

Original Article

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The vocal behavior of telemarketing operators before and after a working day

Comportamento vocal de teleoperadores pré e pós-jornada de trabalho

ABSTRACT

Purpose: To evaluate the vocal behavior of receptive telemarketing operators in pre- and post-work shift moments, and to relate the results to the variable gender. **Methods:** Participants were 55 telemarketing operators (11 men and 44 women) working in a receptive mode in the city of Maceió (Alagoas, Brazil). A questionnaire was applied before the work shift to initially identify the vocal complaints. After that, vocal samples were recorded, comprising sustained emissions and connected speech produced 10 minutes before and 10 minutes after the workday to be later evaluated. Auditory-perceptual and acoustic analyses of voice were conducted. **Results:** Vocal complaints and symptoms reported by the operators after the work shift were: dry throat (64%); neck and cervix pain (33%); hoarseness (31%); voice failure (26%); and vocal fatigue (22%). Telemarketing operators presented reduced maximum phonation time before and after the day of work ($p=0.645$). Data from the auditory-perceptual assessment of voice were similar in pre- and post-shift moments ($p=0.645$). No difference was found between moments also on acoustic analysis data ($p=0.738$). **Conclusion:** Telemarketing operators have high indexes of vocal symptoms after the work shift, and there are no differences between pre- and post-work shift in auditory-perceptual and acoustic assessments of voice.

RESUMO

Objetivo: Avaliar o comportamento vocal de teleoperadores receptivos em momento pré e pós-jornada de trabalho e relacionar os resultados à variável gênero. **Métodos:** Participaram 55 teleoperadores de uma empresa de teleatendimento na cidade de Maceió (AL), sendo 11 homens e 44 mulheres, com atuação no modo receptivo. Inicialmente, foi aplicado um questionário antes da jornada de trabalho para identificação das queixas vocais. Em seguida foi feita gravação de amostras vocais compostas por emissões sustentadas e fala encadeada 10 minutos antes e 10 minutos após a jornada de trabalho para serem posteriormente avaliadas. Foram realizadas avaliações perceptivo-auditiva e acústica da voz. **Resultados:** Os sintomas e queixas vocais referidos pelos teleoperadores após a jornada de trabalho foram: garganta seca (64%); dores na região de nuca e pescoço (33%); rouquidão (31%); falhas na voz (26%) e cansaço vocal (22%). Os teleoperadores apresentaram tempos máximos fonatórios reduzidos antes e após a jornada de trabalho ($p=0,645$). Os dados da avaliação perceptivo-auditiva da voz foram semelhantes nos momentos pré e pós-jornada ($p=0,645$). Também não houve diferença nos dados de análise acústica no início e ao final da jornada de trabalho ($p=0,738$). **Conclusão:** Os teleoperadores apresentam elevado índice de sintomas vocais após a jornada de trabalho, e não há diferenças entre a pré e pós-jornada de trabalho nas avaliações perceptivo-auditiva e acústica da voz.

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INTRODUCTION

The technological advance combined with the modern life style has been leading the companies to seek for new strategies for successful relationship with clients, in order to dynamize their profits. Following this tendency, the telemarketing (now called teleservice) was born from the original telephonist profession and developed from direct marketing techniques⁽¹⁾. Thus, the teleservice is characterized by the integrated application of telecommunication technologies and data processing⁽²⁾.

Independently of the teleservice category, the teleoperator usually works under stressful conditions and considerable pressure. These professionals should be competent in performing their jobs, obey rigorous control mechanisms, and reach the goals established by the company. However, there is a regulation rule, the NR17 which recommends that the work hours for teleoperators should not exceed six hours a day, besides covering other aspects such as preventive and security measures that must be provided to these professionals⁽³⁾.

According to the Sindicato dos Trabalhadores em Telemarketing – SINTRATEL, the teleservice is one of the fastest growing and job-creating sectors in Brazil, with nearly 850 thousand employees⁽⁴⁾. Therefore, this sector performs an important contribution to the country's socio-economic development.

Considering the important role of the teleoperators to the country's socio-economic scenario, one can say that any vocal alteration throughout a working day could significantly affect their professional performance. Hence, it is extremely important for these professionals to have speech-language advice for vocal intervention. Besides that, it is necessary not only to understand the singularities of this professional category, but also to identify the vocal characteristics that are common to this group⁽³⁾.

In that sense, the speech-language pathologist plays a crucial role in preventing vocal disorders in teleoperators by assessing the perceptive-hearing parameters and voice acoustic measures both in the beginning and in the end of a working day.

Given the importance of the teleoperators as a professional category, new studies are needed to better understand the particularities of this population, making possible the development of vocal training programs that are specific to the teleoperators necessities, allowing the elimination or attenuation of factors that hinder communication.

Any vocal alteration or unbalance in the use of the communication resources could affect the teleoperators' productivity. Therefore, the aim of this study was to evaluate the vocal behavior of receptive teleoperators in pre and post-workday conditions, as well as to correlate the results to the variable 'gender'.

METHODS

This research was approved by the Research Ethics Committee of the Universidade Federal de São Paulo (UNIFESP), under protocol number 2012/08. All participants reviewed and signed the free and informed consent form.

Subjects were 55 receptive teleoperators (11 male; 44 female) with ages ranging from 18 to 55 years, who had been employed for at least six months to 15 years in an Energy Company of the Alagoas State. The professionals who were attending speech-language therapy for voice problems or who had ever attended to vocal therapy, and also the professionals who had performing other activities that require professional use of their voice were excluded from the study.

Initially, we administered a survey which was structured and adapted to the teleoperators for determining their vocal profile (Appendix 1). This survey was administered aiming to investigate the socio-demographic aspects, signs and symptoms of vocal disorders, and information about vocal care prior to a working day.

The data collection was carried out in the beginning (pre) and in the end (post) of a six-hour working day. The teleoperators were assessed at the own company, in a private and quiet room (noise level under 50 dB). After explaining the procedures to the teleoperators, we conducted vocal samples recording, which were composed of: sustained vowels emissions (/ε:/, /i:/ and /u:/) for three consecutive times, at comfortable pitch and loudness, and without examiner modeling task; and counting numbers from 1 to 10 in connected speech. The samples were recorded onto a unidirectional headset microphone (Plantronics audio 40), placed approximately 10 centimeters (cm) from the teleoperators' lips in the connected speech task, and 4 cm from the teleoperators' lips in the sustained emission task. To reduce the aerodynamic noise from the mouth in speech, the microphone was also positioned at a 45-degree angle.

In order to avoid any bias in data analysis, the CD with the vocal samples (sustained emissions and connected speech) of pre and post-workday conditions was edited and each voice sample received a number, in the way that it would not be possible for the examiners to identify the initial (pre-workday) and final (post-workday) recordings.

The emission of the sustained vowel /ε:/ was chosen because it allows the stabilization of the vocal tract in a neutral and medial position. The GRBASI⁽⁵⁾ scale was used for voice quality description. The voice quality was scored from 0 to 3 (0 – normal, absence of any alteration; 1 – mild voice deviation; 2 – moderate voice deviation; 3 – severe voice deviation). The parameters: vocal attack, pitch, loudness, and speech rate were assessed based on connected speech (counting 1 to 10).

The vocal samples were coded by three speech-language pathologists who were voice specialists with more than ten years of experience working in the area. Each specialist received a CD comprising all the subject's voice samples with no additional repetitions, and also the coding protocol for auditory-perceptual analysis, accompanied with coding instructions.

The specialists were allowed to hear each voice sample for up to five times, and their judgments were computed. Next, the three specialists were gathered to discuss any disagreements, and the final statement about the subject's vocal quality was determined based on a majority agreement among them.

For the assessment of phonatory efficiency, the subjects were asked to perform the sustained vowels /a:/, /i:/ and /u:/ at

comfortable speech level for three consecutive times, in two different moments: 10 minutes before getting into work and 10 minutes after leaving work. The mean for the three emissions performed concerning each vowel was calculated right after their measuring. The results were presented in a table, considering the variable gender ⁽⁶⁾.

The acoustic assessment of the voice quality was carried out based on the recording of the sustained vowel /ε/, at comfortable pitch and loudness, using the Voxmetria® Program, version 2.0h (CTS informatics). The frequency used for the recordings was 44.100 Hz. The first and final seconds of the emissions were not considered because of their irregular characteristics, which could interfere with the data analysis.

Thus, we adopted standardized seven-second sustained /ε/ vowel emissions, using the Sound Forge 7.0 Program by Sony®, and the following voice acoustic parameters were considered for analysis: fundamental frequency (f_0), vocal intensity, jitter, and shimmer.

The personal information of each subject (for registration at the Acoustic Analysis Program), as well as all of his or her recordings and objective acoustic measures of voice, were gathered in the presence of a single examiner. The obtained data were tabulated and processed.

After verifying normal distribution of the data using the Kolmogorov-Smirnov and Shapiro-Wilk Statistical tests, we carried out comparisons for each variable concerning the auditory-perceptual evaluation, using the Pearson Qui-square parametric test. The phonatory measures were compared using the T-Student test. The comparisons between pre and post-workday conditions were carried out for each variable of the acoustic analysis, using the paired-t test. The significance level adopted was 0.05 and the admitted β error was 0.1.

RESULTS

The results showed that all teleoperators reported vocal

symptoms and voice-related complaints, although there were differences in the symptoms' frequency of occurrence. The most frequently mentioned symptoms were: dry throat (64%), nape of the neck and neck sore (33%), hoarseness (31%), voice failure (26%), and vocal fatigue (22%) (Table 1).

The general degree of vocal deviation, roughness, breathiness, asthenia, tension and instability were found to be similar, when the pre and post-workday conditions were compared (Table 2).

The auditory-perceptual analysis showed no significant differences concerning the vocal characteristics between male and female subjects in both pre and post-workday conditions (Table 3).

Regarding the maximum phonation time (MPT), we found that both female and male subjects presented reduced values

Table 1. Vocal complaints presented by teleoperators

Vocal complaints	Yes		No	
	n	%	n	%
Dry throat	35	64	20	36
Nape of the neck/neck sore	18	33	37	67
Hoarseness	17	31	38	69
Voice failure	14	26	41	74
Vocal fatigue	12	22	43	78
Throat cleaning	10	18	45	82
Sore throat	5	9	50	91
Sensation of something stuck in throat	5	9	50	91
Weak voice	4	7	51	93
Breatiness	2	4	53	96
Blazing in the throat	2	4	53	96
Aphonia	2	4	53	96
Cough	2	4	53	96

Table 2. Results concerning the auditory-perceptual assessment of voice (GRBAS) in pre and post-workday conditions

Vocal quality (0-3)	Male					Female				
	Pre		Post		p-value	Pre		Post		p-value
	n	%	n	%		n	%	n	%	
G	11(1)	100	11(1)	100	-	3(0)	7	2(0)	5	0.645
R	11(0)	100	11(0)	100	-	41(0)	93	42(0)	95	0.645
B	10(0)	91	9(0)	82	0.534	32(0)	73	30(0)	68	0.632
A	11(0)	100	11(0)	100	-	44(0)	100	44(0)	100	-
S	11(0)	100	11(0)	100	0.306	42(0)	95	42(0)	95	1.0
I	11(1)	100	11(1)	100	-	4(0)	9	3(0)	7	0.694
						40(1)	91	41(1)	93	

Pearson Qui-square test ($p \leq 0.05$)

Note: G = grade of hoarseness; R = roughness; B = breathiness; A = asthenia; S = tension; I = instability

Table 3. Results concerning vocal attack, pitch, loudness and speech rate in pre and post-workday conditions

Assessment		Male					Female				
		Pre		Post		p-value	Pre		Post		p-value
		n	%	n	%		n	%	n	%	
Vocal attack	Isoc	7	64	10	91	0.127	32	73	30	68	0.802
	Sudd	4	36	1	9		11	25	12	27	
	Breat	0	0	0	0		1	2	2	5	
Pitch	Adeq	8	73	9	82	0.611	41	93	40	91	0.899
	Low	3	27	2	18		1	2	1	2	
	High	0	0	0	0		2	5	3	7	
	Unst	0	0	0	0		0	0	0	0	
Loudness	Adeq	10	91	11	100	0.306	26	59	24	54	0.802
	Weak	1	9	0	0		17	39	18	41	
	Stro	0	0	0	0		1	2	2	5	
	Flut	0	0	0	0		0	0	0	0	
Speech rate	Adeq	10	91	11	100	0.306	44	100	43	98	0.315
	Decr	1	9	0	0		0	0	0	0	
	Incr	0	0	0	0		0	0	1	2	

Pearson Qui-square test ($p \leq 0,05$)**Note:** Isoc = isochronic; Sudd = sudden; Breat = breathy; Adeq = adequate; Unst= unstable; Stro = strong; Decr = decreased; Incr = increased**Table 4.** Maximum phonation times of in pre and post-workday conditions

MPT	Male			Female		
	Pre	Post	p-value	Pre	Post	p-value
	Mean \pm SD	Mean \pm SD		Mean \pm SD	Mean \pm SD	
Vowel /a:/	13"48 \pm 1.32	15"37 \pm 0.35	0.0001*	11"22 \pm 1.08	11"60 \pm 0.95	0.098
Vowel /i:/	16"22 \pm 0.42	15"09 \pm 0.12	0.0001*	11"18 \pm 1.24	11"38 \pm 0.76	0.416
Vowel /u:/	15"14 \pm 0.47	13"20 \pm 0.45	0.0001*	11"37 \pm 0.98	11"42 \pm 0.74	0.807

Student-t test ($p \leq 0,05$)**Note:** SD = standard deviation; MPT= maximum phonation times**Table 5.** Results concerning the acoustic analysis in pre and post-workday conditions

Acoustic analysis	Male			Female		
	Pre	Post	p-value	Pre	Post	p-value
	Mean \pm SD	Mean \pm SD		Mean \pm SD	Mean \pm SD	
f_0 (Hz)	118.40 \pm 16.87	119.64 \pm 17.56	0.684	212.47 \pm 31.14	211.12 \pm 24.59	0.738
Intensity (dB)	60.23 \pm 4.44	62.63 \pm 3.99	0.112	56.90 \pm 6.23	59.20 \pm 5.99	0.141
Jitter (%)	0.21 \pm 0.09	0.24 \pm 0.14	0.558	0.95 \pm 0.81	0.60 \pm 1.02	0.242
Shimmer (%)	8.83 \pm 4.11	9.27 \pm 3.85	0.785	7.22 \pm 2.24	6.60 \pm 4.73	0.598

Paired-t test ($p \leq 0,05$)**Note:** f_0 = fundamental frequency; SD = standard deviation

of vowel sustaining in both pre and post- workday conditions (Table 4).

No significant differences were observed concerning the teleoperators' voice acoustic measures, when the pre and post-workday conditions were compared (Table 5).

DISCUSSION

Among the professional voice users, the teleoperators are the second most studied professional category in scientific publications⁽³⁾. Thus, the present study aimed to evaluate the vocal behavior of teleoperators during their professional performance, considering pre and post-workday conditions. Such decision is due to the fact that the majority of the studies

developed in this area has concentrated their assessments at a single moment of teleoperators' working day, or has investigated issues concerning teleoperators' vocal expressiveness during customer service⁽⁷⁻⁸⁾.

The analysis of socio-demographic aspects in the present study revealed that 70% of the subjects were female with mean age of 29.9 years, and 58% of the teleoperators have completed high school. These data corroborate a previous study carried out by the Sindicato dos Trabalhadores em Tele-marketing - SINTRATEL, which have found that 84% of the teleoperators' positions are occupied by young people with ages ranging from 23 and 25 years, mostly women at high school or college education level⁽⁴⁾. Therefore, it is important to notice that the teleoperators are young adults who are in the period

of maximum vocal efficiency (25 to 45 years). At this period, structural alterations in the larynx may be identified with more or less effect⁽⁸⁾. Moreover, the vocal disorders that are inherent to this professional activity, which is part of the fastest-growing business today, may lead to serious socioeconomic prejudice to the country.

The results point out to a positive self-perception of teleoperators regarding their voices. The most part of them like their voices. This finding may be related to the adoption of healthy habits related to the vocal production, such as maintaining proper hydration during the workday. Recently, several studies have looked at the effects of hydration in the regulation of vocal folds vibration⁽⁹⁻¹¹⁾, despite the complexity of determining the effect of hydration and viscosity in human vocal folds⁽⁹⁾. It is important to highlight that some aspects may affect hydration, such as insufficient water intake, low levels of air humidity, and the use of medications that cause dryness of the vocal fold mucosa^(9,11-13).

Regarding the vocal symptoms and voice-related complaints, all the teleoperators reported two or more symptoms, although there were differences in the symptoms and complaints' frequency of occurrence. The main complaint was dry throat, followed by nape of the neck and neck sore, hoarseness, voice failure, and vocal fatigue. Other voice-related complaints were also mentioned by these professionals, but with a lower frequency. The complaints reported by the teleoperators may indicate an incipient dysphonia, and offer high risk to the vocal function, since the teleoperators don't stop performing their activities in the presence of some laryngeal discomfort during phonation.

The complaint about dry throat reported by the majority of teleoperators may be a result of exposure to air conditioning combined with repeated mouth opening for constant talking. The cervical sores can be due, among other reasons, to the incorrect body posture during long periods throughout the workday. A Swedish research group has also reported higher prevalence of cervical and upper extremities disorders in teleoperators, when compared to other professionals who were computer users⁽¹⁴⁾.

Previous studies have reported high prevalence of dysphonia in teleoperators, independently of its frequency of occurrence^(8,15). Moreover, the main complaints listed by teleoperators are anxiety, stress, fatigue, visual and hearing problems, and back pain⁽¹⁴⁾. Studies about vocal modifications in teleoperators are scarce in literature, pointing out the imperative needing of more research concerning this professional category.

The complaints concerning hoarseness, voice failure and vocal fatigue might be due to the prolonged use of voice during the workday. Therefore, studies focusing in the investigation of parameters related to the intensive use of voice, as well as in the period needed for vocal rest, in the way that the vocal folds and paralaryngeal structures do not get into fatigue are fundamental, since this information is not yet totally clarified in literature⁽¹³⁾. The literature reports weak voice, vocal fatigue, voice failure, sore throat and hoarseness as symptoms of vocal overload⁽¹⁶⁻¹⁸⁾.

Concerning the auditory-perceptual assessment of voice,

the operators presented mild voice deviation in both conditions before and after a working day. Probably, favorable work conditions linked to a certain degree of adaptation of these voices throughout the workday should help the teleoperators to do not present more severe vocal disorders.

Although we have not found differences between pre and post-workday conditions concerning the teleoperators vocal quality, we observed that even in the presence of a mild voice deviation, these professionals continue to perform their daily work activities. This fact may contribute to increase the risk for laryngeal and vocal disorders.

We did not find any degree of voice deviation concerning hoarseness, breathiness, asthenia and tension. However, all the teleoperators of both genders presented mild vocal instability in both pre and post-workday conditions.

In the auditory-perceptive assessment of voice, we observed that isochronic vocal attack, as well as adequate pitch and speech rate were predominant among the teleoperators of both genders in both pre and post-workday conditions. The results suggest that these professionals are vocally healthy individuals, and that some degree of adaptation in their voices probably occurs throughout the workday.

Concerning the MPT, reduced values were obtained in the pre-workday condition and remained the same in the end of the workday for teleoperators of both genders. This finding suggests some inability to control the expired air flow by part of these professionals.

Regarding the acoustic assessment of voice, there was no significant difference between pre and post-workday conditions concerning the fundamental frequency, jitter and shimmer for teleoperators of both genders. The male group presented mean fundamental frequencies ranging from 118.4 to 119.64 Hz, while the female group presented mean fundamental frequencies ranging from 212.47 to 211.12 Hz. These values are slightly higher than the mean fundamental frequency found for Brazilian Portuguese speakers of the city of São Paulo⁽¹⁹⁾, which was 113 Hz for male voices and 205 Hz for female voices. Nevertheless, these values are within the range of distribution for male (80 to 150 Hz) and female (150 to 250 Hz) voices⁽¹⁸⁾.

Several studies⁽²⁰⁻²⁴⁾ in literature have investigated the fundamental frequency with distinct values found for different studied populations. However, all of these values were within the range of distribution for the respective genders. We suppose that comparisons between results from different programs for acoustic analysis of the voice, even when similar measures are used, can generate some variation probably due to differences in the algorithms, in the methods for calculating the fundamental frequency, in the types of recorded voice storage, and in the types of sustained or connected speech used as voice samples⁽²⁵⁾.

Among the several systems for acoustic analysis, the f_0 has been considered as the most consistent parameter, although less sensitive concerning the characteristics of voice recording⁽²⁶⁻²⁹⁾. Other acoustic parameter contemplated in this study was the vocal intensity, which is defined as the amplitude of the audio signal, and is directly related to the glottal resistance

to the airflow. In the male group, the mean vocal intensity in pre and post-workday conditions were 60.23 dB and 62.63 dB, respectively. In the female group, the values were 56.90 dB and 59.20 dB. The fact that the values found for vocal intensity in this study were lower than the values reported in literature⁽²⁵⁾ lead to a reflection. It is possible that the teleoperators keep their voice in a lower intensity because of the use of microphones that amplifies the sound. This finding could also be related to the fact that the teleoperators usually sit next to each other.

The measures of vocal fundamental frequency perturbation contemplated in the present study were the jitter and the shimmer. In the male group the mean values for jitter during the vowel /e/ emission, in pre and post-workday conditions were 0.21 and 0.24%, respectively. Concerning the shimmer, the mean values were 8.83 and 9.27%, respectively. In the female group, the mean values for jitter were 0.95 and 0.6%, and the mean values for shimmer were 7.22 and 6.6%. According to the normative values proposed for jitter by the analysis program used in this study (0.0 to 0.6%) as well as by data found in literature^(21,26), the male group of teleoperators are within the normal range in both pre and post-workday conditions, evidencing more periodicity of vocal folds vibration. Conversely, the female group presented increased jitter measures only in the pre-workday condition, suggesting that the periodicity of vocal folds vibration becomes adequate during or in the end of the workday.

The shimmer measures obtained for both male and female teleoperators were not within the normal range (0.0 a 6.5%), based on the values established by both the analysis program used in this study and the literature^(21,25,26,29). The values were increased, which indicates possible irregularities in the glottal closure. The standard deviation was high due to the variability of the vocal parameters among the subjects.

We believe that the differences between the results found for the acoustic analysis of voice in the present study and the results from the literature, even using similar measures, are due to the diversity of existent programs for acoustic analysis. Differences in the algorithms are common, hindering the normalization of voice objective measures^(28,30).

It should be noted that the results of this study are based on a small sample size of teleoperators from a single institution. Therefore, we suggest that other studies be carried out with a larger number of teleoperators acting in different modalities of telemarketing service, with the aim to better comprehend the singularities of these professionals. The results of such studies will allow the development of vocal training programs that are specific to the teleoperators' necessities.

CONCLUSION

The teleoperators can be considered as professional voice users who are at a high risk for developing vocal disorders, since they usually present high indices of vocal symptoms. The most frequent symptom is dry throat. The auditory perceptual and acoustical assessments of voice showed no significant differences in the teleoperators vocal behavior, when the pre and post-workday conditions were compared.

REFERENCES

1. Algodal MJ. Voz profissional: o operador de telemarketing [dissertação]. São Paulo: Pontifícia Universidade Católica de São Paulo; 1995.
2. Stone B, Wyman J. Telemarketing. São Paulo: Nobel; 1988.
3. Oliveira S, Raize T, Algodal J, Moreira-Ferreira AE, Marchion MQ. A voz no Telesserviço. In: Oliveira IB, Almeida AAF, Raize T. Voz Profissional – Produção científica da fonoaudiologia brasileira [CD-ROM]. São Paulo: Sociedade Brasileira de Fonoaudiologia; 2008.
4. Sindicato dos Trabalhadores em Telemarketing [homepage on the Internet]. São Paulo: SINTRATEL [citado 2009 Nov 9]. Disponível em: www.sintratel.org.br.
5. Behlau M. Consensus auditory – perceptual evaluation of voice (CAPE-V), ASHA 2003. Rev Soc Bras Fonoaudiologia 2004;9(3):187-9.
6. Steffen LM, Moschetti MB, Steffen N, Hanayama EM. Paralisia unilateral de prega vocal: associação e correlação entre tempos máximos de fonação, posição e ângulo de afastamento. Rev Bras Otorrinolaringol. 2004;70(4):450-5.
7. Ferreira-Moreira AE. Recursos de expressividade oral e linguísticos-discursivos de operadores de telemarketing: relação com a sensação gerada em prováveis clientes e o desempenho profissional [dissertação]. São Paulo: Pontifícia Universidade Católica de São Paulo; 2007.
8. Ferreira LP, Akutsu CM, Luciano P, Viviano NA. Condições de produção vocal de teleoperadores: correlação entre questões de saúde, hábitos e sintomas vocais. Rev Soc Bras Fonoaudiol. 2008;13(4):307-15.
9. Chan RW, Tayama N. Biomechanical effects of hydration in vocal fold tissues. Otolaryngol Head Neck Surg. 2002;126(5):528-37.
10. Verdolini K, Titze IR, Fennell A. Dependence of phonatory effort on hydration level. J Speech Hear Res. 1994;37(5):1001-7.
11. Yiu EM, Chan RM. Effect of hidration and vocalrest on the vocal fatigue in amateur karaoke singers. J Voice. 2003;17(2):216-27.
12. Roy N, Merrill RM, Thibeault S, Parsa RA, Gray SD, Smith EM. Prevalence of voice disorders in teachers and the general population. J Speech Lang Hear Res. 2004;47(2):281-93.
13. Titze I. Choir warm-ups: how effective are they? J Sing. 2000;56:31-2.
14. Norman K. Call centre work – characteristics, physical, and psychosocial exposure, and health related outcomes [thesis]. Stockholm: Mechanical Engineering Linkoping University; 2005. Available from: <http://www.arbetslivsinstitutet.se/>.
15. Jones K, Sigmon J, Hock L, Nelson E, Sullivan M, Ogren F. Prevalence and risk factors for voice problems among telemarketers. Arch Otolaryngol Head Neck Surg. 2002;128(5):571-7.
16. Titze IR, Svec JG, Popolo PS. Vocal dose measures: quantifying accumulated vibration exposure in vocal fold tissues. J Speech Lang Hear Res. 2003;46(4):919-32.
17. Patel S, Shrivastav R. Perception of dysphonic vocal quality: some thoughts and research updates – perspectives on voice and voice disorders. ASHA Division 3. 2007;17(2):3-6.
18. Rechenberg L. Prevalência de sintomas vocais em operadores de telemarketing. [dissertação]. Porto Alegre: Universidade Federal do Rio Grande do Sul; 2005.
19. Spinelli IC, Behlau M. Estudo comparativo das medidas de frequência fundamental, jitter e shimmer em diferentes sistemas de análise vocal. In: Behlau M, organizador. A voz do especialista I. Rio de Janeiro: Revinter; 2001. p.265-71.
20. Zhang Y, Jiang JJ. Acoustic analysis of sustained and running voices from patients with laryngeal pathologies. J Voice. 2008;22(1):1-9.
21. Holmberg EB, Doyle P, Perkell JS, Hammarberg B, Hillman RE. Aerodynamic and acoustic voice measurements of patients with vocal nodules: variation in baseline and changes across voice therapy. J Voice. 2003;17(3):269-82.
22. Speyer R, Wieneke GH, Dejonckere PH. Documentation of progress in voice therapy: perceptual, acoustic and laryngostroboscopic findings pretherapy and posttherapy. J Voice. 2004;18(3):325-40.
23. Morris RJ, Brown WS Jr. Comparison of various automatic means for measuring mean fundamental frequency. J Voice. 1996;10(2):159-65.

24. Fröhlich M, Michaelis D, Strube HW, Kruse E. Acoustic voice analysis by means of the hoarseness diagram. *J Speech Lang Hear Res.* 2000;43(3):706-20.
25. Felipe AN, Grillo MH, Grechi TH. Normatização de medidas acústicas para vozes normais. *Rev Bras Otorrinolaringol.* 2006;72(5):659-64.
26. Van Borsel J, Janssens J, De Bodt M. Breathiness as a feminine voice characteristic: a perceptual approach. *J Voice.* 2009;23(3):291-4.
27. Awan SN, Roy N. Acoustic prediction of voice type in women with functional dysphonia. *J Voice.* 2005;19(2):268-82.
28. Yu PR, Revis J, Wuyts FL, Zanaret M, Giovanni A. Correlation of instrumental voice evaluation with perceptual voice analysis using a modified visual analog scale. *Folia Phoniatr Logop.* 2002;54(6):271-81.
29. Vasconcelos LR. Análise de intensidade no campo dinâmico vocal de acordo com o gênero e a idade [monografia]. São Paulo: Centro de estudos da Voz; 1994.
30. Araujo AS, Grellet M, Pereira JC, Rosa MO. Normatização de medidas acústicas da voz normal. *Rev Bras Otorrinolaringol.* 2002;68(4):540-4.

Appendix 1. Initial interview for teleoperators.

I- Identification: Date: __/__/__
 Name: _____
 Address: _____
 Phone number: _____
 Age: _____ Date of birth: __/__/__
 Gender: () Male () Female
 Natural from: _____ Civil status: _____
 Education level: () analphabet () up to four years education () up to nine years education
 () incomplete high school () high school () incomplete college
 () college () post-graduation

II- Professional and vocal history
 How long working as a teleoperator: _____ years _____ months

- 1) Shift: () Morning () Afternoon
- 2) Workload: _____ hours a day
- 3) Have you ever worked in another telemarketing area? () No () Yes: () active () receptive
- 4) Have you noticed any change in your voice after start working in telemarketing?
 () No () Yes: Which one?: _____
- 5) Among the complaints bellow, which one do you notice in your voice?
 () hoarseness () constant throat cleaning () aphonia () sore throat when speaking
 () fatigue when speaking () nape of the neck / neck sore () blazing when speaking () constant cough
 () weak voice () voice failure () dry throat () breathiness () sore when swallowing
 () sensation of something stuck in throat
- 6) Have you performed other activity as a professional voice user? () No () Yes:
- 7) Do you like your voice? () No () Yes
- 8) Have you ever had some voice problem? () No () Yes:
- 9) Have you ever had to stop working because of some voice problem? () No () Yes
- 10) Do you usually scream? () Yes () No
- 11) Do you usually speak loud? () Yes () No
- 12) Your voice sounds better: () in the morning () in the afternoon () in the evening () in the weekend
- 13) Does your voice change during a working day? () No () Yes:
- 14) Do your emotions influence your voice? () No () Yes
- 15) How do you define your work environment?
 () calm () stressful () demotivating () wearing () casual
- 16) Have you ever seen an otorhinolaringologist? () No () Yes
- 17) Have you ever seen a speech-language pathologist? () No () Yes
- 18) Do you warm up your voice? () No () Yes
- 19) Have you ever had a voice training? () No () Yes
- 20) Are you allergic? () Yes () No
- 21) Do you usually drink water during a working day? () No () Yes
- 22) How many glasses of water do you drink in a day? () 1 to 2 () 3 to 4 () 5 to 6 () more than 7
- 23) Do you smoke? () Yes () No
- 24) Do you usually smoke during the workday (rest break at work)? () No () Yes:
- 25) Do you usually drink alcohol? () Yes () No
- 26) Your sleep is: () restful () restless
- 27) How many hours do you sleep a night?
 () 3 to 4 h () 5 to 6 h () 7 to 8 h () 9 to 10 h () 11 to 12 h