

AMATEUR CHOIR SINGERS: SELF-IMAGE, DIFFICULTIES AND SYMPTOMS OF THE SINGING VOICE

Coralistas amadores: auto-imagem, dificuldades e sintomas na voz cantada

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ABSTRACT

Purpose: to evaluate vocal self-perception, difficulties and presence of negative symptoms after singing of amateur choir singers of different vocal classifications, age and experience. **Method:** one hundred and twenty five singers answered a questionnaire containing identification data, information about self-perception of the singing voice, difficulties with singing and negative symptoms after singing. **Results:** the comparison considering vocal classification evidenced greater difficulties with high notes for altos and basses, greater difficulty regarding the transition to high notes for basses and greater vocal fatigue for altos. Comparing the singers by age, both adults and young adults referred more breathiness than the elderly. The adults referred better vocal intensity than the young adults. The young adults referred better timbre than adults. Regarding the experience, the less experienced singers reported self-perception of hoarseness and presence of hoarseness after singing in greater number than the experienced singers. **Conclusion:** the difficulties with singing are connected to the vocal classification and do not depend on age or experience. Vocal symptoms are related to the vocal classification and to the experience with singing. Negative self-perception is also related the vocal classification and to the experience with singing, and positive self-perception was more reported by experienced singers.

KEYWORDS: Voice; Voice Disorders; Music

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■ INTRODUCTION

Choral singing is characterized by group activity, and diversity is one of its main characteristics. Its demands vary depending on the amateur or professional nature and on the repertoire characteristics, which also vary widely¹.

The literature states several factors that can impact directly the performance of a choir singer. They include the vocal classification², vocal changes related to age since maturation until senescence³⁻⁶, and also the great diversity of the participants regarding singing experience in choirs^{7,8}.

One of the characteristics of amateur choirs is the great evasion of singers⁹. Generally, the new participants are inexperienced and often have little

knowledge about how to protect their vocal health¹⁰. However, it is usually possible that people who are beginning the practice of singing may develop a healthy and pleasant voice with appropriate training¹¹.

Musical experience seems to have different effects on the singing performance and is considered important for the musical development¹². Braun-Janzen and Zeine¹³ investigated the levels of interest and knowledge of vocal production of singers, concluding that amateur singers were susceptible to developing negative symptoms. Cohen et al.¹⁴ investigated the quality of life in elderly singers with vocal complaints, concluding that less experienced singers present greater vocal handicap than professional singers.

An important step for beginning singers is the vocal classification, in which they are divided in high vocal range ("soprano" for women and "tenor" for men) and low vocal range ("alto" for women and "bass" for men). Due to the vocal characteristics and demands observed in each vocal classification, it is common that singers have more ease in performing determined tasks and greater difficulties in others.

In an investigation of vocal use of choir singers, Ribeiro and Hanayama² concluded that sopranos present a higher number of overall difficulties and that altos present higher number of multiple vocal symptoms, such as difficulties changing registers and in the emission of high notes in low intensity.

The singing activity can be performed by people of different ages or profiles, who normally practice amateur singing seeking entertainment. The literature has been making growing reference to the use of the singing voice in middle aged and elderly singers. Spiegel, Sataloff and Emerich¹⁵ cite that the prevalence of vocal abuse and health problems related to age can be important factors to be considered. Moreover, vocal changes during the normal aging process may be related to implications such as decrease of the breathing volume and respiratory control during singing¹⁶. Other vocal alterations caused by aging include decrease of maximum phonation time, breathiness, asthenia, instability, hoarseness, inability to sustain phonation, inadequate loudness and loss of vocal range¹⁷. However, age related changes in the habitual frequency seem to be less prominent or even absent in trained voices¹⁸. The vocal maturation of professional singers shows phonatory stability, promoting the optimization of breathing control and phonatory abilities. This way, it is possible that well prepared elderly professionals can add training and experience to their vocal performance, and not present significant vocal changes with aging⁹.

In this context, studies about the impact of choral singing in the voice of the elderly who are beginners in singing revealed decrease of vocal complaints e difficulties during singing, and also verified increase of the vocal range^{4,5}. However, elderly singers who never received proper training can present vocal alterations common with aging¹⁶.

The purpose of this study was to investigate the self-perception, difficulties and the presence of negative symptoms after singing in amateur choir singers with different vocal classifications, ages and levels of experience.

■ METHOD

This prospective, cross-sectional study, counted with 125 members of five choirs conducted by the same professional, being 95 women and 30 men, aged between 18 and 77 years.

No exclusion criteria were used, since we sought to understand the characteristics and vocal difficulties of the members of these groups.

After signing the informed consent, the singers individually answered a partly written and partly multiple choice questionnaire, which addressed: 1. Identification data: age, time of singing experience, vocal classification (soprano, alto, tenor or bass); 2. Information regarding self-perception of the singing voice: regarding vocal quality – hoarse, breathy or normal, volume – too weak, too strong or adequate and timbre – clear, dark or neither; 3. Difficulties during singing: emission of high or low notes, *false* *setto*, *passaggio* to high and low notes, difficulties in the emission of *fortes* and *pianos*, difficulties related to vocal attacks and cuts (beginning and end of the part of a song), difficulties related to breathing and breath support, and no difficulties; 4. Presence or absence of vocal symptoms after singing: hoarseness, vocal fatigue, weakness; laryngo-pharyngeal discomfort, itchiness, pain or stinging in the laryngeal are, sensation of lump or tightness in the throat, strain in the neck area.

The singers were divided according to the vocal classification, age, and time of singing experience.

This work was submitted to the appraisal of the ethics committee of the Bauru School of Dentistry and was approved under process n^o 115/2005.

The answers of the questionnaires were charted and the comparison of the groups for each variable studied was performed using the Fisher's Exact Test, Qui-square Test, and Comparison of Proportion, with significance levels of 5%.

■ RESULTS

For a more didactic placement of results, the groups were divided according to the selected variables as follows:

- Vocal classification:
 - Sopranos: 59 singers
 - Altos: 36 singers
 - Tenors: 14 singers
 - Basses: 16 singers
- Age:
 - Group 1: 46 young adults ranging in age from 17 to 25 years
 - Group 2: 53 adults ranging in age from 26 to 49 years
 - Group 3: 26 middle-aged adults and elderly over 50 years of age
- Singing experience:
 - Group A: 64 singers with less than one year of experience
 - Group B: 17 singers with little experience, from 1 to 2.5 years

- Group C: 26 experienced singers, from 2.5 to 5 years
- Group D: 18 very experienced singers, over 5 years

The aspects investigated refer to the singer's vocal self-perception, their main difficulties practicing singing and to the presence of negative symptoms after singing.

Comparing the vocal classifications (Table 1), we observed that the altos present greater difficulties with high notes than sopranos ($p=0.001$) and that the basses have the same difficulty against tenors ($p=0.032$). The opposite also occurred for the female voices, as the sopranos referred greater difficulty in producing low notes than the altos ($p=0.007$). Moreover, the basses referred more difficulty with the transition of the low to the high register in comparison to tenors ($p=0.018$). Regarding the negative symptoms, the altos referred more vocal fatigue after singing than sopranos ($p=0.021$).

Table 1 – Vocal self-perception of the singing voice, singing difficulties and presence of negative symptoms after singing, comparing sopranos and altos, tenors and basses

Vocal self-perception	General	Sopranos	Altos	p	Tenors	Basses	p
Hoarse	6 (4,8%)	1 (1,7%)	1 (2,8%)	$p=1,000$	0 (0,0%)	4 (25,0%)	$p=0,102$
Breathy	21 (16,7%)	12 (20,0%)	4 (11,1%)	$p=0,396$	4 (28,6%)	1 (6,3%)	$p=0,157$
Too strong	5 (4,0%)	0 (0,00%)	3 (8,3%)	$p=0,049^*$	0 (0,0%)	2 (12,5%)	$p=0,485$
Adequate intensity	91 (72,2%)	44 (73,3%)	26 (72,2%)	$p=1,000$	12 (85,7%)	9 (56,3%)	$p=0,118$
Too weak	30 (23,8%)	15 (25,0%)	7 (19,4%)	$p=0,620$	2 (14,3%)	6 (37,5%)	$p=0,225$
Clear timbre	53 (42,1%)	25 (41,7%)	16 (44,4%)	$p=0,833$	7 (50,0%)	5 (31,3%)	$p=0,457$
Adequate timbre	71 (56,3%)	34 (56,7%)	20 (55,6%)	$p=1,000$	7 (50,0%)	10 (62,5%)	$p=0,713$
Dark timbre	3 (2,4%)	1 (1,7%)	0 (0,0%)	$p=1,000$	0 (0,0%)	2 (12,5%)	$p=0,485$
Singing difficulties	General	Sopranos	Altos	p	Tenors	Basses	p
High pitched notes	44 (34,9%)	12 (20,0%)	19 (52,8%)	$p=0,001^*$	3 (21,4%)	10 (62,5%)	$p=0,032^*$
Low pitched notes	24 (19,0%)	17 (28,3%)	2 (5,6%)	$p=0,007^*$	3 (21,4%)	2 (12,5%)	$p=0,642$
Falsetto	17 (13,5%)	10 (16,7%)	3 (8,3%)	$p=0,358$	3 (21,4%)	1 (6,3%)	$p=0,315$
Passaggio to high notes	29 (23,0%)	11 (18,3%)	12 (33,3%)	$p=0,137$	0 (0,0%)	6 (37,5%)	$p=,0185^*$
Passaggio to low notes	20 (15,8%)	13 (21,7%)	4 (11,1%)	$p=0,271$	2 (14,3%)	1 (6,3%)	$p=0,586$
Voice breaks	29 (23,0%)	14 (23,3%)	10 (27,8%)	$p=0,634$	2 (14,3%)	3 (18,8%)	$p=1,000$
Respiratory support	22 (17,5%)	15 (25,0%)	4 (11,1%)	$p=0,118$	1 (7,1%)	2 (12,5%)	$p=1,000$
Fortes	7 (5,5%)	3 (5,0%)	0 (0,0%)	$p=0,289$	3 (21,4%)	1 (6,3%)	$p=0,315$
Pianos	5 (4,0%)	4 (6,7%)	1 (2,8%)	$p=0,647$	0 (0,0%)	0 (0,0%)	-
Attacks and cuts	6 (4,8%)	3 (5,0%)	0 (0,0%)	$p=0,289$	1 (7,1%)	2 (12,5%)	$p=1,000$
Breathing	55 (43,6%)	31 (51,7%)	16 (44,4%)	$p=0,532$	4 (28,6%)	4(25,0%)	$p=1,000$
None	21 (16,7%)	8 (13,3%)	5 (13,9%)	$p=0,999$	4 (28,6%)	4 (25,0%)	$p=1,000$
Negative symptoms	General	Sopranos	Altos	p	Tenors	Basses	p
Laryngopharyngeal discomfort	71 (56,3%)	37 (61,6%)	16 (44,4%)	$p=0,100$	11 (78,6%)	7 (43,7%)	$p=0,052$
Hoarseness	44 (34,9%)	19 (31,6%)	14 (38,9%)	$p=0,470$	4 (28,6%)	7 (43,7%)	$p=0,3894$
Vocal fatigue	51 (41,3%)	19 (31,6%)	20 (55,5%)	$p=0,021^*$	5 (35,7%)	6 (37,5%)	$p=0,919$
Vocal weakness	20 (15,9%)	8 (13,33%)	6 (16,7%)	$p=0,654$	2 (14,3%)	4 (25%)	$p=0,464$

Fisher's exact test ($p<0.05$)

Regarding age (Table 2), we observed that young adults and adults refer more breathiness than the elderly ($p=0,014$). The adults refer better vocal intensity ($p=0,01$) and clear timbre ($p=0,23$) than young adults. Likewise, a significant higher number

of young adults considered their timbre as adequate in comparison to the adults ($p=0,28$). As to the difficulties during singing and symptoms after singing, there were no statistically differences between the groups.

Table 2. Vocal self-perception of the singing voice, singing difficulties and presence of negative symptoms after singing comparing the young adults, (Group 1), adults (Group 2) and elderly (Group 3)

Vocal self-perception	Group 1	Group 2	Group 3	p
Hoarse	4 (8,69%)	2 (3,77%)	0 (0,00%)	$p=0,227$
Breathy	12 (26,08%)	8 (15,09%)	1 (3,84%)	$p=0,014$ *G1xG3/G2xG3
Too strong	2 (4,34%)	3 (5,66%)	0 (0,00%)	$P=0,447$
Adequate intensity	30 (65,21%)	48 (90,56%)	20 (76,92%)	$p=0,01$ *G1xG2
Too weak	14 (30,43%)	10 (18,86%)	6 (23,07%)	$p=0,402$
Clear timbre	12 (26,08%)	28 (52,83%)	12 (46,15%)	$p=0,023$ *G1xG2
Adequate timbre	33 (71,73%)	24 (45,28%)	14 (53,8%)	$p=0,028$ *G1xG2
Dark timbre	2 (4,34%)	1 (1,88%)	0 (0,00%)	$p=0,486$
Singing difficulties	Group 1	Group 2	Group 3	p
High pitched notes	16 (34,78%)	21 (39,62%)	7 (26,92%)	$p=0,538$
Low pitched notes	12 (26,08%)	10 (18,86%)	2 (7,79%)	$p=0,163$
Falsetto	9 (19,56%)	8 (15,09%)	0 (0,00%)	$p=0,055$
Passaggio to high notes	14 (30,43%)	9 (16,98%)	6 (23,07%)	$p=0,286$
Passaggio to low notes	9 (19,56%)	10 (18,86%)	0 (0,00%)	$p=0,052$
Voice breaks	13 (28,26%)	9 (16,98%)	7 (26,92%)	$p=0,365$
Respiratory support	7 (15,21%)	10 (18,86%)	5 (19,23%)	$p=0,866$
Fortes	3 (6,62%)	4 (7,74%)	0 (0,00%)	$p=0,368$
Pianos	1 (2,17%)	3 (5,66%)	1 (3,84%)	$p=0,676$
Attacks and cuts	3 (6,52%)	2 (3,77%)	1 (3,84%)	$p=0,790$
Breathing	21 (45,65%)	19 (35,84%)	14 (53,8%)	$p=0,289$
None	7 (15,21%)	6 (11,32%)	8 (30,76%)	$p=0,088$
Negative symptoms	Group 1	Group 2	Group 3	p
Laryngopharyngeal discomfort	29 (63,04%)	31 (37,73%)	12 (46,15%)	$p=0,373$
Hoarseness	19 (41,30%)	20 (37,53%)	5 (19,23%)	$p=0,149$
Vocal fatigue	21 (45,65%)	22 (41,51%)	9 (34,61%)	$p=0,660$
Vocal weakness	10 (21,74%)	7 (13,20%)	3 (11,54%)	$p=0,402$

Chi-squared test and three-sample comparison of proportions ($p<0,05$)

Finally, regarding singing experience (Table 3), we observed that the less experienced singers have more perception of hoarseness than more experienced ones ($p=0,04$). There were no statistically significant differences regarding difficulties in

singing. The more experienced singers reported adequate vocal intensity in greater number than the others ($p=0,028$). The less experienced singers also reported also greater occurrence of hoarseness after singing than the experienced singers ($p=0,035$).

Table 3 - Vocal self-perception of the singing voice, singing difficulties and presence of negative symptoms after singing comparing inexperienced singers (Group A), singers with little experience (Group B), experienced (Group C) and very experienced singers (Group D)

Vocal self-perception	Group A	Group B	Group C	Group D	p
Hoarse	3 (4,76%)	3 (17,65%)	0 (0,00%)	0 (0,00%)	p=0,040*
Breathy	14 (22,22%)	1 (5,88%)	4 (15,38%)	1 (5,56%)	p=0,208
Too strong	3 (4,76%)	2 (11,76%)	0 (0,00%)	0 (0,00%)	p=0,207
Adequate intensity	42 (66,67%)	10 (58,82%)	22 (84,62%)	17 (94,44%)	p=0,028*
Too weak	18 (28,57%)	6 (35,29%)	5 (19,23%)	1 (5,56%)	p=0,135
Clear timbre	24 (38,10%)	4 (23,53%)	11 (42,31%)	12 (66,67%)	p=0,063
Adequate timbre	37 (58,73%)	13 (76,47%)	15 (57,69%)	6 (33,33%)	p=0,077
Dark timbre	2 (3,17%)	0 (0,00%)	0 (0,00%)	1 (5,56%)	p=0,579
Singing difficulties	Group A	Group B	Group C	Group D	p
High pitched notes	21 (33,33%)	6 (35,29%)	12 (46,15%)	5 (27,78%)	p=0,596
Low pitched notes	12 (19,05%)	4 (23,53%)	4 (15,38%)	3 (16,67%)	p=0,918
Falsetto	10 (15,87%)	2 (11,76%)	3 (11,54%)	2 (11,11%)	p=0,916
Passaggio to high notes	14 (22,22%)	6 (35,29%)	8 (30,77%)	1 (5,56%)	p=0,146
Passaggio to low notes	7 (11,11%)	5 (29,41%)	5 (19,23%)	2 (11,11%)	p=0,259
Voice breaks	12 (19,05%)	6 (35,29%)	7 (26,92%)	4 (22,22%)	p=0,531
Respiratory support	15 (23,81%)	0 (0,00%)	3 (11,54%)	4 (22,22%)	p=0,103
Fortes	4 (6,35%)	1 (5,88%)	1 (3,85%)	1 (5,56%)	p=0,975
Pianos	3 (4,76%)	0 (0,00%)	2 (7,69%)	0 (0,00%)	p=0,483
Attacks and cuts	2 (3,17%)	0 (0,00%)	3 (11,54%)	1 (5,56%)	p=0,289
Breathing	29 (46,03%)	6 (35,29%)	1 (46,15%)	6 (33,33%)	p=0,817
None	11 (17,46%)	4 (23,53%)	3 (11,54%)	3 (16,67%)	P=0,783
Negative symptoms	Group A	Group B	Group C	Group D	p
Laryngopharyngeal discomfort	43 (68,25%)	7 (41,18%)	12 (46,15%)	8 (30,77%)	p=0,061
Hoarseness	25 (39,70%)	8 (47,05%)	10 (38,46%)	1 (3,85%)	p=0,035 *GAXGD/GBXGD
Vocal fatigue	27 (42,86%)	5 (29,41%)	12 (46,15%)	7 (26,92%)	p=0,717
Vocal weakness	12 (19,04%)	4 (23,52%)	2 (7,69%)	2 (7,69%)	p=0,425

Chi-squared test and four-sample comparison of proportions (p<0.05)

■ DISCUSSION

As in this study, researchers^{2,20,21} found several complaints of various natures in professional singers.

Regarding age, we observed that the elderly present lower occurrence of complaints of breathiness in the singing voice than the younger individuals. This finding goes against literature that describes the ontogenetic development of the voice and its effect on vocal characteristics^{17,22,23}. However, we observed that the average years of choir experience was higher among the elderly, followed by young adults and adults, which shows that the older group is also more experienced and that the younger participants are those who have less choral experience.

If this is taken into consideration, this finding is in agreement with the literature that states that trained voices have less chances of developing negative signs and symptoms^{3-5,16,18,24}.

A greater number inexperienced singers and singers with little experience referred hoarseness,

and none the experienced singers reported this symptom. Likewise, the most experienced singers referred better intensity control for singing. The literature states that trained voices²⁵ have decreased risks of presenting alterations^{13,26,27}. Therefore, the negative self-perception is more common in younger singers. The more experienced singers referred significantly higher positive self-perception, such as adequate intensity than the less experienced singers.

We did not find significant data regarding the difficulties during singing considering age and experience, suggesting that these difficulties are related to the vocal classification. The findings related to the difficulties in reaching high or low notes evidence the purpose of each vocal type. In other words, sopranos and tenors sing predominantly in higher keys and altos and basses sing predominantly in lower keys. The difficulties with the *passaggio* to high notes, referred by the basses suggest that the vocal equalization during the *passaggio* is tricky²⁸. The basses already present reduced range for high notes, which can hamper

the coordination of the laryngeal muscles, where the activity of the cricoarytenoid muscle should surpass the activity of the thyroarytenoid muscle.

In the analysis of negative symptoms after singing, we observed statistically significant index of vocal fatigue in altos in comparison to the sopranos. These findings contradict the data of a similar study²⁹, which found higher index of vocal fatigue in sopranos than in altos. The researchers stated that the causes and the context of the vocal fatigue may be the incorrect vocal use in singing high notes in high intensities³⁰, which favors more vocal fatigue in sopranos, which is the contrary of our finding. We did not observe differences of this nature in the comparison of the groups by age. However, most of the complaints came from the young adults, followed by the adults and the elderly, respectively. The groups of inexperienced singers or singers with little experience presented high occurrence of hoarseness after singing in comparison to the more experienced singers. This way, we reinforce that long term vocal training is a determinant factor for the maintenance of a healthy voice^{3-5,13,16,18,24,25}.

The performance of further studies involving choir singers can evaluate whether the quality of voice of these singers is consistent with the vocal complaints reported. Moreover, the familiarity with the vocal features of choir singers can offer important information to the conductor, who can adjust the vocal techniques, redirecting them to the singer's difficulties, and collaborating with a better performance of the singing voice and with the singer's vocal health.

■ CONCLUSION

The difficulties found in signing are related to the vocal classification, and do not depend on age or experience. Symptoms such as vocal fatigue are related to the vocal classification and to the level of singing experience. The group of inexperienced singers presented greater occurrence of hoarseness after singing. The negative self-perception is also related to the vocal classification and level of experience and the positive self-perception is more common in experienced singers.

RESUMO

Objetivo: conhecer a auto-imagem, dificuldades e presença de sintomas negativos após o canto em coralistas amadores com diferentes classificações vocais, idades e experiência. **Método:** cento e vinte e cinco cantores responderam a um questionário que abordou dados de identificação, informações sobre a auto-imagem da voz cantada, dificuldades apresentadas no canto e ocorrência ou não de sintomas vocais após o canto. **Resultados:** a comparação por naipes evidenciou maior dificuldade na emissão de sons agudos para os contraltos e baixos, maior dificuldade na emissão graves para os sopranos, maior dificuldade na transição de registro grave para agudo para os baixos, e maior cansaço vocal para os contraltos. Na divisão por idade, tanto adultos jovens e adultos referiram maior sopro do que os idosos. Os adultos referiram melhor intensidade vocal do que adultos jovens. Os adultos jovens consideraram seu timbre de voz adequado mais frequentemente do que adultos. Em relação à experiência, os cantores menos experientes referiram percepção de voz rouca em maior número do que os cantores mais experientes, que referiram apresentar intensidade adequada durante o canto em maior número do que os demais. Cantores menos experientes referiram maior ocorrência de rouquidão após o canto do que cantores mais experientes. **Conclusão:** as dificuldades encontradas no canto estão atreladas ao naipe, e não dependem da idade e nem da experiência. Sintomas estão relacionados ao naipe e ao grau de experiência com o canto. A auto-imagem vocal negativa também está relacionada ao naipe e ao nível de experiência, sendo que a auto-imagem positiva é mais comum em cantores experientes.

DESCRIPTORIOS: Voz; Distúrbios da Voz; Música

■ REFERENCES

1. Fernandes A, Kayama A, Östergren E. O regente moderno e a construção da sonoridade coral [The modern conductor and today's choral practice: sonority and technique]. In: *Per Musi*. Belo Horizonte: UFGM (Programa de Pós-Graduação em Música). 2006;(13):33-51.
2. Ribeiro LR, Hanayama EM. Perfil vocal de coralistas amadores. *Rev CEFAC*. 2005;7(2):252-66.
3. Sorrel JA, Sorrel LM. Music as a Healing Art for older Adults. *J Psychosoc Nurs*. 2008;46(3):21-4.
4. Cassol M, Bos AJG. Canto coral melhora sintomas vocais em idosos saudáveis. *Ver Brás de Ciên do Envelh Hum*. 2006;3(2):113-22.
5. Rocha TF, Amaral FP, Hanayama EM. Extensão vocal de idosos coralistas e não coralistas. *Rev CEFAC*. 2007;9(2):248-54.
6. Perry BE. Health information-seeking behaviors among classically trained singers. *J Voice*. 2012;26(3):330-5. [epub ahead of print].
7. McCrea CR, Morris RJ. Effects of Vocal Training and Phonatory Task on Voice Onset Time. *J Voice*. 2007;21(1):54-63.
8. Phyland DJ, Oates J, Greenwood KM. Self-reported voice problems among three groups of professional singers. *J Voice*. 1999;13(4):602-11.
9. Cunha AL. A oficina coral como atividade de apoio ao coro amador. *Dissertação (Mestrado) – Escola de Comunicação e Artes, Universidade de São Paulo, São Paulo*. 1999; 129p.
10. McKinney J. The singing/acting young adult from a singing instruction perspective. *J Voice*. 1997;11(2):153-5.
11. Emerich KA, Sataloff RT. Chronic Fatigue Syndrome in Singers. In: Sataloff RT. *Professional Voice: the science and art of clinical care*, 2ed. San Diego: Singular; 1997. p. 447-51.
12. Mang E. Effects of Musical Experience on Singing Achievement. *Bulletin of the Council for Research in Music Education*. 2007;174:75-92.
13. Braun-Janzen C, Zeine L. Singers Interest and Knowledge Level of Vocal Function and Dysfunction: survey findings. *J Voice*. 2009;23(4):470-83.
14. Cohen SM, Jacobson BH, Garrett CG, Noordzij JP, Stewart MG, Attia A, et al. Creation and validation of the singing voice handicap index *Ann Otol Rhinol Laryngol*. 2007;116(6):402-6.
15. Spiegel JR, Sataloff RT, Emerich KA. The Young Adult Voice. *J Voice*. 1997; 11(2):138-43.
16. Boone D. The singing voice in the mature adult. *J Voice*. 1997;11(2):161-4.
17. Takano S, Kimura M, Nito T, Imagawa H, Sakakibara K, Tayama N. Clinical analysis of prebylarynx – vocal fold atrophy in elderly individuals. *Auris Nasus Larynx*. 2009; doi:10.1016/j.anl.2009.11.013.
18. Sataloff RT, Roses DC, Hawkshaw M, Spiegel JR. The aging adult voice. *J Voice*. 1997;11(2):156-60.
19. Heman-Ackah YD, Dean CM, Sataloff RT. Stroboscoped laryngoscopic findings in singing teachers. *J Voice*. 2002;16(1):81-6.
20. Prakup B. Acoustic measures of the voices of older singers and nonsingers. *J Voice*. 2012;26(3):341-50. [epub ahead of print].
21. Schmid-Tatzreiter E, Schmid R. Interdisciplinary voice examination (screening) for (choir) singers at the Salzburger Sanger Service-tag 2003. *Logoped Phoniater Vocol*. 2004Apr;(29):92-6.
22. Brasolotto A, Pontes P, Behlau M. Glottic characteristics and voice complaint in the elderly. *J Voice*. 2005;19(1):84-94.
23. Behlau M, Azevedo R, Pontes P. Conceito de voz normal e classificação das disfonias. In: *Voz: O livro do especialista*. Volume I. Rio de Janeiro: Revinter; 2001. p. 53-73.
24. Cohen S, Noordzij J, Garrett G, Ossoff RH. Factors associated with perception of singing. *Otolaryngol Head Neck Surg*. 2008;138(4):430-4.
25. Fuchs M, Meuret S, Thiel S, Taschner R, Dietz A, Gelbrich G. Influence of singing activity, age and sex on voice performance parameters, on subjects' perception and use of their voi in childhood and adolescence. *J Voice*. 2009;23(2):182-9.
26. Siupsinskiene N, Lycke H. Effects of vocal training on singing and speaking voice characteristics in vocally healthy adults and children based on choral and nonchoral data. *J Voice*. 2011;25(4):e177-89.
27. Awan SN, Ensslen AJ. A comparison of trained and untrained vocalists on the Dysphonia Severity Index. *J Voice*. 2010;24(6):661-6.
28. Neumann K, Schunda P, Hoth B, Euler HA. The interplay between glottis and vocal tract during the male passaggio. *Folia Phoniater Logo*. 2005;57(5-6):308-27.
29. Tepe E, Deutsch E, Sampson Q, Lawless S, Reilly J, Sataloff R. A pilot survey of vocal health in young singers. *J Voice*. 2002;16(2):244-50.
30. Kitch JA, Oates J. The perceptual features of vocal fatigue as self-reported by a group of actors and singers. *J Voice*. 1994;8(3):207-14.

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