

## **Association between voice problems and noise effects among call center operators in the city of Campinas-SP**

**Associação entre problemas de voz e efeitos do ruído na saúde de operadores de um Call Center da cidade de Campinas-SP**

**Asociación entre problemas de voz y efectos de ruido entre operadores de call center en la ciudad de Campinas-SP**

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### **Abstract**

**Objective.** To investigate the associations between voice complaints and noise effects among call center operators in the city of Campinas-SP. **Methodology.** Observational and cross-sectional study carried out on 212 telemarketing operators of a company in the city of Campinas-SP. The procedures included the application of two instruments: questionnaire on noise annoyance and other effects and Voice Disorder Screening Index (VDSI). The statistical analysis used as main outcome the presence of voice complaint. The associations between the main outcome and the other variables were performed through the use of chi-square tests and a multiple logistic regression model. **Results:** The sample consisted mainly of women (87.3%) and the mean age was 24.8 years. The results identified high occurrences of vocal complaints (45.3%) and other health effects related to noise exposure such as stress, communication difficulties, lack of attention and headaches. **Conclusion:** Environmental and organizational conditions and health effects were not only significantly associated, but also increased the chance of a call center operator reporting voice complaints.

**Key-words:** Occupational Health; Voice; Voice Disorders; Noise; Hearing.

### **Resumo**

**Objetivo.** Investigar as possíveis associações entre as queixas de voz e os efeitos do ruído na saúde de funcionários de um *Call Center* na cidade de Campinas-SP. **Metodologia.** Estudo observacional e transversal de inquérito, realizado em 212 operadores de teleatendimento de uma empresa na cidade de Campinas-SP. Os procedimentos incluíram a aplicação de dois instrumentos: questionário sobre incômodo ocasionado por ruído e os demais efeitos e Índice de Triagem de Distúrbio de Voz (ITDV). A análise estatística utilizou como desfecho principal a presença de queixa de voz. As associações entre o desfecho principal e as demais variáveis foram realizadas por meio da aplicação de testes qui-quadrado e de um modelo de regressão logística múltipla. **Resultados.** A amostra foi constituída principalmente por mulheres (87,3%) e a média de idade foi 24,8 anos. Os resultados identificaram altas ocorrências de queixas vocais (45,3%) e dos demais efeitos relacionados à exposição ao ruído no local de trabalho como incômodo, estresse, dificuldade de comunicação, falta de atenção e dores de cabeça. **Conclusão:** As condições ambientais e organizacionais e os efeitos à saúde não somente foram associados significativamente, mas, também, aumentam a chance de um operador de teleatendimento apresentar queixas de voz.

**Palavras-chave:** Saúde do Trabalhador; Voz; Distúrbios da Voz; Ruído; Audição.

### **Resumen**

**Objetivo.** Investigar las asociaciones entre las quejas de voz y los efectos del ruido entre los operadores de call center en la ciudad de Campinas-SP. **Metodología.** Estudio observacional y transversal realizado en 212 operadores de telemarketing de una empresa de la ciudad de Campinas-SP. Los procedimientos incluyeron la aplicación de dos

instrumentos: cuestionario sobre molestias por ruido y otros efectos y el índice de detección de trastornos de la voz (VDSI). El análisis estadístico utilizó como resultado principal la presencia de queja de voz. Las asociaciones entre el resultado principal y las demás variables se realizaron mediante el uso de pruebas de chi-cuadrado y un modelo de regresión logística múltiple. Resultados: La muestra estuvo constituida principalmente por mujeres (87,3%) y la edad media fue de 24,8 años. Los resultados identificaron una alta incidencia de quejas vocales (45,3%) y otros efectos en la salud relacionados con la exposición al ruido, como estrés, dificultades de comunicación, falta de atención y dolores de cabeza. Conclusión: Las condiciones ambientales y organizativas y los efectos en la salud no solo se asociaron significativamente, sino que también aumentaron las posibilidades de que un operador del centro de llamadas informara quejas de voz.

**Palabras clave:** Salud Laboral; Voz; Trastornos de la Voz; Ruido; Audición.

## 1. Introduction

In 2011, the World Health Organization (WHO) ranked noise pollution as the second leading cause of pollution in the world, following air pollution. The increase in noise pollution can directly impact health, as it causes several auditory effects, such as hearing loss; and non-auditory effects, such as discomfort, stress, irritability, attention and concentration difficulties, increased blood pressure, psychological effects, interference in communication, behavioral and sleep changes. These phenomena may reflect in the form of behavioral changes such as nervousness, mental fatigue, feelings of frustration, poor work performance, increased absenteeism and social conflicts among workers exposed to noise (WHO, 2000; WHO, 2001; WHO, 2011; Ising & Kruppa, 2005; Sameli & Fiorini, 2011; Aavang, 2018; Cordeiro et al, 2019; Junior, Dias and Pelli, 2021).

Noise is a common hazard in almost all professions and workplaces and is typically present at higher levels in some industries, such as mining, metallurgy, textiles, agriculture and transport. However, certain professions, such as musicians, traffic controllers in cities, military personnel, and hospital workers, among others, are also considered high-risk groups with regard to noise exposure (Mrena, 2007; Serafini et al, 2019; Passos & Fiorini, 2022; Bloedow and Barba, 2021)

Although the association between noise exposure and auditory effects is well documented in the biomedical literature, the same is not true for non-auditory effects. However, it has been shown that noise exposure levels that can cause non-auditory effects may be different from the levels that cause auditory effects. The frequent presence of noise in the most diverse work environments shows a need for studies that investigate the non-auditory effects in exposures below 85 dB(A) (Souza et al, 2015; Diedio, Amaral and Conto, 2021).

Call center operators are also among the various professions impacted by noise whose work environment can also present a set of risks to their health. Although most studies focus only on voice problems, there are certainly other changes related to this work. In this sense, although the noise is normally not so high, it can cause a series of effects, such as stress, tiredness, communication difficulties, in addition to vocal complaints. Despite this, there are still few studies with call center operators that address the non-auditory effects resulting from exposure to noise, even at low levels.

This study aimed to investigate the possible associations between voice complaints and the effects of noise on the health of call center operators in the city of Campinas-SP.

## 2. Methodology

This was an observational, cross-sectional survey study. This study was submitted to the Research Ethics Committee of the institution and it was approved under the Process No. 1.679.508. The study was carried out with employees of a call center who agreed to participate in the research and signed the Informed Consent Form (ICF).

The sample consisted of 212 operators of a call center that provides telesales service, located in the city of XXXX. It should be noted that there was no gender and age differentiation for this study. The company starts activities at 8:00 AM and ends at 8:00 PM, and the operators work six hours a day, with 40 minutes of breaks that are distributed in breaks of 10, 20 and

10 minutes. During the workday, employees work seated at tables, separated by partitions and each operator has a computer, telephone and a headset. The researcher invited all operators to participate in the study and only those who were on vacation or on sick leave during the data collection period were included in the sample.

In order to characterize noise exposure, the researcher and the company's occupational safety team performed noise dosimetry in the call center environment. The method consisted of two measurements at two different points, over a period of two hours. For this purpose, two 01dB Wed007 type 2 dosimeters were used, which were duly calibrated before each measurement. The two dosimeters, which measure the individual dose of sound pressure level as a function of time, were positioned at the ends of the workplace.

Measurements were performed minute by minute, obtaining the following levels:

- $L_{Avg}$ : weighted average sound pressure level at "A"
- $L_{10}$ : statistical descriptor of the sound level exceeded for 10% of the time of the measurement period.
- $L_{50}$ : statistical descriptor of the sound level exceeded for 50% of the time of the measurement period.
- $L_{90}$ : statistical descriptor of the sound level exceeded for 90% of the time of the measurement period.

The locations for positioning the dosimeters were randomly chosen and measurements were taken in the morning. However, the equipment's software allows estimating six hours of exposure (the operator's total daily journey).

The data from the two measurements indicated a  $L_{Avg}$  of 55.2 and 69 dB(A),  $L_{10}$  of 70.5 and 69.8 dB(A),  $L_{50}$  of 68.3 and 67.5 dB(A) and  $L_{90}$  of 65, 8 and 65.1 dB(A).

According to Regulatory Norm 17 (NR-17) of the Ministry of Labor and Employment (Brazil, 1990), exposure to noise in call center operators (headphone users) must comply with the provisions of NBR 10152 (ABNT, 1987), which means that the sound pressure level must be up to 65 dB(A) and the noise rating curve (NC) must not exceed 60 dB. Thus, the values found in the dosimetry show exposure to noise at levels slightly higher than those recommended in the norm.

The data collection procedures included the application of two questionnaires, including an instrument adapted by Ferreira (2013), which was based on the instrument proposed by Juang et al. (2010), investigating the perception of noise and its effects on health. As the instrument was originally intended for employees and users of hospitals, as well as in its adaptation, it had to be modified to meet the objectives of this study. Thus, a pilot study with five operators was conducted for the final adjustments of the instrument.

Later, the final instrument consisted of the following seven sections: sources of noise, subjective perception of noise, effects of noise on emotion and physiology, experience with noise inside and outside the work environment and impact of environmental noise on work performance. All sections had the same responses on a five-point Likert scale, as follows: "Not at all", "Slightly"; "Moderately", "Very" and "Extremely". For statistical analyses, variables with more than two alternatives were dichotomized as follows: Not at all/Slightly = Slightly; and Moderately/Very/Extremely = Very.

The second instrument was a questionnaire adapted by Ghirardi et al. (2013) for evaluation of voice complaints (*Índice de Triagem de Distúrbio de Voz – ITDV*, Voice Disorder Screening Index). The instrument assesses the frequency of 12 symptoms that may suggest a voice problem and has the following alternatives for answers: "Never"; "Rarely"; "Sometimes" and "Always". The presence of at least one of the last two responses ("Sometimes" and "Always") implies a point for each of the 12 symptoms. Thus, the instrument score can range from 0 to 12. The variable "IDTV score" was categorized as follows: 0-5 (No= There is no voice complaint), and 6-12 (Yes= There is a voice complaint). The variable "*Do you have any voice complaints?*" was created from this categorization.

The main outcome for the statistical analysis was the variable “*Do you have any voice complaints?*”. The associations between the main outcome and the other variables were performed by applying Chi-Squared Tests of independence. A significance level of 10% was adopted in each test in order to adjust a logistic regression model.

### 3. Results

The study included 212 call center operators aged 18 to 54 years old, 27 (12.7%) men and 85 (87.3%) women. The median age of the participants was 23, while the mean age was 24.8 and the standard deviation was 6.75 years. As for the time of work in the company, the participants worked in the company for a period between 1 and 84 months, with a median of 7, mean of 13 months and standard deviation of 15 months. It should be noted that there was great variability in working time in the company (standard deviation of the same order of magnitude as the mean), and that the mean value was almost twice the median value, which characterizes an asymmetric distribution. Under these conditions, the median was the measure of central tendency that best represents the working time in the company.

The questionnaire on noise-related annoyance in the workplace evaluated both the perception of the subjects and possible health complaints and changes in work performance. Regarding the frequency of noise in the work environment, 102 (48.1%) operators answered “Very Frequently or Always”; 98 (46.2%) reported it as “Sometimes” and only 5 (5.7%) answered “Never or Rarely”. Most participants classified the noise as moderate or intense (90.5%) and 128 (60.4%) of the respondents believed that they contributed to the existing noise. In addition, conversation during customer service (95.7%) was reported as the main source of noise in the environment. In addition, the following sources of annoyance were reported: noise in the head set (67%), noise from other colleagues working (63%), external noise from the place where the client is located (43.4%), noise in the company's food court (25.9%), noise from the streets around the company (17.1%) and noise from the corridor and/or external environment (28.2%).

Regarding the main health complaints related to noise in the workplace, most participants reported discomfort (77.3%), stress (75.9%), communication difficulties (71.1%), lack of attention (62.3%) and headaches (59.4%).

The ITDV analysis related to the question “*Do you have any voice complaints?*” showed that 45.3% of respondents answered “Yes” (score between 6 and 12) for at least six of the symptoms. The frequencies of the 12 symptoms related to possible voice problems are shown in Table 1.

**Table 1:** Frequency distribution of the variable “How often do you experience the symptoms below” (percentages calculated by symptom, on the 212 interviewees).

Symptom	Frequency			
	Never	Rarely	Sometimes	Always
Hoarseness	46 (21.70)	81 (38.21)	71 (33.49)	14 (6.60)
Loss of voice	79 (37.26)	82 (38.68)	48 (22.64)	3 (1.42)
Voice failure	45 (21.23)	74 (34.91)	73 (34.43)	20 (9.43)
Rough voice	104 (49.06)	48 (22.64)	48 (22.64)	12 (5.66)
Throat clearing	72 (33.96)	69 (32.55)	56 (26.42)	15 (7.08)
Dry cough	37 (17.45)	79 (37.26)	87 (41.04)	9 (4.25)
Cough with mucus	75 (35.38)	73 (34.43)	56 (26.42)	8 (3.77)
Pain when speaking	112 (52.83)	54 (25.47)	37 (17.45)	9 (4.25)
Pain when swallowing	91 (42.92)	62 (29.25)	49 (23.11)	10 (4.72)
Mucus in the throat	94 (44.34)	64 (30.19)	47 (22.17)	7 (3.30)
Dry throat	23 (10.85)	56 (26.42)	97 (45.75)	36 (16.98)
Fatigue when speaking	42 (19.81)	57 (26.89)	80 (37.74)	33 (15.57)

Source: Prepared by the authors.

There were statistically significant associations between having a voice complaint and several variables, namely: annoyance to noise from different sources, stress, discomfort, headaches, communication difficulties and changes in work performance (Table 2).

**Table 2.** Joint frequency distribution between the variable “Do you have any voice complaints?” and some variables of interest for which the p-value of the association test<sup>1</sup> was less than 10%.

Do you have any voice complaints?	No		Yes		Total		p-value ( $\chi^2$ )
	n	%	n	%	n	%	
<b>Do you believe that you contribute to the existing noise?</b>							
No	35	66.0	18	34.0	53	100.0	<b>0.060</b>
Yes	65	50.8	63	49.2	128	100.0	
<b>Does ambient noise make you stressed?</b>							
Slightly	38	74.5	13	25.5	51	100.0	<b>0.001</b>
Very	78	48.4	83	51.6	161	100.0	
<b>Does ambient noise make you inattentive?</b>							
Slightly	52	65.0	28	35.0	80	100.0	<b>0.019</b>
Very	64	48.5	68	51.5	132	100.0	
<b>Does ambient noise bother you?</b>							
Slightly	35	72.9	13	27.1	48	100.0	<b>0.004</b>
Very	81	49.4	83	50.6	164	100.0	
<b>Does ambient noise make it difficult to communicate with other people?</b>							
Slightly	44	72.1	17	27.9	61	100.0	<b>0.001</b>
Very	72	47.7	79	52.3	151	100.0	
<b>Does ambient noise irritate you?</b>							
Slightly	66	75.9	21	24.1	87	100.0	<b>&lt;0.001</b>
Very	50	40.0	75	60.0	125	100.0	
<b>Does ambient noise cause you a headache?</b>							
Slightly	68	79.1	18	20.9	86	100.0	<b>&lt;0.001</b>
Very	48	38.1	78	61.9	126	100.0	
<b>Possible noise in the head set</b>							
Slightly	45	64.3	25	35.7	70	100.0	<b>0.049</b>
Very	71	50.0	71	50.0	142	100.0	

<b>Does noise from other colleagues at work bother you?</b>							
Slightly	56	71.8	22	28.2	78	100.0	<b>&lt;0.001</b>
Very	60	44.8	74	55.2	134	100.0	
<b>Does the external noise of the operation bother you?</b>							
Slightly	103	62.8	61	37.2	164	100.0	<b>&lt;0.001</b>
Very	13	27.1	35	72.9	48	100.0	
<b>Does the external noise of the place where the person/client is located bother you?</b>							
Slightly	81	67.5	39	32.5	120	100.0	<b>&lt;0.001</b>
Very	35	38.0	57	62.0	92	100.0	
<b>Does the noise at lunchtime in the food court bother you?</b>							
Slightly	102	65.0	55	35.0	157	100.0	<b>&lt;0.001</b>
Very	14	25.5	41	74.5	55	100.0	
<b>Does street noise (surroundings) bother you?</b>							
Slightly	107	60.8	69	39.2	176	100.0	<b>&lt;0.001</b>
Very	9	25.0	27	75.0	36	100.0	
<b>Does the noise from the corridor (external) bother you?</b>							
Slightly	98	64.5	54	35.5	152	100.0	<b>&lt;0.001</b>
Very	18	30.0	42	70.0	60	100.0	
<b>Does noise impact your work efficiency?</b>							
Slightly	69	67.0	34	33.0	103	100.0	<b>&lt;0.001</b>
Very	47	43.1	62	56.9	109	100.0	
<b>Does noise impact your thinking?</b>							
Slightly	71	71.7	28	28.3	99	100.0	<b>&lt;0.001</b>
Very	45	39.8	68	60.2	113	100.0	
<b>Does noise make you inattentive?</b>							
Slightly	77	72.6	29	27.4	106	100.0	<b>&lt;0.001</b>
Very	39	36.8	67	63.2	106	100.0	
<b>Does noise impact you when performing tasks?</b>							
Slightly	79	68.7	36	31.3	115	100.0	<b>&lt;0.001</b>
Very	37	38.1	60	61.9	97	100.0	
<b>Does noise prevent you from understanding what others are saying?</b>							
Slightly	44	79.2	13	22.8	57	100.0	<b>&lt;0.001</b>
Very	72	46.5	83	53.5	155	100.0	
<b>Do you think the noise from this place can harm your health?</b>							
No	70	63.6	40	36.4	110	100.0	<b>0.007</b>
Yes	46	45.1	56	54.9	102	100.0	
<b>In general you would say your hearing is</b>							
Regular	114	56.3	88	43.7	202	100.0	<b>0.024</b>
Altered	2	20.0	8	80.0	10	100.0	

Source: Prepared by the authors.

In general, it is possible to infer a relationship between inadequate working conditions and the occurrence of health complaints. The logistic regression analysis (Table 3) allowed the following interpretations:

- Based on the categories of the variables “*Does the external noise of the place where the person/client is located bother you?*” e “*Does the noise at lunchtime in the food court bother you?*”, when the operator understands that ambient noise is very likely to cause a headache, the chance of the operator having a voice complaint is 4.75 times the chance of having the same complaint when the operator understands that there is little chance of causing a headache;
- Based on the categories of the variables “*Does ambient noise cause you a headache?*” and “*Does the noise at lunchtime in the food court bother you?*”, when the participant understands that the external noise of the place where the person/client is located is very uncomfortable, the chance of the operator having a voice complaint is 2.31 times the chance of having the same complaint when the operator understands the noise as slightly disturbing;
- Based on the categories of the variables “*Does ambient noise cause you a headache?*” and “*Does the external noise of the place where the person/client is located bother you?*”, when the participant understands that the noise at

lunchtime in the food court is very annoying, the chance of the operator having a voice complaint is 3.47 times the chance of having the same complaint when the operator understands the noise as slightly disturbing.

**Table 3.** Estimates, P-values, odds ratios and 95% confidence intervals for the odds ratios for the logistic regression parameters.

Parameter	Estimate	Standard error	P-value	Odds ratio	CI (95%) for Odds Ratio	
					Lower limit	Upper limit
Headache	1.559	0.339	<0.001	4.75	2.45	9.24
Local external noise	0.836	0.326	0.010	2.31	1.22	4.37
Noise at lunch	1.243	0.386	0.001	3.47	1.63	7.38

The Hosmer–Lemeshow test (2000) was applied to verify the quality of adjustment of the logistic regression model. The p-value associated with the test was 0.963, which shows the good adjustment of the model. Source: Prepared by the authors.

#### 4. Discussion

In general, this study had a sample that can be understood as young and composed mainly of women, which is common in studies carried out with call center operators. Another study that aimed to assess the quality of life of call center operators in a city in the state of São Paulo found the following characteristics in the sample: 80.2% were women, 66.3% were single, with an education level up to high school, a 6-hour workday, average age of 28 years, for 92.9% of the participants this was their only job and their average time working at the company was three years (Parise & Soler, 2016). In turn, the sample of this study was a little younger and had worked for less time at the company (median of 7 months), but was also mainly composed of women.

Another study carried out in 2004 already showed that the majority of employees who work as call center operators in Brazil are young people, who are willing to have the opportunity to work and continue their studies. However, as in any profession, they are subject to risks inherent to their activities. The use of a call distributor with a computer and monaural headset can be an important exposure to risks and cause a condition of rich and varied symptoms where nervous and mental fatigue stand out; in addition to changes in voice, mood, sleep and complaints of headaches (Vilela & Assunção, 2004).

In addition, it should be noted that around 1.4 million people work in the telemarketing sector in Brazil, mainly young women, in their first job and with complete high school at a public school. The *Sindicato Paulista das Empresas de Telemarketing, Direct Marketing e Conexo* (Sintelmark, São Paulo Union of Telemarketing, Direct and Connected Marketing Companies) estimates that the number of employees will maintain an annual growth of 11%, which is a similar rate to that recorded in the last 12 years (Cavallini, 2012; Conceição et al, 2018) .

Regarding the frequency of noise in the workplace, almost half of the sample (48.1%) chose the options “Very Frequently” or “always”. While 46.2% of the participants answered “Moderately”, which shows that, in general, most of them perceives the presence of environmental noise and classify it as moderate or intense (90.5%). Despite the environmental assessments carried out at the company showing that the noise levels, in weighted average ( $L_{Avg}$ ), were between 55.2 and 69 dB(A), there are real difficulties in estimating individual exposures.

According to NR-17, exposure to noise in call center operators (headphone users) must comply with the provisions of NBR 10152 (ABNT, 1987), which means that the sound pressure level must be up to 65 dB(A) and the noise rating curve (NC) must not exceed 60 dB. However, it should be noted that there is no consensual method that allows the assessment of actual exposures and their possible consequences for the health of operators. To this end, ISO 11904 (ISO, 2002) has been used to quantify exposures during activities carried out in the workplace. A study that used this method found mean values of noise

exposure measured in individuals between 66 dB(A) and 90 dB(A), which are considered to be significantly high variations in relation to the levels established in NBR 10152 (ABNT, 1987). The authors compared these results with experimental measurements performed on a dummy and, as the differences in the average global values did not exceed 2.3 dB(A), they concluded that the two methods determine the exposure to noise, in sound sources close to the ear of the operators, producing good estimates efficiently and effectively (Vergara et al, 2006). In this study, the values found in the dosimetry show exposure to noise at levels slightly higher than those recommended in the NR-17%. However, complaints related to the work environment are legitimate and found in the results of the majority who report moderate and intense noise in the workplace, in addition to reports of discomfort from the following sources: headset, other colleagues working, external noise from the place where the customer is located, in the company's food court, in the streets around the company and in the corridor and/or external environment.

The high occurrence of complaints such as discomfort, stress, tiredness, communication difficulties, lack of attention and headaches shows that there are important health effects resulting from both environmental noise and other working conditions of the operators in this study. A study conducted at a call center in South Korea in 2015 found correlations between occupational stress, fatigue and depression. The sample of this study consisted of 150 operators and the study procedures included depression scales to measure levels of stress, fatigue and depression. There were no statistically significant differences between fatigue and depression. According to the study's findings, fatigue was reported as a predictor variable for the level of depression among call center employees ( $p < 0.001$ ). Occupational stress was mainly caused by the conditions of the work, which include a job perceived as unfavorable, with low pay and lack of prestige. The average time of break for rest and relaxation was 1.23 hours and the average daily sleep was 6.4 hours, which shows the lack of sleep and rest of the employees. Irregular sleep habits and excessive stress were risk factors for fatigue. Findings show great emotional stress and predisposition to depression and fatigue (Kim & Cha, 2009).

Adverse effects resulting from exposure to noise in different professional segments have been the object of investigation by several researchers. The high occurrence of complaints such as stress, irritability, headaches, communication difficulties and sleep disorders, among others, was found in many studies with workers from non-industrial segments (Sousa et al, 2009; Siqueira, 2012; Golmohammadi et al, 2013; Hamidi et al, 2014; Gelardi, 2014; Nelli, 2015; Cordeiro et al 2019).

The results of the ITDV analysis show the presence of voice complaints in 96 (45.3%) of the participants in the sample. In this sense, the high occurrence, mainly of hoarseness, voice failure, fatigue when speaking and dry cough, has already been reported in several studies with call center operators (Parise & Soler, 2016; Vilela & Assunção, 2004; Kim & Cha, 2009; Alencar et al, 2019).

There was another study that investigated the conditions of vocal production in call center operators and possible correlation with dissatisfaction related to their own voice. The sample consisted of 100 operators from companies from different segments, who answered a questionnaire about general health, vocal habits and symptoms. In total, 80% of respondents were satisfied with their voice. The most reported habits were: talking a lot (69%), eating chocolate (65%), and drinking coffee (60%). The main voice complaints reported were: dry throat (53%), throat clearing (33%) and fatigue when speaking (31%). When asked about possible causes of these symptoms, the following answers were reported: intense use of voice (51%), presence of air conditioning (57%), too cold/hot environment (40%). Statistically significant differences were found in the comparison between the groups of voice-satisfied and dissatisfied operators in the following variables: presence of airway disorders, such as rhinitis ( $p = 0.009$ ) and sinusitis ( $p = 0.014$ ); the habit of talking a lot ( $p = 0.024$ ); symptoms such as fatigue when speaking ( $p = 0.010$ ), sore throat ( $p = 0.044$ ), voice failures ( $p = 0.002$ ); bad relationship ( $p = 0.041$ ) and stress at work ( $p = 0.001$ ). Thus, as in this study, both the factors resulting from changes related to the physical health of the operators, as well



as the organizational factors of the company, explained the presence of vocal symptoms and, consequently, the dissatisfaction with their own voice in the work context (Ferreira et al, 2008).

In addition, there is another study that is in line with the relationship between voice complaints and work conditions. The study carried out with 72 operators of an emergency call center aimed to investigate the association between vocal symptoms, vocal complaints, working conditions and voice self-assessment. Participants answered a questionnaire about vocal complaints and symptoms, in addition to data on working conditions. The findings showed an association between the group of operators with voice disorders, both for aspects related to working conditions, such as excessive noise in the company, and for aspects related to voice conditions, such as vocal changes that led to absences from work. Differences were also found between the means of vocal symptoms and the following variables: stressful workload, noise in the company, noise from other rooms, echo in the room, use of the radio, change in voice and absence from work. There was an association between the presence of vocal complaints, the number of vocal symptoms and the working conditions reported by the call center operators (Christmann et al, 2010).

In many companies, telemarketing has become the main sales and customer service tool, with the operator being the professional responsible for the communication link between the company and the customer. These professionals primarily use their voice in their activity for a continuous period of six hours a day, with an average break of 15 minutes. Another study aimed to estimate the prevalence of vocal symptoms, the associated occupational risk factors and the impact on the professional activity of the call center operator. The cross-sectional study was carried out with a sample of 124 operators and 109 administrative staff (control group), selected from a random sample stratified by gender. Participants answered a self-administered questionnaire anonymously, which involved questions regarding the presence of vocal symptoms, potential risk factors for voice and the impact of vocal symptoms on professional activity. The prevalence of vocal symptoms found was 33% in operators and 21% in the control group, showing an association between vocal symptoms and professional activity. When adjusted for confounding factors, this association remained risky. The sensation of dry air, environmental noise and lack of vocal rest were more frequent in operators with vocal symptoms. Almost 70% of operators with vocal symptoms reported that these symptoms impact their professional activity. A 29% absenteeism rate caused by vocal symptoms was found in the group. The authors concluded that vocal symptoms are more frequent in operators when compared to their control peers, and that vocal symptoms significantly affect professional performance (Rechenberg et al, 2011).

## 5. Conclusion

The findings of this study show high occurrences of vocal complaints and other adverse effects related to noise exposure in the workplace, which is in line with previous studies. In addition to having a significant association between environmental and organizational conditions and health effects, this association also showed an increase in the possible presence of voice complaints in a call center operator.

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