

The relationship between vocal fatigue and voice-related quality of life in university professors

Relação entre fadiga vocal e qualidade de vida relacionada à voz em professores universitários


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Keywords

Faculty
Fatigue
Voice Quality
Quality of Life
Voice

Descritores

Docentes
Fadiga
Qualidade da Voz
Qualidade de Vida
Voz

ABSTRACT

Purpose: To identify and correlate vocal fatigue and voice-related quality of life in university professors and verify possible differences between genders. **Methods:** This is a cross-sectional, observational, and analytical study approved by the Research Ethics Committee of the institution under number 1,708,786. The Voice Fatigue Index (VFI) and the Voice Related Quality of Life (VRQOL) were applied to 126 university professors, 71 women and 55 men, with an average age of 43 years. Scores were calculated using the formula for each protocol and statistical analysis was performed using Spearman's Correlation. **Results:** Regarding the VFI, the average score found for factors 1, 2 and 3 were 13.78, 4.05 and 7.93, respectively. As for VRQOL, professors had an average global score of 91.90; 88.49 for the physical domain and 97.02 for the socioemotional domain. There was a negative weak to strong correlation between the protocols. There was no statistical difference between genders for both VFI and VRQOL. **Conclusion:** University professors have good levels of voice related quality of life, but self-reported vocal fatigue, with no differences between genders. The lower the vocal fatigue is, the higher is the voice related quality of life, and vice versa.

RESUMO

Objetivo: Identificar e correlacionar fadiga vocal e qualidade de vida em voz de professores universitários e verificar possíveis diferenças entre os sexos. **Método:** Trata-se de um estudo transversal, observacional e analítico aprovado pelo Comitê de Ética em Pesquisa da instituição sob parecer n. 1.708.786. Foram aplicados os protocolos Índice de Fadiga Vocal (IFV) e Qualidade de Vida em Voz (QVV) em 126 professores universitários, sendo 71 mulheres e 55 homens, com média de idade de 43 anos. Foram calculados os escores pela fórmula de cada protocolo e a análise estatística foi realizada por meio da Correlação de Spearman. **Resultados:** Em relação ao IFV, o escore médio encontrado para os fatores 1, 2 e 3 foram 13,78; 4,05 e 7,93, respectivamente. Quanto ao QVV, os professores apresentaram escore médio global de 91,90; 88,49 para o domínio físico e 97,02 para o domínio socioemocional. Houve correlação negativa de fraca a forte entre os protocolos. Não houve diferença estatística entre os sexos tanto para o IFV quanto para o QVV. **Conclusão:** Professores universitários apresentam bons índices de qualidade de vida em voz, mas autorreferiram fadiga vocal, sem diferenças entre os sexos. Quanto menor é a fadiga vocal, maior é a qualidade de vida em voz e vice-versa.

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Received: June 01, 2020

Accepted: September 30, 2020

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Financial support: nothing to declare.

Conflict of interests: nothing to declare.



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INTRODUCTION

The voice can convey to the listener specific information such as age, gender, and emotional state. Aided by auditory feedback, the voice transmits information about the projected discourse through the communicative context and is one of the main resources in the teaching-learning relationship⁽¹⁾. The professor uses his voice as the main method of communication and expression of content in the administration and conduct of his classes⁽²⁾.

In addition, professors are appointed as the professionals who have a higher rate of vocal impairment⁽³⁾ due to the high need imposed by the profession and exposure to aggressive agents in their work environment that can influence their vocal health in general, for example, external and internal noises causing competitive noise during phonation, rooms with inadequate acoustics, excess of students in the classroom, causing sound competition and requiring more significant effort and vocal demand⁽⁴⁾. It is important to emphasize that it is essential that these professionals have an encouraging, pleasant voice that stimulates their students' focus to absorb the content exposed⁽⁵⁾.

The professor is susceptible to presenting several vocal symptoms, such as voice fatigue⁽⁶⁾, which is an impression referred to by an intensity of phonatory effort related to increased voice demand, misuse, or abuse⁽⁷⁾. Among the findings of vocal assessment reported by individuals, there are weak voice, tense vocal quality, and reduced vocal projection, in addition to laryngeal discomfort, signs such as dryness and total loss of voice⁽⁷⁾. Such signs and symptoms tend to be mitigated with appropriate vocal rest⁽⁸⁾.

For professors, low quality of life is highly harmful to their health and professional performance⁽⁹⁾. The voice-related quality of life helps understand people's perception concerning their vocal health and their reactions to changes in the voice⁽¹⁰⁾. When assessing the impact of the voice on the quality of life, health is now understood as a fundamental strategy that drives social, economic, and personal development and a parameter for determining the quality of life. Therefore, health and quality of life are related in a complementary way⁽¹¹⁾.

Through the voice, there is the transmission of specific socioemotional information for each individual⁽¹²⁾, and vocal self-perception is important for voice professionals. However, few demonstrate a good command of this aspect⁽¹³⁾. Self-assessment tools have proven to be effective for assessing and detecting vocal discomfort⁽¹⁴⁾.

We believe that possible voice problems in professors, such as voice fatigue, have a close relationship with working conditions, which may or may not impact the quality of life of these professionals. Such problems and impacts need to be clarified and better understood. Thus, the present study aimed to identify and correlate voice fatigue and quality of life in the voice of university professors and the difference between genders. It is believed that the data may motivate future actions to help the class in the prevention and treatment of dysphonia and promote vocal health.

METHODS

This study was cross-sectional, observational, and analytical, approved by the institution's Ethics Committee, under opinion no. 1,708,786. The calculation of the sample was carried out through the Confidence Interval of an average, and the recruitment of the sample was for convenience, carried out online by e-mail. Contacts were obtained on the websites of the institution's study centers.

Of any age group, professors of both genders, linked to any teaching center of a public university, who previously signed the Free and Informed Consent Term, were included. During the data collection process, professors who were on leave for some reason who underwent resections of tumors in the head and neck and/or professors who underwent speech therapy were excluded.

To clarify the objectives and methodology of the study, the researchers participated in meetings with professors from different departments of the university to guide them in completing the protocols Voice Fatigue Index (VFI) and Voice Related Quality of Life (VRQOL). Then, the protocols were sent to the professors' e-mails via the Google Forms online platform.

The VFI is composed of 19 questions divided into 3 categories: Voice fatigue and restriction (factor 1), Physical discomfort associated with the voice (factor 2), and Recovery with vocal rest (factor 3). The score for each question varies between never (zero), rarely (one point), sometimes (two points), almost always (three points), and always (4 points). The VFI does not have a total overall score; however, there are scores for each subitem. The scores for factors 1 and 2 are made by a simple sum of the questions corresponding to each of them, with 44 being the maximum value for factor 1 and 20 the maximum value for factor 2, allowing the interpretation that the higher the score, the greater is also the aspect of fatigue related to the sub-item. However, factor 3, because it is vocal recovery, allows the interpretation that the higher the scale score, the greater the recovery from fatigue with vocal rest, with 12 being the maximum score for this factor⁽¹⁵⁾.

The VRQOL assesses, through ten questions, the voice-related quality of life involving the Physical (six questions), Socioemotional (four questions), and Global domains, the last being the junction of the first two aspects. Responses vary on a scale of 1 to 5, according to the frequency at which a given event occurs, where 1 is equivalent to "it never happens, and it is not a problem" and 5 to "it always happens, and it really is a bad problem." According to the protocol's calculation formula⁽¹⁰⁾, the protocol offers a total score ranging from 0 to 100 (from the worst to the best quality of life) and a score for each domain. The cut-off score for the VRQOL protocol is 91.25 points, and the global averages found for individuals with dysphonia and healthy voices were 65.9 and 98 points, respectively⁽¹⁶⁾.

The data were organized and tabulated on an MS Excel spreadsheet, and the results were analyzed using the statistical package IBM SPSS (Statistical Package for Social Sciences), version 24.0. The study of the relationship between the variables was carried out. The test for Normality used was the Kolmogorov-Smirnov Test, and all variables submitted to the test

showed non-normality; therefore, non-parametric treatment was applied using the Spearman correlation test. For the interpretation of the magnitude of the correlations, the following classification of the correlation coefficients was adopted: correlation coefficients <0.4 (weak magnitude correlation), ≥ 0.4 to <0.5 (of moderate magnitude), and ≥ 0.5 (of substantial magnitude)⁽¹⁷⁾. The level of significance adopted was 5% ($p < 0.05$).

RESULTS

126 university professors were interviewed, 71 women (56.3%) and 55 men (43.7%), with an average age of 43. Table 1 shows the minimum, maximum, standard deviation, mean and median scores of the protocols used.

Table 2 shows the correlation between the domains of the VFI and VRQOL protocols. There was a strong statistical correlation between factors 1 and 2 of the VFI and the physical domain of the VRQOL and between the same factors and the global VRQOL score.

According to Table 3, it can be seen that there was no statistical correlation between the protocols used and the sex factor.

DISCUSSION

The present study identified and correlated voice fatigue and the voice quality of life of university professors and possible differences between genders. The professors studied do not report the impact of the voice on their quality of life. However, they

Table 1. Scores found in the Voice Fatigue Index and Voice Related Quality of Life protocols

Protocols and domains	Minimum - maximum found	Mean and sd	Median
VFI – factor 1 – VFR	0-38	13.78±8.25	14
VFI – factor 2 – PD	0-18	4.05±3.84	3.5
VFI – factor 3 – RVR	0-12	7.93±3.73	9
VRQOL – Physical	45.83-100	88.49±11.70	91.6
VRQOL – Socioemotional	62.5-100	97.02±7.27	100
VRQOL – Global	52.5-100	91.90±8.85	95

Caption: VFI = Vocal Fatigue Index; VFR = Vocal fatigue and restriction; PD = Physical discomfort associated with the voice; RVR = Recovery with vocal rest; VRQOL = Vocal Related Quality of Life; sd = standard deviation

Table 2. Correlation between Voice Fatigue Index and Voice Related Quality of Life protocols

	VRQOL – Physical	VRQOL – Socioemotional	VRQOL – Global
	r	r	r
	p-value	p-value	p-value
VFI – factor 1 – VFR	-0.663 < 0.001*	-0.317 < 0.001*	-0.652 < 0.001*
VFI – factor 2 – PD	-0.542 < 0.001*	-0.297 < 0.001*	-0.539 < 0.001*
VFI – factor 3 – RVR	-0.325 < 0.001*	-0.186 0.037*	-0.338 < 0.001*

*Statistically significant values ($p \leq 0.05$) – Spearman's correlation;

Caption: VFI = Vocal Fatigue Index; VFR = Vocal fatigue and restriction; PD = Physical discomfort associated with the voice; RVR = Recovery with vocal rest; VRQOL = Vocal Related Quality of Life; r = correlation coefficient; p-value = level of statistical significance

Table 3. Comparison between female and male scores obtained in the protocols

Domains	Female			Male			p-value	
	Mean	Median	sd	Mean	Median	sd		
VFI	Factor 1 – VFR	14.63	15	8.83	12.69	11	7.37	0.226
	Factor 2 – PD	4.56	4	4.05	3.4	3	3.47	0.120
	Factor 3 – RVR	7.59	8	3.67	8.38	9	3.8	0.142
VRQOL	Physical	87.85	91.67	11.58	89.32	91.67	11.88	0.700
	Socioemotional	98.06	100	4.79	95.68	100	9.46	0.594
	Global	91.93	92.5	8.06	91.86	95	9.86	0.782

Spearman's correlation

Caption: p-value = level of statistical significance; VFI = Vocal Fatigue Index; VFR = Vocal fatigue and restriction; PD = Physical discomfort associated with the voice; RVR = Recovery with vocal rest; VRQOL = Vocal Related Quality of Life; sd = standard deviation

self-report fatigue and vocal restriction, physical discomfort associated with the voice, and recovery with vocal rest.

Voice fatigue is considered a common complaint by professors⁽¹⁸⁾. Although it is frequent in this professional class⁽¹⁹⁾, the literature has different concepts for fatigue, which can be considered a symptom or an isolated aspect⁽¹⁸⁾. It is a self-perceived parameter and challenging to measure and imprecise in its concept. The VFI proves to be a useful and reliable tool in identifying factors associated with voice fatigue^(15,18).

When comparing vocally healthy individuals and dysphonic individuals, a study⁽⁸⁾ found that the VFI averages for vocally healthy individuals were 5.16, 1.44, and 5.8 for the respective factors one, two, and three. For dysphonic individuals, the values were 24.47, 6.9, and 7.71 for the same factors, respectively. In analysis and comparison with the results obtained by our research, the participants obtained scores for factors one and two (Table 1) higher than those obtained by vocally healthy individuals and lower than the scores obtained by dysphonic individuals. As for factor 3, the score was similar to the average score of dysphonic individuals (Table 1). This evidence demonstrates that the university professor self-reported voice fatigue more intensely than healthy vocal individuals, which should be considered an alert to the speech-language pathologist.

The score obtained by university professors in this research makes us pay attention to the fact that these professionals are closer to the scores of dysphonic individuals. Several factors can disadvantage vocal production, from anatomical variation to severe dysphonia or even socioemotional factors⁽²⁰⁾, which should be further investigated in this population. However, attention should be paid to the fact that, if ignored and left untreated, the complaint of voice fatigue can disappear on its own. On the other hand, it can also lead to more significant health problems, such as laryngeal discomfort, vocal and breathing effort, and problems in vocal quality⁽¹⁹⁾.

When investigating the voice fatigue index in professors of private schools of basic elementary and high schools, a study found that professors with vocal complaints and who sought speech therapy obtained an average of 24.83 for factor 1, 7.73 for factor 2, and 9.0 for factor 3⁽⁷⁾. University professors had lower scores concerning factors 1 and 2. However, it should be noted that the professors participating in both studies are of different educational levels and that higher education professors tend to have better working conditions⁽²¹⁾. In addition, elementary and high school professors tend to have a higher weekly workload in the classroom than public school university professors since they perform and teach research, extension, and administration activities.

Considering the average global score of 91.9 among university professors in this study, it is understood that they presented positive results in VRQOL, similar to the average of individuals with healthy voices (Table 1).

A survey conducted in Brazil found that the averages for the domains of the protocol of quality of life in the voice of professors at a federal public institution were 92.5 in the global domain, 89.3 for the physical domain, and 97.3 for the socioemotional domain⁽²²⁾. Although quality of life is a broad concept⁽²³⁾, when quantifying this indicator using the VRQOL protocol, the present

study results are similar to those of the study mentioned above, demonstrating that university professors do not have an impact on the quality of life on account of the voice.

Of the nine statistical correlations present in Table 2, four showed negatively strong correlation coefficients. These correlations were between the physical and global domains of VRQOL with factors 1 and 2 of the VFI protocol. It means that there is a strong correlation between voice fatigue and restriction and the physical discomfort associated with the voice with the quality of life indexes related to the voice in its physical and global aspects. Thus, for university professors' voice-related quality of life to be maintained, such factors must be minimal or absent; therefore, the fatigue parameter should not be underestimated in this population.

There was no statistical association between the protocols and the sex factor (Table 3). However, attention should be paid to the scores obtained by the female professors in this study, which, compared to men, obtained higher scores of voice fatigue. This difference may result from the fact that female professors use their voices more than male counterparts⁽¹⁹⁾. This fact was observed by a study on the use of professors' voices during several weeks of observation⁽²⁴⁾; female professors vocalized 10% more than men at work and 7% more outside work. A more in-depth analysis of the same professors showed that female professors were more likely than their male counterparts to adjust their use of voice due to the situational need⁽²⁵⁾. In addition, women have a predisposition for developing vocal problems in a ratio of 2/1 concerning men⁽²⁶⁾ and a higher prevalence of vocal symptoms in similar educational activities for both genders⁽²⁷⁾.

Finally, it is interesting to note that, when comparing the domains of VRQOL, the most significant impacts occur in the physical domain, which indicates the perception of how much the voice is not working as it should, either due to problems in the mechanics of its production or to problems in the daily use of the voice^(28,29). In addition, professors have great demand and vocal risk in their work, so it is expected that dysphonia can be a limiting agent of good professional performance. This limitation can result in absences, a drop in professional performance, frustration, and even the desire to change the profession⁽²⁹⁾.

Since the findings of this study are relevant to the scientific production on the voice of university professors, it should be noted that the research was carried out at a specific federal university, and such data should not be generalized to the entire class of higher education. Another limiting aspect in our study is the failure to investigate vocal complaints in the investigated population.

CONCLUSION

The university professors studied obtained good levels of voice related quality of life. However, they referred to the presence of voice fatigue, with no record of difference in the comparison between the genders. There was an association between voice-related quality of life and voice fatigue, that is, the lower the score for voice fatigue, the higher the voice-related quality of life, a fact that confirms the need for preventive and clinical speech therapy follow-up for these professors, especially

in which concerns the need to pay attention to the risk factors for vocal production to which they are exposed.

REFERENCES

1. Domínguez-Alonso J, López-Castedo A, Núñez-Lois S, Portela-Pino I, Vázquez-Varela E. Perturbación de la voz en docentes. *Rev Esp Salud Publica*. 2019;93:e201908055. PMID:31395851.
2. Anhoque CF, Almeida CMC. Quality of life and coping voice. *Rev Bras Pesq Saúde*. 2017;19(2):29-35. <https://doi.org/10.21722/rbps.v19i2.18859>.
3. Limoeiro FMH, Ferreira AEM, Zambon F, Behlau M. Comparison of the occurrence of signs and symptoms of vocal and change discomfort in the vocal tract in teachers from different levels of education. *CoDAS*. 2019;31(2):e20180115. <http://dx.doi.org/10.1590/2317-1782/20182018115>. PMID:30892420.
4. Silva SSL. Main laryngeal pathologies in teachers. *Distúrb Comun*. 2018;30(4):767-75. <http://dx.doi.org/10.23925/2176-2724.2018v30i4p767-775>.
5. Marçal CCB, Peres MA. Self-reported voice problems among teachers: prevalence and associated factors. *Rev Saude Publica*. 2011;45(3):503-11. <http://dx.doi.org/10.1590/S0034-89102011005000025>. PMID:21519720.
6. Depolli GT, Fernandes DNS, Costa MRB, Coelho SC, Azevedo EHM, Guimaraes MF. Fatigue and vocal symptoms in university professors. *Dist. Comun*. 2019;31(2):225-33. <http://dx.doi.org/10.23925/2176-2724.2019v31i2p225-233>.
7. Abou-Rafée M, Zambon F, Badaró F, Behlau M. Vocal fatigue in dysphonic teachers who seek treatment. *CoDAS*. 2019;31(3):e20180120. <http://dx.doi.org/10.1590/2317-1782/20182018120>. PMID:31188907.
8. Nanjundeswaran C, Jacobson BH, Gartner-Schmidt J, Verdolini Abbott K. Vocal Fatigue Index (VFI): development and Validation. *J Voice*. 2015;29(4):433-40. <http://dx.doi.org/10.1016/j.jvoice.2014.09.012>. PMID:25795356.
9. Putnoki DS, Hara F, Oliveira G, Behlau M. Voice-related quality of life: the impact of a dysphonia according to gender, age and occupational use of voice. *Rev Soc Bras Fonoaudiol*. 2010;15(4):485-90. <http://dx.doi.org/10.1590/S1516-80342010000400003>.
10. Fabrício MZ, Kasama ST 2nd, Martinez EZ 3rd. Voice-related quality of life of university teachers. *Rev CEFAC*. 2010;12(2):280-7. <http://dx.doi.org/10.1590/S1516-18462009005000062>.
11. Servilha EAM, Roccon PF. Relation between voice and life quality for university teachers. *Rev CEFAC*. 2009;11(3):440-8. <http://dx.doi.org/10.1590/S1516-18462009005000029>.
12. Cielo CA, Ribeiro VV, Bastilha GR, Schilling NO. Quality of life in voice, perceptual-auditory assessment and voice acoustic analysis of teachers with vocal complaints. *Audiol Commun Res*. 2015;20(2):130-40. <http://dx.doi.org/10.1590/S2317-64312015000200001511>.
13. Kyriakou K, Petinou K, Phinikettos I. Risk factors for voice disorders in university professors in Cyprus. *J Voice*. 2018;32(5):643.e1-9. <http://dx.doi.org/10.1016/j.jvoice.2017.07.005>. PMID:28826977.
14. Moghtader M, Soltani M, Mehravar M, JafarShaterzadehYazdi M, Dastoorpoor M, Moradi N. The relationship between vocal fatigue index and voice handicap index in university professors with and without voice complaint. *J Voice*. 2020;34(5):809.e1-5. <http://dx.doi.org/10.1016/j.jvoice.2019.01.010>. PMID:30770170.
15. Zambon F, Moreti F, Nanjundeswaran C, Behlau M. Cross-cultural adaptation of the Brazilian version of the Vocal Fatigue Index – VFI. *CoDAS*. 2017;29(2):e20150261. <http://dx.doi.org/10.1590/2317-1782/20172015261>. PMID:28300936.
16. Behlau M, Madazio G, Moreti F, Oliveira G, Santos LM, Paulinelli BR, et al. Efficiency and cutoff values of self-assessment instruments on the impact of a voice problem. *J Voice*. 2016;30(4):506.e9-18. <http://dx.doi.org/10.1016/j.jvoice.2015.05.022>. PMID:26168902.
17. Hulley SB, Cummings SR, Browner WS, Grady D, Hearst N, Newman TB. *Delineando a pesquisa clínica: uma abordagem epidemiológica*. 2. ed. Porto Alegre: Artmed; 2003.
18. Banks RE, Bottalico P, Hunter EJ. The effect of classroom capacity on vocal fatigue as quantified by the vocal fatigue index. *Folia Phoniatr Logop*. 2017;69(3):85-93. <http://dx.doi.org/10.1159/000484558>. PMID:29232686.
19. Hunter EJ, Banks R. Gender differences in the reporting of vocal fatigue in teachers as quantified by the vocal fatigue index. *Ann Otol Rhinol Laryngol*. 2017;126(12):813-8. <http://dx.doi.org/10.1177/0003489417738788>. PMID:29078706.
20. Leite AF, Nogueira JAD. Fatores condicionantes de saúde relacionados ao trabalho de professores universitários da área da saúde: uma revisão integrativa. *Rev Bras Saúde Ocup*. 2017;42:e6. <http://dx.doi.org/10.1590/2317-6369000010116>.
21. Servilha EAM, Arbach MP. Assessment of effect of vocal coaching with college professors. *Distúrb Comun*. 2013;25(2):211-8.
22. Lopes MCLA, Fagundes SN, Mousinho KC, Correia MGC, Ribeiro CMB, Vanderlei AD. Factors associated with vocal health and quality of life in teachers/professors. *Rev CEFAC*. 2018;20(4):515-31. <http://dx.doi.org/10.1590/1982-021620182048417>.
23. Gasparini G, Behlau M. Quality of Life: Validation of the Brazilian Version of the Voice-Related Quality of Life (V-RQOL) Measure. *J Voice*. 2009;23(1):76-81. <http://dx.doi.org/10.1016/j.jvoice.2007.04.005>. PMID:17628396.
24. Hunter EJ, Titze IR. Variations in intensity, fundamental frequency, and voicing for teachers in occupational versus nonoccupational settings. *J Speech Lang Hear Res*. 2010;53(4):862-75. [http://dx.doi.org/10.1044/1092-4388\(2009/09-0040\)](http://dx.doi.org/10.1044/1092-4388(2009/09-0040)). PMID:20689046.
25. Hunter EJ, Bottalico P, Graetzer S, Leishman TW, Berardi ML, Eyring NG, et al. Teachers and teaching: speech production accommodations due to changes in the acoustic environment. *Energy Procedia*. 2015;78:3102-7. <http://dx.doi.org/10.1016/j.egypro.2015.11.764>. PMID:26949426.
26. Russell A, Oates J, Greenwood KM. Prevalence of voice problems in teachers. *J Voice*. 1998;12(4):467-79. [http://dx.doi.org/10.1016/S0892-1997\(98\)80056-8](http://dx.doi.org/10.1016/S0892-1997(98)80056-8). PMID:9988034.
27. Smith E, Kirchner HL, Taylor M, Hoffman H, Lemke JH. Voice problems among teachers: differences by gender and teaching characteristics. *J Voice*. 1998;12(3):328-34. [http://dx.doi.org/10.1016/S0892-1997\(98\)80022-2](http://dx.doi.org/10.1016/S0892-1997(98)80022-2). PMID:9763182.
28. Behlau M, Hogikyan ND, Gasparini G. Quality of life and voice: study of a Brazilian population using the voice-related quality of life measure. *Folia Phoniatr Logop*. 2007;59(6):286-96. <http://dx.doi.org/10.1159/000108335>. PMID:17965571.
29. Putnoki DS, Hara F, Oliveira G, Behlau M. Voice-related quality of life: the impact of a dysphonia according to gender, age and occupational use of voice. *Rev Soc Bras Fonoaudiol*. 2010;15(4):485-90. <http://dx.doi.org/10.1590/S1516-80342010000400003>.

Author contributions

SCC and GTD participated in project design, data collection, data analysis, and article writing; DNSF and MRBC participated in data collection; KSC participated in article writing; EHMA and GO participated in article review and writing; MFG participated preparing the research project, guiding all stages of the work, participating in data analysis, review and writing of the article.