




# Teachers' perception of the impact of noise in the school environment

## Percepção de professores quanto ao impacto do ruído no ambiente escolar

## Percepción del docente sobre el impacto del ruido en el entorno escolar

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### Abstract

**Introduction:** noise pollution is present at school; therefore, it is important to know the sources of noise, the impact on the teacher's health and on teaching. **Purpose:** to evaluate the perception of elementary school teachers regarding the impact of noise in the school environment, as well as their vocal symptoms. **Method:** observational, descriptive, analytical, cross-sectional study. An inventory was applied, in which 26 teachers from the municipal network of the city of Santo Amaro da Imperatriz, (SC). participated. A questionnaire was applied with questions related to age, gender, working time, daily workload, impact and perception of noise in the school environment. The Voice Disorders Screening Index was used, a screening to identify risk for voice disorders in teachers. For the analysis of the association of results, the chi-square test was used, with a significance level of 5%. **Results:** 53.57% of the teachers answered that there is excessive noise in the school and 57.14% consider that the noise inside the room harms the activities. The most disturbing external and internal sources of noise are courtyard, corridor, parallel conversations and fan. As for the reported vocal symptoms, the following stand out: dry throat, tiredness when speaking, throat clearing and hoarseness. Full-time teachers complained more about throat clearing. **Conclusion:** the subjects have the perception that the school environment is excessively noisy and causes damage to the development of activities. The participants have few voice-related complaints, the most

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#### Authors' contributions:

MSG: participated in the design of the study and methodology and was responsible for data collection and writing the article. ACAMG: was responsible for co-advising the study and participated in the critical review, writing, and final review of the article. RCS: participated in the design of the study and methodology and was responsible for advising on the study and for the critical review, writing, and final review of the article.

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frequent being dry throat. In addition, teachers who teach full-time had significantly more complaints of throat clearing.

**Keywords:** Noise; Learning; Faculty; Voice.

### Resumo

**Introdução:** a poluição sonora está presente na escola, sendo assim, é importante conhecer as fontes de ruído, o impacto na saúde do professor e no ensino. **Objetivo:** avaliar a percepção de professores do ensino fundamental I quanto ao impacto do ruído no ambiente escolar, bem como seus sintomas vocais. **Método:** estudo observacional, descritivo, analítico, transversal. Aplicou-se inventário, do qual participaram 26 professoras da rede municipal da cidade de Santo Amaro da Imperatriz, SC. Aplicou-se um questionário com questões referentes à idade, sexo, tempo de trabalho, carga horária diária, impacto e percepção do ruído no ambiente escolar. Utilizou-se o Índice de Triagem para Distúrbios da Voz, uma triagem para identificação de risco para distúrbio de voz em professores. Para a análise de associação dos resultados foi utilizado o teste de Qui Quadrado, com nível de significância de 5%. **Resultados:** 53,57% das professoras responderam que há excesso de ruído na escola e 57,14% consideram que o ruído dentro da sala prejudica as atividades. As fontes externas e internas de ruído que mais atrapalham são: pátio, corredor, conversas paralelas e ventilador. Quanto aos sintomas vocais referidos, destacaram-se: garganta seca, cansaço ao falar, pigarro e rouquidão. Professoras que lecionam em período integral apresentaram mais queixas para o pigarro. **Conclusão:** os sujeitos têm a percepção de que o ambiente escolar é excessivamente ruidoso e causa prejuízos no desenvolvimento das atividades. As participantes têm poucas queixas relacionadas à voz, sendo a mais frequente, garganta seca. Além disso, professoras que lecionam em período integral apresentaram, significativamente, mais queixas de pigarro.

**Palavras-chave:** Ruído; Aprendizagem; Docentes; Voz.

### Resumen

**Introducción:** la contaminación acústica está presente en la escuela, entonces es importante conocer las fuentes del ruido, el impacto en la salud del docente y en la enseñanza. **Propósito:** evaluar la percepción de docentes sobre el impacto del ruido en el ambiente escolar, así como sus síntomas vocales. **Método:** estudio observacional, descriptivo, analítico, transversal. Se aplicó un inventario, en el que participaron 26 docentes de la red municipal de la ciudad de Santo Amaro da Imperatriz, (SC). con preguntas relacionadas con edad, género, tiempo de trabajo, carga diaria de trabajo, impacto y percepción del ruido en el ambiente escolar. Se utilizó el Índice de Detección de Trastornos de la Voz para identificar el riesgo de trastornos de la voz. Para el análisis de asociación se utilizó la prueba de chi-cuadrado, con un nivel de significación del 5%. **Resultados:** 53,57% respondió que en la escuela hay exceso de ruido y 57,14% consideram que el ruido dentro del salón perjudica las actividades. Las fuentes de ruido más molestas son: patio, pasillo, conversaciones paralelas y ventilador. En cuanto a los síntomas vocales reportados destacan sequedad de garganta, cansancio al hablar, carraspeo y ronquera. Los maestros de tiempo completo se quejaron más de carraspear. **Conclusión:** los sujetos tienen la percepción de que el ambiente escolar es excesivamente ruidoso y provoca perjuicios para el desarrollo de las actividades. Los participantes tienen pocas quejas relacionadas con la voz, siendo la garganta seca la más frecuente. Además, los maestros que enseñan a tiempo completo tenían muchas más quejas de carraspeo.

**Palabras clave:** Ruido; Aprendizaje; Docentes; Voz.

## Introduction

According to the World Health Organization (WHO), noise pollution is a public health issue, surpassing water pollution and second only to air pollution. It ranks second among the leading causes of disease. High levels of noise may cause damage to health, including discomfort, sleep disorders, cardiovascular diseases, or cognitive impairments.<sup>1</sup>

Currently, it is observed that noise pollution is also present in the school environment.<sup>2</sup> The *Associação Brasileira de Normas Técnicas* (ABNT, Brazilian Association of Technical Standards)<sup>3</sup> considers acceptable in classrooms an ambient noise of 50 dBA. However, Brazilian studies have been conducted in which the mean values for these environments ranged from 63.8 dBA to 76.6 dBA.<sup>4,5</sup> Most such studies found high values considering the WHO and ABNT standards, which recommend that sound levels within classrooms not exceed the equivalent continuous sound levels (LAeq) of 50 dBA and 35 dBA, respectively.<sup>3,6</sup>

There are several sound sources external to classrooms that are generators of noise in the school environment, with the cafeteria, schoolyard, and leisure areas standing out for contributing to increasing the noise inside classrooms. Inside classrooms, there are noises from the fan, dragging desks, voices of students and teachers, and air conditioning, among others.<sup>7</sup>

High noise levels impair verbal communication and require a more significant vocal effort from people to be understood. In an elementary school classroom, this is prejudicial since the loss of speech intelligibility may generate distractions, thus hampering student school performance.<sup>8</sup>

This problem becomes even more severe when considering that children with hearing loss who wear Personal Sound Amplification Devices (PSAPs) or Cochlear Implants (CIs) have difficulty understanding speech amid the noise resulting from the injury.<sup>9</sup> Thus, the difficulty will be even more significant within the school environment considering that the signal-to-noise ratio (SNR) required for a child with hearing difficulties is at least +15 dB, while a child with no hearing loss needs an SNR at least greater than +10 dB.<sup>10</sup>

Since students with learning disorders have more difficulty concentrating, learning complaints may aggravate because of the worsening of the signal-to-noise ratio due to the increase in noise

intensity inside classrooms, with its interference generating a loss of concentration and attention, possibly hampering school performance even further.<sup>11</sup>

Another aspect to be considered regarding the deleterious effect of noise in the school environment is related to the health of teachers, given that teaching in a classroom with inadequate acoustics requires one to raise their voice, possibly leading to functional and organofunctional dysphonia. Dysphonia is one of the leading causes of leave due to health problems among teachers and the most significant cause of absenteeism at work in this profession.<sup>12</sup>

Considering the negative impact that noise may have on the school environment, it is important to study more deeply the knowledge of teachers about what are the primary sources of noise in this environment, how much it can affect their health in general, and the damage it may bring to the teaching-learning process. A well-informed teacher may become aware of the need to reduce noise inside and outside the classroom for the sake of teaching, their health, their general well-being, and their role as a multiplier of knowledge, collaborating to change the behavior of teachers and students, in addition to assisting the administrative sphere of educational institutions in improving the school environment.

Based on the above, this study aimed to evaluate the perception of elementary school teachers from Santo Amaro da Imperatriz, Santa Catarina (SC), Brazil, regarding the impact of noise in the school environment and assess their vocal symptoms.

## Method

This observational, descriptive, analytical, cross-sectional study was conducted by applying a survey.

The research project was analyzed and approved by the Research Ethics Committee of the Federal University of Santa Catarina (UFSC) under number 2.245.982. Before answering the questionnaire, all participants were informed of the objectives of the research and having agreed to participate, read and signed the Informed Consent Form. The study was conducted with all elementary school teachers of the municipal network of Santo Amaro da Imperatriz, a municipality in the

metropolitan area of Florianópolis, SC, Brazil. Thus, 26 teachers who worked in the five elementary schools of the municipality participated. The largest school served 718 students, and the smallest had 215 students. The research was conducted as authorized by the City Hall through the Municipal Department of Education.

The inclusion criteria established for participation in the research were being an elementary school teacher in effective practice, having been born in Brazil, and being 18 to 54 years old. Physical education and music teachers were excluded from the study due to the dynamics of their classes and different acoustic environments, as well as teachers in functional rehabilitation and with self-reported diagnoses of hearing loss.

The following instruments were used for data collection:

- a) questionnaire with eight questions developed by the authors, composed of socio-demographic data on the teachers: age, gender, time on the job, work regime, work regime at their schools, classrooms in which they taught at their schools, breaks between classes, and number of students per class. This questionnaire was complemented by the following four closed-ended questions related to voice and the impact of noise: “Does frequently speaking loudly affect your voice?”; “Do loud sounds generated by the children bother you?”; “Do you remain calm even in the presence of intense sounds?”; “Are you tired and exhausted after work?”.
- b) questionnaire proposed by Costa and Durante<sup>13</sup>, composed of ten questions, nine closed and one open-ended, which address the following aspects: a survey of the knowledge of the teachers about the primary sources of noise internal and external to classrooms and the impact of noise on teacher health.
- c) Screening Index for Voice Disorders (SIVD), a screening to identify the risks of voice disorders developed and validated for use with teachers.<sup>14</sup> This instrument presents 12 vocal symptoms: hoarseness, voice loss, breaking voice, low-pitched voice, throat clearing, dry cough, cough with phlegm, pain when speaking, pain when swallowing, phlegm in the throat, dry throat,

and fatigue when speaking. The teachers were instructed to indicate the frequency with which they presented each symptom on a four-point Likert scale, on which each “never” or “rarely” answer was not scored (zero points) and each “often” or “always” answer received one point. Teachers who obtain five or more points on this instrument must be advised to seek a speech therapist and an otorhinolaryngologist for evaluation and diagnosis.

The sample was non-probabilistic, by convenience, and the questionnaires were handed over to the teachers and answered without the interference of the evaluator.

The data were organized in an Excel 2013 spreadsheet, tabulated, and submitted to descriptive and inferential statistical analysis using SPSS version 13.1 for Windows. In this research, associations were studied among the variables of age and work regime of the teachers and their time on the job, using their answers to the questionnaire questions related to the impact of noise in the school environment on their health. The Chi-Square test was used to analyze the association of the results. The significance level was set at 5% ( $p < 0.05$ ).

## Results

All 26 teachers who worked in elementary schools of the municipal network of Santo Amaro da Imperatriz, SC, participated in this study. The participants were aged 22 to 54 years, with a median age of 38. Two of the teachers worked in two schools where the research was conducted, so they answered one questionnaire for each school, thus totalizing 28 questionnaires distributed. Hence, they each answered two questionnaires, one for each school.

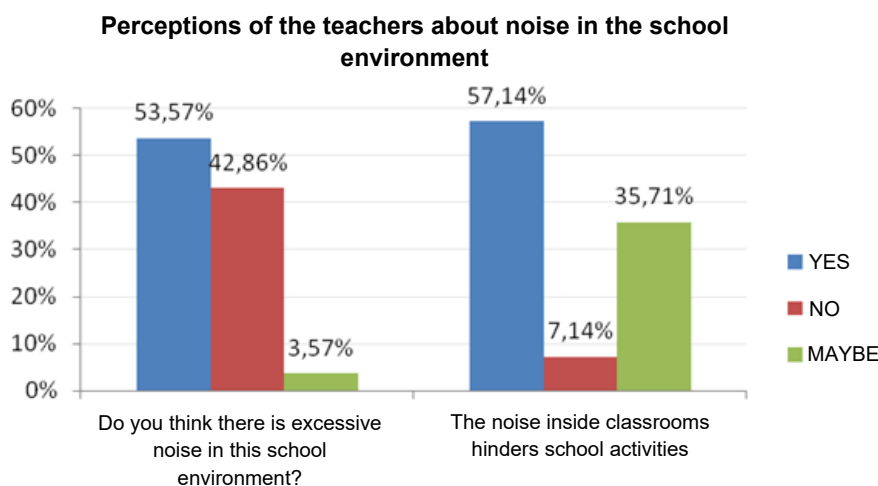
Regarding the time of the participants on the job, it ranged from two to 30 years, with a median of eight years. The observed number of students per classroom ranged from 15 to 30, averaging 21 (Table 1). Relative to their work regime, 20 teachers (71.43%) worked full-time, five (17.86%) only taught in the mornings, and three (10.71%) in the afternoons.

**Table 1.** Description of the measures of the variables of age of the teachers, time on the job, and number of students per class observed in the questionnaires answered by the elementary school teachers of the municipal network of Santo Amaro da Imperatriz (SC) (n = 28)

Variables	Mean	Standard Deviation	Median	Minimum	Maximum
Age (years)	37.25	10.28	38	22	54
Number of students per class	21.893	40	22	15	30
Time on the job (years)	11.607	8.5822	8	2	30

Regarding the presence of noise in the school environment, 15 teachers (53.57%) responded that there was excess noise in the school environment in which they taught, and 16 (57.14%) considered

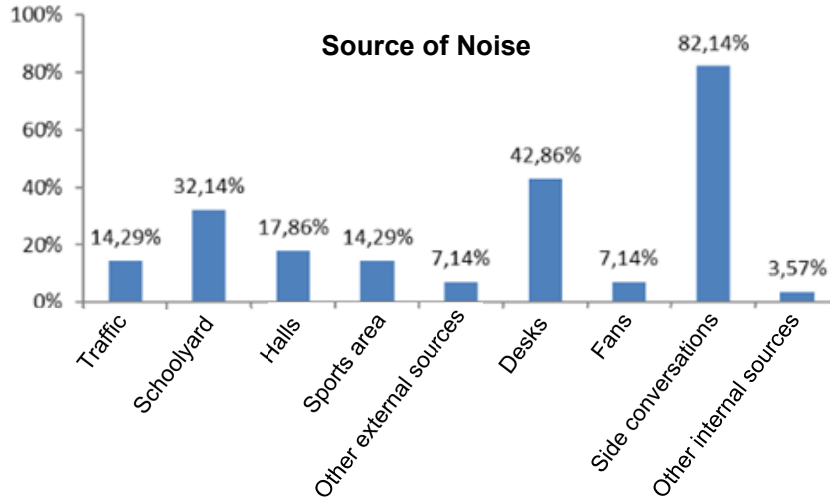
that noise inside classrooms harms school activities (Figure 1). As for the noise intensity, 53.57% of the teachers considered it moderate, 32.14% weak, and 14.29% strong.



**Figure 1.** Perception of elementary school teachers from the municipal network of Santo Amaro da Imperatriz (SC) of noise in the school environment (n = 28)

Regarding the external noise sources with the highest occurrence, nine teachers (32.14%) reported the noise coming from the schoolyards, and five (17.86%) the noise from the halls. As for

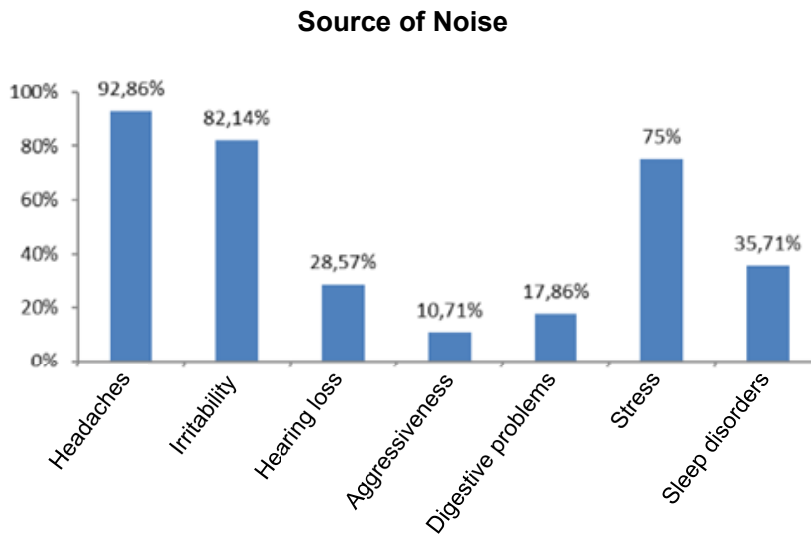
the internal noise sources, 23 teachers (82.14%) reported it was the noise coming from side conversations, and 12 (42.86%) the noise from the desks (Figure 2).



**Figure 2.** Sources of noise in classrooms reported by the elementary school teachers of the municipal network of Santo Amaro da Imperatriz (SC) (n = 28)

Of the participants, 22 teachers (78.57%) considered that excessive noise can harm health. When asked about the health problems they believed to be

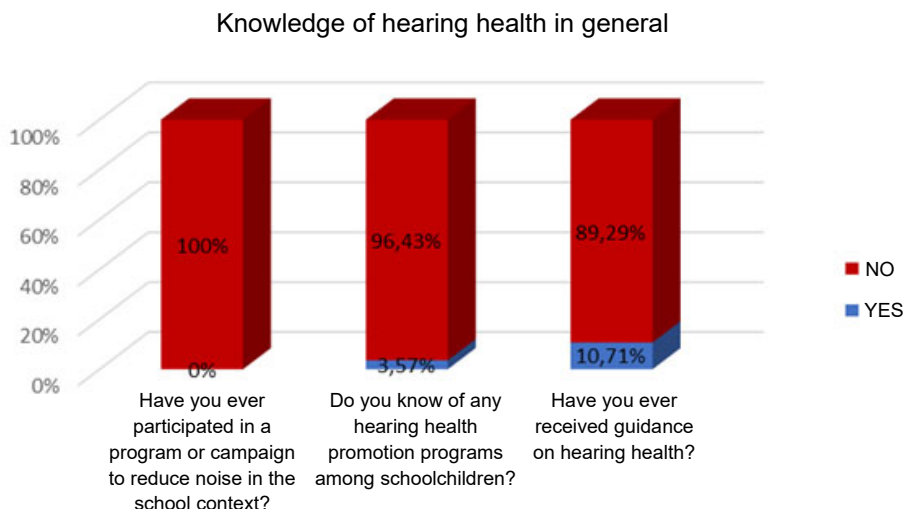
generated by noise, 26 teachers (92.86%) reported headaches, 23 (82.14%) irritability, and 21 (75%) stress (Figure 3).



**Figure 3.** Health problems that the elementary school teachers of the municipal network of Santo Amaro da Imperatriz (SC) believed to be generated by noise in the school environment (n = 28)

Regarding knowledge about hearing health programs in general (Figure 4), no teacher had participated in a project or campaign to reduce noise in the school context. When asked if they

knew of any hearing health promotion programs among schoolchildren, only one teacher (3.57%) did. When asked if they received guidance on hearing health, three (10.71%) answered yes.



**Figure 4.** Questions related to the knowledge of hearing health in general asked to the elementary school teachers of the municipal network of Santo Amaro da Imperatriz (SC) (n = 28)

Regarding what may be done to reduce noise in classrooms, 20 teachers (71.42%) presented the following solutions: dialoguing and raising awareness among students; keeping doors and windows closed; turning fans off; organizing breaks and physical education classes; conducting campaigns on noise pollution; and reducing the flow of students in the halls.

In this study, the Chi-Square test did not reveal significant associations (Table 2). To carry out the associations, regarding age, the teachers were divided into two groups considering the period in which the maximum vocal efficiency is reached (18); regarding their time on the job, the group of teachers was divided considering the median (years) obtained in this study, i.e., eight years.



**Table 2.** Association of the results of the questionnaire regarding the voice and impact of noise with the variables of age, work regime, and time on the job (years) of elementary school teachers of the municipal network of Santo Amaro da Imperatriz (SC) (n = 28)

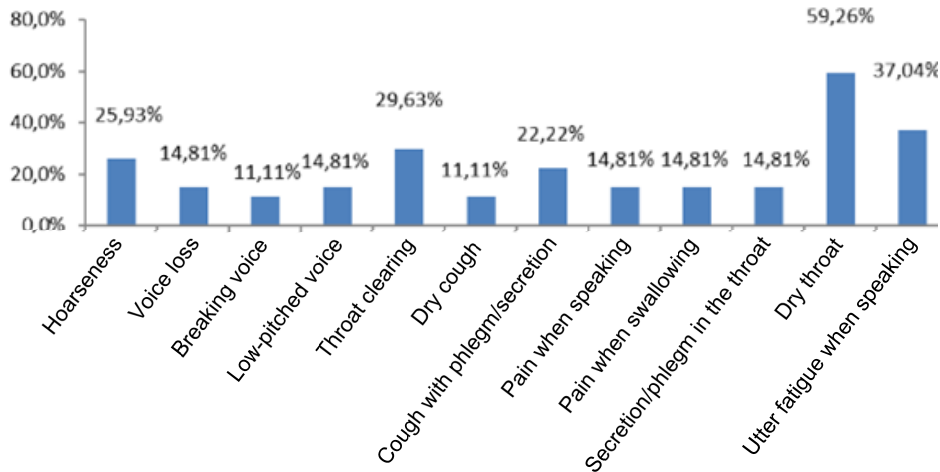
	Age (years)					Work regime					Time they had been teaching (years)				
	Up to 44		45 or above		p-value	Part-time		Full-time		p-value	Up to 8 years		Over 8 years		p-value
	n	%	n	%		n	%	n	%		n	%	n	%	
Does frequently speaking loudly affect your voice?	8	28.57	5	10.71	0.137	3	10.71	10	35.71	0.431	7	25	6	21.42	0.638
Do loud sounds generated by the children bother you?	7	25	3	10.71	0.491	2	7.14	8	28.57	0.385	7	25	3	10.71	0.184
Do you remain calm even in the presence of intense sounds?	7	25	2	7.14	0.602	1	3.57	8	28.57	0.170	6	21.42	3	10.71	0.293
Are you tired and exhausted after work?	5	10.71	4	14.28	0.123	0	0	1	3.57	0.170	6	21.42	3	10.71	0.293

Caption: % = percentage, n = number  
 Statistical Test: Chi-Square Test, significance level  $p < 0.05$

Regarding the Screening Index for Voice Disorders (SIVD), the median total score was 2, with a minimum of 0 and a maximum of 12. Among the vocal complaints most frequently

reported by teachers, the following stood out: dry throat (59.26%), fatigue when speaking (37.04%), throat clearing (29.63%), and hoarseness (25.93%) (Figure 5).

**OCCURRENCE OF SIGNS AND SYMPTOMS OF THE SIVD**



**Figure 5.** Occurrence of signs and symptoms of the screening index for voice disorders (SIVD) of the elementary school teachers of the municipal network of Santo Amaro da Imperatriz (SC) (n = 28)



Regarding the associations between the SIVD and the variables of age and work regime of the teachers and their time on the job, it was possible

to observe that the teachers who taught full-time presented more complaints of throat clearing ( $p = 0.034$ ).

**Table 3.** Association of the symptoms of the sivd questionnaire with the variables of age, work regime, and time on the job of elementary school teachers of the municipal network of Santo Amaro da Imperatriz (SC) (n = 28)

SIVD	Time they had been teaching (years)					Age (years)					Work regime				
	Up to 8		Over 8		p-value	Up to 44 years		45 and above		p-value	Part-time		Full-time		p-value
	n	%	n	%		n	%	n	%		n	%	n	%	
Hoarseness	5	18.51	2	7.40	0.216	5	18.51	2	7.40	0.502	1	3.70	7	25.92	0.301
Voice loss	1	3.70	3	11.11	0.216	3	11.11	1	3.70	0.659	0	0	4	14.81	0.221
Breaking voice	2	7.40	1	3.70	0.586	3	11.11	0	0	0.455	1	3.70	2	7.40	0.669
Low-pitched voice	3	11.11	1	3.70	0.389	4	14.81	0	0	0.341	1	3.70	3	11.11	0.663
Throat clearing	6	22.22	2	7.40	0.186	6	22.22	2	7.40	0.594	1	3.70	8	29.62	0.034*
Dry cough	2	7.40	1	3.70	0.586	3	11.11	0	0	0.455	0	0	3	11.11	0.331
Cough with phlegm/secretion	2	7.40	4	14.81	0.219	4	14.81	2	7.40	0.404	0	0	6	22.22	0.092
Pain when speaking	3	11.11	1	3.70	0.389	4	14.81	0	0	0.341	1	3.70	3	11.11	0.663
Pain when swallowing	3	11.11	1	3.70	0.389	4	14.81	0	0	0.341	1	3.70	3	11.11	0.663
Secretion/phlegm in the throat	2	7.40	2	7.40	0.611	3	11.11	1	3.70	0.659	0	0	4	14.81	0.221
Dry throat	8	29.62	8	29.62	0.381	12	44.44	4	14.81	0.528	3	11.11	13	48.14	0.144
Fatigue when speaking	5	18.51	5	18.51	0.481	7	25.92	3	11.11	0.387	3	11.11	7	25.92	0.651

Caption: % = percentage, n = number, SIVD = Screening Index for Voice Disorders  
Statistical Test: Chi-Square Test, significance level  $p < 0.05$

## Discussion

The group of this research was composed of teachers with an average age of 37.25 years. As in other studies, there was a prevalence of women in this profession; however, the age group remains varied. In the present study, it was possible to consider that the participants were younger than teachers in other studies.<sup>15,16</sup>

The questionnaires were applied to all 26 elementary school teachers at the municipal schools of Santo Amaro da Imperatriz (SC). Although this number may be considered small compared to other studies<sup>16-19</sup>, it should be noted that this research presents data on the characterization of the education network of a municipality in the metropolitan area of Florianópolis (SC) with a total population of 19,823 inhabitants.<sup>20</sup>

It was observed that the average number of students per class was 21.8 and the median was 22, which may be considered low when compared to other studies.<sup>16,19</sup> This may be considered positive since a classroom with few students provides a less noisy environment, interfering less in the teaching-learning process and leading to a lower vocal effort for teachers.

Regarding the time on the job, a median of eight years was observed, which is also considered low compared to previous studies.<sup>16,21</sup> The present study showed that teachers from Santo Amaro da Imperatriz (SC) reported that the main external and internal noise sources were the schoolyard, side conversations, and the dragging of desks. In addition to the schoolyard, the literature highlights cafeterias and sports areas as examples of external sources that generate noise in the school environment. Regarding the sources that generate noise



inside classrooms, fans, the movement of students and teachers, and air conditioners have been mentioned, among others.<sup>8</sup>

Given the findings, some solutions could be proposed to mitigate the impact of noise on the teaching-learning process. Regarding the schoolyard and dragging of desks, school management could use resources such as acquiring windows with acoustic insulation, making use of heavy curtains since this is a material that contributes to sound absorption, and using felt or protectors on the feet of chairs and desks to minimize the noise when moving them. Another possibility to reduce the interference of external noise inside classrooms would be installing acoustic barriers, natural or not, which would act as physical obstacles.<sup>22</sup>

Regarding side conversations, as the teachers themselves suggested in the questionnaire, students should be advised and made aware of the impact that noise may have on people's lives, seeking to prevent emotional, auditory, and cognitive disorders.<sup>23</sup>

Teachers and students are exposed to high sound pressure levels in classrooms daily. Thus, both are harmed, requiring a more significant effort from teachers to convey the content of the class and greater attention from students so that the teaching-learning process occurs in the best possible way.<sup>6</sup>

Considering the teaching-learning process, for a student to have good speech intelligibility, a signal-to-noise ratio of +10 dB should be obtained for normal-hearing children and at least +15 dB for children with hearing difficulties.<sup>11</sup> Thus, school activities requiring greater concentration are impaired in a noisy environment.<sup>23</sup>

In addition to children with hearing loss, a noisy classroom also affects children with learning disorders such as Central Auditory Processing Disorder (CAPD) and Attention Deficit Hyperactivity Disorder (ADHD). Children with these disorders may have difficulties understanding speech in competing noise situations and locating the origin of sounds, causing attention difficulties in addition to possible learning difficulties.<sup>12</sup>

Some health problems were frequently reported by the teachers as possibly being generated by noise, with headaches, stress, and irritability standing out. This corroborates the literature, with the World Health Organization having reported that noise impacts health in general and may cause,

for example, cardiovascular diseases, stress, and anxiety.<sup>1</sup>

Regarding the total score of the SIVD, a median of two was obtained, with it being suggested that teachers who score five or more points should be advised to seek a speech therapist and otorhinolaryngologist for evaluation. When compared to a study conducted with a group of 29 teachers from a school in the state public education network of Salvador (BA) in which the average total score in the SIVD was four, it was observed that the average total score in the present study was low.<sup>24</sup> This may be justified by the fact that both the median age of the teachers and the median time on the job were low compared to other studies.<sup>14,15</sup> Another relevant factor is that the classrooms in this study had fewer students than those in other studies,<sup>16,19</sup> suggesting that teachers with fewer students in their classrooms have better control over them, making a smaller vocal effort. Therefore, it was concluded that the teachers of Santo Amaro da Imperatriz (SC) presented a low risk of vocal alterations<sup>14</sup>.

In the present study, age and time on the job had no association with the risk of vocal alterations, as observed in another study.<sup>25</sup> This may be because the teachers were young and, therefore, at the beginning of their professional careers.

The association between the teaching workload of teachers and the presence of a risk of vocal alterations has been observed in other studies.<sup>17,25</sup> In the present study, it was possible to observe that the teachers who taught full-time presented more complaints of throat clearing ( $p = 0.034$ ) only. Throat clearing may be caused by several factors, including the habit of smoking, reflux, and allergies, among others.<sup>26</sup> It is important to point out that since this research focused on studying the relationship between noise in the school environment and health in this environment, the teachers of Santo Amaro da Imperatriz (SC) were not asked about these issues.

Throat clearing is a symptom that may be caused by multiple factors and, in addition to those mentioned above, may be associated with intense use of the voice. As previously stated, teachers who work in classrooms with inadequate acoustics need to raise their voices to teach, which may lead to the development of vocal alterations.<sup>27</sup> However, in addition to inadequate acoustics, studies have reported that vocal alterations may stem from the vocal demand of the profession.<sup>28-30</sup> As the vast



majority of the teachers in the present study work full-time, it may be justified that their complaints (dry throat, fatigue when speaking, throat clearing, and hoarseness) could also result from the high vocal demand.

Given these findings, we stress that it is paramount that teachers receive vocal guidance since they use their voices as a working instrument for long periods. It is necessary to advise on the techniques and resources so that they may use their voices for long periods and on the importance of hydration to prevent possible damage to their vocal health. We emphasize that most of the teachers (59.26%) reported the presence of the dry throat symptom in the SIVD.

To mitigate the adverse effects on the voice, a suggestion would be to carry out annual campaigns to promote health and prevent vocal disorders among teachers, as well as epidemiological surveillance campaigns using the SIVD so that the symptoms reported by the teachers do not worsen, given that, despite most of them being young, they presented complaints of throat clearing, the presence of which was associated with their class workloads.

Another point to be observed is that most of the teachers reported never having received guidance on hearing health (89%) or participated in campaigns to prevent noise in the school environment (100%). With this, one may observe how important it is to alert the population and educators about the effects that noise may have on people's lives and how to prevent them. Annual campaigns carried out to prevent noise in schools or even the presence of speech therapists in these environments contribute to raising the awareness of students to the importance of silence and to guiding teachers on how to minimize the noise in classrooms. Of course, merely raising awareness is not enough. Empowerment on the subject is necessary for behavior change to occur.<sup>28</sup> In the present research, it was observed that the internal noise sources that most bothered the teachers (side conversations and the dragging of desks) are likely to be reduced with changes in the behavior of teachers and students that do not depend directly and totally on the school management.

It is known that both voice disorders and the consequences of noise exposure on health are considered multifactor conditions and do not always have a clearly defined causal link. Thus, the study

of an entire population of teachers in a municipality, albeit with a comparatively small number of individuals, may provide data for understanding the eventual illness of these professionals, which is important in the planning of prevention, epidemiological surveillance, and health promotion campaigns aimed at the quality of life of teachers and the better school performance of students.

A limitation of this study was that it was not possible to measure the sound pressure levels inside the classrooms during classes to determine if they were within the ABNT and WHO recommendations. It is suggested that future studies carry out such a measurement in classrooms and their surroundings.

In addition to the suggestions above, partnerships between health and education managers with architects and engineers become important for the development of specific architectural projects that aim to reduce noise within schools, assisting in acoustic comfort and, thus, collaborating with the improvement of the teaching-learning process and contributing to the health of all.

## Conclusion

Given the findings, it was concluded that most of the teachers had the perception that the school environment is excessively noisy and causes damage to the development of school activities. It was also observed that the teachers of Santo Amaro da Imperatriz (SC) presented few complaints related to their voices, with the most frequent complaint being dry throat. Moreover, it was found that the teachers who taught full-time presented significantly more complaints of throat clearing.

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