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Relationship between working conditions and voice symptoms among operators of a model call center

Relação entre condições de trabalho e sintomas vocais em operadores de um *call center* modelo

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ABSTRACT

Introduction: Call center operators are voice professionals with great vocal demand and, consequently, are exposed to voice disorders. **Purpose:** Characterize vocal and laryngeal aspects among operators of a call center that follows the regulatory standards in ergonomics by measuring voice self-perception, otorhinolaryngological evaluation, and voice perceptual-auditory analysis. **Methods:** The study assessed 30 call center operators between 18 and 41 years old. All subjects were assessed using the *Escala de Sintomas Vocais* (ESV) – the Brazilian version of the Voice Symptom Scale (VoiSS) –, otorhinolaryngological evaluation using fiberoptic video rhinolaryngoscopy, and voice perceptual-auditory assessment using the GRBASI scale that evaluates degree of voice alteration (G), voice roughness (R), breathiness (B), asthenia (A), strain (S), and instability (I). **Results:** The ESV showed a correlation between the overall domain and the other subdomains and between the subdomains limitation and physical. The otorhinolaryngological evaluation revealed that 12 operators had some alteration such as secretion accumulation during phonation and glottic chinks. The voice perceptual-auditory analysis found individuals with normal voice and with slight to moderate degree of alteration, besides a correlation between the item instability in the GRBASI scale and the overall degree, roughness, breathiness, and asthenia. **Conclusion:** Proper work environments that provide care with voice may improve labor quality of call center professionals, thus mitigating the risks of developing voice disorders. Nonetheless, physical, social, environmental, organizational, and psychological factors may cause voice symptoms among those voice professionals.

Keywords: Voice; Voice disorders; Voice quality; Larynx; Occupational diseases

RESUMO

Introdução: Os operadores de *call centers* são profissionais da voz com alta demanda vocal e, consequentemente, sujeitos a distúrbios e sintomas vocais. **Objetivo:** Caracterizar aspectos vocais e laríngeos em operadores de um *call center* que segue as normas regulamentadoras de ergonomia, mensurando autopercepção vocal, avaliação otorrinolaringológica e análise perceptivo-auditiva vocal. **Métodos:** Participaram do estudo 30 operadores de *call center*, entre 18 e 41 anos de idade. Todos os sujeitos foram avaliados por meio da Escala de Sintomas Vocais - versão brasileira da *Voice Symptoms Scale* (VoiSS), avaliação otorrinolaringológica por meio de videonasofibrolaringoscopia e avaliação perceptivo-auditiva da voz com a escala GRBASI, que avalia grau de alteração vocal (G), rugosidade da voz (R), soprosidade (B), astenia (A), tensão (S) e instabilidade (I). **Resultados:** Na Escala de Sintomas Vocais, houve correlação entre o domínio geral e os demais subdomínios e entre os subdomínios limitação e físico. Na avaliação otorrinolaringológica, 12 operadores apresentaram alguma alteração, como acúmulo de secreção à fonação e fendas. A análise perceptivo-auditiva da voz encontrou indivíduos com vozes normais e com grau de alteração discreto a moderado, além de correlação entre o item instabilidade da escala GRBASI com o grau geral, rugosidade, soprosidade e astenia. **Conclusão:** Ambientes de trabalho adequados e que primam por cuidados com a voz podem melhorar a qualidade laboral dos profissionais de *call center*, amenizando os riscos de desenvolvimento de distúrbios vocais. Contudo, fatores físicos, sociais, ambientais, organizacionais e psicológicos podem ocasionar sintomas vocais nesses profissionais da voz.

Palavras-chave: Voz; Distúrbios da voz; Qualidade da voz; Laringe; Doenças profissionais

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INTRODUCTION

Voice disorders at work hinder communication, interaction, and service efficiency. When working on the phone, voice alterations or imbalance in the use of communication resources compromise the performance of professionals[1]. The association of extended voice use and individual, environmental, and labor organization factors may increase the prevalence of voice complaints, leading to absences and inability to perform duties, which leads to financial and social damages[2].

In recent years, several professionals and specialists in voice have come together to classify a new category of pathology, called work-related voice disorder (WRVD), so that the diagnosis and treatment of voice disorders can be organized. WRVD comprehends signs and symptoms such as fatigue when speaking, hoarseness, effort to speak, and loss of vocal efficiency, among others[3].

Call center operators are voice professionals with a high prevalence of vocal wear[4]. They are exposed to the risk of voice disorders due to the intense demand in voice use and have several associated symptoms and complaints[1,5,6]. On average, 64% of call center operators have dry throat; 33%, neck pains; 31%, hoarseness; 26%, voice failures; and 22%, vocal weariness[1]. These professionals often also complain about anxiety, vocal fatigue, eyesight and hearing issues, and back pain[7].

Overall, call center professionals do not enjoy favorable conditions to execute their duties since they often work long shifts in an open station inside a room shared with many other people amidst background noise, insufficient acoustic conditions, and poor air quality[8]. Besides the occupational burden on voice, operators answer too many calls with few breaks and a lot of stress. However, some call centers have been trying to improve working conditions to prevent operator discomfort based on Regulatory Standard (RS) 17 of the Ministry of Labor and Jobs, which sets guidelines for phone support and telemarketing[9,10]. Care with the workplace, ergonomics, and follow-up with speech therapists and psychologists, combined with shorter work hours, make up a favorable scenario for a model call center. Such actions in call centers prevent work-related voice disorders, thus hindering very significant social, economic, professional, and personal impacts[3].

This study aimed to characterize the vocal and laryngeal aspects of operators in a call center properly created in accordance with regulatory standards of ergonomics using voice self-perception measures, perceptual-auditory voice analysis, and otorhinolaryngologic assessment.

Since this research focuses on a model call center, it sought to find individuals with differentiated voice and laryngeal characteristics, as well as those with fewer complaints, when compared with the large majority of call center operators and with other related studies.

METHODS

The present cross-sectional study was approved by the Research Ethics Committee of the *Universidade Federal de Ciências da Saúde de Porto Alegre* under protocol 412.927.

The sample consisted of 30 call center operators of both sexes between 18 and 41 years old. The inclusion criteria were being over 18 years old and having at least three months of experience as a call center operator. The convenience sample included all operators who met the inclusion criteria and agreed to take part in the research by signing a consent form.

Data were collected by a speech therapist researcher on call center operators of the National Service of Counseling and Information on Drug Use Prevention located in southern Brazil, which provides counseling and information on psychoactive substances to the entire Brazilian population free of charge and ensuring caller anonymity. The call center is features furniture that meets regulatory standards, ample space, frequent cleaning, appropriate temperature, job training, and knowledge recycling, thus providing a structure that favors the overall health of workers. Moreover, all operators have 10-minute breaks every other hour as established by RS 17[9]. The call center also has a speech therapist on site[10].

The screening questionnaire prepared by the researchers was applied to identify the sample to collect information such as age, work experience, complaints, voice symptoms, and voice self-perception. Age was described as mean and standard deviation while sex, by absolute and relative frequency. Work experience as a call center operator was categorized into three to six months, seven to 11 months, and 12 months or more. The operators were asked to classify their voice self-perception into "excellent," "very good," "good," "regular," or "poor."

The *Escala de Sintomas Vocais* (ESV)[11], a culturally adapted version of the Voice Symptom Scale (VoiSS)[12] validated for Brazilian Portuguese was used, comprising 30 questions divided in three domains: limitation (15 questions), emotional (eight questions), and physical (seven questions). In this protocol, the question scores ranged from 0 to 4 according to frequency: "never," "rarely," "sometimes," "almost always," and "always." The scores were calculated by adding the points. The total score indicates the overall degree of voice alteration with the following thresholds: total= 16; limitation=11.5; emotional=1.5; physical= 6.5. The ESV results were expressed as means and standard deviation according to other studies[13]. Just as the original VoiSS, ESV is an instrument for the self-assessment of voice symptoms and of the impact of a voice issue. The higher the scores, the higher the perception of the overall degree of voice alteration regarding limitations in voice use, emotional reactions, and physical symptoms[13].

The participants' voice samples were recorded in a Powerpack® DVR 576/1076 digital recorder with the microphone placed at 45° and 5 cm from their mouths while

they were sitting in a silent environment. The participants were asked to stand during the sustained emission of the vowel /a/ and while counting from 1 to 20 at regular pitch and loudness[1]. The voice perceptual-auditory assessment was performed based on the GRBASI[14,15] scale, used internationally for being a simple method to assess the overall degree of dysphonia. On this scale, the evaluators were able to identify the following voice quality parameters: degree of voice alteration (G), voice roughness (R), breathiness (B), asthenia (A), strain (S), and instability (I). Each parameter could be classified on a severity scale from 0 to 3 in which 0 is considered normal or free of alteration, 1 is slight, 2 is moderate, and 3 is severe alteration. The scores were described according to the frequency in the sample.

The recordings were analyzed by three independent speech therapists with clinical experience in voice who were blinded to the study outcome. The voice samples were stored in a computer in MP3 format and individually given to each evaluator for the analysis using the headphones bundled with the digital recorded used in the recording connected to the computer.

During the otorhinolaryngologic evaluation, the subjects underwent flexible fiberoptic video nasolaryngoscopy (Machida® 3.2 mm) under topical anesthesia with xylocaine. The exam was performed by an otorhinolaryngologist blinded to the study outcome. During the exam, the subjects were asked to sustain the emission of the vowel /a/ followed by the aspirated emission of the same vowel.

Bivariate analyses were performed using Spearman's correlation (ρ). The variables included in the correlation were the ESV domains (limitation, emotional, and physical) and of the GRBASI scale. For the qualitative values of correlations among variables, the following scores were considered: 0= null; 0-3= weak; 0.3-0.6= regular; 0.6-0.9= strong; 0.9-1= very strong; 1= perfect[16]. The level of significance adopted was 5% ($p \leq 0.05$) and the analyses were performed in the software SPSS version 21.0.

RESULTS

The sample comprised 30 call center operators, four (13.3%) of whom men and 26 (86.7%) women, with mean age of 22.77±3.6 years. Of those, 15 (50%) subjects had been working as call center operators for up to six months; one (3.3%), for 10 months; and 14 (47%), for 12 months or more.

In the voice self-perception reports, 16 (53.3%) operators considered their voices "good"; eight (26.7%), "regular"; five (16.7%), "very good"; and only one (3.3%), "poor."

The mean overall ESV score was 25.60±11.65, while the score in the limitation domain was 14.13±8.1, 2.13±2.4 in the emotional domain, and 8.77±4.47 in the physical. The values in the ESV domains showed no significant alteration.

The video nasolaryngoscopy otorhinolaryngologic examination revealed that 12 (40%) operators had some alteration. The changes found were: secretion accumulation with phonation (n=7), glottic chinks (n=4), edema (n=1), vocal fold thickening (n=1), vocal fold nodules (n=1), and pseudosulcus (n=1). More than one change could be identified in the same subject.

The results of the voice perceptual-auditory analysis, based on the GRBASI scale, showed no subject with severe degree of alteration in voice parameters, but rather only slight and moderate.

Important correlations were found among the voice symptom scale. The overall degree domain had a strong positive correlation with the limitation and physical domains, besides a regular positive correlation with the emotional domain. Another positive regular correlation was seen between the physical and limitation domains. Among the items on the GRBASI scale, correlations were also found between the general degree of alteration and the parameters roughness, breathiness, asthenia, strain, and instability, all positive and regular ($p<0.05$). Furthermore, instability was positively correlated with roughness, asthenia, and breathiness at a regular level. No correlation was seen between the ESV and GRBASI findings (Table 2).

DISCUSSION

This study aimed to characterize the vocal and laryngeal aspects of operators in a call center that follows regulatory

Table 1. Sample distribution regarding voice perceptual-auditory analysis

Voice parameter	Degree of alteration			
	Normal	Slight	Moderate	Severe
Overall degree of dysphonia	17 (56.7%)	9 (30%)	4 (13.3%)	-
Roughness	17 (56.7%)	13 (43.3%)	-	-
Breathiness	19 (63.3%)	9 (30%)	2 (6.7%)	-
Asthenia	25 (83.3%)	5 (16.7%)	-	-
Tension	20 (66.7%)	8 (26.7%)	2 (6.7%)	-
Instability	12 (40%)	17 (56.7%)	1 (3.3%)	-

Data presented as n (%)

Table 2. Correlations among the domains of the *Escala de Sintomas Vocais* and the GRBASI scale

Variables	ESV- G	ESV- L	ESV- E	ESV- F	G	R	B	A	S	I
ESV- G	1									
ESV- L	0.8*	1								
ESV- E	0.4*	0.1	1							
ESV- F	0.6*	0.3*	0.1	1						
G	-0.9	0.02	0.07	0.1	1					
R	-0.08	0.07	-0.1	-0.2	0.5*	1				
B	0.1	0.1	-0.1	0.09	0.5*	0.2	1			
A	-0.07	0.06	-0.2	-0.1	0.4*	0.07	0.3*	1		
S	-0.1	0.001	-0.5	-0.4	0.4*	-0.03	-0.04	0.2	1	
I	0.1	0.2	-0.2	-0.06	0.4*	0.4*	0.3*	0.3*	0.2	1

* Significant values (p≤0.05) – Spearman's correlation and correlation r

Subtitle: ESV-G = Overall domain of the *Escala de Sintomas Vocais*; ESV-L = Limitation domain of the *Escala de Sintomas Vocais*; ESV-E = Emotional domain of the *Escala de Sintomas Vocais*; ESV-F = Physical domain of the *Escala de Sintomas Vocais*; G = Overall degree of dysphonia; R = Roughness; B = Breathiness; A = Asthenia; S = Strain; I = Instability

standards of ergonomics using voice self-perception measures, perceptual-auditory voice analysis, and otorhinolaryngologic assessment. The evaluations showed a prevalence of positive responses regarding the voice self-assessment of the operators. Voice symptoms were observed in the sample, however, no significant alterations were found in the ESV and its domains. The voice perceptual-auditory analysis revealed predominantly normal voices and with slight to moderate degrees of alteration. The otorhinolaryngologic assessment using fiberoptic video nasolaryngoscopy mostly showed normal laryngeal results.

The literature widely reports that call center professionals have voice symptoms. It is known that their work environment may be intimately related to the development of voice symptoms and alterations[17]. According to a study carried out in the United States, call center operators are twice as likely to have voice symptoms than those who do not use voice professionally[18]. Such results show that the occupational assessment of voice pathologies must involve all factors impacting health since the onset of alterations of this nature is influenced by physical, social, environmental, organizational, and psychological factors, This way, treatment must focus on biological and environmental changes and personal factors instead of simply on reducing voice workload[17,18,19]. According to the principles of concausality, even if a disorder may have concomitant factors away from the workplace, it can be considered occupational when it is set off by the labor activity – the so-called work-related voice disorder (WRVD) [3,20]. An analysis of the labor activity of call center operators shows, besides high voice demand, great cognitive effort concerning resolution, argumentation, communication, persuasion, and problem-solving. Such requirements, allied with the organizational capacity of the workplace – which involves call duration goals, inadequate postures for extended periods, and inefficient furniture and equipment to perform the duty[21] – leads to a higher prevalence of WRVD[2]. Those disorders are increasingly common, resulting in both absences and long medical leaves[3]. Thus, WRVDs cause financial losses to the employer and to the professional affected with harm both to health and social, financial, and psychological aspects. It is, hence, on the company's best interest to create voice health programs with actions that prevent and minimize the onset of such disorders, in addition to adopting an environment with favorable conditions to these voice professionals.

The current labor market in this segment is promoting positive change with constant evolution and compliance with regulations on ergonomics. Moreover, speech therapists have been sought to provide the operators with the care needed for their professional voice demand. The organization and logistics of the call center where this study was carried out allow the operators to properly perform their duties.

In spite of the favorable working conditions of that call center, voice symptoms were found among the operators. There may be a relation between these symptoms and the exposure and influence of external factors beyond the call center's control, as reported in the literature, such as environmental pollution, stress, and voice use away from the workplace, among others[18]. The sample consisted of predominantly young subjects likely with active social lives, which makes it hard for this study to monitor the activities performed away from the workplace that could involve voice abuse, even if it is avoided during work hours. It is known that adequate overall health conditions are needed for one's satisfactory vocal performance. Thus, it must also be considered that the study was carried out in southern Brazil, with characteristic climate that is related to a high frequency of allergic and respiratory disorders[22,23].

The ESV protocol aims to detect voice symptoms and the impact of dysphonia on individuals, being a valuable tool to complement voice assessment. Correlations were found that show that individuals with alterations in the overall domain also had alterations in the emotional, physical, and limitation domains. Such result was expected since the score of the overall degree is composed by adding up the scores of the other domains. Alterations in the overall domain reflect global alterations in voice and are better characterized according to their association with the subdomains. Another correlation was found between the physical and limitation domains, which deal with physical symptoms and voice limitation, respectively. Physical symptoms such as pain, coughing, or secretion, for example, are factors that may limit the use of voice as they cause discomfort during voice emission. No correlation was found among the other domains[13].

The perceptual-auditory assessment data showed most subjects evaluated in this study had no alteration in the parameters investigated, likely due to the speech therapy care offered at the workplace[10]. The call center has a speech therapist on site, who evaluates the operators on a case by case basis and daily helps the professionals concerning voice symptoms. When the operators begin their shifts, they receive detailed instructions on care with professional voice use, emphasizing the need for proper hydration during the calls and the mandatory 10-minute break every other hour. When needed, specific evaluations and referrals to otorhinolaryngologic and speech therapy treatment are performed and verified by the in-house speech therapist. In addition, the operators receive psychological support[24], which helps them understand the emotions experienced during the calls. This is an essential element to lower anxiety and stress, which may also hinder voice use[25].

The slight to moderate voice alterations identified by the GRBASI scale and noticed by some operators in the sample may be related to the results of the otorhinolaryngologic evaluation. The accumulation of secretion on the vocal folds – the most prevalent laryngeal image in this study – is characteristic of professional voice users and the mucus formed on the vocal folds is a protective reaction in face of the voice behavior[26]. The accumulation of secretion shown by the video laryngoscopy altered some of the parameters analyzed in the perceptual-auditory evaluation such as overall degree, roughness, and instability. One study[27] stated that the secretion is associated with inefficiency in speech and less stable voice quality. It is understood that this is because the presence of secretion hampers proper vocal fold mobility, causing a sensation of roughness during emissions[14].

Another common finding in the otorhinolaryngologic evaluation in this study was the presence of glottal chinks. These chinks may lead to alterations in several voice parameters during the perceptual-auditory assessment since they impact vocal dynamics due to incomplete glottal closure, particularly regarding breathiness. Previous research has shown a relation between breathiness and incomplete glottal closure, more commonly among women[28]. The other laryngeal alterations found in this study are part of a functional dysphonia setting related to inadequate voice use. Since those are professionals that deal with the public, it is justified that no severe alterations were found, otherwise those operators would not be capable to properly perform their duties.

Regarding the voice perceptual-auditory aspects, the overall degree of alteration was correlated with all other parameters, which was expected since an overall degree of dysphonia is only present if there is some voice alteration. Another relation observed was between instability and the parameters roughness, breathiness, and asthenia. Instability, characterized by a fluctuation in fundamental frequency and/or voice quality[14], may derive from a mixed respiratory mode with poor thoracic movements, which is common in everyday speech. This mode is not recommended for voice professionals due to the insufficient respiratory flow that, along with high voice demand, may lead to voice disorders, which explains the association with the other perceptual-auditory parameters[29]. Roughness, the sound sensation caused by the irregular movement of the vocal folds, is related to laryngeal imbalances caused by inadequate voice use, thus impairing emission quality. Breathiness is described as an audible air leak at the glottis associated with inefficient vocal fold closure, which entails loss of intensity during emission. Asthenia, in turn, indicates loss of voice potency. This reduction in vocal energy justifies the relation with instability, which is characterized by fluctuations in the voice[14].

Among the shortcomings of this study, the difference in the number of men and women stands out. Some discrepancies are well known in studies with professionals working at call centers and it is difficult to obtain more homogeneous samples regarding sex since it is a predominantly female job[30]. Furthermore, the call center in the present study does not represent most such services in Brazil and, thus, the voice symptoms found in this professional category may have been underestimated. The reality of the site of this study is unlike other call centers, which employ thousands of operators routinely exposed to poor working conditions and harm to health[30]. Hence, this is a specific situation at the company studied that does not reflect the reality of the sector. This way, the present research sheds light on how organizational measures in a call center are able to lower the onset of voice pathologies among operators.

CONCLUSION

The findings in this study support the ideia that an environment with favorable working conditions may improve labor quality of call center operators, thus reducing the incidence of voice disorders. Nonetheless, physical, social, environmental,

organizational, and psychological factors may cause voice symptoms among those voice professionals.

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