigned on a four-point Likert scale (not at all = 0, a little = 1, moderately = 2, a lot = 3).

Teachers were invited to have their voices recorded during regular teaching activities in the classroom to determine their vocal intensity [10]. Their voices were recorded with a portable recorder (H1n Handy Recorder, 2018 model, Zoom), placed at desk height in three different locations: the front, center, and back of the classroom. The researchers explained the purpose and procedure of the recording to the participants beforehand. Teachers were instructed to continue their class without interruption, and students were asked to be quiet when the recording began, to capture the teacher's voice with as little competing noise as possible. The samples were up to one minute long and were analyzed with PRAAT software (Boersma, Wernink, Amsterdam/NL) to determine vocal intensity, with the beginning and end of the recording discarded.

Noise measurements between the academic semester and holiday periods were compared using an unpaired Student's t-test, and the teachers' vocal intensity measurements were compared using a paired Student's t-test, both with a 95% significance level.

Results

The maximum recorded noise level was 66.56 dB, while the equivalent continuous sound level (Leq) was 55.71 dB; this difference was not statistically significant (p=0.374). Within the UAC, noise levels during the academic semester were 64.9 dBA (Max) and 54.0 dBA (Leq), compared to 60.9 dBA (Max) and 53.9 dBA (Leq) during the academic vacation period.

Twenty-four professors (17 women and 7 men), with a mean age of 48.04±8.02 years, completed the Sample Questionnaire, VAPP, and SIVD protocols. All participants were from the Health Sciences field, affiliated with the Departments of Biological and Health Bases, Nursing, Pharmacy, Physiotherapy, Speech-Language Pathology, and Public Health.

Of the participants, 17 (12 women and 5 men) stated they did not use their voice for professional activities other than teaching. Regarding hearing, 18 participants (15 women and 3 men) self-reported as having good auditory acuity, yet only 8 of them (5 women and 3 men) had undergone an audiometric examination. Furthermore, 4 female participants reported work absenteeism due to vocal fatigue or noise-induced vocal issues. No participant reported practicing vocal cool-downs, while only 2 female

participants engaged in vocal warm-ups for a duration of 5 to 10 minutes.

The mean total score on the VAPP for the assessed group was 28.3 points, which is above the cut-off score for teachers. The highest perceived impact was in the Daily Communication domain (9.8 points), and the lowest was in the Social Communication domain (2.8 points). When broken down by sex, 10 women (mean score of 56 points) and 3 men (mean score of 27 points) had a total score above the protocol's cut-off. In all domains, women presented higher mean scores than men (Figure 1).

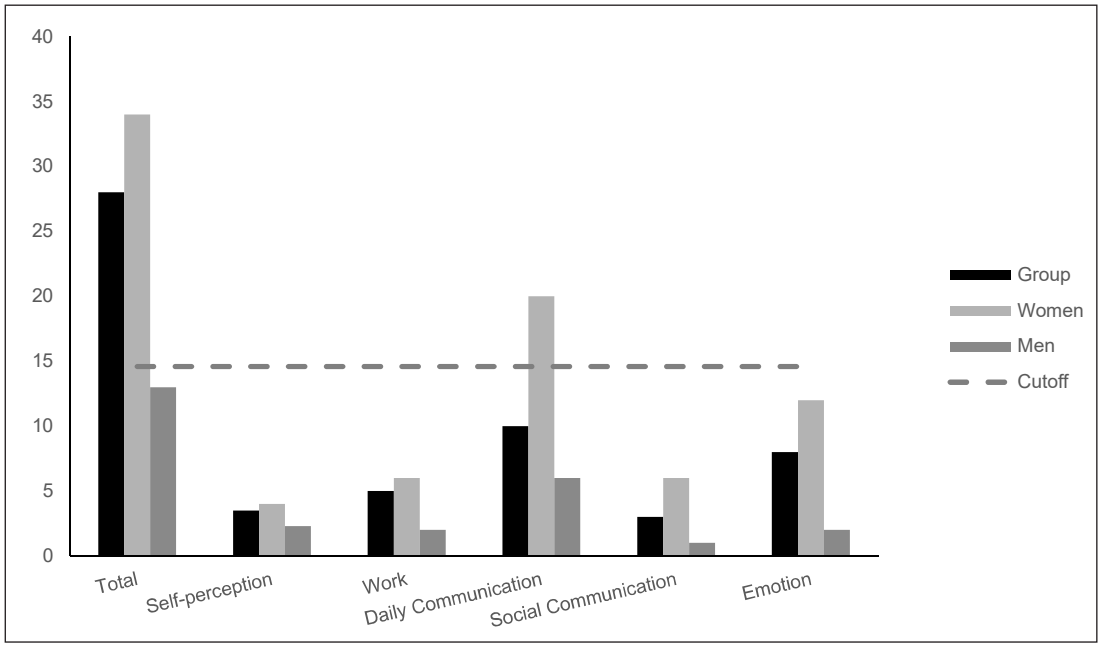

Figure 1. Mean scores on the Voice Activity and Participation Profile (VAPP) and its domains, presented for the Group, Women, and Man participants (n=24) of this study.

For the evaluated group, the mean total scores on the ALS and PRS were 10.7 and 6.5, respectively, both of which are above the cut-off values for teachers. A gender-based analysis revealed that the ALS cut-off was surpassed by 12 women, whose mean score was 18.0, and by 5 men, whose mean score was 8.0. Similarly, the PRS cut-off was exceeded by 6 women (mean score of 22.0) and 4 men (mean score of 5.0) (Figure 2).

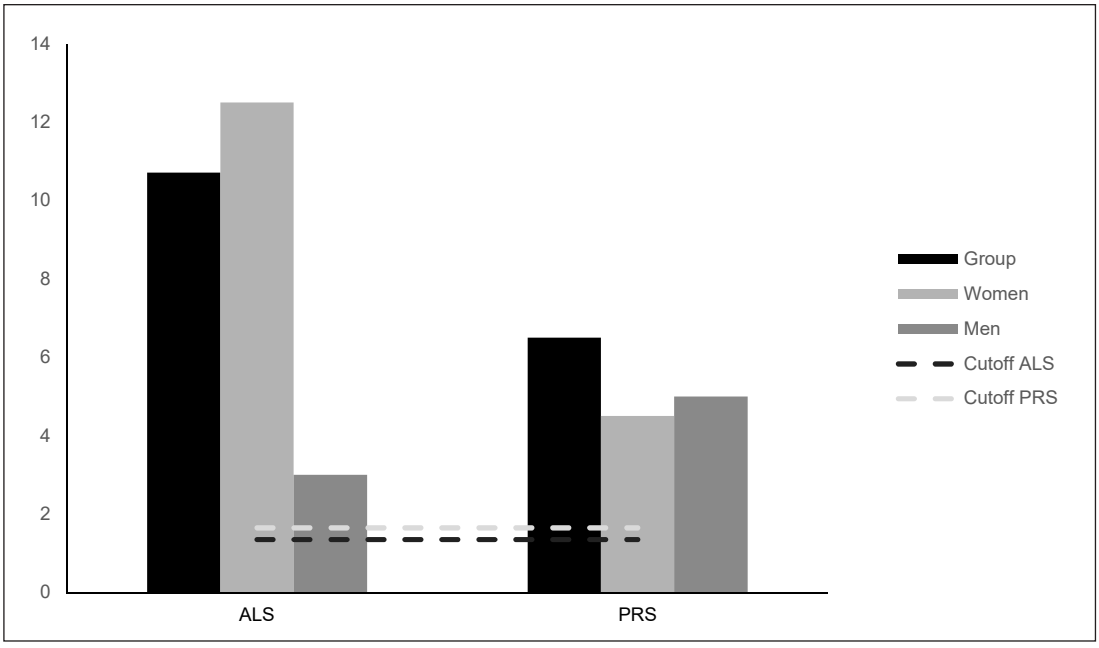

Figure 2. Mean scores for the Activity Limitation (ALS) and Participation Restriction (PRS) subscales, presented for the Group, Women, and Man participants (n=24) of this study.

The mean SIVD score was 3.41. Scores of 5 or higher were recorded for 4 female and 2 male participants, indicating a potential need for medical and/or speech-language pathology assessment. The most cited vocal symptoms were throat clearing, dry throat, and vocal fatigue.

After the initial phase, the Noise Questionnaire was completed by 19 professors (13 female and 6 male), aged 48.7±8.7 years. These data are shown in Table 1, where the values express the median responses.

Table 1. Perception of noise and its effects on teaching activities for the Group, Women, and Men participants of this study.

DOMAINS AND PARAMETERS	GROUP (N=19)	WOMEN (N=13)	MEN (N=6)
DOMAIN: Predominant noises in the classroom			
Students from other classrooms	3	3	2
Students in the classroom	2	2	1
Neighboring classroom teacher's voice	2	1	2.5
Conversations in the corridor	3	3	2.5
Conversations in the courtyard	2	2	2.5
Foot traffic in the corridor	2	2	1
Audio equipment used in neighboring classrooms	1	1	1
DOMAIN: Disturbance caused by noises external to the building			
Horns, alarms, ambulances, police sirens, etc.	1	1	1
Cars, motorcycles, trucks, etc.	1	1	1
Aircraft	1	1	1
Construction	1	1	1
DOMAIN: Situations causing the greatest interference in the classroom			
Noise from students inside the classroom	2	2	1
Noise from neighboring classrooms, the corridor, and the courtyard	3	3	2
Noise from sources external to the building (e.g., vehicles, neighbors, renovations)	1	1	1.5
DOMAIN: Classroom activities most affected by noise			
Teacher's lecture	3	3	2
Students' individual reading	2	2	1
Students' concentration during exams	3	3	3
Students' comprehension of class content	2	3	2
Students' academic performance	2	2	2
DOMAIN: Effects of noise			
During and at the end of classes	3	3	2
Headaches	1	1	0.5
Irritability	2	2	1
Physical fatigue	3	3	2
Tinnitus	0	0	0.5
Vocal fatigue	2	2	2.5

Legend: 4-point scale (0 = Not at all; 1 = A little; 2 = Moderately; 3 = Very much)

In the subsequent phase of the study, 5 professors (2 female, 3 male), with a mean age of 54.0±7.0 years, agreed to voice recordings during their lectures. The results indicate that the mean voice intensity increased from 66.00±2.11 dB at the start of the lecture to 69.20±1.56 dB at its conclusion. Regarding location, the mean recorded intensity was 68.2±8.8 dBA at the front of the room, 64.0±5.9 dBA in the center, and 65.8±8.5 dBA at the back. The difference in intensity between the beginning and end of the lecture was statistically significant (p=0.04), as was the result for the back of the room (p=0.00), with absolute differences of 3.2 dB and 4.2 dB, respectively.

Discussion

This study was conducted at the request of campus professors and administrators, whose primary complaint concerned excessive noise and its interference with voice use during teaching activities. Interestingly, when the study was proposed, participation was reduced. Furthermore, a reduction in the sample size was observed throughout the stages of the study, which limits the interpretation of the results to this specific sample. The aim of the present study was not to assess voice quality. From an ecological perspective, professors were not fitted with individual microphones for the recording, given the need to evaluate voice perception from

the different positions that students occupy in the classroom and the consequent impact of distance on vocal intensity.

The academic environment, beyond serving as a space for intellectual activities of teaching and learning, also constitutes the workplace for education professionals. NBR 10.152 standard [5] recommends sound levels between 35 and 55 dBA for the execution of activities in educational environment. Data obtained from noise measurements at the UAC, a building housing classrooms and practical laboratories on the university campus, exceed the recommended levels and indicate that noise levels are comparable during both the academic term and student holiday periods.

The acoustic environment of the campus is suboptimal for educational activities, and environmental noise acts as a potential stressor, negatively impacting both the physical and mental health of exposed individuals. This necessitates increased vocal effort to overcome the noise, a challenge particularly for teachers. Even when pedestrian traffic is reduced, noise levels remain elevated, which can compromise the quality of teaching [15].

Perceived environmental noise further impairs student learning due to the generation of distractors and heightened irritability. In environments where activities demand high levels of concentration and cognition, such as classrooms, the tolerable noise limit is up to 65 dBA, and per national standards, up to 55 dBA in circulation areas [10,16]. Consequently, noise diminishes the learning potential of students by causing attention and concentration deficits, leading to significant consequences for academic performance, including reduced assimilation of taught content, irritability, and physical ailments [6,17,18].

In a study comparing the proportion of women and men across different fields - humanities and social sciences, arts, and medicine - a greater prevalence of women was observed [19], a finding consistent with the sample in this study. The predominance of females among health sciences faculty in higher education aligns with a trend observed in national data. The 2023 Higher Education Census reports that women constitute most graduates in teaching, health, and well-being programs [20], which naturally influences the demographic composition of the faculty in these areas.

The sample consisted of full-time professors from a public university, which may explain why the majority do not report using their voice for professional activities other than teaching. Among the study participants, 70.8% stated they do not use their voice in activities beyond teaching. This suggests that, for many, vocal use is confined to the classroom, potentially increasing vocal strain due to continuous use without dynamic variation or vocal adjustments. This lack of diversification in vocal use may contribute to fatigue and the risk of vocal disorders among professors [1].

Auditory complaints can compromise vocal quality, stemming from a lack of monitoring the voice across its various aspects. Regarding audition, 75% (15 women and 3 men) of the participants reported good hearing. However, only 41.7% (5 women and 3 men) had undergone audiometry, suggesting a lack of regular auditory health monitoring. Audiometric evaluation is a crucial step for identifying potential hearing impairments, especially in noisy environments such as classrooms. Neglecting auditory health can impair vocal self-perception, leading to further vocal abuse and misuse. Scant attention has been paid to professors exposed to classroom noise, yet studies indicate that these professionals report hearing loss, vestibular alterations, tinnitus, and extra-auditory symptoms [15,21].

Vocal fatigue was a significant concern among participants. Although leaves of absence for issues related to voice or environmental noise were reported exclusively by women, men also highlighted vocal fatigue as a "consequence" of noise in the academic setting when responding to the Noise Questionnaire. This response underscores the vocal overload experienced by professors, causing them to suffer the effects of excessive effort. It is, therefore, a condition that can adversely affect not only health but also work quality [4,22,23].

Previous studies indicate that professors frequently underestimate their own vocal fatigue, whereas professional evaluations detect clear signs of vocal overload. Furthermore, targeted vocal interventions can help mitigate this impact by promoting more efficient and healthier vocal use [4,24].

The disparity between the teachers' self-perception of their voice and clinical assessments suggests that many may not recognize the early signs of vocal overload, thereby delaying the adoption of preventive measures. The high prevalence of vocal disorders among teachers, as evidenced by systematic reviews, underscores the necessity of preventive and rehabilitative actions. Factors

such as vocal tract discomfort, excessive effort, and prolonged noise exposure significantly increase the risk of vocal fatigue. This suggests that interventions such as vocal training and environmental adjustments could reduce the incidence of these problems [25].

Vocal fatigue may manifest as increased phonatory effort and is a prevalent symptom among professors [23]. It could be minimized through both vocal training and the implementation of vocal warm-up and cool-down routines. Despite being well-known among various voice professionals, vocal warm-up and cool-down practices are either not performed frequently or are executed improperly. Recognized as fundamental, these practices are implicated in vocal longevity and the prevention of injuries arising from inadequate vocal behavior [26]. In this study, only 8.3% of participants, who were also women, adopted vocal warm-ups, with no mention of cool-down practices. Vocal warm-ups are critical for preparing the voice for intensive use, but the absence of cool-downs may elevate the risk of vocal injury, as many professors without vocal training maintain an unnecessarily high voice intensity, irrespective of ambient noise [26-28].

The VAPP protocol is a widely utilized instrument for assessing how vocal disorders affect various domains of daily life. It measures the severity and frequency of vocal symptoms, offering a comprehensive overview of their impact on daily communication, emotions, work, and social life. Its significance lies in its capacity to quantify the impact of vocal disorders, thereby facilitating the identification of specific areas requiring intervention. Additionally, it aids in monitoring treatment efficacy and evaluating patients' quality of life [11].

Analysis of voice-related quality of life using the VAPP revealed that the mean total score (28.3 points) was above the protocol's recommended cut-off (14.6 points). The most affected domain was Daily Communication, with a mean score of 9.8 points, while the least affected, interestingly, was Social Communication (2.6 points). Women reported a greater impact than men, reflected in higher mean scores across all domains. When the ALS and PRS subscales were assessed (10.7 and 6.5 points, respectively), scores for both women and men were above the respective cut-off points for teachers [12].

Effective teaching communication must be clear and thus requires adequate vocal quality. Working conditions - compounded by a lack of vocal knowledge, the presence of competitive noise, and inadequate room acoustics - may be associated with the perception of a vocal handicap, fostering the emergence of vocal symptoms and alterations. Beyond environmental factors, emotional stress can heighten laryngeal muscle tension, leading to a perception of vocal effort during professional activities and facilitating the onset of voice problems (4,28).

The diagnosis of a voice disorder entails a series of specific procedures, including a medical diagnosis and a vocal quality assessment, which must be performed by qualified professionals. Not all professors with voice-related symptoms report complaints or seek professional help, as these symptoms are often perceived as an inherent consequence of the profession. Therefore, periodic screenings in schools and other workplaces are recommended for early detection and appropriate treatment of potential voice disorders [13].

In the studied sample, the need for a voice disorder evaluation, as identified by the SIVD, was indicated for four women and two men whose scores surpassed the protocol's proposed cut-off. The most frequently cited vocal signs were throat clearing, dry throat, and fatigue while speaking, which corroborates data from the Noise Questionnaire, wherein participants identified perceived vocal fatigue/tiredness as an influence of noise. Notably, participants who reached the SIVD cut-off also exhibited elevated scores on the VAPP.

Nineteen professors (13 women and 6 men, mean age 48.7±8.7 years) completed the Noise Questionnaire. In their domain assessments, the greatest impact ("very much") reported was that the predominant classroom noises originate from "students in other classrooms" and "conversations in the corridor". Noise from "other classrooms, the corridor, and the courtyard" was found to interfere with teaching activities, affecting "lectures" and "students' concentration during examinations". Beyond its interference with academic activities, noise was reported to influence the "progress and conclusion of classes" and to generate "physical tiredness/fatigue".

Female professors demonstrated greater sensitivity to the interference of noise on their activities and health. The World Health Organization identifies noise as the second largest environmental stressor from a public health standpoint, affecting health from both physical and psychological

perspectives. Multiple studies suggest that noise can disrupt cellular homeostasis in the auditory, immune, cardiovascular, and nervous systems, and contribute to sleep disturbances [15,21].

The response to noise is individual; however, within the educational context, it can impair the perception and comprehension of the professor's voice. The voice may be detected, but due to a loss of intelligibility, it fails to effectively transmit its message. For effective classroom communication, the signal-to-noise ratio must be maintained at 15 dB. This would theoretically grant all students complete auditory access to the presented content [29]. Excessive competitive noise, exceeding levels suggested by standards as measured in the campus classrooms in question, demands auditory skills such as figure-ground discrimination, auditory closure, and both directed and divided auditory attention. Therefore, adopting measures to reduce noise in academic spaces is essential to ensure that professors can perform their duties more efficiently and, in an environment, more suitable for teaching [7,17,18].

Five professors (3 men and 2 women, mean age 54.0±7.0 years) consented to have their voices recorded during teaching activities. An increment of 3.2 dBA was observed in the mean intensity of the professors' voices. Voice intensity is naturally higher at the "front of the room", while, perhaps due to acoustic conditions, intensities in the "middle" and "back of the room" are equivalent.

Professors adjust their voices in response to environmental demands to ensure all students, particularly those seated farther away, can hear them adequately, as well as to maintain student attention and classroom control. For a professor's speech to be intelligible in a room with noise levels around 45 dB, the professor would need to project their voice at approximately 65 dBA and, by adjusting produce a stronger voice without shouting, could reach up to 75 dBA (29). These vocal adjustments, when made without proper training or technical guidance, though necessary, can exceed controlled limits and result in vocal abuse. This overloads the phonatory system and consequently leads to vocal effort, a prevalent symptom among professors, which can generate difficulties in the phonation process, trigger stress, increase laryngeal muscle tension, and heighten its perception during teaching, thereby facilitating the emergence of voice problems [4,23,30].

The perception among many professors that voice problems are an inevitable consequence of their profession may explain their reluctance to participate in preventive evaluations and treatments. The prevalence of voice disorders among teachers can be as high as 60% [4,13,16,24]. This reinforces the complex relationship between the acoustic environment of classrooms and the vocal health of professors. The increase in vocal intensity throughout a class, influenced by environmental noise, demonstrates the need for constant vocal adaptation, which can lead to vocal fatigue and the long-term development of vocal disorders.

It is essential that institutional policies be implemented to minimize the impacts of noise on the voices of professors, such as improving the acoustic conditions of classrooms and promoting vocal training programs. Short-term vocal training programs have already demonstrated significant benefits in vocal quality and resistance to vocal effort among teachers and other voice professionals [4,26].

Strategies such as vocal education, stress management, and ergonomic adaptations can contribute to the preservation of vocal health and the well-being of these professionals. This study reinforces the importance of future investigations that further explore the relationship between noise exposure, vocal adaptation, and the impact on the health of professors. Understanding these mechanisms is fundamental to developing effective prevention and intervention strategies, ensuring better working conditions and quality of life for professors.

Conclusion

Environmental noise on the university campus exceeds recommended levels and is perceived by the professors, who acknowledge its impact on their voice and on the teaching-learning process.

Professors adapt their voices to classroom demands to compete with environmental noise, aiming to be heard and to maintain student attention. This adaptation appears to generate vocal strain and contributes to the emergence of vocal symptoms associated with vocal abuse. Overall, professors seem to disregard the signs and symptoms of vocal strain, despite recognizing the impact of noise in the educational environment on their vocal use. This awareness, however, does not compel them to adopt vocal self-preservation strategies, such as the

implementation of vocal warm-up and cool-down sequences or the audiological monitoring of their own hearing.

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