Original Article

https://doi.org/10.1590/2317-6431-2020-2365

Audiology Communication Research
ISSN 2317-6431

Vocal alteration in active elderly and associated factors

Alteração vocal em idosos ativos e fatores associados

Priscila Cristine Santos[1], *Noeli Dias Romão*[1], *Jessica Danielle Santos de Jesus*[1], *Iara Barreto Bassi*[2], *Adriane Mesquita de Medeiros*[1]

ABSTRACT

Purpose: To verify suspected vocal alterations in active elderly and its association with sociodemographic, voice-related lifestyle habits and vocal handicap aspects. **Methods:** Cross-sectional observational study conducted with 254 elderly users of public health gyms in Belo Horizonte municipality. Data collection included an interview containing sociodemographic information, voice-related life habits and hoarseness self-report, in addition to the application of protocols: vocal handicap index (IDV-10) and screening for voice disorders (RAVI in Portuguese). The result of RAVI was considered the outcome variable. The data were subject to descriptive and association analysis using Pearson's Chi-square and Poisson Regression tests with Robust variance (5% significance level). **Results:** It was found that the majority of the elderly are female (83.5%), aged 60 to 70 years (65.4%), retired (84.9%) and without a partner (61.8%). According to the RAVI protocol, 44.5% of them are suspected of voice alteration. Through multivariate analysis, the self-reported variables of hoarseness and vocal handicap showed association with suspected vocal changes measured by RAVI. **Conclusion:** The vocal alteration suspicion was high in the elderly actives. The suspicion of vocal alteration was higher among the elderly with self-reported hoarseness and with vocal handicap.

Keywords: Voice; Elderly; Speech therapy; Voice disorders; Hoarseness; Aging

RESUMO

Objetivo: Verificar a suspeição de alteração vocal em idosos ativos e a associação com aspectos sociodemográficos, hábitos de vida relacionados à voz e desvantagem vocal. **Métodos:** Estudo observacional transversal realizado com 254 idosos usuários de academias públicas do município de Belo Horizonte (MG). A coleta de dados incluiu uma entrevista, contendo informações sociodemográficas, hábitos de vida relacionados à voz e autorrelato de rouquidão, além da aplicação dos protocolos Índice de Desvantagem Vocal (IDV-10) e Rastreamento de Alteração Vocal em Idosos (RAVI). O resultado do RAVI foi considerado a variável resposta. Os dados foram submetidos à análise descritiva e de associação, por meio dos testes Qui-quadrado de Pearson e Regressão de Poisson, com variância robusta (nível de significância de 5%). **Resultados:** Verificou-se que a maioria dos idosos era do sexo feminino (83,5%), na faixa etária de 60 a 70 anos (65,4%), aposentada (84,9%) e sem companheiros (61,8%). Segundo o protocolo RAVI, 44,5% dos idosos apresentaram suspeição de alteração vocal. Na análise multivariada, as variáveis autorrelato de rouquidão e desvantagem vocal apresentaram associação com a suspeição de alteração vocal mensurada pelo RAVI. **Conclusão:** Foi elevada a suspeição de alteração vocal em idosos ativos, sendo maior entre os idosos com autorrelato de rouquidão e com desvantagem vocal.

Palavras-chave: Voz; Idoso; Fonoaudiologia; Distúrbios da voz; Rouquidão; Envelhecimento

Study carried out at Universidade Federal de Minas Gerais – UFMG – Belo Horizonte (MG), Brasil.
[1]Universidade Federal de Minas Gerais – UFMG – Belo Horizonte (MG), Brasil.
[2]Fundação Hospitalar do Estado de Minas Gerais – FHEMIG – Belo Horizonte (MG), Brasil.
Conflict of interests: No.
Authors' contribution: PCS collection, analysis, interpretation of the data, writing of the article and final approval of the version to be published; NDR collection, analysis, interpretation of the data, writing of the article and final approval of the version to be published; JDSJ collection, analysis, interpretation of the data, writing of the article and final approval of the version to be published; IBB analysis and interpretation of the data, critical review of the article and final approval of the version to be published; AMM design, design, analysis, interpretation of the data, critical review of the article and final approval of the version to be published
Funding: This work was carried out with the support of the Coordenação de Aperfeiçoamento de Nível Superior- Brasil (CAPES) - Financing Code 001.
Corresponding author: Priscila Cristine Santos. E-mail: priscilacristinest@gmail.com
Received: June 11, 2020; **Accepted:** October 13, 2020

INTRODUCTION

There is a challenge for society and the State in confronting the aging process: the need to ensure comprehensive care for the elderly recognizing their characteristics and specificities while maintaining their quality of life[1,2]. It is estimated that in 2040, 23.8% of the Brazilian population will be elderly, an accelerated growth of this age group above 60 years old[2].

Actions aiming at active aging must be based on the principle of optimization of health opportunities, participation and safety[1]. The adoption of an active life style must be encouraged, as it prevents frequent non-communicable chronic diseases in the elderly and contributes to the maintenance of functional independence[3,4] The benefits of physical activity by the elderly may be classified in the biological, psychological and social spheres, such as the improvement of the mood and life quality[4].

It is believed that active elderlies need a healthy voice for better communication in the collective spaces, such as the practice of physical activity. The prevalence of vocal disorders in this population, individuals with 60 years old or more, varies from 4.8% to 29.1%[5]. The etiology of vocal disorders is multifactorial, and in aged persons it may be functional, organic or due to laryngeal aging[6,7]

Natural changes in the larynx and structures involved in phonation[8] may or may not generate changes in the voice of the elderly, such as reduced loudness, breathy voice, trembling voice, vocal fatigue and decreased maximum phonation time[6,9]. These voice changes resulting from aging are called presbyphonia[6], and the diagnosis is made by exclusion[6].

Active elderly people who perceive the influence of vocal changes in the daily life report an impact on the quality of life. There are handicaps in the communication efficiency, compromising socialization mechanisms, maintenance of autonomy and sense of well-being[10]. Considering that vocal disorders in aged persons may be associated to physical, behavioral and social health status[5], there is a need to investigate the demographic aspects, voice related habits and self-perception of how voice alteration affects daily life related with aging.

Vocal alteration tracking in active elderly can help in the planning of preventive and vocal health promotion actions and early intervention to favor communicative ability. Therefore, the objective of this study was to verify the vocal alteration suspicion in active elderly and the association with socio-demographic aspects, life habits related to voice and vocal handicap.

METHOD

The research was approved by the Committees of Ethics in Research of the Federal University of Minas Gerais and the Municipal Secretary of Health of Belo Horizonte under opinion 2.313.952. All participants in this research agreed to participate and signed the Term of Free and Informed Consent.

A cross-sectional observational study was conducted with 254 elderly people over 60 years of age, 212 women and 42 men. The elderly researched are users of public gyms in the city of Belo Horizonte (MG). The place of collection was selected for convenience, because there are a large number of aged persons attending the municipal public gyms. The capital city hall has a network of gyms with free activities for population over 18 years old, through a health promotion program developed by the Municipal Health Department, supported by incentives from the Ministry of Health (Gyms of the City Program).

The sample calculation was made considering the total number of elderly people (n=474) that were attending the public gyms, during the collection period, in the center-south region of the municipality. The sample was stratified proportionally by sex and by public gyms, considering the list of the elderly attending six of those facilities in the regional center-south of the city. The assumptions used were: 20% sample loss, 40% prevalence of speech and hearing problems in elderly and 95% confidence interval. The estimated sample size was 235 subjects, considering a sample error of 5%. The survey was carried out in a district of the municipality due to the cost of displacement and time for data collection.

Contacts were made with the managers of the gyms through calls and e-mails, survey of activity schedules, dissemination in the units through folders, scheduling and recruitment before and after the hours of activities of the elderly.

The inclusion criteria were: age equal or superior to 60 years, both sexes, with no report of vocal disorder and some acute health problem at the time of the interview, registered elderly and frequent use of the activities carried out in one of the six Gyms of the City Program selected for the study. Before the data collection, the researchers asked questions about the aspects considered as inclusion criteria for the selection of participants. Five elderly people that answered the questionnaire more than once in different days of the research were excluded from the study. It is important to point out that this situation occurred because the data collection was carried out by a team of researchers and the aged person agreed to participate more than once in the same research.

The data collection was carried out through structured interview and protocol application. Two speech-language therapists collected the data with experience in assisting the elderly as well as three previously trained speech-language therapy students. The students were supervised by speech-language therapists through weekly meetings. The approximate time for interview and response to protocols was 25 minutes on average. This duration was already foreseen in the pilot study to verify the appropriateness of the choice of protocols and understanding of the elderly regarding the selected questions. In a first step, a structured interview was carried out to collect socio-demographic information and life habits related to voice and later application of the protocols Screening for Voice Disorders in Older Adults (RAVI in the Portuguese acronym), developed with the Brazilian population[11] and the Voice Handicap Index (IDV-10 in the Portuguese acronym)[12] .

The following data were collected: gender, marital status, age, retirement, being or having been a smoker, previous or current participation in activities such as singing and choir, and self-reported voice hoarseness. The presence of smoking adopted as a reference the fact that the elderly smoke or have smoked at least 100 cigarettes (five packs of cigarettes) throughout life.

The RAVI protocol deals with issues for the screening of vocal alterations in the elderly, prepared specifically for the Brazilian geriatric population, which can be used for epidemiological studies. The protocol is composed of 10 issues associated with sensations and perceptions of vocal symptoms, as well as the frequency with which they appear. The protocol contemplates the following issues: Does your voice bother you? Does your voice disappear throughout the day? Does your voice get worse throughout the day? Does your voice make an effort

to come out? Does your voice feel tired? Does your throat feel dry? Does your throat feel itchy? Does your throat feel ardency or burning? Do you need to clear your throat? Do you feel throat pain? Its application is easy, fast and low cost and allows the tracking of vocal changes in the impossibility of laryngeal evaluation[11].

RAVI is a vocal self-assessment protocol with three response options (no=0, sometimes=1 and yes=2). The final score is a simple sum with a maximum score of 20. The presence of suspected vocal changes was considered a final score of three or more, according to the validation[11]. The response variable was dichotomous, allowing the comparison between the presence and absence of vocal alteration.

The IDV-10 protocol consists of ten questions with five response options (never=0, almost never=1, sometimes=2, almost always=3 and always=4). IDV-10 measures the presence of vocal handicap in an individual's life. The maximum score of this protocol is 40 points. The total score is obtained by a simple sum, and results higher than seven and a half are considered as presence of vocal handicap, while lower than this value, as its absence [12].

For the purposes of the statistical research, a descriptive analysis was performed using the absolute and relative frequency of qualitative variables and measures of central tendency and dispersion of the IDV-10 and RAVI protocols. The RAVI protocol response was used as a response variable (presence or absence of suspected vocal change). We compared the groups with and without suspicion of vocal alteration, in relation to the other variables. We used Pearson's Chi-square statistical test with a 5% significance level. The multivariate analysis was performed using Poisson Regression with robust variance. This strategy allows obtaining the magnitude of the association through the Prevalence Ratio (PR). Variables that presented significance up to 0.20 (p-value) in univariate analysis were selected for multivariate analysis. In the final model, statistical significance was considered in the 95% confidence interval. The analysis used STATA program, version 12.0. (Stata Corp., College Station, USA).

RESULTS

It was evident that within the 254 elderly interviewees there is a majority of females (83.5%), between 60 and 70 years old (65.4%), retired (84.9%), with no companions (61.8%), and with high school or higher education completed (56.1%). The results showed that 32.3% of the participants declared being current or former smokers and 27.9% reported participating or having participated in a choir at some point in their lives. Hoarseness was declared by 24.1% of the elderly (Table 1).

The results of the RAVI and IDV-10 protocols, considering the established cutoff point, indicated that 44.5% of the elderly had suspected vocal alteration and 12.6% had vocal handicap (Table 1).

In the univariate analysis it was observed that the variables participation in chorus, hoarseness self-reported, and vocal handicap presented a statistically significant association with the presence of vocal alteration according to RAVI (Table 2).

The variables with statistical significance in the univariate analysis ($p \leq 0,05$) were included in the multivariate model. In the final model the self-reported hoarseness and the vocal handicap remained statistically associated. Hoarseness self-reporting increases 65% the probability of suspected vocal alteration in the elderly, while vocal handicap increases 2.16 times this probability. (Table 3).

DISCUSSION

Currently, it is possible to observe that there has been investment in the promotion of a better quality of life, regardless of age. Data found in the literature suggest that the participation of the elderly in convivial groups contributes to a more active lifestyle[13]. Furthermore, it is possible to infer that senescent changes in the elderly communication as well as their perception about those changes are of extreme importance[10].

The results showed that the elderly studied are predominantly female (83.5%), aged between 60 and 70 years (65.4%). The predominance of women engaged in physical activities shows that in fact, women are physically more active than men[13].

It was also verified that most of the elderly surveyed are retired (84.9%) and without partners (61.8%), which may indicate the importance of insertion in the municipal public gyms for greater socialization. Communication possibilities are extremely relevant for social interaction, the act of interacting is

Table 1. Frequency distribution of socio-demographic data and aspects related to the voice of elderly (n=254)

	n	%
Sex		
Females	212	83.5
Males	42	16.5
Age range (years)		
60-70	166	65.4
71-90	88	34.6
Retired		
No	38	15.1
Yes	214	84.9
Schooling		
Illiterate - Elementary	111	43.9
High School - Higher Education	142	56.1
Marital status		
With a partner	97	38.2
Without a partner	157	61.8
Smoker		
No	172	67.7
Smoker/ former smoker	82	32.3
Sings in a Choir		
No	183	72.0
Participates /participated	71	27.9
Hoarseness		
No	192	75.9
Yes	61	24.1
Vocal Alteration (RAVI)		
No	141	55.5
yes	113	44.5
Vocal Handicap (IDV-10)		
No	222	87.4
Yes	32	12.6

Obs: totals may differ due to missing data

Subtitle: n = number of participants; % percentage; RAVI = Screening for Voice Disorders in Elderly; Vocal Handicap Index (IDV-10)

Table 2. Association between socio-demographic data, voice-related aspects and vocal change of elderly (n=254)

Variables	Vocal Alteration		*p*
	No	Yes	
	n (%)	n (%)	
Sex			
Female	117(55.2)	95 (44.8)	0.816
Male	24 (57.1)	18 (42.9)	
Age Range (years)			
60 - 70	85 (51.2)	81 (48.8)	0.058
71 - 90	56 (63.6)	32 (36.4)	
Retired			
No	20 (52.6)	18 (47.4)	0.734
Yes	119(55.6)	95 (44.4)	
Schooling			
Illiterate - Elementary	54 (48.6)	57 (51.4)	0.059
High School -Higher Education	86 (60.6)	56 (39.4)	
Marital status			
With a partner	59 (60.8)	38 (39.2)	0.180
Without a partner	82 (52.2)	75 (47.8)	
Smoking			
No	96 (55.8)	76 (44.2)	0.888
Smoker/ former smoker	45 (54.9)	37 (45.1)	
Sings in a Choir			
No	74 (40.4)	109 (59.6)	0.037
Participates – participated	39 (54.9)	32 (45.1)	
Hoarseness			
No	122(63.5)	70 (36.5)	<0.001
Yes	18(29.5)	43 (70.5)	
Vocal handicap			
No	139(62.6)	83 (37.4)	<0.001*
Yes	2 (6.2)	30 (93.8)	

Obs: totals may differ due to missing data; Chi-Square Test; *Fisher test
Subtitle: n = Number of participants; % percentage

Table 3. Multivariate analysis of the association between hoarseness self-reported, vocal handicap and vocal alteration (RAVI) of elderly (n=254)

	PR (CI95%)
Hoarseness	
No	1
Yes	1.65 (1.12-2.46)*
Vocal handicap	
Yes	1
No	2.16 (1.41-3.34)**

*p<0.05; **p<0.001
Subtitle: PR = Prevalence Ratio; CI95% = 95% Confidence Interval

necessary for the preservation of independence and autonomy[9]. The socialization promoted by the practice of collective physical activity may be a way to help in the promotion of the active communication process[14].

The sample was composed of elderly people with a great diversity of schooling achievement. The suspicion of vocal change was more frequent among the elderly with less schooling that grouped the illiterate until the complete elementary school when compared to those with high school or higher education, but there was no statistical significance. Despite scarce in literature, there is evidence of association between the presence of vocal disorder and schooling[15].

Smoking is a risk factor for several diseases and a major public health problem[16]. Cigarette components in contact with the larynx alter the vocal quality, the histology of vocal cords and favor the appearance of laryngeal disorders such as Reinke's edema and cancer[17]. There is evidence in the literature of the relationship between smoking and vocal symptoms of hoarseness and thick voice[18]. A survey conducted with institutionalized elderly people revealed that 73% of the interviewees smoked, while 27% had already being smokers. In the present survey, a much lower frequency (32.3%) of current or former smokers was observed, which can be explained by the profile of the elderly. This finding may be related to the active profile of the population investigated, therefore pointing out to the importance of health education practices to increase the adoption of other healthy habits such as smoking cessation or reduction.

Almost one third of the researched elderly (27.9%) reported that they participate or have participated in a choir. A study showed that elderly people who sing tend to perform physical exercises, because singing is motivating and stimulates the elderly to be more physically and socially active, which may influence their vocal quality[19]. Regarding the higher frequency of vocal alteration found among practicing singing participants, it can be explained by the fact that the elderly singing present a higher perception and appreciation of vocal symptoms[20]. In the case of elderly people, singing is reflected in the opportunity for establishing a more intimate perception of themselves, both physically and emotionally[20]. In multivariate analysis, the practice of singing has lost its statistical significance regarding the suspicion of vocal alteration. If on one hand the practice of singing increases the perception of vocal symptoms, on the other hand, it may be related to the interest in taking more care of the voice.

According to the RAVI protocol, 44.5% of the active elderly presented suspicion of vocal alteration. The prevalence was higher than the findings of a review study[5] indicating frequencies ranging from 4.8% to 29.1% of vocal alteration in four surveys with elderlies. The methodological diversity of the studies makes difficult the comparison of results, since the methods adopted to evaluate the presence of vocal alteration were different, and in some studies the elderly were divided as voice professionals and non voice professionals. It is important to highlight the fact that the present study has investigated active elderly, calling for caution in the discussion of the data that uses the comparison that studied elderly with distinct characteristics. Two researches that also used RAVI in elderly of the general population and institutionalized elderly in the northeast of Brazil, identified suspicion of vocal alteration of 51.4% and 39.3% respectively[21,22].

Vocal disorder in the elderly may be associated to several factors such as respiratory condition, gastroesophageal reflux, thyroid problems, body weight, rheumatoid arthritis, vocal fold diseases, sleep disorders, among others[23] that were not investigated in the present study. The multicausality of the vocal disorder and the high frequency of chronic non-communicable diseases in the elderly increases the complexity of investigating the vocal disorder in this group through epidemiological studies. On the other hand, the use of RAVI aims to track possible vocal alteration for further investigation of suspected cases and subsequent diagnosis[11].

The present study showed a statistically significant association between vocal alteration measured by RAVI and self-reported hoarseness. It is worth mentioning that the symptoms investigated in RAVI refer to proprioceptive sensations without the inclusion

of auditory symptoms. The frequency of hoarseness in the elderly in this study was lower than in other studies with results ranging from 35% to 78.2%[24–26]. The elderly participants, due to the fact that they are active, tend to present healthier life habits that may have influenced this finding. The elderly perceive that the need to adopt habits and behaviors inherent to lifestyle, such as healthy eating, physical activity, not being a smoker or drinking, are important behaviors to age in a healthy way[27], which may reflect in a better vocal quality.

There was a strong statistical association between the suspicion of vocal alteration and the presence of vocal handicap. The frequency of vocal handicap in this study was much higher among the elderly with suspected vocal alteration. Few studies have investigated the association of vocal symptoms with vocal handicap in the elderly. It is known that the voice disorder is a dynamic and functional manifestation that has multiple and complex causality. Vocal disorder is not only a laryngeal problem, but an oral communication difficulty that prevents the natural voice production[28], being therefore important to investigate the perception of the elderly on the impact of vocal symptoms on daily life activities and quality of life[29].

In the present study, the vocal handicap was reported by 12.6% of the elderly, a result close (9.7%) to that found among the elderly at the Open University for the Elderly in São Paulo[10]. Vocal handicap was much higher (70.0%) among elderly European men with presbyphonia, non-smokers and who did not use their voice professionally[29]. The identification of vocal impairment has a subjective character and confirms the suspicion of vocal alteration, indicating the need for further investigation for diagnostic confirmation of the case.

This study presents as limitation the absence of speech-language clinical evaluation and laryngeal examination, which makes impossible the diagnosis of presbyphonia and/or presbylarynx in the elderly. The results cannot be generalized to the whole elderly population, because they were researched only elderly people from the center-south region of the city. Furthermore, the researched elderly fit in a profile of active elderly, practicing physical activities in public gyms. Because it is a cross-sectional study it is not possible to establish causality relation.

The results of this study allow us to say that the use of RAVI protocol can help in the tracking of vocal alterations. In addition, it allows the monitoring of the actions of prevention and promotion of vocal health carried out in collective environments, such as public spaces for the practice of physical activity. The use of RAVI combined with IDV-10, for situations of health education actions in collective spaces, allows better identification of the need for referrals for diagnostic confirmation and conduct of the elderly. Campaigns and actions aimed at maintaining healthy habits such as smoking cessation should be encouraged.

It is necessary to encourage more research about the vocal changes in the elderly in order to increase the longevity in the population. The speech-language actions with the elderly are important and aim to mitigate the impact of the vocal aging process and its implications on social integration, communication and quality of life[30], alongside with vocal rehabilitation.

CONCLUSION

The results of the study show the high presence of suspected vocal alteration in active elderly. The suspicion of vocal alteration was associated with self-reported hoarseness and vocal handicap. Strategies to identify active seniors with suspected vocal alteration, hoarseness symptoms and vocal handicap are necessary to stimulate vocal health promotion and prevention actions, fostering early referrals and interventions.

ACKNOWLEDGEMENTS

To Daniele Veloso de Castro Ferreira and Rosane da Silva Soares for their help in the data collection.

REFERENCES

1. OMS: Organização Mundial de Saúde. OPAS: Organização Pan-Americana da Saúde. Envelhecimento ativo: uma política de saúde. Brasília: OPAS; 2005.
2. Miranda GMD, Mendes ACG, Silva ALA. O envelhecimento populacional brasileiro: desafios e consequências sociais atuais e futuras. Rev Bras Geriatr Gerontol. 2016;19(3):507-19. http://dx.doi.org/10.1590/1809-98232016019.150140.
3. Matsudo SM, Matsudo VKR, Barros TL No. Atividade física e envelhecimento: aspectos epidemiológicos. Rev Bras Med Esporte. 2001;7(1):2-13. http://dx.doi.org/10.1590/S1517-86922001000100002.
4. Maciel MG. Atividade física e funcionalidade do idoso. Motriz. 2010;16(4):1024-32.
5. Pernambuco L, Espelt A, Balata PM, De Lima KC. Prevalence of voice disorders in the elderly a systematicreview of population based studies. Eur Arch Otorhinolaryngol. 2015;272(10):2601-9. http://dx.doi.org/10.1007/s00405-014-3252-7. PMid:25149291.
6. Meirelles RC, Bak R, Cruz FC. Presbifonia. Rev Hosp Univ. Pedro Ernesto. 2012;11:77-82.
7. Kendall K. Presbyphonia: a review. Curr Opin Otolaryngol Head Neck Surg. 2007;15(3):137-40. http://dx.doi.org/10.1097/MOO.0b013e328166794f. PMid:17483679.
8. Tarafder KH, Dattas PG, Tariq A. The Aging voice. BSMMU J. 2012;5(1):83-6.
9. Penteado RZ, Penteado LAPB. Percepção da voz e saúde vocal em idosos coralistas. Rev CEFAC. 2009;12(2):288-98. http://dx.doi.org/10.1590/S1516-18462009005000053.
10. Chiossi JSC, Roque FP, Goulart BNG, Chiari BM. Impacto das mudanças vocais e auditivas na qualidade de vida de idosos ativos. Cien Saude Colet. 2014;19(8):3335-42. http://dx.doi.org/10.1590/1413-81232014198.07642013. PMid:25119073.
11. Pernambuco LA, Espelt A, Magalhães HV Jr, Cavalcanti RVA, Lima KC. Screening for voice disorders in older adults-Part I. J Voice. 2016;30(2):246.e9-17. http://dx.doi.org/10.1016/j.jvoice.2015.04.008.
12. Costa T, Oliveira G, Behlau M. Validação do Índice de Desvantagem Vocal: 10 (IDV-10) para o português brasileiro. CoDAS. 2013;25(5):482-5. http://dx.doi.org/10.1590/S2317-17822013000500013. PMid:24408554.
13. Cardoso AS, Levandoski G, Mazo GZ, Prado APM, Cardoso LS. Comparação do nível de atividade física em relação ao gênero de idosos participantes de grupos de convivência. RBCEH. 2008;5(1):9-18.
14. Wichmann FMA, Couto AN, Areosa SVC, Montañés MCM. Grupos de convivência como suporte ao idoso na melhoria da saúde. Rev Bras Geriatr Gerontol. 2013;16(4):821-32. http://dx.doi.org/10.1590/S1809-98232013000400016.

15. Kim KH, Kim RB, Hwang DU, Won SJ, Woo SH. Prevalence of and Sociodemographic Factors Related to Voice Disorders in South Korea. J Voice. 2016 Mar;30(2):246.e1-7. http://dx.doi.org/10.1016/j.jvoice.2015.04.010. PMid:25985718.

16. Rocha DR Fo, Araújo KM, Gomes PV, . Tabagismo na terceira idade em uma instituição de longa permanência. R. Interd. 2017;10(2):26-31.

17. Hashibe M, Bofetta P, Zaridze D, Shangina O, Szeszenia-Dabrowska N, Mates D, et al. Contribuição do tabaco e do álcool para as altas taxas de carcinoma espinocelular da supraglote e glote na Europa central. Am J Epidemiol. 2007;165(7):814-20. http://dx.doi.org/10.1093/aje/kwk066. PMid:17244634.

18. Ferreira LP, Heringer MRC, Pompeu ATS, Pedra AM, Latorre MRDO. Efeitos deletérios do tabagismo e a maconha na voz de estudantes Universitários. Distúrb Comun. 2016;28(1):102-13.

19. Aquino FS, Silva MAA, Teles LCS, Ferreira LP. Características da voz falada de idosas com prática de canto coral. CoDAS. 2016;28(4):446-53. http://dx.doi.org/10.1590/2317-1782/20162015109. PMid:27652927.

20. Degani M, Mercadante EF. Os benefícios da música e do canto na maturidade. Rev Kairós. 2011;13(2):149-66.

21. Gois ACB, Pernambuco L, Lima KC. Prevalence and associated factors with voice disorders in Brazilian community-dwelling older adults. J Voice. 2019;33(5):806.e1-7. http://dx.doi.org/10.1016/j.jvoice.2018.02.025. PMid:29678439.

22. Pernambuco LA, Espelt A, Góis ACB, Lima KCL. Voice disorders in older adults living in nursing homes: prevalence and associated factors. J Voice. 2017;31(4):510.e15-21. http://dx.doi.org/10.1016/j.jvoice.2016.11.015. PMid:28069466.

23. Gois ACB, Pernambuco LA, Lima KC. Factors associated with voice disorders among the elderly: a systematic review. Rev Bras Otorrinolaringol. 2018;84(4):506-13. http://dx.doi.org/10.1016/j.bjorl.2017.11.002. PMid:29331352.

24. Soares EB, Borba DT, Barbosa TK, Medved DM, Montenegro ACA. Hábitos vocais em dois grupos de idosos. Rev CEFAC. 2007;9(2):221-7. http://dx.doi.org/10.1590/S1516-18462007000200011.

25. Roy N, Stemple J, Merrill RM, Thomas L. Epidemiology of voice disorders in the elderly: preliminary findings. Laryngoscope. 2007;117(4):628-33. http://dx.doi.org/10.1097/MLG.0b013e3180306da1. PMid:17429872.

26. Menezes LN, Vicente LCC. Envelhecimento vocal em idosos institucionalizados. Rev CEFAC. 2007;9(1):90-8. http://dx.doi.org/10.1590/S1516-18462007000100012.

27. Tavares RE, De Jesus MCP, Machado DR, Braga VAS, Tocantins FR, Merighi MAB. Envelhecimento saudável na perspectiva de idosos: uma revisão integrativa. Rev Bras Geriatr Gerontol. 2017;20(6):889-900.

28. Behlau M. The 2016 G. Paul Moore Lecture: Lessons in Voice Rehabilitation: Journal of Voice and Clinical Practice. J Voice. 2019 Set;33(5):669-81. PMid:29567050.

29. Kosztyła-Hojna B, Zdrojkowski M, Duchnowska E. The application of *High-Speed* camera (HS), acoustic analysis and Voice Handicap Index (VHI) questionnaire in diagnosis of voice disorders in elderly men. Otolaryngol Pol. 2019;73(5):25-30. PMid:31701899.

30. Cardozo CN, Heidemann ITSB, Marçal CCB, Arakawa-Belaunde AM. Percepção de idosos cantores sobre a promoção da saúde da voz. Rev CEFAC. 2018;20(6):734-41. http://dx.doi.org/10.1590/1982-0216201820617017.